



# Living and Learning on Organic Farms

*Your introduction to learning as a  
volunteer on an organic farm*

March 2016



LLOOF

LIVING AND LEARNING ON ORGANIC FARMS

# Living and Learning on Organic Farms (LLOOF) Guide

## *Your introduction to learning as a volunteer on an organic farm*

September 2016



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## WWOOF UK

World Wide Opportunities on Organic Farms



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Erasmus+

## Introduction

The LLOOF Learning Guide - A free downloadable learning guide about organic food production, entrepreneurship, volunteering and cultural exchange on farm enterprises.

This free downloadable guide is for anyone who wants to learn more about growing food organically and living more sustainably – an extension to the hands-on practical experience of volunteering, supported by experienced host farmers.

It is mainly written for the 30,000 or so adults (mainly under 30 years old) who volunteer each year to live and learn on organic farms and smallholdings across Europe. Farm volunteering is practical learning in an informal situation, undertaken in a hands on way. It aims to complement the volunteer's practical residential work experience and informal one-to-one learning offered by host farms in different European countries. It is for these farm volunteers before, during or after their visit to a host organic farm or smallholding. They may want to learn about sustainable diets and lifestyles, more formally about organic food production, or as potential food producers or processors.

The guide focuses on the practical skills of organic food production (eg. making compost, saving seed, managing pests) that volunteers may be able to experience on a host farm or smallholding. However these skills are dependent on the particular local resources, conditions, cultures and, most importantly the experience and interests of the farm host. So this guide will only complement the practical volunteering experience and informal one-to-one learning offered by the host farms.

It introduces the farm volunteers to eleven basic topics ranging from working with hand tools, other people and healthy soil to growing organic crops, rearing organic livestock, and possibly setting up their own starter enterprise. Each topic of 5 to 8 pages is only presented as text but has many weblinks to other sites and videos, rather like Wikipedia. The text and weblinks are also the basis of the LLOOF website [www.lloof.eu](http://www.lloof.eu), which is more pictorial, collaborative and interactive.

The main sections for each topic include Introduction, Background (basic information, approaches and principles), Practice (the practical aspects on the farm), and Across Europe (the wide variety of farming). These are followed by a section on what WWOOF can offer to volunteers and then weblinks to a wide range of Organisations, Networks and Links. The Hands on section, in italic text, gives simple, short activities that could be done on the host farm by the volunteer. Lastly a range of practical skills are included in the Competencies section.

The ten partner organisations are all part of the European WWOOF Network (World Wide Opportunities on Organic Farms) and are based in Germany, Italy, Norway, Serbia, Czech Republic, Hungary, Ireland, Spain, Turkey, and the UK.

**WWOOF** – Worldwide Opportunities on Organic Farms - is the largest and one of the oldest exchange schemes for young farmers in Europe and has been continually expanding over the last 40 years. WWOOF, first established in the early 1970's, is now a worldwide movement linking volunteers with farmers and growers to promote cultural and educational experiences based on trust and non-monetary exchanges, helping to build a sustainable global community.

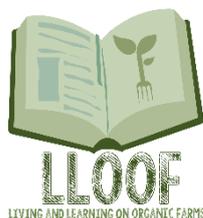
More information is available at:

LLOOF Youtube Channel: [www.youtube.com/lloof..](http://www.youtube.com/lloof..)

LLOOF e-learning Moodle site: [www.lloof.eu](http://www.lloof.eu) – accessible from mid-2016

Promotional site: [www.edvorg.weebly.com](http://www.edvorg.weebly.com) – accessible until mid-2016

Email: [info@lloof.eu](mailto:info@lloof.eu)



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## Managing soils and composts

### Introduction

Although soil may seem lifeless, it absolutely is not. It is considered to be the “skin of the earth”, with an extremely diverse living community of microbes and animals, which depend on organic matter, and everything on a field or in a garden depends on the health of this soil community. Have a look at [the soil food web](#) to get an idea about the life in and on the soil and at some of the videos listed below.

Whether we realise it or not, soil affects each of us in our everyday lives. Besides being fundamental to the production of our food and other agricultural products, the soil performs a wide range of functions that go beyond farming. It regulates water, sustains plant and animal life, recycles organic wastes, recycles nutrients, stores carbon, filters out pollutants, and serves as a physical support for structures.

### Farmers

Soil and water are fundamental elements in farming. How much land and water there is available, and the quality of the soil and water, are major factors that influence whether farms are productive or not. For farmers, understanding the functioning of the soils on their farms - and how to make the best use of the water available - forms the basis of their livelihoods.

### Organic farmers

Soils are a non-renewable resource on which 95% of our food supply depends. Short-sighted chemical fertiliser applications in conventional farming are depleting soils of organic matter at an alarming rate. Instead of using potent chemicals that degrade soil, organic farmers continuously give back to the soil, maintaining soil health and fertility for future generations.

Sustainable farming which builds organic matter in the soil can overcome all the threats to soil functioning - loss of nutrients and/or organic matter, desertification, climate change, soil sealing/ compaction, soil erosion, decline in biodiversity, contamination and pollution, and salinisation.

### Industrial farmers

In many parts of the developed world, industrial agriculture is based on large-scale monoculture, which can lead to degraded soils that need the application of synthesised fertilisers to be productive. It is worth remembering that the mismanagement of soils has destroyed civilisations. After the “American dust bowl” soil disaster of the 1930s, Franklin D. Roosevelt said that “A nation that destroys its soils, destroys itself.”

### Background

“Feed the soil to feed the plant” is a basic principle of organic farming and gardening. Healthy food comes from healthy soil. It is not only about food, the health of soil is directly related to the wellbeing of the entire ecosystem.

Certain principles about soil and water systems are common to all farms – such as how nutrient cycles (of Carbon, Nitrogen and Phosphorus). Soils play a crucial role in a number of life-sustaining natural biological and chemical cycles. Soil stores, moderates the release of, and transforms nutrients and other elements, often into forms that are more available to plants. The most well-known and important biogeochemical cycles include the carbon cycle, the nitrogen cycle, the oxygen cycle, the phosphorus cycle, the sulphur cycle, the water cycle and the mineral cycle. These substances are continuously recycled between the soil and plants, geological deposits, groundwater and the atmosphere. The intensity of these bio-geochemical exchanges (fluxes) varies from place to place and is regulated by soil characteristics, land use and climate. Decomposition and transformations by soil organisms (mostly at microscopic scales) are at the core of most nutrient cycles.

### Soil food webs

More than 25% of all living species are found in the soil. The total weight of soil organisms often equals or exceeds the above ground visible biomass. A few hundred grammes of fertile soil can contain billions of bacteria, kilometres of fungal hyphae, tens of thousands of protozoa, thousands of nematodes, several hundred insects, arachnids and worms, and hundreds of metres of plant roots. The biota turns the soil into a biological engine. Living organisms are involved in most of the key soil functions, driving fundamental nutrient cycling processes, regulating plant communities, degrading pollutants and stabilising soil structure. In addition, soil supports above ground ecosystems and biodiversity.



## Structure

- Although they vary greatly from place to place, all soils include five different basic components that are essential to life:
- Organic matter - non-living material coming from decaying plants and animals. Organic matter usually takes up only a small proportion (usually between 1 to 6 percent) of the soil. The quality of the soil's organic matter has a fundamentally important impact on plant growth.
- Soil organisms - the living and largely invisible part of the soil, made up of soil microorganisms such as bacteria and fungi, as well as soil animals such as worms and insects. This biota forms a complex food web.
- Soil minerals - these take up about half of the soil volume. The mineral elements exist as different-sized soil particles, classified (from large to small size) as sand, silt and clay, of which clay has the greatest capacity to hold nutrients.
- Water - the amount of water or moisture present in soils varies greatly between soil systems and also over time, but on average it takes up about a quarter of soil volume. The capacity of soils to retain moisture also varies but greatly determines farm productivity.
- Air - this contains oxygen, hydrogen, nitrogen and carbon in gaseous forms. These are essential for plant growth.

## Climate change

While climate is a recognised soil-forming factor, most people are unaware of the impact of soils on global climates. Soil plays a key role in the Earth's carbon cycle and, therefore, is an important factor in global climate models. Soil is the largest terrestrial source of organic carbon - well above the combined total of carbon stored in the atmosphere and in plants. Carbon is taken out of the atmosphere by plant photosynthesis, and some is incorporated into various types of soil organic matter such as surface litter, roots, and plant or microbial exudates. The thawing of organic-rich permafrost soils could lead to significant natural emissions of methane - a major greenhouse gas.

## Compost

Compost is the key to organic farming. It is a mixture of decaying organic matter, such as leaves and manure, used to improve soil structure and provide nutrients. Composting is a biological, chemical and physical process that transforms coarse organic material to a homogeneous, stable end product by aerobic decomposition. Any addition of organic matter to soils, e.g. by mulching (covering over the soil), will result in compost but the quality will vary. All compost adds humus to the soil. Humus improves water retention, binds and releases nutrients for plants, and improves soil structure. If hot compost is made using nutrient rich materials, compost can also be a fertiliser.

Large-scale farm composting includes turned or passively-aerated wind-rows (long narrow piles), aerated static piles, bin composting, and various systems for aerating the compost. See [large-scale composting](#).

## Biochar

Biochar is charcoal that is used as a soil conditioner. It is produced by heating wood and organic materials with limited oxygen – pyrolysis. It has a large surface and porosity so can hold water, nutrients and microbes, increasing soil fertility. It can act as a carbon sink by sequestering carbon in the soil for a long time reducing greenhouse gases – carbon sequestration. It can also reduce eutrophication by holding nitrogen. It has been used in forested areas of Sweden for many years as well as by Amazon Indians as Terra preta.

## Practice

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### Soil structure and fertility

#### *Hands on*

*Try some simple and quick soil tests:*

- [A soil stability test](#)
- [A smell test](#)
- Use a chemical soil test to check the levels of nitrogen (N), phosphorus (P) and potassium (K).*

See [Testing soil and improving fertility](#).

- ☑ Use a pH meter to check the acidity or alkalinity of the soil.
- ☑ Dig a soil pit to show the soil profile. Look at the different colours and structures of the layers (or horizons).
- ☑ Compare the colour, stoniness and structure of organically and non-organically (synthetically) farmed soil.

Try some [practical activities and experiments with soil and nitrogen](#) including 1) growing soil microbes 2) clover and nitrogen fixation 3) nitrification and denitrification 4) nutrient pollution 5) testing water for nitrate 6) visual soil assessment.

- ☑ Sieve farm or garden soil or compost to see the range of living organisms.
- ☑ Compare the number of earthworms extracted from organically and non-organically (synthetically) farmed soil, by pouring a bucket of soapy water on a meter square.

## Composting

There is no single formula for composting. However there are certain requirements for good compost:

Greens – Nitrogen-rich wet materials -1 part

- Provide nutrients and moisture
- eg. Food scraps, grass, fresh manure, garden waste

Browns – Carbon-rich dry materials – 2-3 parts

- Aerate, prevent compaction, provide energy, absorb moisture
- eg. Brown leaves, straw, soiled paper, sawdust, woodchips
- The compost needs a balance of carbon-rich (brown) material and nitrogen-rich (green) material. A C:N ratio – or brown : green ratio- of 2 or 3:1 by bulk is good
- Smaller pieces decompose quicker
- Compost should be wet to the touch, but not soaking
- Turning the compost pile aerates and speeds up the process, by making it warmer and mixing material
- Minimum volume of compost pile is 1 m<sup>3</sup>
- 3 bays provide a long-term rotation of compost piles, with each pile moved onto soil after 6-9 months depending on the climate.

If there is not a large amounts of greens, a compost activator that is high in nitrogen can be used. These include comfrey leaves (extremely high in nitrogen), liquid fish fertilisers, and any animal manure. Human urine (diluted 1:4 in water, or collected in sawdust) is also high in nitrogen, as well as phosphorus – adding it to composts is better than flushing it away! However unless you know you can make good hot compost, it is best to avoid using pet and human manure.

### Hands on

- ☑ Take a handful of mature compost and check if it has a dark brown colour, consistent crumbly texture, temperature close to ambient temperature, greasy feel when squeezed, and earthy smell. All these can be considered as signs of finished compost. The finished compost should look and smell like dark rich soil.
- ☑ Look at how long different materials take to decompose, and how much a completed compost heap shrinks.
- ☑ Feel the temperature in different parts of the compost but be careful with heat from fresh compost!
- ☑ Look for decomposing organisms in cooler, older piles for colonies of visible filamentous bacteria (*Actinobacteria*), fungi (white threads and mould), mites, insects, brandling worms, earthworms, centipedes, millipedes, woodlice, spider etc. A sieve, torch, white tray and magnifying lens may help.
- ☑ Think about the waste stream from the house and kitchen, either by cataloguing it or estimating how much of this waste could be composted, or by asking the hosts about the waste management from the

house and farm.

- ☑ *Look out for common examples of natural decomposition of plants. Identify different compost source materials found around the farm or garden.*
- ☑ *Locate a part of the farm or garden that has some trees or shrubs and has not been raked or tilled for a year or so, an area with wood chips, or some other area with plant material that has been on the soil surface and has been relatively moist for over a month. Dig and look around in the plant litter on the ground. What is happening to the leaves and other plant parts that fall on the ground? How is it breaking down? What happens to it? Can plants benefit from this at all?*
- ☑ *Farmers can mimic nature and recycle dead plant material which can then be re-used on the farm.*
- ☑ *Walk around the farm and identify commonly found plant (and animal, if present) wastes.*

## Across Europe

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[Soils of the European Union](#)

[State of soil in Europe](#)

## WWOOF

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[WWOOF Hawaii's video library](#)

[Compost: I knew better](#)

## Organisations

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[Soil Association](#)

[List of European soil research organisations](#)

## Networks

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[The Community Composting Network, UK](#)

## Videos

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[The living soil \(8 mins.\)](#)

[A close-up of creatures living beneath the soil - Deep Down & Dirty: The Science of Soil - BBC Four \(2 mins.\)](#)

[What lies beneath?](#)

[The soil story \(4 mins.\)](#)

[Let's talk about soil, FAO \(5 mins.\)](#)

[What is soil, EEB \(2 mins.\)](#)

[Soil stories – The whole story \(30 mins.\)](#)

[No till farming \(22 mins.\)](#)

[Farm-based composting \(38 mins.\)](#)

[Dirt – The movie \(80 mins.\)](#)

[Better Save soil \(4 mins.\)](#)

[From potato to planet \(1 min.\)](#)

## Links

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[Soils](#)

[Living soil: A call to action](#)

[We are soil](#)

[Managing soil health](#)

[Making and using compost](#)

[Making and using compost – Garden scale demonstration and field scale operation – presentation](#)

[Building fertile soil](#)

[Master Composter](#)

[Cornell cooperative extension compost resources](#)

[Cornell Waste Management Institute – Composting](#)

[Composting at home](#)

[Learning AgriCultures – Insights from sustainable small-scale farming. Module 2 Soil and water systems](#)

[2015 International Year of Soils](#)

[Soil and Health Library](#)

[Agrodok 8 - The preparation and use of compost](#)

[Agrodok 2 – Soil fertility management](#)

[Biomass of soil organisms](#)

[Numbers of soil organisms](#)

[Soil properties](#)

Competencies – skills

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- Building a compost frame
- Making compost
- Adding to compost
- Making a soil stack
- Making, sieving wood compost
- Spreading compost
- Recognising compost organisms
- Recognising health
- Sterilising soil
- Making seed and potting compost
- Using mulches – wood chips, straw
- Making compost additives
- Composting manure
- Testing soil structure, fertility
- Liming soil

## Growing vegetables, fruits, nuts and herbs

### Introduction

Growing your own food is important to more and more people as they try a vegetarian or vegan lifestyle for the reason of food intolerance or to go for a low-impact lifestyle. Vegetables and fruit are full of healthy carbohydrates and vitamins. Nuts are rich in oil and proteins and can be stored easily. Herbs and wild foraged plants are also rich in medicinal and flavouring properties.

### Background

#### Growing vegetables

Some vegetables are perennials but most are annuals and biennials, usually harvested within a year of sowing or planting. Whatever system is used for growing crops, cultivation follows a similar pattern:

- preparation of the soil by loosening it, removing or burying weeds and adding organic manures or fertilizers
- sowing seeds or planting young plants
- tending the crop while it grows to reduce weed competition, control pests and provide sufficient water
- harvesting the crop when it is ready; sorting, storing and marketing the crop or eating it fresh from the ground.

#### Permaculture

Permaculture (permanent agriculture) is the conscious design and maintenance of agriculturally productive ecosystems which have the diversity, stability, and resilience of natural ecosystems. It has a set of agricultural and social design principles centred around simulating or directly using the patterns and features observed in natural ecosystems. It is the harmonious integration of landscape and people providing their food, energy, shelter, and other material and non-material needs in a sustainable way. The philosophy behind permaculture is one of working with, rather than against, nature; of protracted and thoughtful observation rather than protracted and thoughtless action.

The three core elements of permaculture are:

- Care for the Earth - Provision for all life systems to continue and multiply. This is the first principle, because without a healthy Earth humans cannot flourish.
- Care for the people - Provision for people to access those resources necessary for their existence.
- Return of surplus - Reinvesting surpluses back into the system in order to care for the Earth and people. This includes returning waste back into the system to recycle into usefulness. This is sometimes referred to as “Fair share” as each of us should take no more than we need and then reinvest the surplus.

#### Mixed cropping

Mixed cropping is growing of two or more crops simultaneously on the same piece of land. It is also known as multiple or multi-cropping. This type of cropping leads to an improvement in the fertility of the soil and hence increase in crop yield. When the two crops are properly chosen the products and refuse from one crop plant help in the growth of the other crop plant and vice-versa. Mixed cropping can also be an insurance against crop failure due to abnormal weather conditions. If one crop fails due to shortage of moisture or insufficient availability of nutrients, the other crop can cover the risk of complete failure.

#### Mulching

Many different materials (both organic and inorganic) can be used to cover the soil surface. Examples include wood or bark chippings, leaf mould, well-rotted farmyard manure, old carpet or plastic sheets. Mulching has many benefits - providing plant nutrients, holding moisture, killing weeds, forming a barrier against weed seed and insulating the roots and crowns of vulnerable plants from winter cold. The right time to mulch is depending on the plant species. The best time to mulch is in late-winter or early spring. This will trap in moisture from wet weather and ensure soil does not dry out quickly in the heat of summer.



## Crop rotation

The idea is simply to divide the growing area into sections for different types of crop. Every year the crop sections are rotated in the growing area, so that each crop section (with its own requirements, habits, pests and diseases) can have the advantage of new soil and microclimate. As a rule of thumb, crop rotation runs for at least three or four years. This is the number of years it takes for most soil-borne pests and diseases to decline to harmless levels. If the crops are divided into three or four groups, this means that each crop group will only grow on the same soil every three or four years. A traditional 4 course crop rotation is Legumes - Roots - Fruit - Leaves.

- Legumes: lentils, beans, peas
- Root vegetables: radish, carrot, potato, onion, garlic, shallots, beet, sweet potato
- Fruit-bearing: tomato, corn, cucumber, squash, pumpkin, eggplant
- Leafy greens: lettuce, salad leaf vegetables, spinach, chard, kale, cabbage, cauliflower, broccoli

However a permanent growing area can be used for perennial vegetables and fruit such as soft fruit, rhubarb, asparagus, horse radish and globe artichoke.

## Genetic diversity

Organic vegetable and fruit production is much about conserving old varieties. Every variety (or cultivar), old or new, has unique genetic attributes. This genetic diversity is important to conserve as it suits different soils and climates and provides future disease resistance. For example some of the old varieties have a natural resistance against apple scurf whilst new varieties like Braeburn and Gala are rather susceptible to this fungus and so are treated with pesticides. Different regions have local varieties which are adapted to the local climate. The aspect of regionalism is no longer important for modern varieties, as pests and diseases can be controlled by pesticides. Many organic farmers see it as their social duty to save the genetic potential of old varieties so that it stays available for future generations and as an insurance against future changing diseases and climates.

## Chestnuts

Chestnuts are grown as tall trees, up to 30m high. There are two types, marron and domestic chestnut. The marron, more a plant of the south of Europe, is grown for its nuts as they are large and sweet. Although chestnut trees need sun for growing their fruits they also need a cold winter. So they are normally grown on the colder northern slopes of hills in the Mediterranean climate.

Chestnuts should be de-husked once they have fallen to the ground and have been collected, as with walnuts. Otherwise the husk turns black and is difficult to shell. The nuts are spread out in a warm place to dry out, turning them two/ three times a week. When dry they can be packed in barrels or earthenware jars. Alternate layers of sand help to keep them stored for up to 6 months, provided that the storing place is cool, dry, frost-free and away from mice or squirrels. Once dried and cleaned of their shells chestnuts can be grounded. Chestnut flour is mostly used for cakes and cookies, but it can also be mixed with wheat flour during the preparation of bread or pasta. It is possible to preserve fresh chestnuts keeping them in water for 7-10 days. Afterwards it is necessary to dry them for a few days and then they can be stored for a few months in a cool and dry place. In this way chestnuts remain fresh and can be used as normally (roasted or boiled).

## Hazelnuts

Wild hazel trees have rather small nuts but there are many cultivated varieties with larger cobnuts. Valuable truffle fungi can be cultivated in hazelnut plantations as a secondary crop. Hazelnuts can be processed as roasted nuts and nut-cream and even hazelnut milk.

## Walnuts

Walnut trees grow slowly but reach a height of more than 30 metres. It takes up to 15 years until they start providing nuts, unless scions are grafted onto rootstocks. Walnut trees stand alone as no other plants flourish under their spreading crown. Insects also avoid the trees. Oil can be extracted by grinding and pressing. Nut residue can be used for sauces, cakes, biscuits or pastry. Nuts that are harvested in a green condition are good for making liquor.

## Herbs

There are a huge range of culinary, medicinal or ornamental herbs. Annual herbs like coriander are sown each year usually in the spring. Perennial herbs like sage and rosemary can be propagated by soft shoot cuttings. Other perennial herbs like the mints can be propagated by dividing the roots. Many herbs originate from the Mediterranean, growing on dry rocky slopes in poor soil and with xerophytic, or drought tolerant, leaves. However they may still need to be watered in hot dry summers. Enriching the soil with compost would only stimulate the growth of the leaves, while the flavouring substances would be unaffected. Many wild plants can be used as culinary or medicinal herbs but obviously some may be poisonous unless carefully identified. So good plant identification is vital for wild plant foraging.

## Practice

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### *Hands on*

*Look at the range of vegetables and fruit grown on the farm and check out the guidance on the simple grow your own cards that cover Vegetables, Edible Flowers, Fruit, Herbs and Green Manures.*

*[See Growing Cards](#)*

## Vegetables

*In the summer and autumn save seed of different vegetables to clean and store in recycled envelopes and sow in the spring either in rows of a single crop variety or mixed crop varieties of the same vegetable, or broadcast in a block. It is interesting to compare the different ways of sowing seed but record your results for the next growing season. Buy different varieties of dried beans from a market stall and sow and compare them in the same way as above. Look at and research the different sources of seed, growing material and growing media used on the farm.*

*See [Organic Gardening Guidelines - Part 3](#)*

## Mulching

*Make sure the site is clear of weeds and the soil is moist. Water if necessary as it's difficult to wet dry soil through a layer of mulch. Fill up a wheelbarrow with your chosen mulch and spread a 5cm layer around plants or across the soil with a spade, leaving a little gap around the stems of plants. Rake to a level finish.*

## Fruit trees and orchards

*In the winter learn how to graft a scion onto a rootstock of a fruit or nut tree like apple or walnut. Or graft a scion of one variety of apple onto a branch of a different variety of apple tree, making a family tree. Also in the winter either plant fruit trees or prune certain fruit trees like apple.*

*See [Orchard practical guides](#)*

## Herbs

*Try propagating some herbs from those in the farm garden. eg. In the autumn collect and sow seeds of basil, parsley and coriander; throughout the year take softwood cuttings of sage, mint and rosemary; throughout the year divide the roots of marjoram and chives.*

*See [Easy herbs to grow](#)*

## Across Europe

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Fruit and vegetable production is most common in the southern and Mediterranean countries of Europe. It is about a quarter of the total agricultural output of Spain, Italy and Romania and more than a third of the output in Greece, Cyprus, Malta and Portugal. In the EU production is just 10% for vegetables and 7% for fruit of the total agricultural output.

See [Seasonal calendar for vegetables and fruit across Northern and Western Europe](#)

## WWOOF

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Find a WWOOF host farm where there is a good sized market garden growing a variety of vegetables, fruit, nuts and herbs throughout the year in a variety of ways eg. in polytunnels, raised beds, with both row and block planting. Countries in the south of Europe are likely to have the greatest variety of crops throughout the year. Choose to visit in the season of clearing and preparing the ground, growing, cultivating or harvesting. There are interesting tasks and skills to learn in all seasons.

## Organisations

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[Garden Organic](#)

[Seed Savers Exchange – garden planner](#)

## Networks

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[World Permaculture Network](#)

## Videos

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[Permaculture by Geoff Lawton \(4 mins.\)](#)

[BBC Mud, Sweat and Tractors - The Story of Agriculture 2 – fruit and vegetables \(60 mins.\)](#)

## Links

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[Organic Gardening Guidelines](#)

[Edible Backyard](#)

[Market Gardening - A start-up guide](#)

[The sustainable organic gardening guide for self-sufficient people](#)

[Farming the woods - A website dedicated to forest gardening](#)

[Orchard practical guides](#)

## Competencies – skills

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- Sowing seed – rows, broadcast
- Saving seed
- Storing seed
- Stratifying seed
- Protecting seedlings – cloches
- Erecting polytunnel
- Pricking out, potting on
- Hardening off seedlings
- Making, using a cold frame
- Making, using a hot bed
- Measuring weather – temp, rainfall, humidity
- Watering, irrigating
- Taking cuttings – root, stem
- Taking cuttings – hardwood, softwood
- Grafting – fruit trees
- Pruning – fruit trees and shrubs
- Layering – runners, stools
- Recognising ill health – virus, water
- Making, using a propagating frame
- Growing Artichokes
- Growing Aubergines
- Growing Beetroot
- Growing Beans
- Growing Cabbages
- Growing Potatoes
- Growing Carrots
- Growing Tomatoes
- Growing Turnips, Swedes
- Growing Celery
- Growing Salad leaves
- Growing Onions
- Growing Leeks
- Growing Garlic
- Growing Marrows, Courgettes
- Growing Squashes, Pumpkins
- Growing Melons
- Growing Parsnips

- Growing Peas
- Growing Chilli peppers
- Growing Peppers
- Growing Maize
- Growing Culinary herbs
- Growing Medicinal herbs
- Growing Apples
- Growing Pears
- Growing Apricots, Peaches
- Growing Plums
- Growing Cherries
- Growing Currants – black, red, white
- Growing Figs
- Growing Grapes
- Growing Gooseberries
- Growing Raspberries
- Growing Strawberries
- Growing Hazelnuts – cobs
- Growing Sweet Chestnuts
- Growing Walnuts

## Managing grassland, including weeds and boundaries

### Introduction

Grassland is land covered by vegetation dominated by grasses, with little or no tree cover. UNESCO defines it as “land covered with herbaceous plants with less than 10 percent tree and shrub cover.” The vegetation, mainly of different grass species, remains dominant in a particular grassland usually due to grazing, cutting, or natural or man-made fires, otherwise shrub and tree seedlings colonise the grassland as part of ecological succession. However, changes in agricultural practices and land use pressures mean that grasslands are disappearing at an alarming rate and are nowadays among Europe’s most threatened ecosystems.

Some of the world's largest expanses of grassland are maintained by wild herbivores as well as by nomadic pastoralists and their cattle, sheep, horses or goats. Much grassland in north-west Europe developed after the Neolithic Period, when people gradually cleared the forest to create areas for raising their livestock.

Grassland ecosystems hold an important part of Europe’s biodiversity. They offer ideal conditions for a vast diversity of habitats and species, and are especially important for birds and invertebrates, providing vital breeding grounds. Grasslands are also the source of a wide range of public goods and services, ranging from meat and dairy products to recreational and tourism opportunities. In addition, they act as carbon sinks and are therefore a vital asset in the effort to reduce levels of greenhouse gases.

Above all, grasslands are used for the production of domestic livestock. From cattle, sheep and goat herds, to horses and water buffalo, grasslands support large numbers of domestic animals, which become the source of meat, milk, wool, and leather products for humans.

### Background

#### Grasses

Grasses are edible and we can eat them, either directly or indirectly. Poaceae, the botanical grass family, are monocotyledonous flowering plants with more than 10,000 domesticated and wild species - the fifth largest plant family. It includes rice, wheat, barley, oats, millet, bamboo and maize as well as what is commonly called grass. Most grasses are very palatable to livestock. In fact it is their survival tactic.

The species mixture in any grassland is adaptable – it can reach an equilibrium adapted to the grazers, soil, weather and the farmer’s management. When these change the species mixture changes. A ley (sown pasture) of high yielding perennial ryegrass and white clover will gradually revert to a more mixed sward – but this can be slowed down by applying high nitrogen fertiliser.

#### *Hands on*

*Ask the farm host how the species mixture of different pastures or meadows have changed in their experience, why this might have happened, and what the ideal species mixture for this grassland is.*

Grassland, especially pasture, holds and builds up fertility, especially nitrogen. The store of nitrogen in grasslands is added every year in a variety of ways – rain, fixation of ammonia, fixation by algae and bacteria, and droppings. A small amount of this fixed nitrogen is converted to free nitrogen which can then be taken up by the grassland plants. Manure supplies both fixed and free nitrogen.

#### *Hands on*

*Consider your daily diet and think how much of it is based on the grass family.*

#### **Biodiversity and conservation**

Biodiversity and species richness is particularly high in grasslands of low soil fertility, such as chalk grasslands. Grasslands dominated by unsown wild plant communities can be called unimproved or semi-natural grasslands. Although their plant communities are natural, their maintenance depends upon human activities such as low-intensity farming, which maintains these grasslands through grazing and cutting. These grasslands contain many species of wild plants – grasses, sedges, rushes and herbs. Wild grasslands are becoming increasingly rare in Europe and their associated wild flora equally threatened.

Associated with the wild-plant diversity of the unimproved grasslands is usually a rich invertebrate fauna. Also there are many species of birds that are grassland specialists. In many parts of the world unimproved grasslands are one of the least threatened habitats, and a target for acquisition by wildlife conservation groups or for special grants to landowners who are encouraged to manage them appropriately.

Agriculturally improved grasslands, which dominate modern intensive agricultural landscapes, are usually poor in wild plant species due to the original diversity of plants having been destroyed by cultivation, the original wild plant communities having been replaced by sown monocultures of cultivated varieties of grasses and clovers, such as perennial ryegrass and white clover.

## *Hands on*

*Mark out a metre square of grassland to count the number of different plant species by just spotting different leaf shapes and growth habits. Compare different grasslands in the area. Sown, or improved, grassland may only contain a few species such as perennial ryegrass and white clover. Semi-natural or unimproved grassland can have many different grass, legume and other plant species. Chalk grassland can have up to 80 different plant species in a square metre.*

## **Carbon sink**

Grasslands can store approximately double the stock of carbon on land compared to arable land. Unlike forests, where vegetation is the main source of carbon storage, most of the grassland carbon stocks are in the soil. However the cultivation and urbanisation of grasslands, and other modifications of grasslands through desertification and livestock grazing can be a significant cause of carbon emissions.

## **Practice**

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### **Boundaries**

Livestock can either be allowed to roam freely where there are no boundaries (eg. on mountains or common land) or confined to limited area in some way. Traditional herders and nomadic pastoralists still manage sheep, goats, horses and reindeer like this especially on unimproved semi-natural grasslands eg. on Alpine mountains, Spanish semi-deserts and Norwegian tundra. To find their daily supply of milk they might also use cow or sheep bells or goat tethers.

Most livestock in Europe is now more confined using fences, walls, hedges or water-filled ditches. Erecting and maintaining these boundaries is a common task for livestock farmers. In North-west Europe, especially England and northern France, hedges are some of the commonest boundaries and are traditionally layered with an axe and billhook every 10 years or so in the winter. In hard stone and mountainous areas dry stone walls may be built, often using just a wooden former and mallet. Many boundary hedges, walls and ditches around pasture and meadow may be 1,000 or more years old – some of the oldest agricultural features in the landscape. These traditional boundaries are now being removed in terms of modern agricultural efficiency with large machines.

## *Hands on*

*In a hedged area try counting the number of different tree and shrub species in a 30 m. length. For every species the hedge may be 100 years old – so 7 species would make it 700 years old. In a stone walled area try your hand at dry stone walling.*

### **Storage**

Grass can be stored for use in winter in a number of ways. Hay is risky to produce in the wetter parts of Europe. The grass is usually cut well into flowering or even seeding to reduce the amount of water that needs to be removed by the sun. The crop is cut and then repeatedly spread during the day and rowed up at night in windrows until the moisture content is reduced to under 15%, and preferably near 10%. It is then baled and carted to the stack.

If hay is stacked in a barn too wet then the stack has a risk of spontaneous combustion and the hay stack may burn down. Over-wet hay is also full of fungal spores which may cause farmer's lung for those people who frequently handling it. Seed hay is very stemmy and usually looks good but is of poor nutritional quality.

Silage is grass which has been cut and dried for about half a day. It is then either chopped and stored under plastic covers (silage pit) or baled and wrapped in plastic (silage bales). The effluent from silage pits can pollute watercourses so is difficult to manage sustainably. Haylage is in between silage and hay. It is not as wet as normal

silage nor is it totally dry like hay. Haylage is only wrapped in bales because if not wrapped they would go mouldy and rotten over time. Haylage is useful because it provides high dry matter as well as high energy.

## Grazing systems

Grass can be wasted if it is not grazed at the right time. Grazing too low or letting swards grow too tall reduces production and livestock output per hectare. Good grazing systems match livestock needs to grass growth. The two basic systems used are continuous or rotational grazing. They may give a similar output except at very high stocking rates. Many farms adopt a combination of systems eg. continuous grazing in the lambing season and rotational grazing later in the year. Whichever system is adopted, the key to success is measuring grass growth and adjusting the grazing area and/or stock numbers and supplementary feed throughout the season.

- Continuous grazing – Grazing is over a large area.
- Mixed livestock grazing – Different livestock such as cattle and sheep are on same area.
- Rotational grazing – Fields are split into smaller paddocks, with electric fencing.
- Block, cell or strip grazing – Stock graze small paddocks or strips for a day before moving on.
- Leader – follower grazing – Stock grazes fields or paddocks in turn with older stock following younger, more productive stock.
- Deferred grazing – Swards are cut or grazed then shut up to allow re-growth.

### *Hands on*

*Ask the farmer which system(s) they use, and the various pros and cons of different systems.*

## Sowing grassland

Nitrogen is the most important crop nutrient and so legumes such as clovers are the driving force in organic systems, because of their ability to fix large amounts of atmospheric nitrogen. The quantity of nitrogen fixed is directly dependent on the proportion of clover in the sward. So a major objective should be to maximise the clover content of the sward. White clover is by far the most appropriate and widely used legume for organic farming systems in temperate maritime climates, because of its adaptability to a range of management and soil fertility conditions. Red clover is also undemanding in terms of soil conditions and is highly productive, but is not persistent nor well-suited to grazing, and is mainly sown in mixtures for short-term leys (up to three years), mainly for cutting and making green manures. Other legumes grown across Europe include alfalfa, lucerne and sainfoin.

Perennial ryegrass is one of the commonest species for ley farming in temperate maritime conditions, given its ease of establishment, high yield, persistence, and fodder quality. Tetraploid varieties may promote a higher clover content in the sward than diploid varieties, because of their more open growth habit. There are many grass seed mixtures containing a range of grass species and varieties which can be sown to suit different soils and climates in Europe. Seed for sowing new grassland can also be sown using the hay bale method.

## Seasons in meadows and pastures

While pasture is grazed by animals without allowing a grass crop to be harvested, meadows are fields grown specifically to produce a hay crop. Any livestock is moved off the meadow in late spring to allow the vegetation to grow and flower.

- Spring – growing. In old meadows this is when the field is shut up for a hay crop and there is zero grazing. This allows the grass and herb species to flower and set seed, thus perpetuating and increasing botanical diversity. In pastures old and young stock is grazed. The sward height may be between 10 and 50 cm.
- Summer – mowing. A meadow is mown, tedded and baled (cropping for hay, haylage or silage) either just before (for high nutritional value of the livestock) or after the flowers and grasses have set seed (for high conservation value for biodiversity). Light mowing machines, tractors and square balers may compact the soil less than modern big round baler machines. Traditional hand-held scything is slow and labour-intensive but has the least environmental impact on birds, invertebrates as well as being fossil fuel – free. In several countries scything competitions are becoming more popular like traditional ploughing competitions. The sward height after cutting will be about 5-10 cm.
- Autumn – grazing. The action of grazing produces a varied sward structure and further spreads seed around the sward via hooves and dung. The dunging by livestock replaces the lost nutrients of N,P and K

after the biomass has been depleted by cropping. Suckler cows are often used for aftermath grazing and dealing with coarse or neglected grasslands. Sheep are important for maintaining a fine sward and a good balance of grass and herbs though they are selective and avoid potentially invasive species such as dock or creeping thistle. Horses have a similar close bite, but can cause compaction and hoof damage and so are carefully managed and often rotation grazed.

- Winter- resting. In colder parts of Europe there will generally be no stock grazing – cattle, sheep and horses will be housed. This will avoid poaching of the damp ground in winter and also over-grazing of the sward. Some light sheep grazing may be done. The sward height may be between 3 and 10 cm.

## **Water and feed for livestock**

Grasslands are not always uniform. They vary over an area according to moisture and fertility gradients. So livestock may tend to concentrate on the better grassland and ignore poorer sites or those farther from water. Some pastures may be suited to grazing at certain seasons or, as in alpine grasslands, only available seasonally. Stocking must be seen in the context of the whole area available and management decisions made in the light of local indigenous knowledge, often passed down the generations.

Water is the major determining factor in stock management in most extensive grasslands. In areas dependent on seasonal surface water, stock must move out once the water sources have dried. Dewponds and other water points can be created as well as shade can help to provide water for livestock. Trees and shrubs are important features of many types of grassland. Some provide valuable shade in hot climates and seasons and give shelter in winter. Some trees are browsed and may be lopped for fodder – their fruits can also provide valuable feed. Natural salt-lick (deposits or salt springs that animals lick) can supplement grassland that is deficient in minerals that are essential for the growth and productivity of the livestock.

## **Bush clearing**

Bush or scrub clearing, as well as stone clearing, is needed on many grasslands, especially near the boundaries. However some trees and shrubs may be left both as shelter from both sun and rain for livestock as well as to help the water cycle. Unpalatable shrubs may increase when the more palatable ones are overgrazed. Goats browse much more than cattle and mixed grazing is probably less favourable to bush establishment than cattle alone.

## **Fire**

In many part of Europe controlled fire has been used to remove scrub and unpalatable grass and create a fresh young sward for grazing livestock. However it can easily get out of control and cause dangerous wildfires especially in hot, dry southern Europe. It also contributes to greenhouse gas emissions and considerable loss of wildlife so now may only considered as a last resort for sustainable farms.

## *Hands on*

*What is the stocking rate on your farm? What type of livestock and breed suits your soil and climate?*

## **Traditional herders and pastoralism**

Often the problems of grasslands and their herders and pastoralists are more socio-economic than technical. Better management and improved livelihoods can only be achieved if the legal, social and economic problems associated with pastoralism, are dealt with. Sustainable grazing management can happen where herders organise themselves into larger groups for deciding local herding policy, share herding tasks and discuss with regional authorities. Secure tenure of land or grazing rights are also essential if traditional herders and pastoralists are to have secure livelihoods and then invest in and manage grassland in a sustainable way.

## **Across Europe**

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According to FAO, grasslands are among the largest habitat type in the world – about 40% of the Earth's landmass. In Europe there are various types of grasslands, ranging from almost desert types in south-east Spain through steppe types to humid grasslands/meadows, which dominate in the north and north-west. Grassland habitats in Europe vary from the dry and calcareous grasslands of England, France and Slovenia (the Karst) to the Alpine mountain grasslands of Austria and Switzerland, the Steppes of Ukraine and the wet meadows of Poland and Eastern Europe. Probably the rarest types of grassland are the semi-natural savanna-like open woodlands of the Montado in Portugal and the Dehesas of Spain. Grasslands are among the most species-rich habitats in Europe. Calcareous (chalky) grasslands are Europe's most species-rich plant communities (up to 80 plant species/m<sup>2</sup>).

According to FAO, the area of grasslands in the EU declined by about 13% from 1990 to 2003. Only a few Member States managed to buck this trend.

## WWOOF

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Many WWOOF host farms have grazing livestock on pastures, meadows or other grasslands. The type of grassland and hence livestock will vary hugely across Europe so choose a WWOOF farm host carefully if you want to learn more about grassland and grazing livestock. Several host farms will enable experienced volunteers to ride their horses or ponies.

## Organisations

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[The Scythe Association of Britain and Ireland](#)

[The Grazing Animals Project](#)

[National Hedgelaying Society](#)

[Dry Stone Walling Association](#)

## Networks

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[Global restoration network](#)

[TECA](#)

## Videos

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[Restoring grassland habitats on Dorset farms - West Dorset Hills & Vales Living Landscape \(6 mins.\)](#)

[National hedgelaying competitions \(4 mins\)](#)

[Dry stone walling \(3 mins.\)](#)

[How to control docks, buttercups, rushes and moss in grassland without herbicides \(4 mins.\)](#)

## Links

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[Lowland Grassland Management Handbook](#)

[Organic grassland: the foundation stone of organic livestock farming](#)

[Organic grassland: principles, practices and potential](#)

[Electric Fence reference manual](#)

[How to build a wire and timber stock fence](#)

[Dry stone walling, Historic Scotland](#)

[Hedge laying and coppicing, Durham County Council](#)

## Competencies – skills

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|---|---|-----------------------|
| ➤ Fencing – electric                        | ➤ Grazing – strip, rotational, block and back fencing | ➤ Collecting hay seed |
| ➤ Fencing – wood, wire, tape, netting       | ➤ Clearing scrubland, nettles                         | ➤ Carting hay bales   |
| ➤ Walling – dry stone                       | ➤ Mowing and scything for hay                         | ➤ Stacking hay bale   |
| ➤ Hedgelaying                               | ➤ Preserving hay – Stooking, haylage, organic silage  |                       |
| ➤ Recognising timing of use                 |   |                       |
| ➤ Recognising pasture esp. poisonous plants |   |                       |

## Managing crops, including water, weeds, pests and diseases

### Introduction

There are many aspects to crop management which can all be considered in their own right. This is a general overview of certain aspects of crop management which focuses on organic small-scale farming and also self-sufficiency. In the modern world, many farmers produce food on specialised monoculture farms which is the agricultural practice of producing or growing a single crop or plant species in one large field at any one time. The majority of the world's population now depends on these farmers to feed them. But they not only purchase food, but also clothing and shelter.

Monoculture is widely used in modern industrial agriculture and its implementation has allowed for increased efficiencies in planting and harvest. All plants in a monoculture are genetically similar. So monoculture crops can be completely destroyed if a disease strikes to which they have no resistance.

### Background

The main crops for organic farming as well as human health are the cereal grains and pulses. They were also among the first crops to be domesticated by early neolithic farming communities in the Fertile Crescent region around Syria and Iraq. These included emmer and einkorn wheat, barley, lentil, pea, chickpea and bitter vetch, as well as flax.

Organic farming and methods combine scientific knowledge of ecology and modern technology with traditional farming practices based on naturally occurring biological processes. While industrial agriculture uses synthetic pesticides and water-soluble synthetically purified fertilisers, organic farmers use natural pesticides and fertilisers – in some countries this is subject to regulation.

### Cereals

Cereals are the commonest group of farm crops. They account for a quarter of the EU's crop production value and for one-eighth of the total value of its agricultural products. Half of EU farms grow cereals, and cereal crops occupy a third of the EU's agricultural area. They include wheat, barley, with oats, rye in the colder parts and rice and maize in the warmer parts of Europe. Wheat is by far the most popular cereal grown in the EU, making up nearly half the total, followed by maize and barley. Durum (for making pasta, biscuits etc) is grown in the Mediterranean. Other cereals grown in smaller quantities include rye and oats (in colder parts), spelt, triticale (a hybrid of wheat and rye, mainly used for animal feed) and even rice (in a few warmer parts).

Spring-sown cereals (oats, barley, spring wheat, spelt, triticale) are sown in early spring for a slightly later harvest. Winter-sown cereals (rye- often as a cover crop, winter wheat, spelt and triticale) are sown in early autumn for a late summer harvest. Winter varieties generally produce better crops. Seeding rates are increased by about a quarter for organic production to increase crop competitiveness with weeds. The earlier a spring cereal crop is planted, the more competitive it will be against annual weeds. Underseeding is a low cost method of establishing a green manure as well as establishing a weed suppressing cover for mid-summer when the canopy of the cereal crop diminishes.

Cereal grains are normally ready to harvest between mid-July and early September, depending on the climate in different parts of Europe when the grain reaches 18% moisture or less. Storage moisture for small grains is around 12-13%, so it may be necessary to dry the crop before storage. The main disease of cereals are the fungi such as rusts, smuts and ergot (containing a toxic alkaloid that can cause abortions). So cleaning the grain is vitally important.

### Legumes

Legumes, including pulses, are the key group of organic farm crops. Pulses include kidney beans, navy beans, faba beans, chickpeas, dried or split peas, mung beans, cowpeas, black-eyed peas, and several varieties of lentils. Only legumes harvested for dry grain are classed as pulses. Legume species used as vegetables (e.g. green peas, green beans), for oil extraction (e.g. soybean, groundnut) and for sowing purposes (e.g. clover, alfalfa) are also key organic farm crops. The fertility of organically farmed soils relies on legumes as they fix nitrogen from the atmosphere in their root nodules using nitrogen-fixing bacteria.



Pulses have several benefits:

- contribute to food security at all levels as they are produced and consumed widely in developing countries.
- have a high nutritional value as a critical source of plant-based proteins, amino acids and other essential nutrients.
- have important health benefits. They are recommended for preventing chronic diseases and obesity.
- promote sustainable agriculture and contribute to climate change mitigation. Their nitrogen-fixing qualities can improve soil fertility and produce a smaller carbon footprint.

## Practice

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More and more experts suggest that one should abandon the so common ambition to completely eradicate weeds, pests and more. This is an eco-friendly gentle approach that will keep pests down at a level where they do not, or only slightly, affect crop yields.

### Weeds

A weed is an unwanted plant growing out of place.

- Weeds have the ability to regenerate themselves.
- Weeds produce many seeds which are easily dispersed.
- Weeds have the ability to establish easily and grow faster than crop plants. They are aggressive.
- Weeds have the ability to survive under adverse climatic and soil conditions. They are persistent.
- Weeds have devices for easy dispersal.
- Weed seeds have a long period of viability.

Weeds have many uses. They can act as cover crop to control soil erosion and can be used as a mulch and compost materials. Mulch helps to conserve soil moisture while compost is an organic manure which improves soil fertility. Weed roots help to bind the soil particles together so preventing erosion. Weeds are sources of feed for livestock. Some weeds are medicinal in nature.

Weeds have a variety of effects on crop plants. They can compete with crop plant for space, light, water, nutrients and air. They can serve as alternate host to pests and disease-causing organisms. Crucially they can reduce the yield, quantity and quality of crops. Some weeds act as parasites of crops and may kill their hosts. Economically weeds can increase costs of production.

Weeds can be classified according to their habitat (eg. aquatic, terrestrial), life cycle (annual, biennial, perennial) or type of leaf (thin leaved, parallel veined monocotyledons, or broad leaved, net veined dicotyledons).

Weeds can be controlled by a variety of organic methods - either physical/ mechanical, cultural or biological methods.

- Hoeing – using a hoe to remove the weeds from the roots
- Hand pulling or roguing – using hand to pull out the weeds
- Slashing – using hoe or mattock to cut the shoot of weeds
- Use of plough – uprooting and burying the weeds
- Mulching – spreading mulch on soil and to suppress weeds and prevent them from sprouting
- Flooding- diverting water to the farm land to kill the weeds
- Burning – burning the vegetation crop residue to kill the weed seeds
- Cover cropping – planting fast growing legumes to compete with the weeds
- Crop rotation – controlling weeds associated with a specific crop
- Close spacing - preventing weed seed germination in low light and space
- Use of parasites and predators - controlling weeds

- Planting legume - smothering weeds
- Grazing - using animals like cattle or sheep to feed on weeds
- Bio-controlling - using insects to kill some weeds

## **Pest control**

The easiest way to prevent insect damage to crops is to discourage them from arriving in the first place. In addition to the examples above, this can be done in a variety of ways:

- Pulling out weak plants which may be infected already and will attract predators
- Building healthy, organic soil
- Applying seaweed mulch or spray which will enrich iron, zinc, barium, calcium, sulfur and magnesium, promoting healthy development in plants and can also help repel slugs
- Minimising insect habitats by clearing garden area of debris, the breeding places for insects
- Inter-planting and rotating crops as insect pests are often plant specific
- Keeping foliage as dry as possible by watering at the roots when necessary
- Disinfecting by cleaning tools after use and before moving on to other areas
- Using smell to confuse predators eg. planting celery with cabbage to confuse the cabbage white butterfly

## **Companion planting**

Nasturtium is a food plant of some caterpillars which feed primarily on members of the cabbage family (brassicas). So planting them around brassicas can protect the food crops from damage, as eggs of the pests are preferentially laid on the nasturtium. This practice is called trap cropping. Similarly, companion planting can be used to attract beneficial elements. For example, whereas the smell of the foliage of marigolds is claimed to deter aphids from feeding on neighbouring crops, marigolds with simple flowers also attract nectar-feeding adult hoverflies, the larvae of which are predators of aphids.

## **Water conservation**

In crop production, an adequate supply of water during the growing season is directly related to produce quality and yields, water stress can contribute to the flavour of the crop, which can even go dormant when the water supply is inadequate.

Techniques include:

- Adding coarse, decomposed organic matter
- Reducing water use with drip irrigation and [mulching](#)
- Planting in blocks, rather than rows
- Controlling weeds that compete with vegetables for water
- Grouping plants with similar water needs in the same area for easy irrigation. Cucumber, courgettes, and squash, for example, require similar water applications.
- Protecting plants and soil from wind with windbreaks to reduce evaporation

## **Seeds**

Saving and growing your own seeds is part of a self-sufficient lifestyle. It provides a greater range of varieties of crops, aids resistance to disease and preserves older and specialised strains. There used to exist thousands of varieties of farm, vegetable and fruit crops, ensuring a huge gene pool for each crop species. Producing your own seeds will give you greater autonomy. You will also help to maintain the ancient genetic diversity of our crop heritage. Lastly if you sell or swop seed you will be committing an act of civil disobedience against increasingly restrictive laws. Recent EU legislation and the monopoly of the multinational agrochemical and seed companies has led to the global dominance of only a few approved and standardised varieties.

A key part of seed production is the pollination, where the flowering plants produce seeds with the male flower part producing pollen which reaches the susceptible female flower.

- Self-pollination occurs within a single flower, without transfer from one flower to another, either on the same plant, or between plants. Such flowers have both male and female parts.
- Cross-pollination occurs when the pollen is moved from one flower to another, either on the same plant or between different plants. Pollen is carried by the wind or insects. There are two kinds of plants with unisexual flowers - monoecious plants where there are separate male and female flowers on every plant, and dioecious plants where each individual plant is either male or female flowers.

## Crop diversity

Crop diversity is a distinctive characteristic of organic farming. Industrial farming focuses on mass production of one crop in one location, a practice called monoculture. The science of [agroecology](#) (the integration of ecological systems in agriculture) has revealed the benefits of [polyculture](#) (multiple crops in the same space), which is often employed in organic farming. Planting a variety of vegetable, fruit, cereal and legume crops supports a wider range of beneficial insects, soil microorganisms, and other factors that add up to overall farm health. Crop diversity helps environments thrive and varieties becoming extinct.

## Biodiversity

The more biodiversity is studied, the more its importance is realised for maintaining essential ecological functions. A diversity of microorganisms below and above ground, as well as plants and animals is needed to maintain essential agricultural functions such as decomposition, nutrient cycling, soil formation, detoxification, natural pest regulation and pollination. This is true for both agricultural production and natural ecosystems. Although agricultural fields are greatly simplified in comparison with natural ecosystems, they are still dependent on complex natural interactions and processes driven by organisms.

## Across Europe

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In Europe with its high proportion of land under agriculture – around 5 million square kilometres comprising nearly half Europe's total land area – there are often no boundaries between food production areas, cultural landscapes and wildlife habitats. At the European scale farmland encompasses a huge variety of habitat types as different as dry steppe grasslands and rice fields, vineyards and mountain pastures. In fact, farmland has the highest overall species richness of birds of any habitat type in Europe, and at least 10% of all flowering plants use arable land as their main habitat.

## WWOOF

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Only larger commercial or semi-commercial WWOOF host farms are likely to grow a variety of cereals and legumes as farm crops, possibly combined with some form of agroforestry as well as large livestock. Smaller WWOOF host farms, market gardens and smallholdings are more likely just to grow vegetables and fruit with some smaller livestock.

## Organisations

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[Soil Association](#)

### Networks

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[The Seed library social network](#)

[Variety-Savers - The European Network of Breed and Seed Savers](#)

[Alternativ blog](#)

[European Network for Rural Development \(ENRD\)](#)

### Videos

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[No Dig gardening \(7 mins.\)](#)

[From seed to seed - Educational films on seed production](#)

[Weed control tools \(8 mins.\)](#)

[BBC Mud Sweat and Tractors The Story of Agriculture 3 – Wheat \(60 mins.\)](#)

[Growing wheat. \(3 mins.\)](#)

[Wheat harvest. \(5 mins.\)](#)

From seed to loaf allotment scale production of bread making wheat: [Part 1 \(7 mins.\)](#) & [Part 2 \(7 mins.\)](#)

[Pulses - The food of the future. \(4 mins.\)](#)

## Links

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[Grow your own wheat](#)

[Agricultural production – crops, Eurostat statistics explained](#)

[2016 International Year of Pulses](#)

[Organic agriculture and pulses](#)

## Competencies – skills

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- Recognising weeds
- Recognising grain crops
- Recognising other crops
- Growing grain crops
- Harvesting grain crops
- Roguing weeds
- Recognising pests and diseases
- Recognising weather patterns
- Terracing
- Irrigating
- Estimating areas, mapping

## Managing livestock, including sheep, goats, pigs, cattle, horses

### Introduction

Although.

Larger farm livestock with hooves, such as cattle, goats, sheep, horses and pigs, are part of a family known as ungulates. Most ungulates are herbivores with plant-based diets, with the exception of pigs which are omnivores and therefore can eat both meat and plants.

Cattle, sheep and goat are **ruminants** - that is they have evolved to feed on grasslands, fermenting grass using bacteria in their specialised stomach (rumen) before digesting it. Their fermented cud is regurgitated and chewed again. The process of re-chewing the cud to further break down plant matter and stimulate digestion is called rumination. By doing that they convert nutrients from the grass or plants into milk or meat.

### Background

#### Value of grazing livestock

Livestock are highly efficient users of available biomass. They consume grasses and other plants that cannot otherwise be consumed by humans and convert it to a range of valuable products: milk, meat, wool, leather, manure and draught power. They contribute to grassland systems by dispersing grass seeds, keeping unnecessary weeds in check and fertilising the soil with their dung and urine.

Livestock products (e.g. eggs, milk, meat) provide almost one-third of humanity's protein intake. They provide 15 percent of total food energy and 25 percent of total dietary protein, as well as essential amino acids and micro-nutrients that are not easily obtained from plant-based food. The demand for livestock products continues to expand, due to growing populations and incomes, along with changing food habits and preferences.

Ruminants fed on grass, herbs, legumes and even fodder trees have a range of environmental and social benefits:

- Carbon is captured and stored in the grassland.
- Meat and milk from pasture-fed livestock will have less pesticide residues.
- Pasture-fed livestock are kept in extensive, natural conditions for a grazing herbivore.

However many beef and dairy cattle are fed on grain and soya beans, both of which may be imported. This is not as sustainable as pasture-fed cattle.

- Fossil fuels are needed to grow and transport cereal feeds.
- Habitats may be destroyed to grow soya feeds.
- Grain-fed livestock are often housed in confined, unnatural conditions

#### Greenhouse gases

About three-quarters of agricultural land is for producing livestock. They also consume about a third of the world's cereal grains. Farm livestock, especially large farting ruminants like cattle, produce about 15% of human-caused greenhouse gases. Demand for meat and dairy products is forecast to increase 60% by 2050. So there is an urgent need to reduce the ecological footprint of livestock farming. However there are ways of selecting and managing large livestock to reduce their greenhouse gas emissions.

#### Daily care

Unlike crops, farm animals need daily care seven days a week. They require watering, feeding, protection from predators, attention to their health and daily routines, such as milking schedules for dairy livestock. Large livestock are living creatures with their individual moods, breed characteristics, sometimes even difficult behaviour! The basic care of livestock can be learned without the need for any special courses or seminars. All large grazing livestock are likely to eat parasites along with the grass and herbs. Natural ethno-veterinary medicines can be used to treat for parasites e.g. tree bark against worms in stomach and lungs. There are also a selection of chemical treatments, but not antibiotics, allowed in organic farming.



## Breeding

The life cycle of ruminants is timed to fit with plant growth so they give birth in late winter or early spring in Europe. For the first two months the newborn drink milk from their mother's udder, It also gives their digestive system time to develop so they can digest grass effectively in spring. After this time they do not need mother's milk. The mothers have a resting period before they are ready to become pregnant again. The new breeding cycle starts with the release of the male in with the group of females. Whereas sheep and goats can repeat breeding their cycle nearly every year, cattle need a rest because they have a longer pregnancy. Horses and cattle have a similar breeding cycle. Domesticated pigs have lost their natural breeding periods.

Livestock	Mother, father, young	Use	Newborn	Length of pregnancy
<b>Cattle</b>	cow, bull, calf	dairy, beef meat, leather	1, possibly 2	9-10 months
<b>Sheep</b>	ewe, ram, lamb	meat, wool or dairy	1 -2, possibly 3	5 months
<b>Goat</b>	nanny, billy, kid	dairy or meat	1 -2, possibly 3	5 months
<b>Pig</b>	sow, boar, piglet	meat	up to 12	114 days
<b>Horse</b>	mare, stallion, foal	Leisure, work, meat	usually 1	11-12 months

Wild cattle and boar live in social groups mainly in wooded or scrub areas with a huge variety of food as well as shelter from the sun and wind. So these conditions need to be recognised in domesticated cattle and pigs when providing food, housing and other conditions.

## Practice

### Goats

Goats were the first ruminants to be domesticated (about 8,000 years ago). They are more important in countries with subsistence or peasant agriculture. They are one of the commonest domesticated grazing animals.

**Feeding** - They can graze on marginal land that is too steep to plough, or unsuitable for other livestock. Goats eat a much wider range of plants than most livestock, and so can find plain grassland boring. They will eat and kill shrubs and bushes. Mixed herbal leys, with clovers, grasses, and other deep-rooted herbs, give goats the high levels of minerals that they need. Russian comfrey, brassicas, roots, lucerne (or alfalfa), some tree leaves as well as hay and concentrates are also fed to goats. Minerals (such as copper, calcium, phosphorus and salt), can also be provided as a balanced mineral supplement.

**Handling** - Goats can be more challenging than sheep as they are good at climbing also escaping into vegetable gardens! Tethering with a swivel link and chain can be a good way of controlling the grazing, as long as the goats are frequently checked and moved to new grass. They will not eat trampled grass, and they need shelter from rain. Running tethers use a swivel link attached to a wire held by two stakes.

**Milking** - Goats can be milked twice a day. The milk can be processed to yoghurt, cream, butter, hard and soft cheese. Goat's milk has nearly double the vitamin A level of cow's milk because goats convert all the carotene to Vitamin A (hence pure white milk) while cows excrete carotene in their milk (hence the yellow colour). By-products such as skimmed milk, whey and buttermilk can be fed to other stock.

### *Hands on*

*Milking goats by hand is a difficult skill. The goats know when they are being milked by a beginner. The goats can be fed and then udder and teats can be cleaned. It is best to sit on a low milking stool with your head against the goat's body, hold the top of the teat between your forefinger and thumb, and then roll fingers down from the top to release the milk into a clean pail.*

**Breeds** - There are several common breeds - the white Saanan from Switzerland, the speckled Anglo-Nubian bred from stock in India and Sudan, the french Alpine, the spanish La Mancha. Horned goats can be dangerous.

**Other tasks** - include disbudding horns, kidding, hoof trimming, recognising diseases and ailments, such as bloat, foot rot and mastitis.

## Sheep

Sheep have been deliberately bred for over 3,000 years for their wool and pelts. In the Middle Ages Spain and Britain competed for the best high quality wool. Now sheep are mainly kept for their meat.

**Breeds** - Some breeds are kept for their milk (like the French Lacaune, the Dutch Fries Melkschaap or the Greek Chios), which is much richer than cow or goat milk.

### *Hands on*

*Examine the teeth. Good teeth are broad and short, and fit squarely together. Older sheep may have lost some of their teeth.*

**Feeding** - Sheep can get all the nutrition they need from grasslands. Grass growth is greatest in the spring when the surplus can be conserved as silage or hay.

**Handling** - Sheep are renowned for their ability to escape from their fields, especially when lambs are weaned. Sheep are great for increasing biodiversity moving up to 10,000 seeds in its wool. However overstocking can reduce biodiversity.

**Other tasks** - the shepherding year includes moving sheep with a sheepdog, lambing in the spring, artificial rearing of orphan lambs, marking lambs and sheep, shearing the fleece in the spring or early summer, dipping sheep against scab in the autumn, selling lambs at the market in the autumn, preparing ewes and rams for mating in the autumn, recognising diseases and ailments, such as foot rot.

## Pigs

Pigs are intelligent animals. The sows can be fierce if defending their piglets. They tend to have white meat. Slaughtering and butchering can be done on the farm.

**Breeds** - The most popular breeds are the Large White and the Swedish Landrace.

**Housing** - Pigs can be kept on open pasture rather than indoors, where they can be used as natural ploughs. However housing in a small shed with a strongly fenced yard or paddock can be more productive. The housing needs to be warm, dry and free from draughts. They also like a mud wallow pit in hot weather, and regularly cleaned housing, with a dunging area filled with straw.

**Feeding** - Pigs are monogastrics (they only have one stomach, like poultry) unlike ruminants. They are also omnivores and eat a wide range of foods, even some that could be considered food waste. They can be left to forage for most of their own food within the farm or smallholding. If pigs are fed on an ad lib system this adds a lot of fat to the carcass. So rationed feeding is more popular. Most pigs are fed on meal or cubes produced from barley, soya beans etc.

**Other tasks** - the pigkeeping year includes frequent worming to kill parasites, farrowing of the sows, tail docking of one day old piglets (to prevent tail biting by other pigs), teeth clipping of one day old piglets (to avoid damage to the sow's udder), castration within one week of birth, and ear marking of piglets.

## Cattle

Cattle are big but calm, producing 10 times more milk than sheep or goats, but not as nutrient rich. In many places it is thought that one cow needs at least half a hectare of grassland. Beef cattle may be ready for slaughter in just over a year.

**Breeds** - The Dutch Freisian dominates the dairy industry across the world. Other breeds include the French Charolais and Maine anjou, the Swedish Red and White, the English Hereford, the Italian Marchigiana, the Swiss Simmental. The Jersey is a favoured breed for smallholders as it produced rich milk.

**Feeding** - The natural food for cattle is grass. Pasture-fed livestock are more sustainable than grain-fed livestock. They can grow, survive and raise their young on grass alone. However from Christmas to May hay, haylage and silage may be used as supplements. Many beef cattle are housed indoors and fed grains, as well as hay, haylage or silage, in winter and spring. The grains would mainly be barley, maize, often together with imported soya beans and other imported feedstuffs.

**Other tasks** - these include dehorning, castration, adding tattoos and ear tags, branding, controlling flies, milking, preparing for artificial insemination, preparing for calving, vaccinating against pneumonia, diarrhoea, scours and worms, recognising diseases and ailments such as ringworm, mastitis or inflammation of the udder and warble fly.

## Horses

Horses are monogastric herbivores, as they have a simple single-chambered stomach. These hindgut fermenters digest cellulose in an enlarged caecum by re-ingestion. Horses need good training and skilled handling to be useful for work and/or leisure activities. Horse power is still used on some farms, especially in Eastern Europe. Medium-sized breeds are most suited for providing horse power on small farms, such as the German Dalmatians, Hungarian Nonius, Italian Salernos, Norwegian Westlands, and Welsh Cobs.

### *Hands on*

*Try to identify the livestock breeds kept on the farm and the common livestock breeds in the region. A visit to the local livestock market would show the range of local breeds. You could even rank the different breeds according to population size, relevance for different sized farms, women/men, farmers/herders, and their economic importance to the region.*

## Livestock decisions

A farmer with grazing livestock has to make many, well-timed and wise decisions about:

- Using livestock and breeds that suit their soil, type of grassland and climate
- Grazing evenly over an area and avoiding localized overgrazing, by rotating the grazing or resting some grassland
- Estimating stocking rate and keeping stock numbers within reasonable limits
- Dividing the livestock herd so they get different treatments
- Controlling parasites (like liver fluke) and predators (like wolves, foxes)
- Providing veterinary care eg. for lameness
- Controlling the breeding, with particular animals and at particular times
- Maintaining and checking the boundaries such as fences, walls, gates and hedges
- Checking (usually daily) numbers and health of livestock, access to water etc.

### *Hands on*

*Look at the way cattle, goats and sheep chew the grass and smell it with their noses close to their mouths. Look at the teeth and tongue adapted for chewing. Also look at the way they re-chew the cud, and smell their breath! Look at the food labels of any feed concentrates to see the ingredients of added minerals, vitamins.*

### *Hands on*

*Here are a few general questions that could be asked to the host when the time is appropriate:*

- What are the advantages of large livestock on the farm?*
- What are the different options for handling livestock manure on the farm?*
- What are the different options for feeding livestock from outputs from the farm?*
- Why have the livestock breeds on the farm been chosen?*
- What are the different criteria for comparing different breeds (e.g. different functions they fulfil, tolerance to specific conditions, productivity, taste, resistance to disease, cost and availability of breeding material)?*

## Across Europe

In general, livestock numbers - particularly of pigs and chickens - are increasing worldwide. However, in some places livestock numbers are falling, for example: pigs in parts of Europe, cattle in most of Europe, poultry in Scandinavia and Eastern Europe, and sheep and goats in central Europe and the former USSR. These declines are usually being offset by increases in productivity, so overall production levels in these regions remain more or less stable. The biggest change happening to the world's livestock is a move away from traditional extensively-farmed poultry and pigs towards very intensive rearing systems that are more commercial and industrial.

European and State policies and agencies are often inherently biased against small-scale livestock systems, and especially against pastoralist systems. Research, extension, conservation, breeding development programmes, infrastructures and markets, and, in many cases, subsidies currently favour high-output large-scale livestock systems. These trends are contributing to the disappearance of valuable local breeds, knowledge and ecosystems.

All large livestock have their worldwide unique mark, usually an earring or a tattoo, recorded by governmental agencies. These agencies control many aspects of livestock management eg. Level of subsidies, mandatory vaccination, meat sales, stocking density etc.

Food wastes have a long history as a source of environmentally benign animal feed, but their inclusion in feed is currently banned in the EU because of disease control concerns. However a number of East Asian states have in the last 20 years introduced regulated, centralised systems for safely recycling food wastes into animal feed.

## WVVOOF

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Volunteering on a farm is a great way to get enough knowledge, experience and competence to learn how to take care of livestock. However specialist courses may be required for processing the products (e.g. milk, cheese, meat, wool) or for handling horses when riding, ploughing or using for therapy.

## Organisations

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[Domestic animal diversity information system](#)

[Endogenous livestock development network](#)

[Ethnovetweb](#)

[FAO publications on livestock production](#)

[Rare Breeds International](#)

[Pasture-fed Livestock Association](#)

[Compassion in World Farming](#)

## Videos

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[BBC Mud, Sweat and Tractors - The Story of Agriculture 1 – milk \(60 mins.\)](#)

[BBC Mud Sweat and Tractors The Story of Agriculture 4 – Beef \(60 mins.\)](#)

[The private life of cows, BBC Scotland \(60 mins.\)](#)

[The private life of pigs, BBC Scotland \(60 mins.\)](#)

## Links

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[Smallstock: The economic value of manure](#)

[Livestock maps](#)

[Learning AgriCultures – Module 4 Livestock systems](#)

[Pasture for Life](#)

## Competencies – skills

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### Cattle

- Handling cattle
- Managing slurry
- Feeding cattle – rations
- Milking cows – by hand and machine
- Drying off cows
- Bulling cows
- Calving
- Suckling calves
- Weaning calves
- Introducing to pasture
- Recognising age
- Recognising health – on heat, due to calve
- Handling milk
- Recognising pests and diseases

## Goats

- Feeding – rations
- Kidding
- Milking – by hand and machine
- Recognising age
- Recognising health – on heat, due to kid
- Recognising ill health, diseases
- Tethering
- Trimming hooves
- Handling
- Cleaning housing

## Sheep

- Handling and casting
- Moving and dividing flock
- Dipping
- Drenching
- Trimming feet
- Recognising health, age
- Recognising ill health – foot rot, strike, scab
- Lambing
- Fitting sire harness
- Switching lambs
- Weaning lambs
- Milking ewes
- Shearing – hand, electric
- Making bundles - fleece
- Teasing, carding
- Spinning, dyeing

## Dairy

- Setting, operating machines
- Cleaning equipment
- Making butter
- Making cream
- Making hard, soft cheese
- Making ice cream
- Making yoghurt

## Pigs

- Cleaning sty
- Fencing – electric, posts
- Feeding – for breeding, fattening
- Handling and moving
- Feeding – swill, mash
- Breeding
- Farrowing
- Weaning piglets
- Housing - for breeding, fattening
- Preparing carcass – scalding, scrapping
- Butchering – skinning, gutting, jointing

## Working horses

- Handling
- Feeding – bait, rations
- Watering
- Grooming, filing molars
- Removing shoes
- Training for work
- Leading and backing
- Mucking out stables
- Harnessing
- Cleaning tackle
- Recognising health

## Managing small livestock, including poultry and bees

### Introduction

This section only focuses on [poultry](#) and [honey bees](#). However small livestock also include rabbits, snails and even insects that are bred for food. Honey bees are the commonest, but not the only, farmed insects. [Insect farming](#) may provide much food for the future. Poultry come in many varieties, shapes and sizes but all are characteristic of [smallholdings](#). They are cheap to buy, relatively easy to feed, breed and keep and mostly need little space. The animals do not have to be legally registered unlike larger livestock, such as cattle, pigs, sheep and goats. Most breeds and species of poultry, as well as honey bees, can be kept throughout Europe, unlike many larger livestock.

### Background

#### Poultry

What makes a sustainable production system?

- Managing small livestock in a sustainable way ideally means that they are housed extensively, treated medicinally without antibiotics, and fed with locally produced and sustainably grown feedstuffs grown without artificial fertilisers or pesticides.

How important are poultry to a balanced organic smallholding?

- Poultry were the last major group of food animals to be domesticated. They are among the most widely distributed food animals in the world and are part of nearly every major cuisine. They are also the second most widely eaten type of meat in the world, accounting for about 30% of total meat production worldwide compared to pork at 38%. There are more chickens in the world than any other poultry. In fact, more than 50 billion chickens are reared annually as a source of food, for both their meat and their eggs. Most are intensively reared in battery cages or deep litter systems. Compared to larger livestock poultry [for meat production](#) can have less environmental impact.

What type of small livestock are on the farm?

- Poultry or domestic fowl include [chickens](#), [ducks](#), [geese](#) and [turkeys](#), and less commonly [pigeons](#), [quail](#), [guinea fowl](#) and [ostriches](#). There are hundreds of varieties, or breeds, of poultry. Generally, heavy breeds of chicken are quieter, eat more, and lay less, but will in most cases go 'broody' (i.e. try to incubate their own eggs). Famous heavy breeds include Light Sussex, Rhode Island Red, and Plymouth Rock, while the Leghorn is the most famous light breed.

What are the stages in their life-cycle?

- For poultry it is about 3-4 weeks from egg to hatched chick, and then 3-4 months to egg-laying adult bird. Male birds are often killed at 3-4 months. Poultry only live for 3-4 years.

#### Honey bees

Honey bees are highly social insects, living in extremely well-organised groups. Each member has a specific job to do, and no bee can survive without the colony. A bee colony consists of workers, drones and one queen. [Beekeeping](#) is one of the oldest forms of farming.

How can the system benefit biodiversity?

- Not only do bees produce delicious honey, the pollination services they provide are vital for both food production and biodiversity. Honey bees are just one of the 25,000 or more species of bees in the world. A healthy ecosystem needs bees and vice versa.

What are the key environmental issues?

- Insecticides are, by their nature, toxic to bees. In 2012, new scientific findings indicate that some neonicotinoids showed high risks for bees. The EC has [regulated their use](#) and produced a useful [review of bee health](#) across Europe. Syngenta is one of the largest pesticide manufacturing companies in the world. In its lobbying against bans on their bee-unfriendly neonicotinoids, it appears to have gone to war against bees, science and democracy. [Ethical Consumer](#) explores the issues and asks what the consumer can do.

## Practice

### Feeding Poultry

Poultry are omnivorous. Chickens can be fed kitchen scraps of veg, fruit and meat but most usually have whole or ground grain. Layers pellets are used in intensive production systems but may be considered unsustainable as they may contain imported GMO soya beans, fishmeal and various antibiotics. Ducks and geese are easier and cheaper to feed than chickens if they have access to grassland and pond or flowing water. Grit is another important part of poultry diet – both a soluble calcium grit which is used to create the egg shell, and a hard grit which the gizzard (a muscular organ) uses to grind up the feed.

#### *Hands on*

*Sit quietly in a chair by the poultry enclosure or run and observe the behaviour of the male and female birds. How differently do the male and female birds behave – feeding, preening, mating, laying eggs etc? How far do they flock together? Are any birds looking unwell – hen-pecked, not feeding, exposed skin? How do they react to different wild and crop foods eg: Snails, worms, tree leaves, old fruit and veg? Can you spot the pecking order?*

### Handling Poultry

It is easiest to pick up poultry at night when they are roosting on a perch or nestling on the ground. Lifting them carefully with thumbs over the wings into a black sack or bag is the easiest way to move them. Catching them during the day is best done by cornering them with a board, sheet or netting, and by two or more people kneeling on the ground and slowly moving to quickly catch them with two hands. Catching them at night with a torch when they are on a perch or in a pen is much easier. Gloves are best worn when handling cockerels.

#### *Hands on*

*Catch some poultry to look and feel the gizzard and layers of feathers.*

### Breeding and Rearing Poultry

Poultry can be hatched in an incubator or under a broody bird (especially in the spring). The temperature needed is 37.5 deg.C. for chickens and chicks hatch after 21 days.

#### *Hands on*

*Candle the eggs using a bright light through a small hole to see the developing embryo inside the egg after a week or two. Weighing the food and matching the weight of young chicks and ducklings shows how quickly they grow.*

### Housing Poultry

Poultry production systems can be free-range extensive (no fencing housing), backyard extensive (only housed at night), semi-intensive (housed communally and often in deep litter), intensive (only housed, and densely in single cells). Battery cages for hens have been illegal in the EU since 2012. The extensive systems are more sustainable and cruelty-free. However protection from predators such as foxes often require electric fencing or poultry wire sunk underground.

Semi-intensive chicken housing includes arks (movable on wheels), folds and runs. Ducks and geese only require simple shelters, mainly to protect them from predators and to collect their eggs. Fresh straw or hay can be put regularly in the chicken nest boxes. Adding a little ash on top may help prevent parasites. Wood chippings, sawdust, straw or dry grass cuttings can makes sustainable bedding. When manured it can be moved to the compost rather than directly onto crops as it is high in phosphates. Ducks and geese are best kept in orchards, as they can mainly eat grassland plants.

#### *Hands on*

*Upload a photo of your poultry and their housing:*

## **Killing Poultry**

If wanted, poultry can be killed for meat on a small scale generally by neck dislocation. For chickens and ducks this involves holding the bird by the legs in one hand, taking the head in the other hand. When the bird is calm, you pull downwards on the head while bending it sharply back. The bird is instantly dead when the neck suddenly stretches. The bird will flap and kick for a few minutes even though it will be dead once the neck is dislocated. For bigger birds, like geese or turkeys, the broom handle method is used. The bird is placed head downwards on the ground with the broom handle over the back of the neck. Then stand on the handle on either side of the neck and pull and twist the legs upwards.

## **Using Poultry**

Poultry can provide not only eggs (up to 200/yr for ducks, 150/year for chickens and 30/year for geese) and meat but also feathers (for stuffing etc) and rich manure.

## **Observing Bees**

Hives should be inspected regularly, preferably every two weeks in order to prevent swarming, spot the queen, check on all stages of brood (egg, larvae and pupa in capped cells), cells filled with honey and pollen, add more supers, move frames, and check for any disease.

Rainfall, temperature and sunlight affect the plants and thus determine the actual nectar flow. The quality, or sugar content, of nectar also varies among the different plant species. Weather also has an effect on quality. High rainfall promotes nectar secretion, but such nectar is often very low in sugar content. Conditions promoting optimum nectar flow are adequate rainfall previous to flowering and dry, sunny conditions during the flowering period.

Bees only need to be tended in spring and summer; from late autumn and throughout the winter they remain in a state of semi-hibernation.

### *Hands on*

*Sit quietly in a chair for a while and observe the bees from the side of a beehive. Are they gathering nectar, pollen or propolis? What local crops or trees are in flower? How does the weather and time of day affect the movement of the bees? Where are the bees sucking up water, or collecting propolis from evergreen and conifer trees?*

## **Handling Bees**

When opening a hive it is best to wear protective clothing of a beekeeping hat and veil tucked inside overalls or a coat. It is also wise to avoid exposed hair, woolly clothing or socks, as bees recognise these as mammals. They also tend to climb up clothing so it is best to tuck clothing down inside. A beekeeping smoker, if used sparingly, can calm bees down and move them within a hive. They recognise the smoke as a forest fire and suck up nectar and honey.

If provoked, a bee will sting in defence of its colony or itself. Avoid perfumes, scented lotions, sweat, brightly coloured or patterned clothing. Move slowly and quietly, and not in front of the hive. Open the hive in the evenings. Remove any stings by scraping with your nail, rather than pulling it between thumb and finger as you might squeeze the venom sac.

### *Hands on*

*Dress up in a bee suit and have a look inside a hive, helped by an expert.*

## **Housing Bees**

Hive can be of clay and mud, straw, basketry, logs, or most commonly wood, and most recently polystyrene. Bees forage up to 3 km so hives and apiaries should be situated within a minimum distance of 3 km from good nectar forage places (forest, trees, nectar producing crops). Bees also prefer to work up hill and along rows of crops.

### *Hands on*

*Upload a photo or video of your bees, hives and apiary to the LLOOF site.*

## Using Bees

Bees can provide not only honey and wax (for candles etc) but also propolis collected from the sap on needle-leaved trees or evergreens. When they combine the sap with their own discharges and beeswax, they create a sticky, greenish-brown product that is used as a coating to build their hives. Thousands of years ago, ancient civilizations used this propolis for its medicinal properties. Cleanings from a honey extractor can also eventually provide alcoholic mead.

### *Hands on*

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*Tell us about the levels of production, and describe the uses.*

## Across Europe

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### Poultry

The varieties of poultry varies considerably around Europe. Anconas from Italy, Campines from Belgium, Faverolles from France, Langshan from Germany, Minorcas from Spain.

### Honey bees

Although there are several species of honey bee, in Europe the species universally managed by beekeepers is the Western honey bee. This species has several sub-species or regional varieties, such as the Italian bee, European dark bee, and the Carniolan honey bee. In different countries hives can be of clay and mud, straw, basketry, logs, or most commonly wood, and most recently polystyrene, depending on the traditions, culture, climate and local resources for construction.

## WWOOF

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If you want to learn more about small livestock search for a WWOOF host farm that is a smallholding or market garden. Some host farms breed their own poultry, others may have commercial apiaries.

The Low Impact Living Initiative (LILI), which is a partner of WWOOF-UK, advertises and runs occasional courses on managing small livestock: [On poultry keeping](#) & [On bee keeping](#)

[The WWOOF experience: Bee Keeping at Simmelknödel organic farm, Germany \(12 mins.\)](#)

[Jeff Lam wwoofing in the UK Part 2.5: Beekeeping \(2 mins.\)](#)

## Organisations

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[Poultry Club of Great Britain](#)

[British Waterfowl Association](#)

[British Beekeeping Association](#)

There are similar member organisations in different European countries, as well as European associations.

## Networks

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[LILI Forum on animal management](#)

## Videos

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[The private life of chickens \(60 mins.\)](#)

[Beekeeping lessons: a beehive check-up and maintenance with Allen the Beekeeper \(15 mins.\)](#)

[Beekeeping course \(7 mins.\)](#)

## Links

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Poultry

[Keeping chickens – A Beginners Guide](#)

[Poultry keeping](#)

[Organic poultry production for meat](#)

[Poultry facts and figures](#)

[Poultry in Wikipedia](#)

[Duck raising](#)

Bees

[Basic Beekeeping – Manual 1](#)

[Advance Beekeeping – Manual 2](#)

[Getting started in beekeeping](#)

[A practical manual of beekeeping](#)

[The Practical Beekeeper - Beekeeping Naturally](#)

[Beekeeping in Wikipedia](#)

Competencies – skills

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## Honey Bees

- Siting a hive
- Capturing a swarm
- Hiving a swarm
- Adding and removing supers
- Clearing supers
- Inspecting hives
- Recognising queen, drones and workers
- Killing queen cells
- Recognising diseases
- Making wax
- Extracting honey
- Bottling honey

## Poultry

- Feeding – grain, grit, mash, pellets, scraps
- Cleaning poultry house
- Handling – disinfecting, whitewashing
- Recognising layers
- Handling poultry manure
- Incubating – setting up, checking
- Candling eggs
- Housing, feeding hatchlings
- Recognising sexes
- Killing poultry
- Plucking, gutting, preparing
- Preserving eggs
- Recognising ill-health, diseases
- Recognising health

## Preserving and processing farm products

### Introduction

Before the age of electricity and artificial food additives, we depended on natural ways to preserve our food. The same principles used for preserving are also used to prepare many of our most common foods. But why do we need to preserve and how does one go about it?

Storing and preserving garden produce is an economical and sustainable way of coping with gluts and having good local food in the dark winter months. Preserving your own food is fun, rewarding and brings us closer to the food we eat.

### Background

It is a well known fact that food left out for a period of time will turn bad. This is mainly because microbes, such as bacteria and fungi, start breaking down the food particles. This changes the quality of the food and give good growing conditions for the microbes, leaving the food inedible. Other natural processes can also break down food, for instance oxidation and degeneration. By preserving our food, this is what we are trying to avoid.

However, let us not forget that the knowledge about microbes and food chemistry is also used to our own benefit. As an example we are dependent on bacteria to make yoghurt, fungi to brew beer and oxidation of fats to achieve the different odours of cheese. The art of preservation can therefore be seen as having two main objectives - Keeping food from being spoiled, as well as preparing different foods.

### Microbes

Bacteria are a natural part of any kind of food and drink, some with great health benefit and others harmful. Bacteria will multiply very fast when conditions are good. Fungi is a huge kingdom, including the familiar mushrooms, yeasts and moulds. Fungi is widespread and can live dormant as spores eg. yeast on the surface of fruit like apples helping to ferment to cider, as well as in the soil or as active and visible structures.

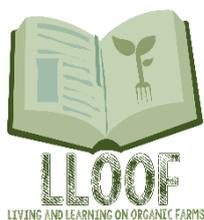
The different species of bacteria and fungi need specific conditions to grow. Some factors are water, nutrients, temperature and pH. These conditions are what we target when we want to stop microbes, making their habitat as uncomfortable as possible. Preserving food and drink is a battle against spoilage by the bacteria, fungi and time which cause it to decompose or ferment. The removal of water and exclusion of air makes it impossible for microbes to grow. So these microbes can be prevented by excluding water and oxygen in a variety of ways:

- Drying - excluding water (dehydration) and/or oxygen
- Smoking – drying with smoke
- Sugaring - using sugar (osmosis)
- Salting - using salt (osmosis)
- Fermenting - using or producing alcohol (kills bacteria, fungi)
- Pickling - using vinegar (lower pH denatures enzymes, pickling)
- Immersing in oil - (lack of water and oxygen)
- Chilling or freezing - controlling by cold (clamping, storing in a cellar, fridge, freezer)
- Sterilising and pasteurising - controlling by heat and excluding oxygen
- Canning – controlling by heat and excluding oxygen

### Benefits

There are several benefits of preserving crops and meat:

- Reduces waste - First and foremost the benefit is that you prevent food from becoming spoiled and inedible, especially when there is a glut.
- Reduces energy use - Many preservation methods require little or no energy. We can harvest in the autumn and preserve it for the winter. So we can have unseasonal, local food in winter instead of flying it around the world.



- Promotes good health - Only natural ingredients are used. Industrially processed foods has a high salt content along with food additives that can be harmful for your health.

## Practice

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Everyone preserves food daily, but this is usually in a fridge. However there are other ways of preserving food and drink. They may be more time consuming but it can more satisfying, enterprising, cheaper, and with lower carbon emissions to process and preserve your own garden and farm produce.

### Drying

Drying depends on lack of moisture and possible high sugar. Most foods can be dried. Fruit, vegetables and mushrooms can dry naturally in the sun as well as over smoke or in an electric dessicator. However herbs normally are dried in an airy place but not in the sun in order to maintain their colour and healing properties. Meat and fish are traditionally hung up under a rain shelter and air-dried or dried by smoking.

- Grains, pulse seeds and nuts usually stay the same or are ground for storage.
- Fungi and chilli peppers can easily be dried and strung up in the kitchen.
- Some root vegetables (like horseradish and carrot) and fruit (like apples, plums and grapes) can be grated or sliced and then dried in an oven or dessicator.
- Many fruits can be made into leathers by making into pulp and then drying in the oven as thin layers on greaseproof paper.
- Many seeds from garden vegetables (like parsley, parsnip, coriander) can be dried and stored in jars for use as garnishes, or as roasted snacks (like pumpkin and sunflower).

### Salting/Curing

The salt draws water out of the food. Commonly used with meat and fish.

### Sugaring

Fruits are commonly preserved in honey or syrup. As with salt, the sugar draws water out of the food. Sugaring is used for making jams, conserves, jellies, chutneys, fruit butters, curds, spreads and marmalade. It depends on lack of moisture and oxygen, as well as a high sugar content.

### Smoking

Usually meat or fish that has undergone salting is hung up in a smokehouse. The smoke is the drying agent. Examples are ham, jerky, smoked salmon.

### Storing

Some fruit and vegetables can be stored in constant, controlled temperature and moisture, slowing down all chemical reactions. Food and drink is traditionally stored in a cool place, like a cellar. A sustainable and traditional way of preserving root vegetables is to store them in a root cellar. Sand and sawdust clamps or damp boxes can also be used for storing root crops for a short time, especially in a cool cellar. Potatoes are traditionally stored in a clamp of straw and soil in the ground. Some fruit with hard skins like apples, pears, pumpkins and squashes can also be stored for a few months in a cool building with some ventilation. Freezing is the easiest and quickest method of storage but the least sustainable. Any frozen and chilled food is much more energy intensive than dried food.

### Immersing in oil

Plant oil preserve by excluding moisture and oxygen. Some herbs like mint and rosemary can be infused in scentless plant oils like almond and stored in dark bottles. Culinary oils can also be used for preserving herbs and fruit such as chilli peppers.

### Chemical pickling

Pickling is characterized by a low pH which means that the food becomes acid. The lower the pH becomes, the more bacteria is killed. The vegetable or fruit is placed in an edible liquid that kills microbes (brine, vinegar, alcohol, oil). Usually the pickling process includes boiling the food in the liquid. It is common to add different

seasonings. An example is pickled cucumbers. Cider vinegar (pH 3.5 or less) can easily be made by exposing cider to the air using Mother of vinegar (a gelatinous lump of bacteria). Vinegars can also be flavoured for example with plums or blackberries. Chutneys can be made with fruit ( eg. green tomato, plum, apple, marrow) and vegetables (french beans).

## **Fermentation pickling**

The food itself produces the preservation agent. By adding a bit of salt and pressing the moisture out of the food, the solution is created. The bacteria already on the food produce lactic acid and thereby ferment the food. An example is sauerkraut made with finely cut cabbage that has been fermented by various lactic acid bacteria.

## **Bottling and canning**

Many vegetables and fruit can be preserved by sterilising and pasteurising. Sterilisation at 100 deg C kills all pathogenic and spoilage bacteria. Pasteurisation at 70 deg C for 20 minutes only kills pathogenic bacteria, but not all spoilage bacteria. Whole vegetables and fruit can be bottled in water and pasteurised using a waterbath. The juice from vegetables (eg. carrots, beetroot) and especially fruit (apples, plums, grapes, citrus fruit) can also be bottled by pasteurisation. A steam juicer (such as the Mehu Liisa) is an easy way of producing and bottling a range of pasteurised juices.

Unlike pickling it is very important that the food and containers are kept sterile when canning. With canning the food is processed and then sealed in an airtight container. To can food you go through three steps: 1. Cook the food 2. Seal it in sterile cans or jars 3. Boil the containers to kill any remaining bacteria by sterilisation. For some foods the last step needs to be in a pressure cooker. A pressure cooker is used to reach temperatures above the boiling point. This is necessary to eliminate some harmful bacteria, like *Clostridium botulinum*. Sealed in a can the food can last for many years. However, once a can or jar is opened, the food will spoil as quickly as before.

## **Jellying**

In this process the food is cooked in solutions with gelatin/maize flour etc. These materials solidify the food into a gel.

### *Hands on*

*Learn more about and try any of the ways of preserving food mentioned above, depending on the surplus of vegetables, fruit, meat or fish from the farm, and, of course, depending on the willingness of the farm family for their kitchen and kitchen preserving equipment to be used. At least ask about all the preserving techniques and equipment in the kitchen and on the farm.*

## **Fermenting**

The fermentation of fruit is a natural process that occurs in nature. It can be controlled using crushed fruit in a bucket so the fruit sugars convert to alcohol using the natural yeasts on the skin of the fruit. Dilute alcohol can preserve food by excluding moisture and oxygen. For example German rumtoft is made by laying different fruits in a jar with sugar and 40 degree alcohol like rum or vodka). Strong 40 degree alcohol made by distillation in an alembic still (eg. aquavit in Portugal) can also be used for sterilising food and wine processing equipment.

Alcohol made from apples (cider), pears (perry) and grapes (wine) can be made by crushing and then pressing the fruit, and then leaving to ferment and settle in a barrel or jar. The easiest, sociable and eco-friendly crusher is a large, strong deep bucket or barrel with about a few layers of apples or pears in the bottom crushed with a 1.5 m. long wooden mallet held by one or two people. Grapes can easily and traditionally be crushed by pounding then in a deep bucket with bare feet. Round wine or apple presses with vertical wooden slats are then filled with the crushed fruit and the juice is collected for pasteurising and bottling or for fermenting in barrels or jars with a fermentation airlock. Apples are very versatile and can make a wide range of drinks - juice, sparkling juice (slightly fermented), cider, and calvados (distilled cider), as well as cider vinegar.

Fermentation is also used for making dairy products such as yoghurt and kefir, using cultures that are often passed on from generation to generation. Fermented dairy products have long been an important component of healthy diets. Historically, fermentation involved unpredictable and slow souring of milk caused by the organisms naturally present in milk. Modern microbiological processes have resulted in the production of different fermented milk products of higher nutritional value under controlled conditions.

## *Hands on*

*If and when you have access to surplus fruit or milk try making fruit juices, cider, wine or yoghurt using simple equipment and the guides listed below.*

### **Making preserves**

To make preserves and fermented food you will need some of the guides listed below, as well as cookbooks and some basic equipment. The most important skills when preparing these foods and drinks are to prepare and clean the equipment, follow the recipe, and be patient.

#### **Some basic equipment**

- Kitchen area, water, cutting board, heating stove
- Stainless steel pots and pans, food-quality plastic buckets, barrels
- Glass jars with sealable lids
- Thermometer, hydrometer
- Salt, sugar, gelatin etc. depending on your recipe.
- Other equipment like, cloths, funnels, tongs and a pressure cooker

### **Herbs**

Herbs are used for everything from flavour to fragrance to medicine. Growing herbs is usually fairly simple, but what is definitely easy is to preserve them. After harvesting some herbs may need to be washed and dried on paper towels. However most herbs can be sun dried or tied up and hung in a ventilated room or building. For teas and culinary use they can be stored in sealed bottles and jars. They can also be distilled in a small alembic still or infused in scentless oils like almond or walnut. For fragrance they can be made into pot-pourris, soaps or added to small sachets.

## *Hands on*

*The easiest and simplest foods to preserve are the herbs, some of which can be collected and dried at most times of year (eg. rosemary, sage, bay)*

### **Nuts**

There are many ways to preserve nuts. They can be dried, cooked, ground or candied depending on the variety. Nuts are usually dried in their shell. However, time can be spared if they are first shelled. Optimal temperature is as high as 35-40 degrees celsius. This usually means using an oven or radiator. For a good result it is also important to keep the air dry.

Storing can be done in airtight containers. If the nuts still have their shell, they usually last longer. The shelf life is usually around 3 months, longer in the refrigerator and up to a year in the freezer. Chestnuts are a little different as they do not need to be dried before storage. It is possible to preserve fresh chestnuts keeping them in water for 7-10 days. Afterwards it is necessary to dry them for a few days and then they can be stored for a few months in a cool and dry place. In this way chestnuts remain fresh and can be used as normally (roasted or boiled). Otherwise chestnuts can be dried and stored for years. Grounding dried chestnuts it is possible to obtain chestnut flour.

## *Hands on*

- ☑ *Take a look around at your host farm. What vegetables, fruit, nuts, meat or fish is plentiful on the farm, even more than can be consumed at the moment? In which way could it be preserved?*
- ☑ *Build a solar dryer for fruits, herbs etc.*
- ☑ *You are at a dairy farm? Ask, whether you are provided with a certain amount of milk to try making yoghurt or even cheese.*
- ☑ *Prepare sour dough for baking your own bread.*
- ☑ *Design some nice labels for glasses, bottles or cans that preserve the food or drink.*

## Across Europe

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### Food waste

As already highlighted, a main purpose of preserving food is to keep it from going bad. The importance of this becomes greater when seen in a European and even global aspect. The FAO calculates that a third of the food produced in the world is lost or thrown away due to microbial spoilage and general waste. Around 100 million tonnes of food are wasted annually in the EU. Wasting food is not only an ethical and economic issue but it also depletes the environment of limited natural resources. Food loss and waste in industrialised countries are as high as in developing countries, but their distribution is different. In developing countries, over 40% of food losses happen after harvest and during processing. In industrialised countries, over 40% occurs at retail and consumer level.

### Commercial preservatives

From the old techniques of preserving food a mass of artificial preservatives have emerged. This is controlled very differently depending on the country. In the EU there is a list of EU-approved preservatives and other food additives, with an E-number. Some common ones are sorbic acid (first isolated from the rowan tree) and nitrates.

## WWOOF

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Before choosing a WWOOF host farm check whether there may be opportunities for some help by you in the kitchen. Most WWOOF hosts would preserve fruit and vegetables but only some would preserve meat or fish. You may wish to research ways of preserving food and drink in your own country or region, and even offer to demonstrate how to preserve particular foods.

## Organisations

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[National Center for Home Food Preservation](#)

### Videos

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[How to: Home food preservation and canning \(7 mins.\)](#)

[How to make easy quick pickles \(3 mins.\)](#)

[How to make cider at home \(8 mins.\)](#)

[How to make clothbound cheddar cheese at home \(24 mins.\)](#)

### Links

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[Agrodok3 – Preservation of fruit and vegetables](#)

[Agrodok12 - Preservation of fish and meat](#)

[Preserving game meats – curing, smoking, corning and canning](#)

[Practical methods for preserving seafoods – salting and drying. A training manual](#)

[Craft cider-making – Beyond the basics](#)

[Craft cider-making](#)

[Traditional fermented food and beverages for improved livelihoods](#)

[Lessons on herbs, spices and seasonings](#)

[The complete home guide to herbs, natural healing and nutrition](#)

[Preserving food](#)

[Food smoking](#)

[Resources for fermentation](#)

[General techniques for home preserving](#)

[Wikipedia on food preservation](#)

[Jams and other preserves](#)

[Wild Fermentation blog](#)

## Competencies – skills

- Drying – fruit and herbs
- Pickling – veg, eggs and meat
- Salting and Curing – veg, fish and meat
- Sugaring - fruit
- Fermentation pickling – veg
- Pastuerising
- Canning – veg, fruit, meat
- Bottling - veg and fruit
- Food smoking – fish, meat
- Cheesemaking - milk
- Yoghurts, butter, kefir making - milk
- Juice making – veg and fruit
- Cidermaking - fruit
- Winemaking – fruit
- Preparing and cleaning equipment
- Recording and following recipe

## Using and maintaining hand tools

### Introduction

In this section, the use and maintenance of the wide range of tools used in small scale [sustainable farming](#), [gardening](#) and [food processing](#) will be examined. Whilst WWOOFers and other adult volunteers will encounter many manual tools, for safety and insurance reasons their use of powered tools is much more limited, and so powered tools are not included here. However tools used in traditional crafts such as [basketry](#) and hedge laying will be included where these contribute to the daily running of organic farms, gardens and kitchens.

Many designs of hand tools are hundreds of years old, and often indigenous to a local region. Hand tools have many advantages over mechanical tools. By their nature they are labour intensive but do not need special training for their use. They are low tech so are low cost, easily repairable and in some cases easily made from local materials. They do not use fossil fuels so are more sustainable and quieter to use.

### Background

The outdoor tools that WWOOFers are most likely to encounter include:

#### Gardening Tools

[Loppers](#), [Saws](#), [Pruners](#), [Fork](#), [Spade](#), [Hatchet](#), [Hoe](#), [Trowel](#), [Rake](#), [Shovel](#), [Axe](#), [Pick Axe](#), [Hedge Trimmers](#), [Wheel Barrow](#)

#### Small Holding Tools

[Scythe](#), [Bill Hook](#), [Pitchfork](#), [Hand Corn Mill](#), [Fruit Press](#), [Honey Extractor](#)

#### Design, Materials and Use

Design, materials and use are inextricably linked. In the Practice Section below are links to examples of good and bad design, the construction of different tools showing stress points and suggestions for use with practical tips from experienced Hosts, presented through video, photographs and text.

#### Storage and Organisation

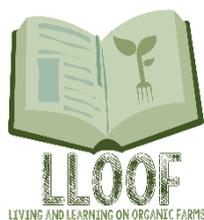
It is important to store tools indoors, away from moisture and rain, and to prevent theft. Storage systems such as [peg boards](#) will keep tools off the ground whilst showing if any are missing or have been left outside. Knowing where tools should be helps communication and saves time. Tools not in use for the winter should be oiled and put away.

#### Daily Maintenance

- Tools need to be cleaned and dried after use to prevent diseases, fungi, insect eggs, and weed seeds from being spread around the garden.
- The life of tools is extended by removing soil from steel surfaces, which could lead to rust.
- Tools such as axes and saws that come into contact with wood need to be wiped down with a thick, rough cotton cloth to remove gum and sap from the blades. [Anti-rust products](#) or oil can be used to prevent rust and there are several products available to help remove rust that has already formed.
- To maintain wooden handles they can be smoothed with sandpaper and oiled with [linseed oil](#).
- The moving parts of loppers, pruners and similar tools need to be lubricated regularly.
- Tools with cutting edges will be much more efficient when properly sharpened, and therefore less prone to being mishandled or damaged. [Sharpening of tools](#) can be done with files, [whetstones](#) or handheld sharpeners. Tools to be sharpened need to be secured to prevent them slipping, and there are different ways of sharpening specific tools.

#### Examples of Kitchen Tools

[Wooden Spoon](#), [Spatulas](#) (metal and silicone), [Grater](#), [Slotted Spoon](#), [Tongs](#), [Whisk](#), [Ladle](#), [Sieve](#), [Apple Corer](#), [Peeler](#), [Colander](#), [Rolling Pin](#), [Scales](#)



## Design, Materials and Use

Design, materials and use are inextricably linked. In the Practice Section below are links to examples of good and bad design, the construction of different tools showing stress points and suggestions for use with practical tips from experienced Hosts, presented through video, photographs and text.

## Storage and Organisation

Every day kitchen tools are best kept in a holder on the counter where they are within reach, rather than in a drawer. In a shared kitchen, a system similar to that used for gardening tools will help keep track of everything and highlight if anything is missing at the end of the day.

## Daily Maintenance

- Kitchen tools should always be put away clean and dry.
- Stainless steel pans can be soaked and scrubbed.
- Knives should be able to slice through a piece of paper and can be sharpened with a [whetstones](#).
- Wooden utensils can be kept in good condition with [walnut oil](#) a few times a year.
- [Cutting boards](#) must be kept very clean, especially when cutting meat, to prevent [cross contamination](#) and wooden boards can be treated with [mineral oil](#) mixed with some [beeswax](#). Using a clean soft cloth, apply the oil in an even layer and let it rest for a few hours or overnight. Buff off any remaining oil with a soft cloth or paper towel.

## Health and Safety

In the mid-1800s, [Wojciech Jastrzebowski](#) coined the word '[ergonomics](#)', which nowadays most frequently refers to fitting the task to the person, and also attempts to look at the decision making performance of humans. In general, ergonomic hand tool features can be classified by the following design goals:

- Decrease the force or grip strength required to use the tool.
- Decrease repetitive motion associated with using the tool.
- Decrease awkward body postures or wrist positions when using the tool.
- Decrease vibration transmitted to the hand and wrist.

No one tool, however well designed, will suit all users and jobs, so developing an awareness of the above in WWOOFers is important to help them protect themselves from injuries through accidents, whilst ongoing incorrect use can lead to repetitive strain and similar injuries.

## Practice

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### Cutting or shearing tools

- Axe - for chopping or felling trees and splitting logs (with a wide splitting axe), with two hands and legs apart.
- Billhook - for chopping wood or laying a hedge, with one hand.
- Bowsaw - for sawing wood on a tree or timber on a sawing frame or horse, with one hand and sometimes two people.
- Pruning saw - to cut unwanted branches of trees, diseased part of crops, with one hand.
- Slasher - for cutting brambles, shrubs, nettles, or grass, with two hands.
- Sickle - for cutting grain crops or grass, with one hand sweeping wide, low and horizontally.
- Scythe - for cutting grain crops or grass, with two hands sweeping wide, low and horizontally.
- Pruners, loppers - for pruning fruit trees, with two hands, often up a tree or on a ladder.
- Secateurs - for pruning fruit trees and bushes, with one hand.
- Garden shears - for cutting grass, with two hands.

- Budding knife - to remove buds for budding - a vegetative propagation method.

## **Tilling or cultivating tools**

- Pitchforks - for lifting and moving cut crops, made of wood or metal, with two hands.
- Fork - for loosening plants, and tilling soil, with two hands and foot.
- Trowel - for lifting plant roots, and weeding, with one hand, often kneeling.
- Spade – for digging vertically in soil, with two hands and foot.
- Shovel - for digging horizontally along soil, manure or other material.
- Hoe – for weeding by pulling back or pushing forward along the soil, with two hands.
- Wheel hoe - for weeding by pushing forward along the soil, with two hands.
- Rake - for dragging soil, plant material or weeds along the ground, made of wood or metal, with two hands.
- Pick axe - for breaking hard soil, digging out trees stumps and stubborn roots, and removing large stones from the ground.
- Mattock – for uprooting difficult stumps and roots, bush clearing, and removal of stones from the ground.

## **Other tools**

- Wheel barrow – for carrying most things, with two hands.
- Sieves - for sieving soil to prepare seed and potting compost.
- Watering can – for watering plants and dry soil (often with a liquid manure using a rose sprayer), and cleaning tools.
- Seed sowers - for sowing seeds by broadcast, or wooden dibbers for sowing large seeds (eg. beans) and potatoes, with a string line.
- Seed sowers - for sowing seed in trays or pots, with plastic or wood labels, and with compost leveller.
- Dibber - for making holes in soil for planting large seeds, seedlings and potatoes.
- Post rammer - for ramming a wooden post or stake into the ground, after a hole has been made with a metal stake, with two hands and often two people.
- Yard brush - for sweeping a farm yard, road or path, with two hands.
- Kitchen knives - for a wide variety of cutting purposes (vegetables, meat, bone, fish, bread), using a wide variety of knives, and a dry, or preferably wet, sharpener.
- Grindstone, oilstone and whetstone - for sharpening hand tools, often using oil.

## **Accessory tools**

These are other tools used in agriculture.

- Crowbar - for removing nails, tight lids, lifting heavy objects etc.
- Mallet - for hitting wood, striking pins, rods or soft metals
- Chisel - for cutting out small areas of wood into proper shape.
- Hammer - for knocking in nails into wood, or for beating metal flat.
- Bradawl - for boring holes in wood
- Files - for sharpening tools like axes, spades, cutlasses, hoes, saws etc.
- Spanners - for tightening or loosening nuts from bolts.
- Pincers - for removing nails e.g as wire nails with the head off
- Pliers - for holding or cutting wire

- Screw drivers - for turning screws into wood tightly.

## Hands on

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- ☑ *Try using any of these tools, by asking your host how, why and when they should be used.*
- ☑ *Also search on Youtube to find out how to use the tool, or about its variety of types and history eg. search on scythe cutting or festival.*
- ☑ *Always remember to clean and possibly sharpen the tools after use, as well as return them to their normal place.*
- ☑ *Take photographs of interesting local tools to upload to the LLOOF website and add a comment about their name, history and use.*
- ☑ *Write a description of the farming tool for [Wikipedia](#)*

## Across Europe

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Across Europe there are huge variations in the designs of basic hand tools such as hoes, spades and rakes. The indigenous designs were slowly and locally evolved by generations of farmers, blacksmiths and woodsmen to suit the local farming methods, soils and climate.

## WWOOF

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Each WWOOF host farmer will have a wide range of hand tools. Many of them may have been used by generations of farmers. They are certainly worth admiring for the craftsmanship and skill that designed and made them.

## Organisations

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[Old garden tools](#)

## Videos

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[The ABC of Hand tools - 1950s film \(30 mins.\)](#)

[Farm Hack - Forging hand tools \(7 mins.\)](#)

## Links

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[Agricultural hand tools in emergencies, FAO](#)

[Farm tools presentation](#)

[Testing of hand tools and non motorized machines](#)

[Antique farm tools](#)

## Competencies – skills

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- |                          |                                  |                                      |
|--------------------------|----------------------------------|--------------------------------------|
| ➤ Using axe              | ➤ Using fork                     | ➤ Planting out                       |
| ➤ Using billhook         | ➤ Using trowel                   | ➤ Using post rammer                  |
| ➤ Using bowsaw           | ➤ Using spade – digging          | ➤ Using yard brush                   |
| ➤ Using slasher          | ➤ Using shovel                   | ➤ Using kitchen knives               |
| ➤ Using sickle           | ➤ Using hoe – draw, push         | ➤ Sharpening, maintaining hand tools |
| ➤ Using scythe           | ➤ Using wheel hoe                |                                      |
| ➤ Using pruners, loppers | ➤ Using rake                     |                                      |
| ➤ Using secateurs        | ➤ Sowing seeds – rows, broadcast |                                      |
| ➤ Using garden shears    |                                  |                                      |
| ➤ Using pitchfork        |                                  |                                      |

## Building in earth, stone, wood and straw

### Introduction

Ecobuilding (ecological building or natural building) is both a design process and the resulting structure. It is a modern architectural form of permaculture design. An ecobuilding is a structure that is designed to create and sustain mutually beneficial relationships with all of the elements of its local ecology. This concept is distinctly different from green building, or sustainable architecture, where the goal is to minimize the negative environmental impact of buildings. This guide will mainly focus on ecobuilding materials and techniques as volunteers are most likely to be working on these sort of farm projects rather than more hi-tech renewable energy systems. However sustainable water management systems are also a key element of farm ecobuilding.

### Background

#### Key elements

- Natural materials - Ecobuilding materials that are commonly used include wood, clay, other earth materials, straw, stone and lime. All of these may be available on the farm or nearby land.
- Recycled, re-used, reclaimed materials – These may be old doors, windows, gutters or other building materials, but could also be re-used building rubble, timbers, tyres and bricks etc.
- Local materials – where there is minimal transport of materials, keeping a low carbon footprint.
- Low energy materials - where low levels of energy are used and embodied in their production. Minimal cement or fired bricks are used, both of which use a lot of energy and cause pollution and greenhouse gas emissions.
- Self-build – local, non-professional labour, often using volunteers. This reduces travel and hence the carbon footprint, reduces the costs, empowers the self-builders and improves their skills.

#### *Hands on*

*Look at any ecobuilding and draw a flow diagram of inputs, processes and outputs, based on these five key elements.*

#### Wood and timber

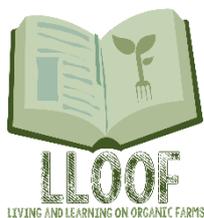
Wood is one of the oldest, most versatile and most sustainable building materials. It is our most valuable renewable resource and its use in construction affects our environment in ways that are not obvious. Efficient use of wood as an ecobuilding material promotes healthy forests that, in turn, clean the air of greenhouse gases and purify drinking water. Wood is not only a versatile structural material, but its use for building also reduces the effects of climate change by storing carbon for as long as the building exists. However one limitation that can shorten the service life of a structure is wood's vulnerability to moisture and decay.

- Roundwood can be used with various joints and designs for constructing frames which can be infilled with other earth or wood materials.
- Timber framing and post-and-beam construction are building techniques with heavy timbers rather than smaller cut timber. Traditional timber framing is the method of creating structures using heavy squared-off and carefully fitted and joined timbers with joints secured by large wooden pegs.
- Cordwood is short pieces of debarked tree laid up crosswise with masonry or cob mixtures to build a wall.
- Wattle and daub uses woven split wood (often hazel or ash) as the base for cob mixtures.
- Roof shingles and shakes were one of the original natural roofing materials, along with thatch and stone. They are waterproof wooden tiles for the exterior cladding of buildings.

#### Earth materials

Earth is one of the oldest building materials and a primary ingredient of natural building. It has many benefits:

- is low tech and economical to build, with low maintenance
- needs little water, so it is good in dry climates



- needs few other resources like aggregates or additives to improve their properties
- can be recycled, is easy and agreeable to work
- insulates if built with high thermal mass especially for hot climate
- gives off no harmful emissions
- reduces noise
- does not burn, so earth materials are fireproof

But building with earth materials is labour-intensive, time-consuming and hard physical work. Earth-based buildings are also poor insulators.

- **Rammed earth (or pise)** - has a long and continued history throughout many regions of the world. Rammed earth is based on naturally damp and crumbly earth which is compressed into a form and left to dry and harden. It is the heaviest form of earthen building. Rammed earth structures can therefore be load-bearing, which reduces the need for structural supports (up to 4 stories), so reducing building costs. The earth is filled into vertical formwork boards and compressed in layers similar to conventional concrete. Alternatively large rammed earth blocks can be pre-cast in moulds and then assembled on site much like brickwork on a larger scale.
- **Adobe or mudbricks** - One of the oldest building methods, adobe is simply clay and sand mixed with water. Often, chopped straw or other fibres are added for strength. The mixture is then allowed to dry in the desired shape. Usually adobe is shaped into bricks that can be stacked to form walls.
- **Cob** - is a mixture of clay, sand, straw and earth. The construction uses no formwork, bricks or wooden framework as it is built from the ground up. Cob is one of the simplest, least expensive and fireproof building materials and techniques available. It is also versatile as it can easily be shaped into any form to create artistic, sculptural forms. Cob is commonly used for building outdoor bread and pizza ovens.
- **Earthbags** - Polypropylene or natural-fibre bags are filled with earth and stacked to form footings, foundations and walls.
- **Straw bales** - can be load-bearing, or used to infill a timber frame. It was pioneered in the US mid-west in the 19th century by farmers whose only building material was the waste from their wheat crop. Whole or cut bales are laid with each course offset, like bricks. Recycled materials can be used, including timber, doors and windows. One of its main benefits is as an insulator with a higher insulation value than brick or concrete, with lower heating bills and reduced CO2 emissions. Like other natural building materials it is biodegradable and can be locally sourced.
- **Earth shelters** - are built into the ground, as opposed to above the ground. This provides external thermal mass, reduces heat loss, as well as a steady indoor air temperature. Earthships are typically built with various recycled materials (such as tyres, plastic bottles, aluminium cans), earthen plasters, large wood beams, and lots of glass for sun-facing windows.
- **Passive solar design** - The building is orientated to the sun to provide passive venting and thermal mass in the building materials. Windows, walls, and floors are made to collect, store, and distribute solar energy in the form of heat in the winter and reject solar heat in the summer. The key to design a passive solar building is to take advantage of the local climate by performing an accurate [site analysis](#). Elements to be considered include window placement and size, glazing type, [thermal insulation](#), [thermal mass](#), and shading. Passive solar design techniques can be applied most easily to new buildings, but existing buildings can be adapted or retrofitted.

## Water management

**Rainwater harvesting** - the collection (often from roofs) and storage (often underground) of rainwater for reuse on-site, rather than allowing it to run off. It can be used for water for garden, livestock, irrigation, and with proper treatment for domestic use and indoor heating systems. In many places the water collected is just redirected to a deep pit with percolation.

**Compost toilets** - are a type of [dry toilet](#) that treats [human excreta](#), by [composting](#) or managed aerobic [decomposition](#). These toilets generally use little to no water and may be used as an alternative to [flush toilets](#).

**Waste water filtration** - Artificial reed beds are used as a method of removing pollutants from [greywater](#). Reedbeds are natural habitats found in [floodplains](#), waterlogged depressions and [estuaries](#). Reed beds are part of a [succession](#)

from young [reed](#) colonising open water or wet ground through a gradation of increasingly dry ground.

## Practice

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**Recyclable, durable materials** - Choose building materials that are durable and from renewable, recyclable or non-depletable resources. Renewable resources such as timber or non-depletable resources such as earth means the potential for building with these materials remains constant, provided they are properly managed. Much energy and labour goes into the production of materials and the creation of buildings, so that if a material is more durable or can be used again, the associated costs to the user and the environment are reduced.

**Low energy materials** - Choose building materials that do not contribute to environmental problems in their production, transportation, installation, demolition or disposal. Building materials need to be considered in all stages of their existence from their initial formation until to their eventual decay. For some materials high energy costs for production or transportation may have a more detrimental effect on the environment than their relatively benign useful life, others may be problematic when the building is demolished, releasing harmful particles or creating non-biodegradable landfill.

**Minimum construction waste** - Avoid unnecessary packaging of building materials and promote reuse or recycling of waste materials. Measuring a building to suit the unit sizes of building materials can save labour and timber off-cut waste. Materials such as bricks can be transported without excessive packaging, leftovers can be returned without wastage and they can be used again. Dismantling a building rather than demolishing it means what cannot be reused can be recycled.

**Small footprint** - Design buildings with efficient planning and multi-use spaces for a smaller physical footprint. Many modern homes are of extravagant size. Smaller, simple buildings use less material to build and take up less land, as well as being easier to heat, cool and clean. Good design means that circulation space is minimised and main spaces can work well for several different functions, but still feel spacious.

**Local materials** - Plan developments to reduce reliance on mechanised transport, and use renewable sources of fuel for longer haul transportation. Fossil fuel use for transport can be reduced or eliminated if most people's needs are met locally. However, there will always be some need for longer haul journeys, so an efficient network of commuter or goods transportation, using renewable sources of fuel, lessens the impact on the environment.

**Water cycle management** - Incorporate efficient water use and on-site stormwater and wastewater disposal in the building design to achieve zero net imported water use. Zero net imported water use involves the harvesting of water on or near the site and the disposal of wastewater back into the same natural ecosystem. Efficient water use ensures neither the supply nor the disposal exceeds the natural capacity of the area. Purification of water supply and treatment of wastewater needs to mimic natural water purification processes.

**Water quality** - Restore and enhance water quality before returning it to the natural ecosystem. It needs to be used with non-toxic cleaners and body care products and returned into the natural environment cleansed and cooled so it can continue its natural course without loss of quality.

**Plan the whole site** - Design the building, site and surrounding landscape to maximise food production using permaculture principles, and allow natural habitat and wildlife to flourish. Healthy and sustainable living does not stop at the walls of the building, but includes the site and its watershed. Growing food on or near one's property makes for greater resilience in times of adversity, as well as lessening the impact of travel either to buy food or supply shops. Permaculture principles exemplify healthy and sustainable living and land use.

### *Hands on*

*When volunteering to construct an ecobuilding, draft a staged plan for the development using these eight elements.*

## Across Europe

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There are a huge range of traditional building materials across Europe. Traditional wood and timber buildings dominate in the north of Europe and in highly forested countries like Austria. Earth materials dominate in the drier south of Europe, thatch and stone materials dominate in hilly, mountainous regions. Building design across Europe is highly regulated by country and regional development control and laws, especially relating to the look of the building, its impact on neighbours, its safety, and increasingly its environmental impact.

## WWOOF

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Many WWOOF hosts use natural ecobuilding materials, especially those that are communities or [ecovillages](#). WWOOF volunteers are often asked to help build with these materials as ecobuilding is very labour intensive. Building projects for volunteers might include compost toilets, paving, walls, lime plaster, cob ovens, barns, wood stores, workshops, simple accommodation for volunteers, and other farm buildings.

## Organisations

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[Devon Earth Building Association](#)

[Low Impact Living Initiative](#)

[The Building Biology and Ecology](#)

[CAT](#)

[Earth building UK and Ireland](#)

[Permaculturist magazine](#)

[Frequently Asked Questions about green building](#)

[Sustainable Building Association](#)

[Forest Stewardship Council](#)

[GreenSpec](#)

[Green Building Forum](#)

## Networks

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[Permies - Homesteading and permaculture forum](#)

[Natural homes - natural building workshops, volunteers and ecovillage start-ups](#)

[Global Ecovillage Network](#)

## Videos

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[Living with the land part 2 - Natural building \(6 mins.\)](#)

[Building cordwood \(3 mins.\)](#)

[Introducing roundwood timber framing \(2 mins.\)](#)

[Reciprocal frame roof - Living in the future series \(15 mins.\)](#)

[Houses of straw - the rediscovery of strawbale building \(6 mins.\)](#)

## Links

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[Information guide to straw bale building](#)

[Straw bale - An introduction to low-impact building materials](#)

[Straw works - Straw bale building](#)

[Roof shingles](#)

[Building with earth](#)

[Building with rammed earth](#)

[Earth building - Learning across Europe Pathways to clay](#)

[Easy guide to ecobuilding - Design,build and live with the environment](#)

[Designing homes for climate change](#)

[Timber as a sustainable building material](#)

[Get rugged – Self-build made simple](#)

[How to build a cob oven](#)

[Build your own earth oven](#)

[Earthbag building](#)

## Competencies – skills

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- Joinery
- Carpentry
- Stone masonry
- Earth building
- Strawbale building
- Greenwood building
- Timber frame building
- Roof shingle building
- Thatching
- Lime plasterwork
- Painting

## Working with other people

### Introduction

Why work together? Mutual aid is arguably as ancient as human culture; an intrinsic part of the small, communal societies universal to humanity's ancient past. From the dawn of humanity, until far before the invention of agriculture, humans were foragers, exchanging labour and resources for the benefit of groups and individuals alike. In Europe for several thousand years until the last one or two generations, agriculture has been hugely labour intensive. It has relied on farmworkers, including whole families and friends working cooperatively. Intensive mechanisation has replaced this teamwork on most European farms and many people who sleep in rural communities work and study in nearby cities. But organic farming is labour intensive and so family members, volunteers and neighbours are often required to work cooperatively together.

Much of the school system and university study is organised on an individual basis. This is mainly because teachers and tutors have to be sure that the work for which you receive your qualification is your own work. However, teamworking skills are highly valued by most employers. This individualistic (some might say capitalist rather than socialist) tendency seems to continue later on in our lives, careers, communities and workplaces. The interpersonal skills of working in a team or group, as well as the values associated with cooperation and social cohesion, are vital for a caring, sustainable society.

### Background

This topic describes several ways in which communities and their local farms can connect with each other, and enjoy mutual benefits.

#### Community supported agriculture (CSA)

Community supported agriculture is, in fact, a big name for a simple idea. Communities of any size make a financial pledge to support a local farm. This helps communities to connect directly with their local farmers and provides benefits for both parties. CSA is a partnership between a farm and consumers where the risks and rewards of farming are shared. The producer/ consumer partnership is based on direct person-to-person contact and trust, with no intermediaries or hierarchy.

The farmer benefits financially from having a secure market of committed customers and the members of the CSA often contribute additional labour and a range of skills. Members receive a share of the farm produce, reconnect to the land and, in many cases, can get involved in producing their food. All those involved play a part in supporting the production of local food and culture whilst helping to build and maintain their local community.

The CSA approach originated in the 1960s in Switzerland and Japan, where consumers interested in safe food and farmers seeking stable markets for their crops joined together in economic partnerships. In Europe there may be as many as 4,000 CSA farms and 400,000 CSA consumers.

#### CSA aims

- Securing a supply of a particular produce (eg. fruit and vegetables), or a particular form of farming (eg. organic or biodynamic).
- Ensuring financial viability for the farmer (pre-payment for the produce and direct market outlets).
- Developing farmer/consumer relations and greater consumer contact with farms – putting the farmer's face on the food.
- Promoting the consumption of local seasonal foods – and increasing local, regional and national food security.
- Introducing children to farming and local foods.
- Providing a caring environment for people with special needs.
- Promoting environmentally-sound farming practices.
- Educating new farmers and introducing ethical management.

## CSA features

- **Partnership** - CSAs are based on a partnership, usually formalised, as an individual contract between each consumer and the producer. It is characterised by a mutual commitment to supply one another (with money and food) over a certain time.
- **Local** - CSAs are part of an active approach to relocalising the economy. Local producers should be well integrated into their surrounding areas, benefiting the communities which support them.
- **Solidarity** - CSAs are based on solidarity between producers and support groups and involve sharing both the risks and the benefits of healthy production that is adapted to the natural rhythm of the seasons and is respectful of the environment, natural and cultural heritage and health.
- **Fair** - CSA members pay a sufficient and fair price up-front to enable farmers and their families to maintain their farms and live in a dignified manner.

## CSA benefits

To local communities:

- Consumers get fresh food from a known local source
- Fewer food miles, less packaging
- More local employment, processing, consumption and a re-circulation of money through local spend
- More education about varieties of food
- More sustainable farming

To farmers:

- More secure income with improved business planning
- Higher and fairer return for products
- More involvement in the local community
- More direct responses to consumer needs
- Volunteering with labour and planning for the future.

## Care (social) farming

### Features

Social farming, also called care farming, is a farming approach that uses agricultural resources to provide social or educational care services for vulnerable groups of people. It includes the integration of disadvantaged groups in productive activities to promote their rehabilitation, social inclusion and employability, as well as providing on-farm care services. Care farming is about using the land for therapy and training. It is a partnership between farmers, carers and vulnerable people.

### Benefits

Social farming offers vulnerable people (with intellectual or physical disabilities, ex-combatants, prisoners, etc.) the possibility to participate in meaningful and productive activities, by appreciating and focusing on their potential and capabilities. Their activities have much in common with those of people in paid employment (i.e. daily routine, social interaction, skills development, opportunities, payment for their work). People with specific needs, by being involved in a worthwhile activity develop a sense of identity and new skills and competence around being a gardener or farm worker. They also regain a feeling of purpose, self-esteem and dignity. Furthermore, actively engaging with the natural environment has a positive influence on their health and well-being.

### Care farms

- Use the whole or part of a farm
- Provide health, social or educational care services for vulnerable groups of people
- Provide a supervised, structured programme of farming-related activities

Many care farms focus on organic farming. One reason may be the need for extensive manual labour and direct contact with plants or farm animals in the organic farming processes. Another reason may be the focus on a local

market, i.e. customers from around the farm interested in buying local and sustainable food.

There are numerous care farms where the farm activities are subservient to the therapeutic process. However providing agricultural produce for the market may also contribute to a person's healing process and/or sense of well-being. Depending on the focus of the farm, the activities that are offered on the farm may depend on the type of vulnerable people, the farm targets or the available agricultural processes on the farm. Some care farms serve as animal sanctuaries to provide homes for formerly abused animals.

Horticultural therapy is defined as the engagement of a person in gardening and plant-based activities, facilitated by a trained therapist, to achieve specific therapeutic treatment goals. Horticultural therapists are specially educated and trained members of rehabilitation teams who involve participants in all phases of gardening, from propagation to selling products, as a means of bringing about improvement in their life.

## City farms

City farms are environmental and agriculture projects, working within a framework of sustainable development, where children, young people and adults can learn about the urban and rural environments and their interrelationship with plants and animals, the importance of the seasons and the relationships between them. City farms bring visitors in touch with animals, nature, their environment and each other. They achieve this by offering practical activities, training and information, a social meeting point, recreational facilities and animal therapy.

## Community gardens

A community garden is a single piece of land gardened collectively by a group of people. Community gardens provide fresh produce and plants as well as satisfying labour, neighbourhood improvement, and a sense of community and connection to the environment. They are publicly functioning in terms of ownership, access, and management, as well as typically owned in trust by local governments or not for profit associations. This can include many different urban networks and approaches - for example, guerilla gardening, the Incredible Edible Network, Abundance Network, European Urban Gardens Otesha project, and Transition Towns Network.

## Intentional Communities

Intentional communities often run organic gardens or farms. Examples of such communities are ecovillages, cohousing, residential land trusts, income-sharing communes, student co-ops, spiritual communities, and other projects where people live together on the basis of explicit common values. The Fellowship for Intentional Community is a nonprofit organisation dedicated to promoting cooperative culture. It believes that intentional communities are pioneers in sustainable living, personal and cultural transformation, and peaceful social evolution.

## Cooperatives

Many organic farms are part of cooperatives which have legal structures where individuals and groups choose to cooperate and work together. The principles for the cooperative model include:

- **voluntary and open membership** - giving access to all, regardless of their background, knowledge or experience
- **democratic member control** - joint decision making, defining the goals and the mission of the cooperative and pursuing them together; autonomy and independence, a secure environment that stimulates growing responsibility, initiative and risk-taking
- **education, training and information** - to achieve common goals and to inform other members through respectful discussion
- **concern for the community** - paying attention to the development of the local community, immediate environment and/or region.

## Practice

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In the context of farm work, a good team has both good cooperative and team working skills. Cooperative skills could be described as the understanding of how to work effectively with other people on an equal basis towards commonly held aims and objectives:

- Have a shared vision - agreeing what needs doing, what the priorities are, and when the work should be done eg. recording a list of tasks with approximate timing, keeping each other informed about developments.

- Put team interests above individual interests, e.g. to get a task finished before the end of the day as the weather may change.
- Agree a way of making decisions and comments together and in a suitable way e.g. during a meal, at the start or end of the day, respecting the opinions of others in the team. Some communities use consensus as a decision making process. It can be a long process as it requires a completely shared decision.
- Include people with different strengths, who know that they can make different contributions, especially with difficult work, work in extreme temperatures, or work with a greater risk of injury.
- Include all members participating equally. Efforts are made to ensure that nobody feels left out or undervalued, e.g. reviewing and reminding people at the end of the day, taking turns, sharing responsibilities.

Good teamwork also involves good communication and inter-personal skills:

- Asking for what you need; asking questions to which you need the answer; asking for help; asking permission
- Answering questions; accepting no for an answer; listening
- Giving constructive criticism; accepting criticism and consequences
- Remembering and using people's names; remembering that others may speak in a different language
- Praising; not putting down
- Following instructions; negotiating changes; disagreeing appropriately
- Getting attention appropriately; using an appropriate tone of voice

## *Hands on*

*Teamworking – If you are volunteering on a farm with a wide range of people (e.g. a large family farm, different families, an intentional community, other volunteers), record some examples of good teamworking, based on the lists above. Use your diary or farm log to explore the way people cooperate. Check the use of your own skills against those listed above.*

## *Hands on*

*Community life - Working together and sharing daily life on a farm requires good organisation of community life. What is the plan for living and working together at your farm like? Draw a small flow diagram or mindmap, if you like! Some farms have a more visible, obvious structure of living together than others. If you are volunteering on several farms, how do they compare? What are advantages and disadvantages that you can detect during your volunteering?*

## WWOOF

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There are many ways that volunteers can experience teamworking on organic farms – through large intentional communities, community supported farms, care or social farms and a wide range of urban and semi-urban city farms and community gardens. A volunteer's relationship with the farm host, other workers, volunteers and the wider farm family can require a wide range of teamworking skills.

Many WWOOF farms are run by just one family. In these cases, there are often no specific rules to follow, every member of the family knows their role. When there is a volunteer guest (WOOFer), everyone has to adapt. That means that the volunteer has to accept the rules of the family. On the other hand, the family has to accept the feelings and habits of the volunteer. It is not always an easy relationship.

## Organisations

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[Care farming UK](#)

[European Federation of City Farms](#)

[Farming for Health – Community of Practice](#)

[Cooperatives Europe](#)

[Mappe di Facilitazione](#)

[Instituto de Facilitaciòn y Cambio-Europa](#)

## Networks

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[URGENCI Network](#)

[CSA UK Network](#)

[Fellowship for Intentional Community](#)

[Global Ecovillage Network](#)

[Rete Italiana Villaggi Ecologici](#)

[Transition Towns Network](#)

[Transition Towns - Italy](#)

## Videos

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[Non Violent Communication \(10 mins.\)](#)

[Chagfoods Community Supported Agriculture \(CSA\), Chagford, Devon \(12 mins.\)](#)

[Community Supported Agriculture \(CSA\) - Dragon Orchard, Herefordshire \(8 mins.\)](#)

[Swillington Organic Farm : Pig and Chicken CSA \(9 mins.\)](#)

[Making Local Food Work: OrganicLea \(4 mins.\)](#)

[Buy Local - A Look at Community Supported Agriculture \(11 mins.\)](#)

[Social Farming in the UK \(4 mins.\)](#)

[Organic Lea \(3 mins.\)](#)

[Care farming UK \(6 mins.\)](#)

[Growing Well \(4 mins.\)](#)

## Links

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[European handbook on community supported agriculture - sharing experiences](#)

[Cultivating Co-operatives](#)

[Food Co-ops Toolkit](#)

[Community Supported Agriculture](#)

[A share in the harvest - An action manual for community supported agriculture](#)

[Cooperative farming - Frameworks for farming together](#)

[Local Harvest – A Multi-Farm CSA Handbook](#)

[Supporting policies for Social Farming in Europe](#)

[Farming and care across Europe](#)

[Care farming: Defining the 'offer' in England](#)

[Non Violent Communication](#)

[Ecological communication](#)

[Consensus handbook](#)

## Competencies – skills

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- Cooperating
- Teamworking
- Communicating
- Networking
- Negotiating
- Leading and following

## Setting up a small farming or processing enterprise

### Introduction

There is a growing movement to get back to the land—to start developing hands-on, land-based careers. An excellent way to find out about different types of organic farming and processing enterprise is to volunteer on their farm. There are also several networks listed below which focus on future farmers. Determining what to grow and how to sell it are the first steps in starting a farm-based business.

Small farms have always been a cornerstone of agriculture in the European Union. They play a significant role both in production and the maintenance of rural vitality – they support rural employment and contribute to regional economic development. They are hugely important for local food production, particularly in the form of local specialist products and provide important social, cultural and environmental services as well as maintaining the vitality of local rural communities.

In recent years small farms have received increased attention in the political debate, recognizing the role they play in rural areas and the need to improve their economic and social conditions in times of structural change of the agricultural sector towards fewer and larger farms. Small farms still dominate agriculture in developing and transitional countries and thus their role cannot be ignored.

### Background

#### Opportunities

Organic produce is one of the few expanding markets in the food and farming sector. This expansion is consumer driven. The greatest demand is for fruit and vegetables but this follows through to a much wider range of products, for example cereals, dairy products, meat, and processed foods. Market surveys in Europe and all over the world show a huge scope for expansion in organic produce.

#### Enterprise options

Organic farming enterprises can start on a very small, part-time scale. Without access to land they can start as enterprises that process harvested crops or livestock products from local farms, for example making preserves or fruit juice. An alternative to enterprise is self-sufficiency which does not require any aid, support, or interaction, for survival. It is therefore a type of personal or collective autonomy. There are still societies which continue to be self-sufficient, never having given up traditional ways of food gathering and food making and their practices can be learnt from by all farm enterprises.

There is a progression that can be made in developing an organic enterprise from small to large-scale, from part-time to full-time, from crop-based to mixed crops and livestock, and from producer-consumer to mainly producer. The marketing, commercial element can be introduced at any level but with increasing complexity and risk. The cooperative or community group element can also be included at any level. A horticultural rather than an animal-based starting point is likely to be the easiest, least time-consuming, and least risky.

- small private or community garden (< 50 m<sup>2</sup>)
- allotment on land rented annually from a local authority (50 – 500 m<sup>2</sup>)
- market garden of vegetable and fruit (500 – 5000 m<sup>2</sup>)
- mixed smallholding eg. with vegetables, fruit, poultry, pigs (5000 – 50000 m<sup>2</sup>)
- mixed farm eg. with cereals, pulses, sheep, goats, (50000 m<sup>2</sup> or 5 hectares +)

Size is not necessarily the only defining feature of these different holdings. Other options might include the use of extensive common land (owned by a local community or the state). For example this could be pastoralism with a sheep flock or goat herd or agroforestry with fruit trees and woodland products.

#### Barriers for new farmers

There are several barriers for young farmers and new entrants:

- Age - The agricultural workforce is the oldest of any enterprise sector in Europe. Only 3% of farmers in the EU are under the age of 35, while the average age is 58 years – and getting older.

- Land - Land tenure is a huge challenge for young farmers. As a person setting out to start a new business as a first career, they typically don't have the cash in hand to purchase land on their own. The constant market pressure on farmers is to 'get big or get out of farming'.
- Capital - The capital costs of land, livestock and equipment in start-up businesses are a major barrier for young farmers and new entrants. Also falling farm incomes are a global problem as a result of globalisation and free trade.

## Entrepreneurship

Entrepreneurship is a key factor for the survival of small-scale organic farming in an ever-changing and increasingly complex global economy. An entrepreneur is someone who produces for the market.

- An entrepreneur is a determined and creative leader, always looking for opportunities to improve and expand their business.
- An entrepreneur likes to take calculated risks, and assumes responsibility for both profits and losses.
- An entrepreneur is passionate about growing their enterprise and is constantly looking for new opportunities.
- An entrepreneur always looks for better and more efficient and profitable ways to do things. Entrepreneurs are also innovators.

## Group entrepreneurship

Some smallholder farmers are more secure if they work together with others in a group. These farmers have similar goals and objectives and a willingness to share the benefits and risks. Ownership and control of the enterprise is shared among the group members. Such enterprises could be set up as cooperatives.

## Characteristics of a farmer-entrepreneur

- Learning by doing under pressure from stakeholders, by experimenting to solve problems, seizing opportunities, and learning from competitors
- Working long and irregular hours to meet demands
- Linking family and business life
- Making their own decisions about the business and the relationship with family
- Controlling what has to be done, when and in what order
- Working alone often in solitude
- Coping with a wide range of managerial and day to day tasks
- Living with uncertainty
- Risking personal assets and security
- Having high level of responsibility and risk of failure
- Living with an inability to control the actions of stakeholders upon whom the success of the business depends
- Developing trust and alliances with other stakeholders where mutual benefits exist
- Linking the success of the enterprise to their local partnerships and social status

## Skills and knowledge

There is a difference between farm business management and entrepreneurship. Farm business management is about better planning, implementation, control and managing risk. Entrepreneurship is about looking forward – identifying opportunities, creating a vision of how the business will grow, innovating and taking risks.

Farmers need knowledge in each of the key areas of farm management - planning, implementing and controlling. They also need information about primary production, harvesting, processing, wholesaling and retailing and about input supply, financial services, transport, packaging, promotion and advisory services.

- Entrepreneurial competencies - There are nine key entrepreneurial competencies for a farmer-entrepreneur: initiative, ambition, focused problem-solving, creative thinking, taking risks, flexibility and adaptability, interpersonal abilities, networking and readiness to learn. With these competencies, farmers will be more able to compete in this new environment and make profits by taking advantage of new market opportunities. These competencies can be acquired through practice, experience and training.
- Technical competencies - In addition to being entrepreneurs, entrepreneurial farmers must also be excellent farmers. This requires technical competencies particularly in three areas: managing inputs, managing production and managing marketing.
- Managerial competencies - Entrepreneurial and technical competencies need to be complemented by managerial competencies in the functions of diagnosis, planning, organising, leading and controlling. The farmer-entrepreneur performs these functions in each of the key areas of the farm business: managing inputs, production and marketing.
- Integrating competencies - Success as a farmer-entrepreneur comes through the ability of the farmer to combine the entrepreneurial, technical and managerial competencies in practice.

## Core Values

These are the key competencies for a caring, sustainable and trusted organic farmer who want to build a sustainable relationship with other staff, volunteers and consumers.

- **Trustworthiness** - Worthy of trust and confidence. Includes such values as integrity, keeping promises, loyalty, dependability and reliability. Actions are consistent with words.
- **Truthfulness** - Honest and true in all business dealings.
- **Respect** - Regard for the dignity, worth, independence and essential equality of all people. Treating people with courtesy, politeness and kindness. Tolerance of others.
- **Responsibility** - Acknowledging and performing duties to others and oneself. Being self-disciplined and accountable for one's actions.
- **Fairness** - Making decisions based on appropriate factors. Being impartial; avoiding conflicts of interest. Being reasonable and consistent. Playing fair.
- **Caring** - Having regard for the well-being of others. Being kind, compassionate, considerate, unselfish and charitable.
- **Social responsibility** - Recognising and living up to community and social obligations. Being law abiding. Doing one's share. Contributing to the betterment of society.

## Income increasing strategies

Farmer-entrepreneurs can increase their profits and create value through different strategies, such as:

- Diversify – eg. into agrotourism
- Lower costs – eg. reduce tillage, save seed
- Expand the size of the enterprise – eg. rent more land
- Add value to the enterprise – eg. process crops
- Specialise – eg. grow and market more pulses
- Differentiate the product – eg. give recipes and poems with the produce
- Integrate – eg. join a cooperative with neighbours

## Practice

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### Planning to develop an organic farming enterprise

<i>Hands on</i>
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*If you are at all interested in becoming a farmer, try answering some of these questions:*

- Why do you want to farm?*

  - For a sustainable household by increasing food sovereignty and self-sufficiency*
  - For a farm/food/processing enterprise as a way of earning a living*
  - Exclusively for home consumption with rarely any surpluses produced. If there is a surplus, they will sell it on the market, but this is very rare.*
  - Mostly for home consumption, but with the intention of selling surpluses on the market.*
  - Partly for the market and partly for home consumption.*
  - Exclusively for the market.*
- What are your income goals for the farm?*

  - You may want to only break even in your first year. Alternatively you may want enough income to work only part-time, supplemental income while holding a full-time job, or for the farm to provide all of your income.*
- What resources and competences have you got?*

  - Do your strengths and weaknesses complement those of other people who might farm with you?*
  - Do you need additional training?*
  - Do you need to improve your plans or develop alternatives?*
- What are your personal resources?*

  - Clear sense of your goals*
  - Ability and desire to maintain personal/professional connections with potential customers, financiers, and service providers*
  - Financial backing or resources*
  - Management skills (managed a business in the past?)*
  - Mechanical/construction/maintenance skills*
  - Access to land (either owned or rented)*
  - Access to equipment (either owned or borrowed)*
- What is your experience as a producer?*

  - Garden experience specific to the region where your farm is located*
  - On-farm experience*
  - Experience with livestock*
  - Experience operating equipment*
- What are your personal preferences?*

  - I like hard work*
  - I like taking risks*
  - I am a good problem solver*
  - I enjoy an outdoor and physical lifestyle*
  - I enjoy working alone*
  - I enjoy working with partners*
  - My current job or lifestyle is flexible*
- How do you evaluate each possible site?*

  - Soil quality (eg. drainage, topography, texture, and organic matter)*
  - Length of growing season*

*Availability of and access to irrigation water*

*Structures on the farm for storage, sales, and washing*

*Accessibility of major roadways*

*Prior stewardship - soil fertility, water quality, and onsite wastes*

*Minimal wildlife pressure*

- What is the market potential in the local community?*

*Local population (within 1 hour)*

*Relative income level of this population*

*Access to nearby farmers markets, grocery coops, other growers, restaurants, and natural food shops*

*Access to wholesale markets (within 1 hour)*

*Potential market niches (eg. organic, pick-your-own, and speciality crops/livestock)*

*Your commitment to product quality and customer satisfaction*

- What is the infrastructure and information support?*

*Availability and quality of extra labour*

*Affordability of local property taxes*

*Zoning for agriculture*

*Proximity of farm-supply dealers, agencies, vets, equipment repair, processors etc.*

*Activity of local grower organisations/ networks*

*Potential support by nearby farms and neighbours*

- What are the available and missing resources?*

*Land for purchase or rent - Area, restrictions, environmental considerations, suitable crops and livestock*

*Capital as loan or lump sums - Investments available, potential returns in terms of time*

*Infrastructure for housing; storage - eg. wells, barns, sheds, fencing – safe, useable, repairable*

*Equipment as hand tools or machines – eg. tilling and carpentry tools, rotovator, tractor, chainsaw*

*Information and support - available training, product marketing, legislation, services provided by related national and international bodies, registration, memberships, licenses, and regulations, farming techniques, marketing farm products, farm legislation, funding sources such as the EU LEADER programme*

- What is the preferred type of farm?*

*crops and/ or livestock*

*home consumption and/or customer consumption*

*specialist or generalist*

- What is the design and plan for the buildings and land in the first year?*

*Observe, design and record – the permaculture system*

*Consider minimum tillage – the min-tillage system*

*Plan for diversity and crop rotation*

*Build soil fertility using legumes*

*Recycle outputs and waste*

- ☑ *What is the business plan ( especially if needing a loan, funding, partners or a market)*

*Main product – primary or processed?*

*Other potential income generating opportunities including tourism, crafts?*

*Any added value?*

*Who will buy your product?*

*What price will your customers pay?*

*How many can you make / supply?*

*What does each unit of product cost you to make?*

*How much investment do you need to get started?:*

## Across Europe

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The number of small farms in the EU is steadily declining as labour moves out of the agricultural sector making land available for consolidation. However there is a lot of variation and big contrasts in farm structures across the EU. Many farms, smaller than 2 ha, may be characterised as semi-subsistence farms, meaning that more than 50% of their output is self-consumed.

## WWOOF

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WWOOF hosts run the whole range of farm enterprises - from small to large-scale, from part-time to full-time, from crop-based to mixed crops and livestock, and from producer-consumer to mainly producer. Some are based on intentional communities or ecovillages, others on large family farms. So there is huge choice for potential volunteers who want to learn about setting up, planning, managing and adapting an enterprise.

## Networks

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[Groundspring Networking](#)

[Greenhorns](#)

[AgriCultures Network](#)

[WWOOF](#)

[Enterprise Europe Network](#)

[European Network for Rural Development \(ENRD\)](#)

## Videos

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[Future farmers in Europe - A compilation of films from "Future farmers in the spotlight" \(7 mins.\)](#)

[Future farmers in the spotlight - films \(13 profiles - each about 5 mins.\)](#)

[AgriCultures videos](#)

[What is social entrepreneurship? \(2 mins.\)](#)

## Links

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[Guidebook for beginning farmers](#)

[Entrepreneurship in farming – 5 Farm management extension guide](#)

[PR and Marketing toolkit, Organic Centre Wales](#)

[Setting up an organic buying group](#)

[Evaluating a farm enterprise](#)

[Farm diversification / rural business start up opportunities](#)

[European Small Business Portal](#)

[The organic business guide – Developing sustainable value chains with smallholders](#)

[Feeding the future - Small and medium scale agroecological farmers can address the agricultural challenges of the twenty-first century](#)

[Tools to enhance family farming: Opportunities and limits](#)

# Living and Learning on Organic Farms (LLOOF) Guide

## *Your introduction to learning as a volunteer on an organic farm*

September 2016



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# LLOOF

LIVING AND LEARNING ON ORGANIC FARMS



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