

Guidance note to the poster:

How to plan a good vegetable rotation

This note provides guidance for using the poster in a training set up. It leads through the different aspects presented on the poster and offers extended information for their presentation, as well as suggestions for the didactical implementation. For further reading, see suggested sources at the end of the guidance note.

Objectives of the poster

- Understand the underlying reasons for crop rotation.
- Introduce the concept of crop rotation and its relevance for soil fertility, pest, disease and weed management.
- Outline the options for crop rotation planning.

Introduction



What is organic farming?

Organic farming is the way of producing good quality farm products in harmony with nature. Organic farmers optimise the growing conditions of crops by enhancing the natural fertility of the soil to ensure good nutrient and water supply, creating diverse cropping systems and promoting natural enemies of pests, recycling organic materials and manures and using natural inputs while renouncing chemical pesticides and fertilisers.



Exchange on organic farming principles

Ask the participants about their understanding of organic farming. What do organic farmers do with respect to selection of crop cultivars and animal breeds, soil fertility management, pest and disease management, animal husbandry and other aspects? Inform the participants which methods are acceptable in organic farming and which are prohibited.



Understanding the need for crop diversification

If a same crop is grown on the same land year after year, yields usually decline or the crops need more fertiliser to reach the same yield. The specific extraction of nutrients leads to an impoverishment of the soil.

In addition, health problems arise in monocropped fields. Often, soilborne crop specific diseases and pests develop. Weeds, which are well adapted to the conditions offered by the crop spread unhindered. This requires increasing efforts to control the weeds.

The following circumstances suggest a rotation of the crops:

- Different crops root at different soil depths and hence explore different soil layers for nutrients. Deep rooting crops can “pump up” leached nutrients from deeper soil layers.
- A diversity of crops leads to a diverse soil flora and fauna, as the roots excrete organic substances that attract different types of useful bacteria and fungi.



Exchange on the underlining reasons for crop rotation (and intercropping)

Most farmers rotate or associate crops. However, many do not know the underlining reasons for crop diversification. As a result, most farmers do not exploit its potential. You may deepen the understanding by asking the following questions:

- Why do you rotate crops?
- Which aspects do you consider in the sequence of crops?
- Have you observed any advantages in specific crop sequences and in practising crop rotation?
- Do you see challenges or reasons for not practising crop rotations?

- Crops of different families do not attract the same pests and are not sensitive to the same diseases. Rotation of crops hinders the development of short-persistent soil-borne diseases, arthropod pests and weeds by reducing their population levels in and above the soil.



What is a crop rotation?

Crop rotation is the practice of growing a planned sequence of different types of crops in the same field area across the growing seasons.

The change of crops serves primarily to create an interval of 1 to 3 seasons (or more) between crops of the same family on the same field to break the lifecycle of soilborne pests and diseases. The minimal duration of the interval depends on the pest's or disease's persistence in the soil. Some diseases stay dormant as spores in a field for many years (e. g. bacterial wilt stays infectious for at least 2 seasons, late blight up to 4 seasons, and Fusarium species up to 6 seasons). Many pests like plant-parasitic nematodes will easily die from starvation if crops are not available in the following year.



Clarification on the understanding of crop rotation

Find out, what the participants know about crop rotation. You may ask the following questions:

- What is your understanding of crop rotation?
- Which principles do you apply in crop rotation design?
- What are the challenges of practising crop rotation under local conditions?



Benefits of rotating vegetable crops

The rotation of crops offers many benefits such as:

- Diverse plant production, thus a more diverse human (and livestock) nutrition or market supply, and a broader-based cultivation risk mitigation
- Reduced risk of pest, disease and weed infestations
- Better use of the soil profile by the roots, thus better water and nutrient uptake
- Considerable nitrogen fixation, if nitrogen fixing plants are included
- Better nitrogen management if soil-building, high-demanding and low-demanding crops follow each other in a logical way
- Higher crop yields when well-managed
- Improved soil structure, if green manure crops are included

Ideally, crop rotations also consider the following aspects:

- Spreading of labour peaks
- No coincidence of sensitive growing periods of the crops with the appearance of pests
- Optimum use of the climatic growing conditions of different seasons
- Best possible use of the value of the previous crop
- Minimal periods of bare soil
- Crops well adapted to local climate and soil

Planning a crop rotation



Grouping of crops

Generally, the crops are grouped based on their feeding habits and their belonging to a crop family. Most vegetable small-scale farmers in Africa distinguish 4 categories of vegetables. These are botanically based, but consider also the crops' nutrient requirements.

- A) **Leaf crops or high feeders:** broccoli, cabbages, cauliflowers, kales, spinach, etc.
- B) **Fruit crops or medium feeders:** chillies, egg plants, peppers, tomatoes, etc.
- C) **Root crops or low feeders:** carrots, beet roots, potatoes, onions, radishes, turnips, etc.
- D) **Legumes:** beans, chickpeas, cowpeas, grams, peas, pigeon peas, etc.

Vegetables are sometimes intercropped with cereals.



Selecting suitable crops

Find out together with the participants, what crops are suitable in the local context. You may orient yourself on the following questions:

- Do you know which vegetable crops belong to the same family?
- What crops are locally grown?
- What other crops may grow in the local situation (based on soils, soil fertility, climate, available seeds, labour and tools), are to be cultivated or may complement the other crops in a useful way?
- To what extent does soil fertility need to be improved by soil-building crops?
- Which crops do well in the dry season, the rain season or in the intermediate season?
- For which crops is there a market or a use on the farm as fodder, green manure or other?



General rules for the crop sequence

When arranging crops in a planned rotation, the following basic rules should be considered:

- Crops with high nutrient demand (heavy feeders) such as Brassicas should be planted before less demanding medium feeders like Solanaceae. For sufficient fertilisation, the heavy feeders should receive a top-up with compost or animal manure. The less demanding plants will then benefit from left-over manure from the heavy feeders. Planting Brassicas before or after Solanaceae also prevents build up of root-knot nematodes and bacterial wilt.
- The heavy feeders should be preceded by soil-builders like leguminous grain legumes or green manures. Green manures leave much more nitrogen in the soil than grain legumes.
- Light feeders like carrots or onions follow medium feeders at the end of the rotation or are planted instead of medium feeders.

Feeding habit	Vegetable family	Examples of crops
Heavy	Cruciferae	Cabbage, Cauliflower, Kale, Broccoli, Brussel sprouts, Mustard
	Chenopodiaceae	Spinach, Beets, Swiss chard
Medium	Curcubitaceae	Pumpkins, Melons, Squashes, Cucumbers
	Solanaceae	Tomatoes, Potatoes, Peppers, Eggplant
	Asparagaceae	Asparagus
	Amaranthaceae	Amaranth
	Malvaceae	Okra
	Compositae	Lettuce, Artichokes
Light	Alliaceae	Onion, Leeks, Shallots, Garlic
	Umbelliferae	Carrots, Fennel, Celery, Parsely
Light/ Soil-builder	Leguminaceae	Beans, Peas



Drafting of suitable crop rotations

Draft possible rotations together with the participants based on the list of crops that are suitable for the local situation, on the basic crop rotation rules and the crops' feeding habits.



Further readings

Organic farming definition

- www.ifoam.bio > Why Organic?
- www.organic-africa.net > Training manual > Module 1

Crop rotation

- www.organic-africa.net > Training manual > Module 2
- www.organic-africa.net > Training manual > Module 4
- www.infonet-biovision.org > Plant Health > Cultural Control Practices > Crop rotation

The guidance note and the corresponding poster were developed by the Research Institute of Organic Agriculture FiBL in 2020 supported by the Green Innovation Centres for the Agriculture and Food Sector (GIC) implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) under the framework of the special initiative “ONE WORLD – No Hunger” on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ).