Training notebook 9

SUSTAINABLE AND RESPONSIBLE PRODUCTION

Training notebook of Manual 9: Educational Objectives & Key Messages

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PIP
FOR SUSTAINABLE DEVELOPMENT OF THE ACP HORTICULTURAL INDUSTRY

SUSTAINABLE AND RESPONSIBLE PRODUCTION

Training notebook of Manual 9

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Training leaflet 1

Sustainable farming and integrated crop management

Training notebook 9

Educational Objectives

On completion of this training sequence, the participant must be able to:

- Understand the impacts of intensive agriculture.
- Understand the responses to these impacts.
- Define the concept of integrated production and understand these principles.
- Know how to put in place the risk analysis method: the 4 steps resulting in an action plan for operation.

Key Messages

1) The impacts of intensive agriculture

- Intensive agriculture has several adverse repercussions on the environment, such as the pollution of soils and water, the loss of biodiversity, modification of the countryside, etc.
- The damage caused by intensive farming also disrupts other economic activities that depend on natural resources, such as tourism and agri-food industries.

2) The reactions to the impacts

- In response / reaction to these impacts, preservation and regulatory policies have been put in place in order to promote a more ecological and proactive agricultural policy.
- Consumers, who are affected by these environmental and socio-economic damages, are now demanding the right to choose authentic and diversified local products, combining cultural traditions and environmental concerns. This can be seen, for instance, in the introduction of environmental requirements in agri-food industry specifications.

3) The integrated crop management concept

- The integrated crop management concept is aimed at developing production systems based on the improved management of agricultural ecosystems with a view to reducing pollution arising from agriculture activities.
- The producer must comply with a “Crop Production Protocol” that is applicable for each procedure. The aim is to optimise all of the relevant production factors (soil, water, fertiliser, plant protection products, etc.).
- This optimisation obliges producers to examine each step in the cultivation process, and pay particular attention to environmental factors.

4) Analysis of risks

- In this optimisation process the producer can perform an environmental risk analysis in order to identify the potential problem areas to target.
- In order to identify the harmful effects of the operation's practices on the environment, a 4-step methodology can be followed:
  - Identifying the hazards of environmental degradation and pollution,
  - Highlighting these hazards or determining their effect,
  - Estimating the probability of their appearance,
  - Highlighting network risks.
- On the basis of this analysis an action plan is put in place. The “Action Plan” generally comprises a consistent series of actions that will help preserve the quality of the environment and guarantee the condition and plant protection status of the harvested produce.

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Training leaflet 2

Soil protection and conservation

Training notebook 9

Educational Objectives

On completion of this training sequence, the participant must be able to:

- Understand the importance of soil in the context of cultivation (roles, interactions, etc.).
- Describe the characteristics of soil.
- List the types of degradation and identify the factors involved.
- Identify the categories of soil contaminants.
- Describe the techniques to prevent soil deterioration and contamination.
- Understand the principles and the operation of integrated fertilisation.

Key Messages

1) Soil

- Soil is an extremely complex medium containing a fragile balance of organic elements and minerals. It should be considered as a “living organism”.
- It can usually be characterised according to its texture, structure and fertility.

2) Soil degradation

Three types of degradations can affect the soil:

- Physical, due to erosion (water, wind), settlement (or consolidation), crusting, etc.
- Chemical (increased salt content, loss of nutrients) due to poor management of fertilisers, irrigation, and other inappropriate cultivation techniques.
- Biological (reduction in the quantity and quality of the micro-fauna and flora in the soil, loss of organic matter).

3) Soil contamination

Four types of contaminants can affect the soil:

- Heavy metals (cadmium, cobalt, etc.),
- Atmospheric fallout,
- Plant protection products,
- Fertilisers / improving agents.

4) Soil protection (preventive methods)

- The main techniques to prevent contamination can be found in training manual 4 "Operator Safety and Good Crop Protection Practices".

- To curb deterioration, a whole system of preventive and/or corrective techniques (crop rotation, soil covering, terracing, windbreaks, etc.) must be put in place.

5) Integrated fertilisation

As an integral part of integrated agriculture, the farmer must follow a cautious programme of fertilisation in order to maintain / improve the fertility of the soil, prevent its deterioration and reduce contamination (by fertilisers). The practice of integrated fertilisation is based on the application of 3 general laws:

- Law of restitution (or advancement): minerals removed by crops and losses from the plot must be offset by restorative measures to maintain the chemical fertility of the soil.
- Law of minimum (or interaction): the volume of the harvested yield is determined by the scarcest resource in relation to crop requirements.
- Law of less than proportional increases: an increase in yields gradually diminishes in relation to the increase in quantities of fertiliser.

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Training leaflet 3

Management of organic waste and use of substrates

Training notebook 9

Educational Objectives

On completion of this training sequence, the participant must be able to:

- Understand the functions of organic matter and humus in the soil.
- Understand the difference between the action of organic fertilisers and chemical fertilisers.
- Name the various types of organic fertilisers and soil conditioners available locally.
- Understand the successive phenomena in the composting process.
- Describe the risks of incorrect management of organic fertilisation.

Key Messages

1) Organic matter contained in the soil

- Organic Matter (OM) is carbonised matter generally produced by living creatures, plants, animals or microorganisms.
- The OM contained in the soil comes from decayed plant and animal material. It is formed by the decomposing action of microorganisms such as bacteria and fungi.
- A fertile soil is composed of a mineral portion, which is formed by the erosion of the bedrock and the decomposition of the organic matter into minerals, and an organic portion – the soil humus, i.e. decomposing organic matter.

2) The role of humus

Humus has numerous properties allowing it, among other things, to:

- Keep the soil crumbly and aerated,
- Retain water in the soil,
- Gradually release nutrients to plants,
- Favour the development of soil organisms (microflora, microfauna, etc.).

3) Organic fertilisation

As the soil's nutrient content is depleted with every harvest, fertilisers have to be added to the soil to preserve its fertility. The producer can use:

- Organic fertilisers:
  - Almost always made from plant and/or animal waste (liquid manures, slurries, droppings, guano, etc.),
  - Do not provide the soils with humus,
  - Contain between 5 to 10% nitrogen (organic conditioner: less than 3%). They are therefore mainly used in market gardening.

- Organic soil improving agents:
  - Contain the precursors of humus components. Elements contained in organic matter are slowly released as it decomposes in the soil. The by-products and residues that can be brought into use are of animal origin, plant origin or even municipal and domestic waste.

4) The recycling of organic waste

- Composting of organic waste (by-products of cultivation or of the food industry) is a recycling technique.
- It can be done in various ways, but always involves the same phenomenon: fermentation. Fermentation takes place in two stages; intense aerobic fermentation at a high temperature (50 - 70°C) under the effect of bacteria, followed by a maturation stage leading to biosynthesis of the humus compounds by fungi.

5) The risks of organic fertilisers

- Nitrogen-rich organic fertilisers such as slurries and liquid manures can indirectly release large quantities of nitrates and phosphates. Especially in low-humus soils, they can be easily leached towards the water tables (groundwater) or adjacent watercourses.
- Liquid manure is potentially rich in agents that are pathogenic for animals whilst biosolids are more pathogenic for humans.

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Training leaflet 4

Water protection and conservation

Training notebook 9

Educational Objectives

On completion of this training sequence, the participant must be able to:

- Describe the risks of water pollution.
- Know how to implement pollution prevention techniques.
- Understand the impacts of pollution and the overuse of water.
- Understand the concept of water footprint and its implications.

Key Messages

1) Water resources

- Water is a unique and limited resource. Globally, about 70% of water usage is intended for agricultural purposes.
- There are three different types of water: rainwater, surface water and underground water. They all are likely to become polluted as a result of agricultural practices.

2) Water contamination

Agricultural activities can cause pollution following the application of:

- Fertilisers / conditioners (nitrates, phosphates and organic matter). (See chapter 3).
- Plant protection products: This pollution may be:
  - Diffuse. The plant protection products applied in the field pollute surface waters either by run-off or by infiltration. (See chapter 2).
  - Accidental or by negligence (loss of control, leaks, drift, etc.).
- Pathogens (Escherichia coli, coliforms...) from certain organic fertilisers (manure and liquid manure).

3) Preventing pollution by plant protection products

Good Phytosanitary Practices (see training manual 7) aim to reduce this risk of pollution mainly by:

- Reducing plant protection treatments (integrated protection practice).
- Improving site layout (examples: installing buffer zones and/or vegetation areas, reconstructing hedges, developing lots, etc.).
- Choosing a product based on its characteristics.
- Soil improvement in order to restore fertile soils capable of breaking down the pollutants.
- Prevention and caution on the part of the farmer.

4) Regulations and Standards

In reaction to the problems relating to the quality and quantity of water, various regulations have been put in place; private reference systems have incorporated this issue and new concepts have been created. Examples:

- European legislation imposing standards on the quantity of plant protection products contained in bodies of water.
- Environmental quality standards (EQS) used as guidelines to ensure the protection of human health as well as the fauna and flora.
- The concept of "Water Footprint" corresponding to the volume of water consumed directly and indirectly for the sake of producing goods and services.

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Training leaflet 5

Maintaining and managing biodiversity

Training notebook 9

Educational Objectives

On completion of this training sequence, the participant must be able to:

- Give a definition of biodiversity.
- Understand the vital services rendered by biodiversity on a daily basis.
- Identify the practices with a positive or negative impact on the protection and management of biodiversity.

Key Messages

1) Definitions and dimensions of biodiversity

- Biodiversity refers to the diversity of all life forms (plants, animals, microscopic organisms, etc.) as well as their habitats.
- Biodiversity has three dimensions:
  - Composition (what is present),
  - Structure (organisation of the elements present in relation to each other),
  - Function (the processes that generate biodiversity).

2) Services rendered

- Biodiversity can be considered as our “green capital”. It is the guarantee of our planet's stability. Biodiversity renders a host of services that are indispensable to our survival, such as the production of oxygen, food, medication, climate regulation, etc.
- Agriculture cannot survive without biodiversity:
  - Origin of plants and animals used in agriculture today;
  - Pollination;
  - Soil fertility (actions of the micro-flora and -fauna);
  - Contributing to the judicious control of pests and diseases;
  - Etc.

3) Threats

- As in the case of the resources discussed in previous chapters (water and soil), biodiversity is threatened by the practices implemented by so-called conventional farming (monoculture, chemical fertilisers, plant protection products, etc.).
- Plant protection products have many effects on non-targeted species and animal populations (bees, birds, soil fauna, etc.) and consequently on all biological equilibriums.

- Plant protection products can become concentrated in certain organisms (bio-accumulation) and build up in food chains (bio-amplification).

4) **Protection and improving the management of biodiversity**

Each operation must implement a range of actions aimed at managing and improving biodiversity:

- Preserving or installing hedges and grassed strips,
- Linking crops in space (inter-cropping) and in time (crop rotation),
- Working with selective plant protection products,
- Favouring the action of beneficial insects (biological control),
- Etc.

Here as well, the environmental risk analysis method can be used to implement these actions.

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Training leaflet 6

Environmental requirements of the main quality standards

Training notebook 9

Educational Objectives

On completion of this training sequence, the participant must be able to:

- List and briefly describe the environmental requirements of the 3 private standards mentioned.
- List the implementation modalities of the environmental requirements.

Key Messages

1) The emergence of the environment in quality standards

- Consumers are giving greater importance to environmental protection and to the concept of sustainable development.
- In this context, sustainable development and environmental protection have become two of the requirements and concerns of quality standards.

2) The environmental requirements of the following three reference systems :
GLOBALG.A.P., TESCO Nature's choice, Fair Trade Labelling Organisation (FLO)
A review of the requirements and control points reveals the importance their standards give to environmental protection:

- Preservation of the soil structure and controlling erosion,
- Rational use of inputs (water, plant protection products, fertilisers),
- Management of waste and polluting substances,
- Applying the principles of integrated control and rational use of fertilisers,
- Protection of the environment (fauna and flora).

3) These requirements are implemented via

- Application of Good Practices (agricultural, hygiene, handling, transport, etc.),
- Management of waste and polluting substances:
  - Identification and classification of all types of generated waste (vegetation, packaging, chemical waste...).
  - Inventory of control measures for each type identified (e.g. placing of marked bins and drains).

- Management of biodiversity:
  - An inventory of the fauna and flora of the farmed area is necessary to analyse the impact of this biodiversity on the crops planted and inversely.
  - The results of these analyses are used to draw up a site plan of the production sites, for a global overview of the production site, the infrastructures, and the natural zones.

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