FOOD & BIODIVERSITY

## Implementation of biodiversity measures

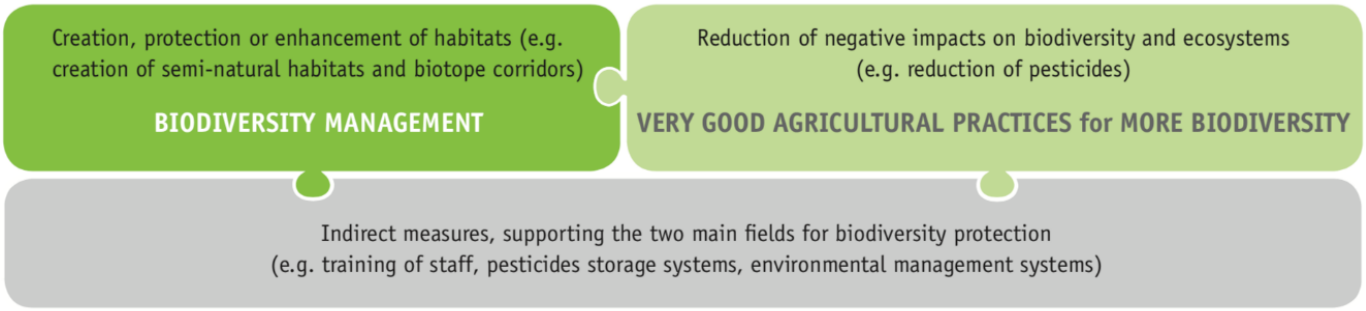
# Experience on processing tomatoes farms in Spain

# Content

# 1. Introduction

The LIFE Food & Biodiversity project supports food standards and food companies to develop efficient biodiversity measures and to implement them in their pool of criteria or sourcing guidelines.

In this paper on the Spanish processing tomatoes pilots in the LIFE Project, we provide information on our experiences gained in the tomatoes pilot projects in Spain in terms of implementation of recommended biodiversity measures. All pilots within the project were subject to a specific biodiversity consultation and measures were put in place that are based on the two pillars for biodiversity-friendly agriculture: Biodiversity Management and Very Good Agricultural Practices (figure below).




This publication targets agents who assess the implementation of requirements regarding cultivation methods (standard advisors, cooperatives, suppliers). We wish to communicate the challenges we experienced in our pilot projects and point out the observed benefits of the measures, as well as the pitfalls and related cost. This may be taken as a guide to avoid similar pitfalls and to enhance the benefit for biodiversity.

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# 2. The Pilot Projects

Within the LIFE Food & Biodiversity project, "Recommendations to improve biodiversity protection in policy and criteria of food standards and sourcing requirements of food companies and retailers" were published. This Guideline includes a catalogue of measures to enhance biodiversity, out of which farmers may chose actions to enhance their farming practices. All of the measures were tested over the years by different stakeholders in different projects and proved their benefits for biodiversity.

In total 15 different measures to enhance on-farm biodiversity were tested in tomato pilot farms. In Spain one company with 15 farmers have developed Biodiversity Action Plans to enhance biodiversity. CONESA company has his own "Good Agricultural Practices Code" and provides for Nestlé and Unilever so its production is under CSV programme of Nestlé and Sustainable Agriculture Programme of Unilever.

The aim of this publication is to give an overview about the main actions taken, the lessons learned, the benefits for biodiversity and the challenges faced during implementation. In this document, we focus on a few measures that were applied by the biggest number of farmers and describe them in detail, including costs and effort.

| Measures to enhance on-farm biodiversity |
|---|
| **IPM Integrated pest management** |
| Pest monitoring |
| Substitute conventional pesticides by substances allowed in organic agriculture |
| Mechanical weeding |
| **Soil and fertilization** |
| Reduced tillage |
| Regular application of organic substances |
| Winter soil covers |
| Diversification of land use |
| **Water** |
| Semiburied drip irrigation systems. |
| Decision-support tools for irrigation (tensiometers and similar technology) |
| |
| **Landscape elements:** |
| Increase the surface of seminatural habitats around and in the middle of the crop. |
| Promoting complex landscape elements |
| Introduce or proomote flowering plants blooming during winter or with different blooming times |
| Riparian strips along water bodies |
| **Farm management** |
| Crop management advisory supported by farm register books and monitoring |
| Organic management |

**Conesa Group**

Villafranca de Guadiana, Badajoz.

The current CONESA Group was founded in 1976 as "Conservas Vegetales de Extremadura" with wholly private capital, its main activity being Tomato Processing. Its annual processing capacity at that time was around 6,000 tons of fresh tomato per campaign.

Today the CONESA Group is the leader in its sector in Europe, with an input capacity of around 16,000 tons of fresh tomatoes/day resulting in a total processing capacity of close to one million tons of fresh tomatoes processed per campaign

Food quality is becoming more and more important and consumers are interested in the origin (traceability), hygiene and manufacturing process of the products they purchase. Conesa's Agricultural Department, aware of this need, maintains direct contact with fields and farmers to achieve these goals. The main function will be the supply of fresh tomatoes in terms of both quantity and quality in keeping with the factory's capacity and the products to be processed.

In the last years, CONESA Group is involved in different projects to improve the environmental performance of the crop and has his own organic production.

**Cultivation area**
Conesa participates in the project with 15 farms (more than 300 ha)

**Cultivation types**
Organic farming, Integrated Production, Babyfood and conventional

## 2.1. Winter covers crops.

Vegetation covering the agricultural plot between cropping during critical periods (autumn and winter) for avoiding soil erosion and nutrient leaching. Depending on the agro climatic conditions, this can be done by using green manures (sown plants for improving nutrient content on the soil and retaining them), cover crops (spontaneous or sown crops that do not have necessarily a commercial interest, but also contribute to soil fertility) Soil covers further aim on enriching soil organic matter and carbon sequestration, even more they help to break weed cycles, reducing the need of using herbicides. Therefore, they are especially valuable for biodiversity. More information on soil covers can be found in the Action Factsheets for advisors, auditors or quality managers (https://www.business-biodiversity.eu/en/biodiversity-training), which describe the measures in detail and give insights in their correct management and implementation.

**First year of winter soil cover in a processing tomato farm (month of December).**

**The implementation (**2018/19: 5 ha sown)

Vegetal covers were sown in at the beginning of December with a density of 15 kg/ha of seeds of *Brassica juncea* var *Scala*. This vegetal cover has a nematicide effect which is an extra benefit for tomato production. Between March-April, depending on the variety of tomato to be planted, vegetal cover will be incorporated to the soil.

### 2.1.1. Benefits and experiences

Winter covers reduce water erosion; contribute to enrich soil organic matter contents and carbon sequestration. Furthermore, farmers benefit from enhanced soil fertility besides improved biological pest control since covers help to break weed cycles reducing the need of using herbicides. In this case, winter covers have a nematicide effect.

#### Farmer´s concerns

1. Not always easy to implement, necessary to explore the best option for every farm system, type of soil and agroclimatic conditions to decide the best species to sow, densities, appropriate time, removal moment, technique for removing it, etc.
2. Cost of sowing

#### Costs

Seed mixture: 94 €/ha

sowing Cost: 50 €/ha for sowing

### 2.1.2. Auditing Tips

The auditor can check the following quality aspects of cover soils:

- Number of days/year with agricultural soil covered by vegetation that is not the main crop.
- Structural diversity of the cover cover crops (not just a grass community) depending on agroclimatic conditions
- High diversity of plant species
- Natural, autochthonous seeding mixtures should be used
- Soil should be left bare the minimum amount of time, mown in Spring (beginning or middle depending on the agroclimatic conditions)

### 2.1.3. Lessons learned and recommendations

Good soil conditions encourages a good implementation of the cover crops. Is recommended:

a) a disc harrowing to leave seeds in a soft and not-clodding soil.
b) To sow the cover crops in the beginning of autumn, when soil is in good condition and rain is expected for the following days after the sowing.
c) Soil incorporation when the plant is fully developed because at this time, winter cover is producing a big amount of glucosinolates. When glucosinolates are hydrolyzed they become isothiocyanate, biocide substance very effective against nematodes, bacteria, fungi and insects.
d) To crop the plant and incorporate to the soil with harrow or tiller

The goal of a well implemented Winter Cover crop is to get a good setting or cover of species during autumn and winter time to avoid soil erosion, increase organic matter and improve biological activity in the soil.

### Quick Note

The experiences gained in the tomatoes pilot farms go along with the notions of related nature conservation and biodiversity projects. Winter covers have a notable positive effect on biodiversity, especially on soil microbiota and consequently for invertebrates and bird populations.

In general, Soil covers can be described as follows:

| **Cost** | **Benefit for biodiversity** | **complexity of implementation and management** |
|---|---|---|
| € € € | | |

„Cost“ relates to the monetary and time expenses caused by the measure.

“Benefit for Biodiversity” symbolizes the positive effect of a measure for biodiversity.

“Complexity of implementation and management” describes the amount of work related to the implementation and the maintenance of a measure.

This scale is meant to compare the different actions with each other regardless of the area on which the actions are usually applied

## 2.2. Landscape elements:

Semi-natural habitats and specific Landscape elements can host a high diversity of animals and plants, being, therefore, important to promote biodiversity. Because they provide refuge and food for a variety of organisms, a well-designed planning of semi-natural habitats and landscape elements can mitigate the impacts of agricultural activities on biodiversity, but also support agricultural production through ecosystem services. Examples of semi-natural habitat range from large ecosystem patches, such as scrubland, permanent grasslands, or fallow land, to vegetated banks associated with stone walls or more specific landscape elements such as hedges, buffer stripes, fallow land and flower strips; other examples include single trees (living and dead) in cropland, and reforested areas; there can also be semi-natural habitats associeted with water elements, like water plots (streams, ditches, ponds) or water margins (riparian galleries). More information on Landscape elements and


**Landscape actions in Perales farm.**

The objective of this project was to enhance the ecological status of the riverine habitats, improving both the structure and the ecological connectivity; but also to improve the landscape value and social perception of the area. More than 4 ha of invasive vegetation were removed, 6 ha of riparian ecosystem were restored and 30 bat refuges were installed for testing bats' efficiency for fighting against processing tomato pests

Invasive blackberry bushes were removed and substituted by riverine plant species, the aim being to improve the biodiversity potential in general terms, but specially creating new microhabitats for animals. Additionally, the new belt of riverine vegetation beside the tomato field result in a fresher environment that helps to regulate the temperature during **cultivation and stabilizes the river shores decreasing erosion problems. This new buffer area also helps to avoid fertilizer and agrochemicals drifting from the crop area and to retain fertile soils in the field.**

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### 2.2.1. Benefits and experiences

Landscape elements provide habitat and winter quarters for a variety of different beneficial animals and wildlife. Flower margins and hedges provide protection, foraging, nesting shelter and refuge for insects (beneficial and pollinators), hare and partridges and birds. Also serve as step stones and connect open countries for butterflies, grasshoppers and other insects. Hedges support structural diversity, act climate regulating and as a windbreak. In Mediterranean regions where water is a scarce resource, the presence of water ponds is very important, especially in dry seasons. These ponds are an important habitat and refuge of amphibians and reptiles linked to aquatic environments and suppose a water recharge of aquifers, and flood control. General increase of beneficial organisms reduces the need of pesticides.

**Farmer´s concerns**

1. Loss of agrarian uses (nevertheless these elements occupy a reduced surface and the losses are not considerable)
2. Shadow from green infrastructures could reduce tomatoes yield.
3. Investment needed

**Costs**

SPECIES/MATERIALS NEEDED PER UNIT

600 helophytic plants/linear kilometre in the first row

80 plants/linear kilometre in the second row

40 plants/linear kilometre in the third row.

COST OF MATERIALS NEEDED PER UNIT (HA/LINEAR METER) 1,96 €/linear meter (each linear meter containing three rows)

### 2.2.3. Lessons learned and recommendations

Restoring riparian vegetation to a healthy state through the conservation and planting of native species (helophytic vegetation, vines, shrubs and trees), conditioning of riverbanks through pruning and slashing of invasive, sick or dead vegetation, and cleaning of the area through the removal of wastes, residues and debris.

Recommendation is for the planting with native species to take place in three rows along each side of the river:

- the first one at a distance of 0.30 m from the water course, using native helophytic vegetation.
- The second one at a distance of 1-3 m from the water course, using native vines, trees and shrubs.
- The third one, at a distance of 2-6 m from the water course, using vines, shrubs and trees as well.

The distance of the second and third row from the water course will depend on the width of the riverbank.

1) Selective slashing of invasive or too thick vegetation in order to make more room for native species and new vegetation to thrive. . Schedule: in autumn (year 0).

2) Selective pruning in order to remove sick or dead parts of trees and shrubs.Schedule: in autumn (year 0).

3) Removal and stacking of residues resulting from the slashing, pruning or cleaning processes, forming piles. Schedule: in autumn (year 0).

4) Burning of the piles. Piles must be placed and burnt far enough from the riverside in order to prevent the residues from reaching the waterbodies. Schedule: between November the 15th (year 0) and February the 15th (year 1).

5) Holes digging in three rows on each side of the river, with a naturalized and non-rectilinear design and alternating species in order to increase diversity of species. Schedule: between November the 15th (year 0) and February the 15th (year 1)

6) Planting of riparian native species (helophytic vegetation, vines, shrubs and trees), with protective tube (0,50-0,60 m long) for the second and third row. Schedule: between November the 15th (year 0) and February the 15th (year 1), right after holes digging.

7) Building of plant surrounds for each plant (with a proportionate size, depending on the plant) Schedule: between November the 15th (year 0) and February the 15th (year 1), right after planting.

8) First irrigation. The amount of water will depend on the age and size of each plant, considering the following values a good approximation: 5 l/plant for small 1 or 2-year-old plants; 30 l/plant for older and bigger plants. Tanks will be used for irrigation. Schedule: between November the 15th (year 0) and February the 15th (year 1), right after building of plant surrounds.

9) Monitoring of mortality rates (up to 10% is acceptable).Schedule: in spring (year 1) and after the summer months (year 1).

10) Replanting (with protective tube for the second and third row), building of plants surroundings and first irrigation, if necessary.Schedule: in spring (year 1) and in autumn (year 1).

11) Irrigation for maintenance. The amount of water will depend on the conditions and size of the plants, considering the following values a good approximation: from 10 to 50 l/plant around six times a year. Tanks will be used for irrigation. Schedule: six times a year from March (year 1) till October (year 1). It can be adjusted depending on the rainfall or high temperatures registered.

12) Removal of wastes during the first summer (debris carried away by the river currents or the wind, debris resulting from human activity, etc.) Schedule: during the summer (year 1).

13) Second selective slashing of invasive or too thick vegetation (only if rows are well defined and new plants easily identified, to avoid damage)Schedule: in autumn (year 1).

14) Second selective pruning of sick or dead plant material removal.Schedule: in autumn (year 1).

### 2.2.1. Quick Note

The experiences gained in the tomatoes farms go along with the notions of related nature conservation and biodiversity projects. Diversified landscape elements have a notable positive effect on biodiversity, especially on benefitial fauna and insects.

In general, Landscape elements can be described as follows:

**Cost** **Benefit for biodiversity** **complexity of implementation and management**

„Cost“ relates to the monetary and time expenses caused by the measure.

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## 3. Conclusion

Overall, different actions were tested by our pilot farms. In this document we describe only a few of them in more detail, even though all the others are also contributing considerably to biodiversity. Most of the measures were considered by the farmer as easy to implement and were of comparable low cost. Many of them are also supported by national or regional agri-environmental schemes. More information can be found on www.business-biodiversity.eu/en/biodiversity-training/advisors .

Summarizing, one can say that the actions presented in this paper and tested in the pilot project overall show examples for very good agricultural practices and biodiversity management. First monitoring results indicate that these actions are favourable for biodiversity.

All pilot farms of the LIFE Food & Biodiversity Project test the Biodiversity Performance Tool (BPT), an online tool that helps to create a farm-specific Biodiversity Action Plan and thus supports the farmer in planning, adjusting and monitoring the measures for biodiversity on the farm. Furthermore, it helps auditors to assess the quality of the implemented measures. The final version of the BPT will be available in summer 2019.

## 3.1. Acknowledgement

Our special thanks go to CONESA agricultural department and its pilot farms which chose voluntary actions in order to increase the biodiversity on farm level. They accomplish the measures very passionately and take their time to evaluate the implementation in regular consultations. Thus they contribute considerably to the project not only with their actions on the farm but also with much expertise. We are very grateful to all the farmers!

# 4. Overview of the EU LIFE Project

The EU LIFE Project Food & Biodiversity "**Biodiversity in Standards and Labels for the Food Industry**" aims at improving the biodiversity performance of standards and sourcing requirements within the food industry by

- Supporting standard-setting organisations to include efficient biodiversity criteria into existing schemes; and encouraging food processing companies and retailers to include biodiversity criteria into respective sourcing guidelines
- Training for advisors and certifiers of standards as well as product and quality managers of companies
- Implementation of a cross-standard monitoring system on biodiversity
- Strong communication to raise awareness among all stakeholders in the industry

The project has been endorsed as a "Core Initiative" of the Programme on Sustainable Food Systems of the 10-Year Framework of Programmes on Sustainable Consumption and Production (UNEP/FAO).

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**Contact**

Fundación Global Nature

info@ fundacionglobalnature.org