

# CATALOGUE OF BEST PRACTICES

LIFE10 NAT/ES/579



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## BACKGROUND



In the Autonomous Community of the Basque Country, areas of mountain cover 85% of the territory, of which approximately 25% is grassland, where grazing has been the most important economic activity since the Neolithic period. Nevertheless, following the general trend of recent decades in the European Union, the reduction in economic performance is leading to the abandonment of this activity.

The area of the Gorbeia Nature Reserve (NR) and its environment is one of the few areas within our community that still has a very active livestock-raising use, especially in the municipalities of Zeanuri and Orozko, with their respective Gorbeiazpi and Itxina livestock-raising associations.



A hypothetical abandonment of the activity in these areas could have a significant impact at both a socio-economic and environmental level, since it is known that they are fragile agroecosystems whose biodiversity is preserved thanks to a combination of biotic and abiotic factors, among which grazing stands out. It is not for nothing that the Gorbeia NR is considered a **site of Community importance (ES2110009 Gorbeia)** which houses several priority habitats under **European legislation (Directive 92/43/EEC)**.

To preserve and revitalise these pasture agroecosystems it is necessary to make decisions on livestock management (type of animals, breeds, stocking rates, grazing periods), vegetation (clearing, fencing, reforestation) and soil (fertilising, types and doses of fertilisers, liming). The management guidelines chosen, even when adapted to local determining factors, have an impact on ecosystem services on a larger scale and contribute to moulding and shaping the mountain landscape.



## PRESENTATION

In this context, the European project **Life+ SOILMONTANA (LIFE10NAT/IS/579)** carried out a series of actions between September 2011 and December 2014 aimed at preserving and promoting these agroecosystems, with special attention to the biodiversity that they house.

**In the short-term:** various specific actions have been carried out on the land (clearing, fencing, fertilising and liming), treating more than 120 hectares of mountain and valley.

**In the medium-long term:** a new tool called “Agroecosystem Health Cards - AHCs” has been developed and distributed free of charge, which allows anyone, even without specific training beforehand, to assess the impact of these and other possible agricultural actions on the health of pasture agroecosystems.

To do this, the AHCs indicate how to measure a series of basic and/or advanced indicators of soil and vegetation (depending on the possibilities of each user), what each of the indicators means and the ranges considered to be “good”, “normal” and “bad”. These indicators, in turn, are grouped to reflect the status of four eco-system services considered to be key for pastures:

1. Pasture production.
2. Conservation of biodiversity.
3. Soil conservation.
4. Fight against climate change.

The overall health diagnosis will depend on the status of these services.



## INTERPRETAION OF THE CATALOGUE OF BEST PRACTICES

We use AHCs to assess the impact of the most common agricultural actions in the management of pastures and compare them with other possible management alternatives, which we also carry out within the project. The actions were carried out in 2012 and their effects were measured over 2013 and 2014.

To do this, once all of the indicators collected in the AHCs were analysed and their results integrated, the impact that each management alternative had on ecosystem services was compared in order to invigorate pastures, with the aim of deciding whether the impact that they produce on the overall health of the agrosystem is acceptable or not. In this regard, it should be noted that every agricultural practice has a certain impact on the environment (even the abandonment of a practice historically carried out up till then has an impact).

We hope and would like this catalogue to be of use to you and help you to clear up any common questions. At the same time, we hope that you may contribute (along with other technical and management criteria) to the sustainability of pasture agroecosystems.

The overall diagnoses shown in this catalogue are based solely on the advanced indicators proposed by the AHCs. According to these criteria, on a scale from 1 to 9:



Diagnosis: "bad"  
(mark from 1 to 3.5).



Diagnosis: "normal"  
(mark from 3.5 to 6.5).



Diagnosis: "good"  
(mark from 6.5 to 9).



**:: APPLY PHOSPHORUS ON MOUNTAIN PASTURES**
**PHOSPHORUS**

	2013	2014
PRODUCTION	6	9
BIODIVERSITY	5	5
SOIL	5	5
CLIMATE	7	7
<b>OVERALL</b>	6	7*

**NO PHOSPHORUS**

	2013	2014
PRODUCTION	6	9
BIODIVERSITY	5	5
SOIL	5	5
CLIMATE	7	7
<b>OVERALL</b>	6	6

**METHODOLOGY**

**Product used:** Organic soft rock phosphate (26.5%  $P_2O_5$ ; 29% CaO). Ecological  
**Dose:** 192 kg/ha. Manual application, in a cross pattern. End of winter 2012.

**Habitats:** 6230\* Grasslands in mountain areas) and 6170 (Alpine and sub-alpine calcareous grasslands

**EXPECTED RESULTS**

Increase in the fertility of the soil and, with it, the production of pasture.

**RESULTS OBTAINED**
**Production Service:**

-Fertiliser did not produce significant effects. 2014 was more productive than 2013.

**Biodiversity Conservation Service:**

- No significant changes in overall terms.
- Slight increase in the genetic diversity of fungi.
- The species *Nardus stricta* is not affected by the phosphoric fertiliser applied, with its coverage being less than 10%.

**Soil Resource Conservation Service:**

- No significant changes in overall terms.
- Slight decline in the abundance of earthworms.

**Fight Against Climate Change Service:**

- No significant changes in overall terms.

**OVERALL DIAGNOSIS OF THE APPLICATION OF PHOSPHORUS  
 (ACCORDING TO AHCs): ACCEPTABLE IMPACT (OVERALL MARK = 6-7)**

\* The change in overall diagnosis is due to decimal differences (not shown).

\* Habitat of priority community interest.



## PRACTICE 2

### :: CLEARANCE OF BUSHES

#### CLEARANCE

	2013	2014
PRODUCTION	9	8
BIODIVERSITY	5	5
SOIL	5	4
CLIMATE	7	6
<b>OVERALL</b>		

#### NO CLEARANCE

	2013	2014
PRODUCTION	5	1
BIODIVERSITY	5	5
SOIL	5	4
CLIMATE	8	6
<b>OVERALL</b>		

#### METHODOLOGY

**Clearance** carried out with a manual brush cutter in 2012.

**Habitat** 4030 (Acidophilic dry heath). Original situation: mature heath (> 5 years).

#### EXPECTED RESULTS

Increase in the surface area of herbaceous pasture on reducing the bushy domain.

#### RESULTS OBTAINED

##### Production Service:

-Positive effect. Great increase in the production of herbaceous pasture (the surface area of pasture goes from 20% to 80%, approximately).

##### Biodiversity Conservation Service:

- No significant changes in overall terms.
- Slight increase in the genetic diversity of bacteria.
- Slight decline in the genetic diversity of fungi.

##### Soil Resource Conservation Service:

- No significant changes in overall terms.
- Slight decline in root depth and the infiltration of rain (compaction).

##### Fight Against Climate Change Service:

- Negative effect. Decline in the abundance of roots (Carbon (C) sequestration).

**OVERALL DIAGNOSIS OF CLEARANCE (ACCORDING TO AHCs):**  
**ACCEPTABLE IMPACT (OVERALL MARK = 6-7)**



## :: CONTROL OF FERNS

### CHEMICAL METHODS

	2013	2014
PRODUCTION	7	9
BIODIVERSITY	5	5
SOIL	5	5
CLIMATE	7	6
<b>OVERALL</b>		

### MECHANICAL METHODS

	2013	2014
PRODUCTION	7	8
BIODIVERSITY	5	5
SOIL	5	5
CLIMATE	7	6
<b>OVERALL</b>		

**METHODOLOGY**  
**Chemical method:** Asulox<sup>®</sup> Herbicide (40% methyl sulfonyl carbamate), 5 l/hectare.  
**Mechanical method:** Chain brush cutter.  
 Both treatments were repeated in August 2012 and 2013.  
**Habitats:** mature ferns on limestone substrate (Zeanuri) and siliceous substrate (Orozko).

**EXPECTED RESULTS**  
 Increase in the production of pasture on reducing the fern domain.

**RESULTS OBTAINED**  
**Production Service:**  
 -Slightly higher under chemical methods. Herbicide was more effective at controlling ferns than manual clearance, as its effect remains over time.  
**Biodiversity Conservation Service:**  
 -No significant changes in overall terms.  
**Soil Resource Conservation Service:**  
 -No significant changes in overall terms.  
 -Slight increase in the % of bare soil under herbicide (greater risk of erosion)  
**Fight Against Climate Change Service:**  
 -No significant changes in overall terms.

**OVERALL DIAGNOSIS OF CONTROL (ACCORDING TO AHCS):**  
**ACCEPTABLE EQUIVALENT IMPACT FOR BOTH CONTROL METHODS (MARK = 6)**



## PRACTICE 4

### :: FERTILIZATION OF VALLEY GRASSLANDS

#### MANURE

	2013	2014
PRODUCTION	8	8
BIODIVERSITY	5	5
SOIL	7	7
CLIMATE	7	7
<b>OVERALL</b>		

#### MINERAL FERTILISERS

	2013	2014
PRODUCTION	8	9
BIODIVERSITY	5	5
SOIL	7	6
CLIMATE	7	6
<b>OVERALL</b>		

#### METHODOLOGY

**Products used:** Manure (cattle or sheep) / Mineral ( $\text{NH}_4\text{NO}_3 + \text{P}_2\text{O}_5 + \text{CIK}$ ).

**Manure dose (Autumn):** 29-35 t/ha, depending on whether the management was for grazing - harvesting.

**Mineral dose (Spring):** 200-250UFN+50-60UFP+275-350U FK (same doses)

**Habitats:** Grasslands in the valley with different management (harvesting, grazing or combined).

#### EXPECTED RESULTS

Increase in the fertility of the soil and, with it, the production of pasture.

#### RESULTS OBTAINED

##### Production Service:

-Slightly higher under mineral fertilising.

##### Biodiversity Conservation Service:

-No significant changes in overall terms.

##### Soil Resource Conservation Service:

-Slight improvement with manure. Less compaction and increased microbial biomass.

##### Fight Against Climate Change Service:

-Slight improvement with manure, assuming the incorporation of C into the soil.

**OVERALL DIAGNOSIS OF FERTILIZATION (ACCORDING TO AHCs): ACCEPTABLE EQUIVALENT IMPACT FOR BOTH TYPES OF FERTILISER (MARK = 7)**



**:: LIMING VALLEY GRASSLANDS**

LIME			NO LIME		
	2013	2014		2013	2014
PRODUCTION	5	9	PRODUCTION	6	9
BIODIVERSITY	5	5	BIODIVERSITY	5	5
SOIL	6	6	SOIL	6	6
CLIMATE	7	6	CLIMATE	7	7
<b>OVERALL</b>			<b>OVERALL</b>		

**METHODOLOGY**

**Liming used:** Slaked lime ( $\text{CaOH}_2$ ).

**Dose:** 1.5 t/ha depending on saturation % of Al measured in soil (20-25%). Autumn 2012.

**Habitats:** grasslands in the valley with different management (harvesting, grazing or combined).

**EXPECTED RESULTS**

Reduction in soil acidity to increase the production and quality of pasture.

**RESULTS OBTAINED**
**Production Service:**

- Liming did not allow increasing production, which was higher in 2014.
- Increases the coverage of *Lolium perenne* (English ryegrass), with a high forage value.

**Biodiversity Conservation Service:**

- No significant changes in overall terms.
- Slight increase in plant diversity.

**Soil Resource Conservation Service:**

- No significant changes in overall terms (not even in the acidity of the soil, which would indicate the need to repeat the application and/or increase the dose).

**Fight Against Climate Change Service:**

- Negative effect. Loss of colouring in the soil (C sequestered in the soil).

**OVERALL DIAGNOSIS OF LIMING (ACCORDING TO AHCs):**  
**ACCEPTABLE IMPACT (OVERALL MARK = 6-7)**



## PRACTICE 6

### :: EXCLUSIONS FOR LIVESTOCK

#### WITHIN THE EXCLUSION

	2013	2014
PRODUCTION	1	1
BIODIVERSITY	5	5
SOIL	5	6
CLIMATE	6	6
<b>OVERALL</b>		

#### OUTSIDE THE EXCLUSION

	2013	2014
PRODUCTION	6	9
BIODIVERSITY	5	5
SOIL	5	5
CLIMATE	7	7
<b>OVERALL</b>		

#### METHODOLOGY

**Enclosures for livestock** of 10 x 10 m (livestock mesh and barbed wire). 2012.

**Habitats:** grasslands in the valley and mountain pastures (Habitats 6230\* and 6170)

#### EXPECTED RESULTS

To assess the effects of a hypothetical abandonment of grazing.

#### RESULTS OBTAINED

##### Production Service:

-Negative effect. In the absence of grazing, the value of the service is minimal according to the AHCs (1 out of 9), as the production of pasture is not used.

##### Biodiversity Conservation Service:

- No significant changes in overall terms.
- Slight increase in microbial diversity and decrease in plant diversity.
- In habitat 6170, the species *Brachypodium pinnatum* is an indicator of the abandonment of grazing.
- In habitat 6230\*, the species *Nardus stricta* (with a coverage of 2%) disappears in the exclusion zones.

##### Soil Resource Conservation Service:

-Positive effect of exclusion. Soil compaction is reduced.

##### Fight Against Climate Change Service:

-Negative effect. Emissions of CO<sub>2</sub> increase from the soil to the atmosphere.

**OVERALL DIAGNOSIS OF ABANDONING THE ACTIVITY (ACCORDING TO AHCs): UNACCEPTABLE IMPACT (OVERALL MARK = 4-5; LOSS OF A SERVICE)**

\* Habitat of priority community interest.





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