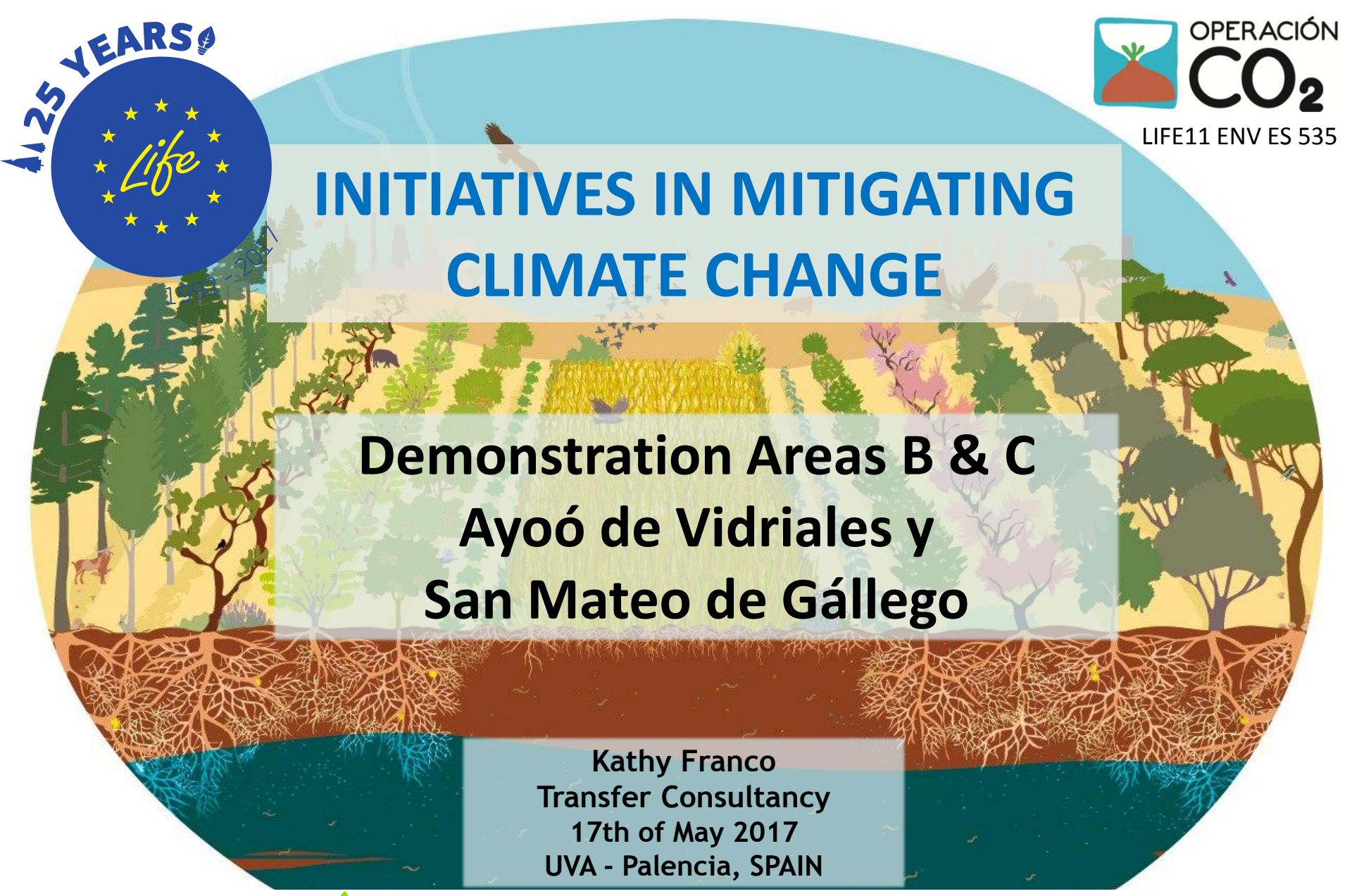


25 YEARS Life 1992 - 2017

OPERACIÓN CO_2

LIFE11 ENV ES 535

INITIATIVES IN MITIGATING CLIMATE CHANGE

Demonstration Areas B & C
Ayoó de Vidriales y
San Mateo de Gállego

Kathy Franco
Transfer Consultancy

17th of May 2017
UVA - Palencia, SPAIN

Universidad de Valladolid · Fundación General de la Universidad de Valladolid · PHC Plant Health Cure · Fundació Catalunya La Pedrera · viverosfuenteamarga S.L. Planta autóctona forestal · Beral Ingeniería, S.L.P. · Edena Alternativas Ecológicas · TRANSFER Consultancy

OBJECTIVES:

- **Restore land** in degradaded areas of Spain that lost fertility due to intensive monoculture and inefficient use of fertilizers.
- **Promote agroforestry practices** by combining agricultural crop growth with productive trees (timber, almond, pistachio, pine nut, etc.)
- **Improve the quality of soil** by changing pH levels and innoculating with microorganisms such as mycorrhizae, beneficial bacteria and fulvic/humic acids.
- **Mitigate climate change by obtaining a positive balance** in CO_2 fixation



Ayoó de Vidriales (Zamora)





San Mateo de Gállego (Zaragoza)

Ayoó de Vidriales (Zamora):

- 25 ha. Plot rainfed land: part of the 500 Ha owned by the City Council
- Area has been abandoned over 15 years ago, not even weeds grow there
- Low pH, acidic soils
- Maximum 500 ml annual intense rainfall, lasting only 30 days
- Watch “Regreening the Planet” video documentary



Soil recovery in Ayóo de Vidriales (Zamora)

METHODOLOGY:

1) AGROFORESTRY PLAN DESIGN: Selection of plants

1. **Timber&Fruits.** Grafted Pistachio
2. **Timber&Fruits.** *Almond v. GUARA & Jara pringosa*
3. **Timber&Fruits.** *Pine mycorrhized with Lactarius deliciosus & Jara pringosa (mycorrhized with boletus)*
4. **Timber&Fruits.** *Jerbo & Lolium spp, Trifolium repens*
5. **Timber&Fruits.** Stone pine mycorrhized with *L.deliciosus*
6. **Timber&Fruits.** Chestnut & *Bromus hordeaceus, Vulpia geniculata, & V. bromides*
7. **Protection border.** Alcornoque, Endrino, Espino blanco, Rosa silvestre
8. **Agricultural crops.** *Ryegrass, alfalfa, lupine, barley, wheat, vetch, oats, sunflouwer, camelina*
9. **Testplot Switchgrass.** *Panicum virgatum*
10. **Safety buffer zone.**



METHODOLOGY:

3) CROP SELECTION AND IMPLEMENTATION:

- pH corrector application
- Vertical land preparation, soil decompaction
- Sowing with cultivation on ridges
- Intercropping (oats & vetches)
- Soil inocculation with endomycorrhizal spores, beneficial bacteria & humic/fulvic acid






- First year with cereals with microorganisms at 100% (A), at 50% (B) and 0% on the control (C)
- The 100% is on the worse land and the control is on the best land (we discovered only later)

METHODOLOGY:

4) TREE & SHRUB PLANTING:

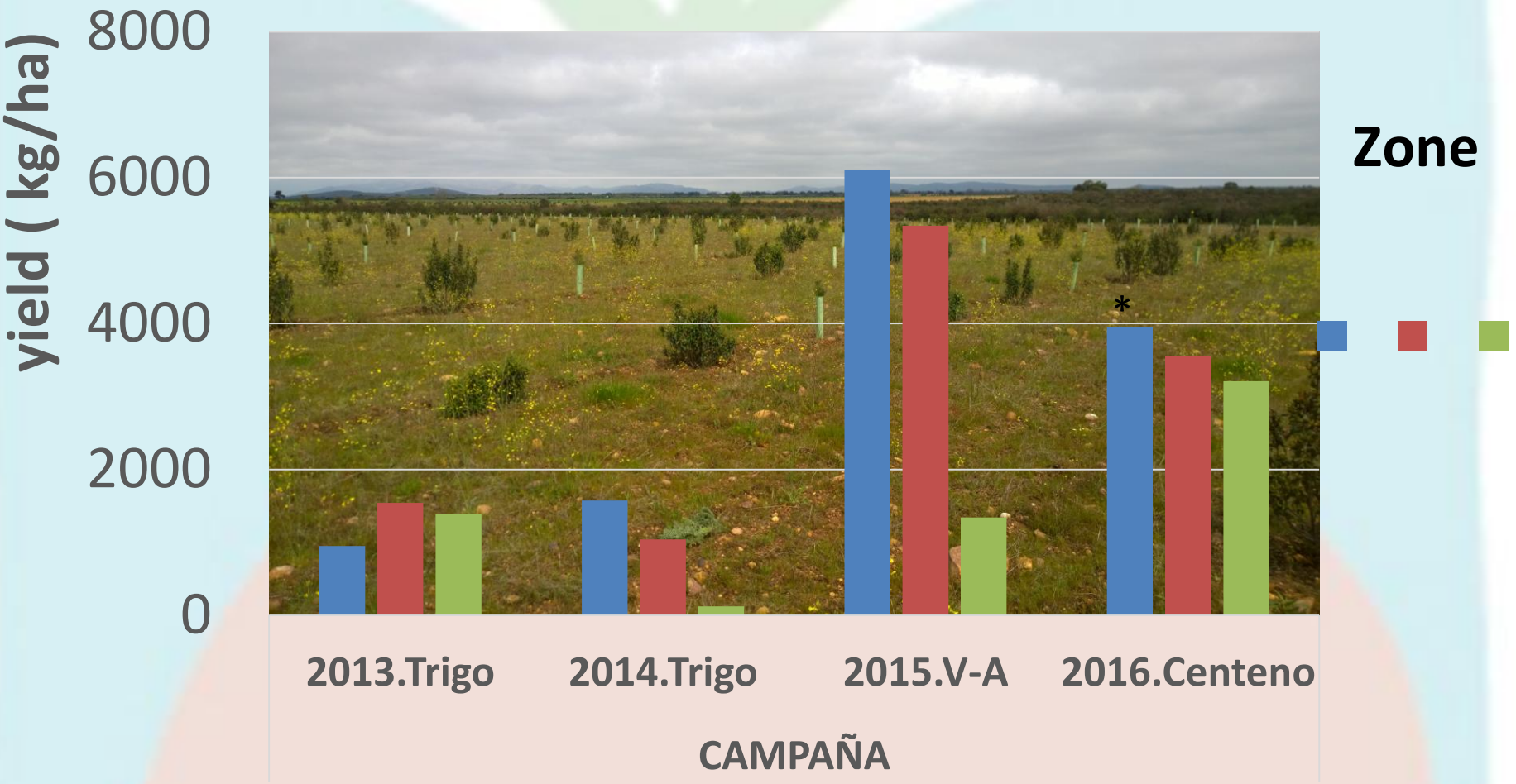
- Buffer area against wind and wildfire and also as a wildlife corridor
- Technologies to support tree growth: water reservoir for tree growth without irrigation





The results of the trials (Zamora):

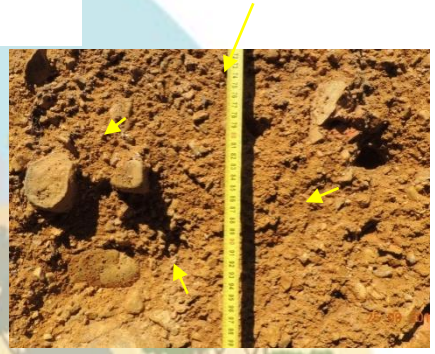
Harvest yield at Ayoó de Vidriales (2013-2016)



The results of the trials (Zamora):

- After 2 years, the roots in the 100% zone are deeper than 1 meter and we can see the symbiosis with the mycorrhizae of the type ‘Glomus’.
- The yield in Zone A is double vs Zone C (control) even if this was a dry year
- The survival rate of the trees is more than 98%. This is very high considering the very dry spring.
- For this year, we expect even better results especially in cases where we didn’t use chemical fertilizers like NPK and urea.



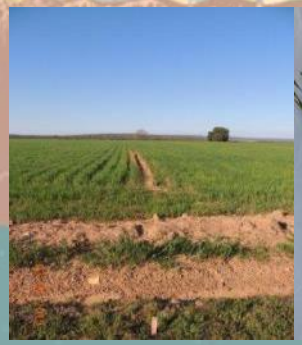


Soil samples (10 - 165 cm depth)

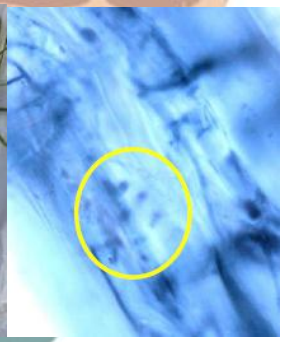




Soil improvement and root development

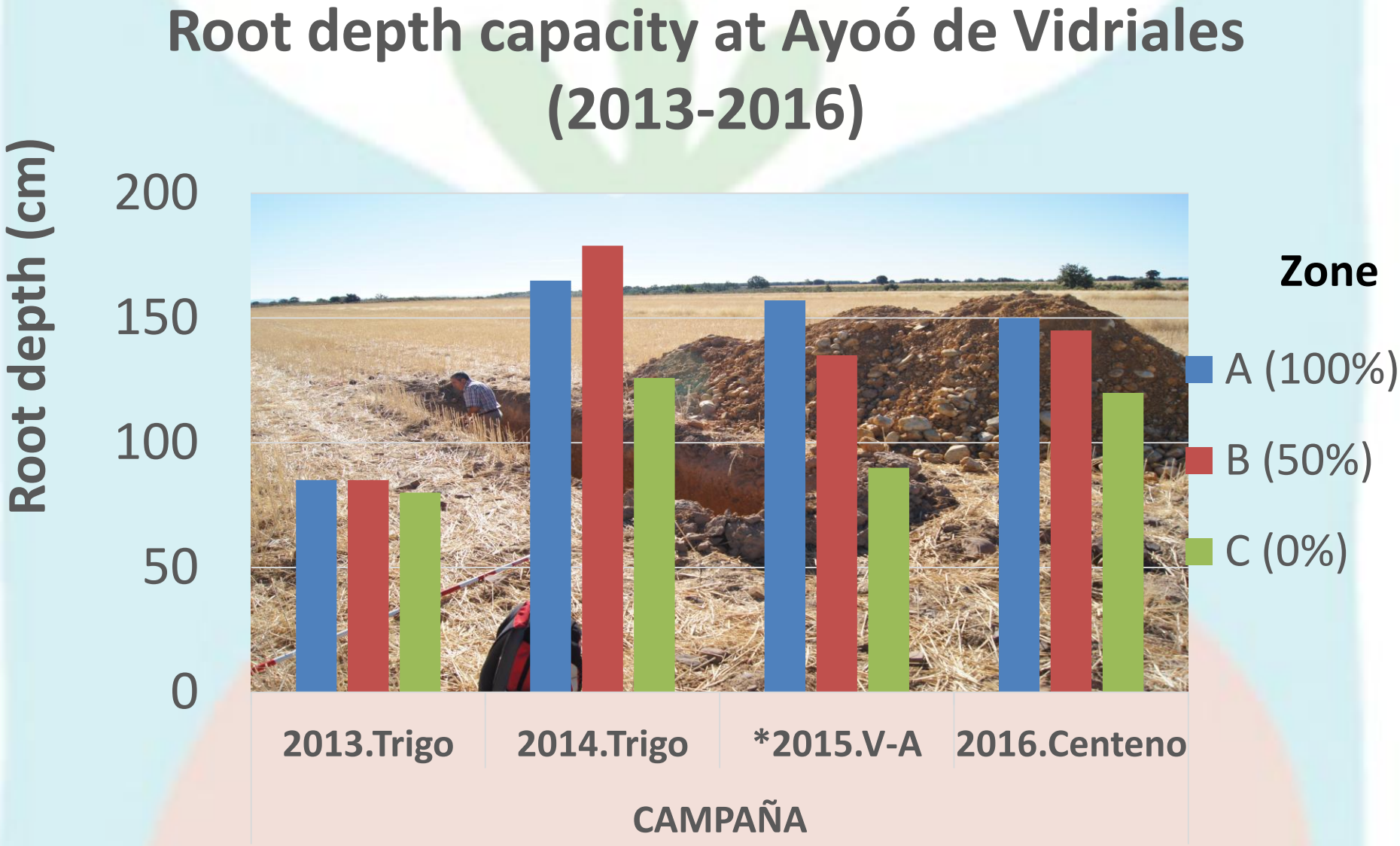






Continuous monitoring of soil, plants and roots

The results of the trials (Zamora):



San Mateo de Gállego (Zaragoza):

1) AGROFORESTRY PLAN DESIGN: Selection of plants

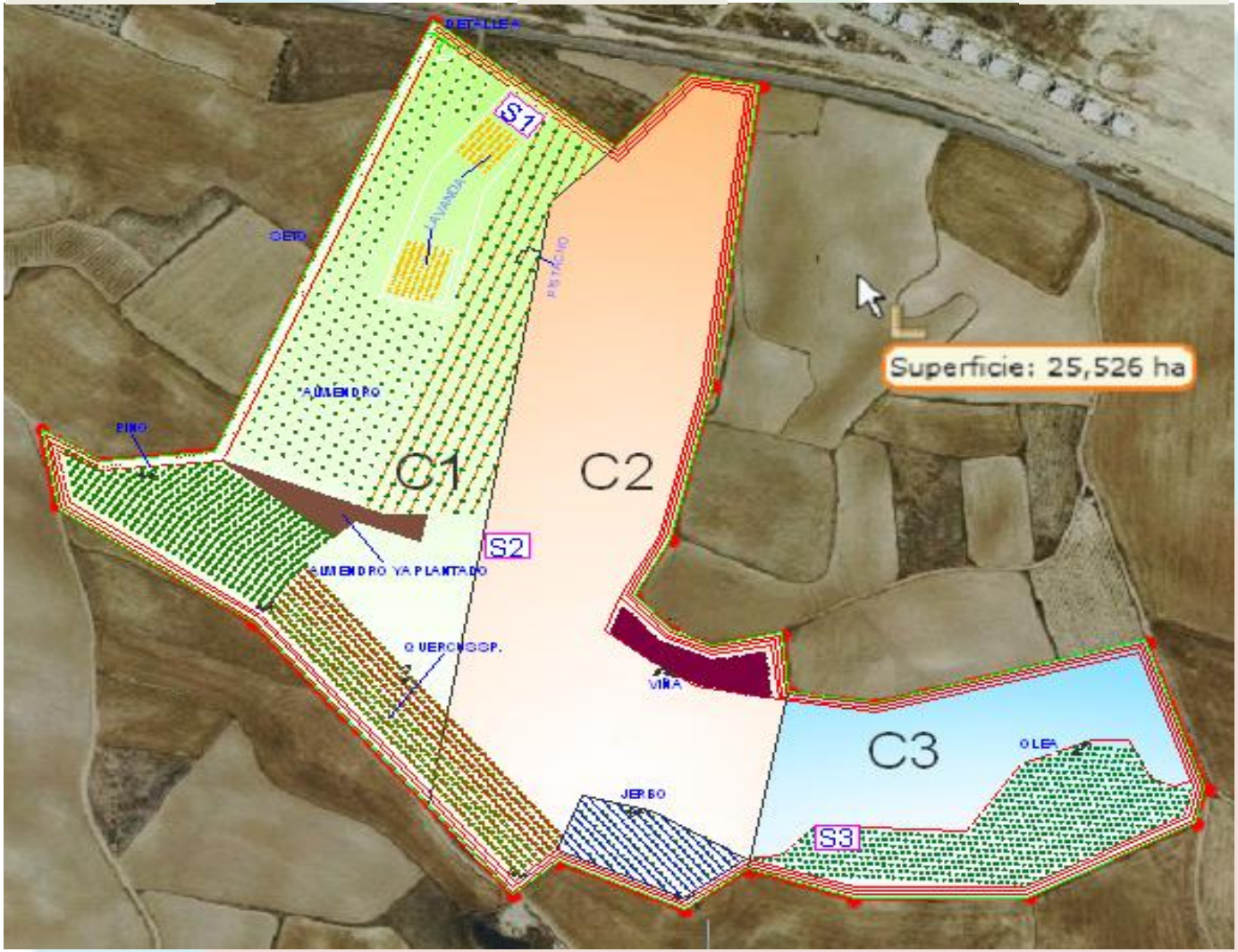
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4. **Timber&Fruits.** Jerbo & *Bromus hordeaceus, Vulpia geniculata, V.bromides*
5. **Timber&Fruits.** Oliva arbequina
6. **Timber&Fruits.** *Quercus ilex* mycorrhized with *tuber melanosporum*
7. **Protection border.** *Juniperus turiphera, J.phoenicea, Tamarix gallica, Q.coccifera, Rosa canina, Retama sphaerocarpa*
8. **Agricultural crops.** Ryegrass, barley, wheat, vetch, oats,
9. **Test area Lavender.** Lavandula.
10. **Testplot Switchgrass.** *Panicum virgatum*
11. **Test area Vines/Vid**
12. **Safety buffer zone.**



METHODOLOGY:

2) DIVISION OF PLOTS:

C1-100% **C2-50%** **C3-0%**



CONSIDERATION IN PLANTING SITES

- The major wind direction
- Fire risks
- To enable biodiversity migration
- Easy access for machines
- Combining crops
- Plant spacing
- Cross pollination
- Diameter and growth trees
- Carbon calculation methodologies
- Potential species competition
- Species tolerant for shade
- The altitude and available water

- Approximately half (50%) of the area will be covered with agricultural (annual) crops, the other half with perennials (trees, shrubs).

METHODOLOGY:





Scoping of the areas and crop plan design





Green cover crops





Lupinus and vetch-oat (Altramuz y veza-avena)

3) CROP SELECTION AND IMPLEMENTATION:

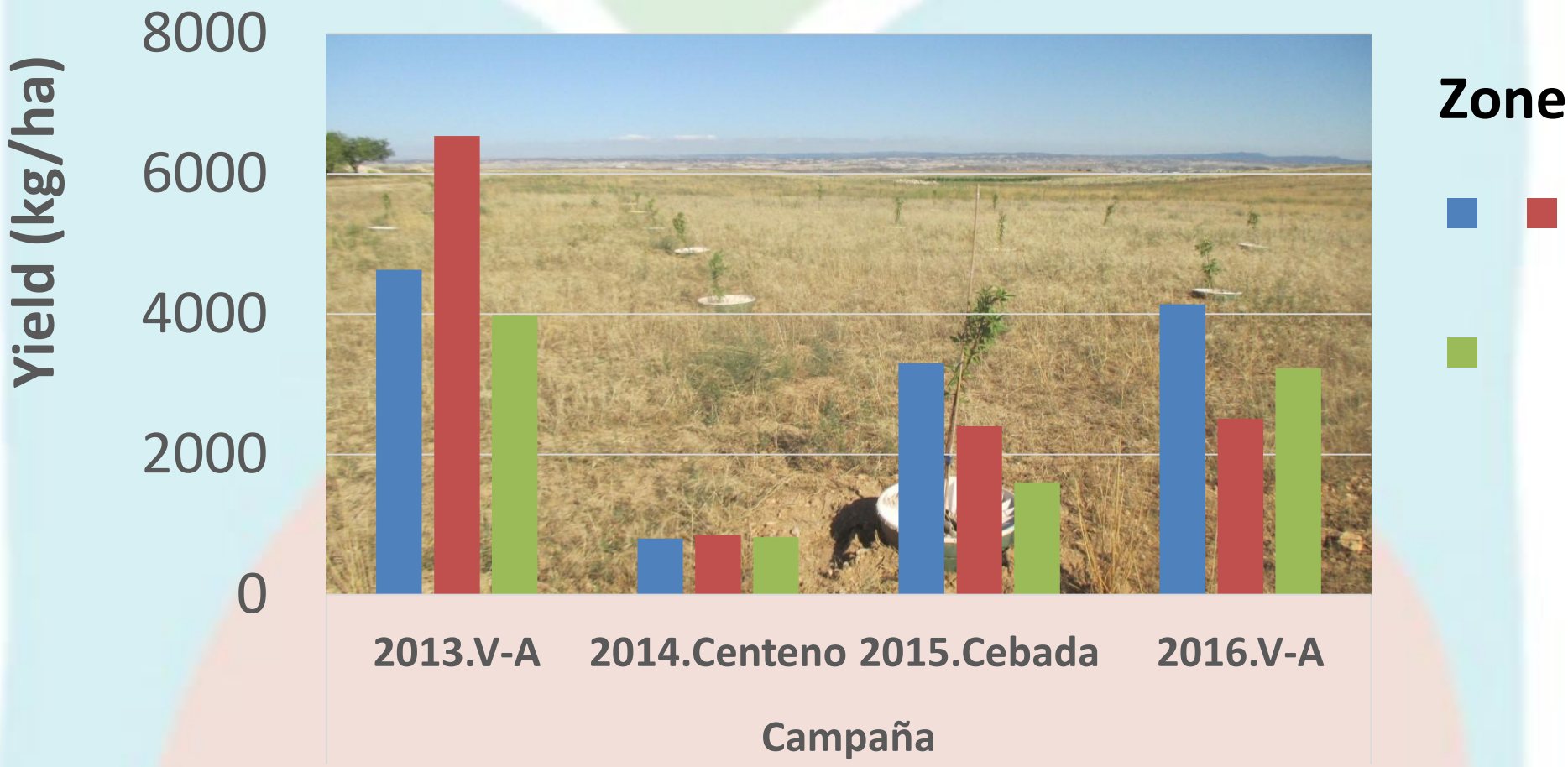
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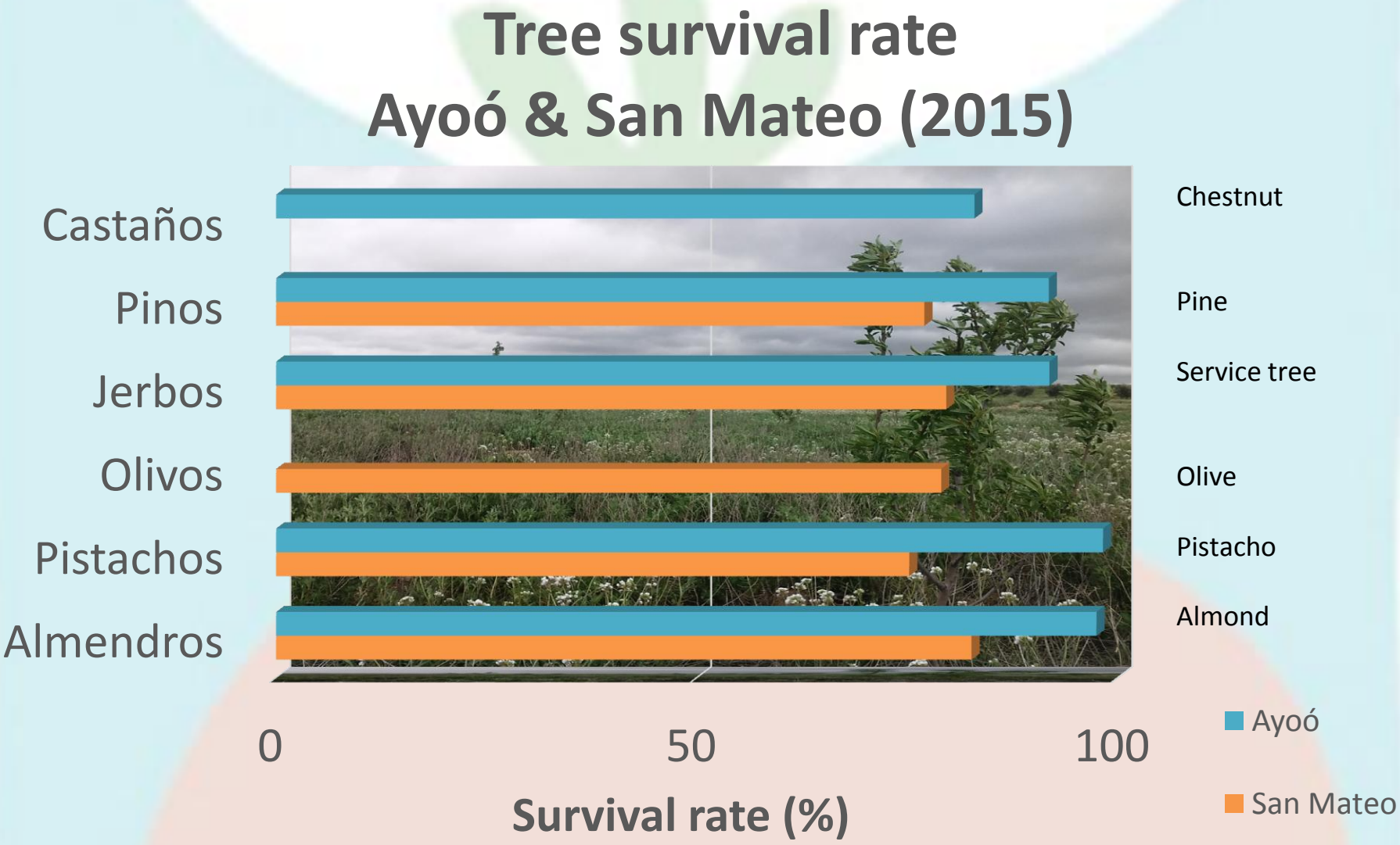
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The results of the trials (Zaragoza):

Harvest yield at San Mateo (2013-2016)



The results of the trials (Zaragoza):



Lessons learned?

- ✓ Soil biology is essential, especially in the Mediterranean area where water is the limiting factor.
- ✓ Soil compactation is a big problem, there are vertical plows that can be used every 3 – 4 years. It is even better to work with crops, like vetch/oat, pulses and sunflower, that penetrate deep in the soil by themselves.
- ✓ Spending a lot on fertilizers in rain fed conditions is not profitable; it is therefore necessary to switch gradually from 100% chemical agriculture to 100% organic.
- ✓ Mitigate soil erosion due to water and wind with trees and Roman plough guarantees very interesting results.
- ✓ We are developing models for ecosystem restoration that have to guarantee economic, social and environmental returns; besides that we have to promote actions to help the local population change their mentality.



Thank you for your attention

www.operationco2.com

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