



Phacelia tanacetifolia is a species of phacelia known by the common names lacy phacelia, blue tansy or purple tansy. (Creative commons)

Annual green manure with Phacelia tanacetifolia in southern Spain (西班牙)

Abono verde con Facelia

描述

Application of annual green manure with Phacelia Tanacetifolia sp. to improve soil quality and productivity on agricultural land.

1. This sustainable land management technology was established on agricultural land in Mutxamel (region of Alicante) in the municipality of Valencia (Comunidad Valenciana), Spain. Agricultural production in this region is of a very high quality and is intensely competitive. Despite this, the region's traditional agriculture industry is nonetheless being overtaken by other sectors, with the scarcity of water emerging as a key factor in this shift. The main orchards in this region are: citrus, lemon, almonds and olives trees, other common crops are vegetables, such as tomatoes, lettuce, etc.

2. The SLM technology focuses on annual cultivation of green manure in the form of the plant of Phacelia tanacetifolia. Phacelia tanacetifolia (Hydrophyllaceae) is commonly known as Lacy or Tancy Phacelia (syn. Purple Tancy, Fiddleneck and Valley Velvenia). Native to Californian drylands, chaparral and Central oak woodland, P. tanacetifolia has been naturalised throughout the western United States and frequently in Europe, whereas it has been extensively used as a nectar crop up and as annual green manure worldwide. Phacelia is listed as one of the top 20 honey-producing flowers for honeybees and is very rich in both nectar and pollen the lavender-coloured flowers attract bees, butterflies and other pollinating insects.

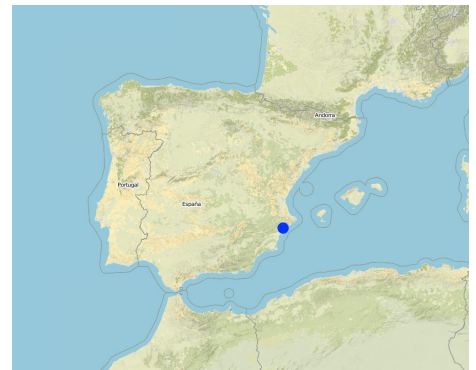
3. Initially, the main objective of the land user applying the technology was to improve the soil quality and the crop production in the vegetable fields (cabbages, tomatoes, lettuce, chards, spinach) by cultivating the Phacelia plant as an annual green manure. In other words, the maintenance of a specific cover crop such as Phacelia tanacetifolia grown in the orchard is intended to add organic matter, nitrogen, potassium and phosphorous and other nutrients coming from the decomposed manuring plant after it is worked into the soil.

4. The land user prepares the soil during September or October by ploughing the surface of soil and then sowing the Phacelia tanacetifolia seed thinly at a rate of 1 gram per square meter and within 25 cm per plant. In the examined case, the land user installed a drip irrigation system to irrigate every two to three days in autumn or every three to four days in winter. During winter time it is recommended to remove manually spontaneous plants. Before seed formation (February or March) the land user cuts the plant and then he is tilling and digging the cover crop gently into the soil, in order to incorporate all the nutrients of this green manure into the soil. It is crucial to cut the plant before seed formation; otherwise the nutrient capacity to the soil is reduced.

5. The major benefit of the intercrop of Phacelia tanacetifolia is the short term enhancement of the soil organic content. It keeps the soil more fertile during one year and therefore it has to be cultivated every year. In consequence also an improvement of the orchard productivity has been determined. Other substantial benefits are the stronger N fixation, the decrease in weeds, and the improved water-holding capacity; further to be mentioned, the better soil aggregation, as green manure crops help to improve the soil structure over time, and by this the aeration increases, and water infiltration and root growth are enhanced. Finally, the improved soil cover helps to control the risk of soil erosion.

6. One major disadvantage is the fact that Phacelia is not polyvalent. It is only an annual green manure plant, but unfortunately not also a marketable crop that could create monetary benefits in addition. Other disadvantages mentioned by the land user are the relative high establishment expenses, as for example for the irrigation equipment and as well the maintenance costs.

地点



地点: Mutxamel, Alicante, 西班牙

分析的技术场所数量: 单一场所

选定地点的地理参考

- -0.44005, 38.42579

技术传播: 均匀地分布在一个区域 (approx. < 0.1 平方千米 (10 公顷))

在永久保护区? :

实施日期: 2014

介绍类型

- 通过土地使用者的创新
- 作为传统系统的一部分 (> 50 年)
- 在实验/研究期间
- 通过项目/外部干预



Orchard plot ready to plant Phacelia Tanacetifolia as green manure (Alicia Morugán Coronado)

技术分类

主要目的

- 改良生产
- 减少、预防、恢复土地退化
- 保护生态系统
- 结合其他技术保护流域/下游区域
- 保持/提高生物多样性
- 降低灾害风险
- 适应气候变化/极端天气及其影响
- 减缓气候变化及其影响
- 创造有益的经济影响
- 创造有益的社会影响

土地利用



农田

- 一年一作: 蔬菜 - 其他
 - 乔木与灌木的种植: 柑橘属, 橄榄树, 树坚果 (巴西坚果、开心果、核桃、杏仁等), lemon
- 每年的生长季节数: 1

供水

- 雨养
- 混合雨水灌溉
- 充分灌溉

土地退化相关的目的

- 防止土地退化
- 减少土地退化
- 修复/恢复严重退化的土地
- 适应土地退化
- 不适用

解决的退化问题



化学性土壤退化 - Cn : 肥力下降和有机质含量下降 (非侵蚀所致)



物理性土壤退化 - Pc : 压实



生物性退化 - Bq : 数量/生物量减少, Bs : 质量和物种组成/多样性的下降

SLM组

- 轮作制度 (轮作、休耕、轮垦)
- 改良的地面/植被覆盖
- 土壤肥力综合管理

SLM措施



农艺措施 - A1 : 植被和土壤覆盖层, A2 : 有机质/土壤肥力, A3 : 土壤表面处理

技术图纸

技术规范

Species used: Phacelia tanacetifolia
 Family: Hydrophyllaceae
 Common name: Lacy Phacelia, Wildlife, Set-aside, Cover Crop or Green Manure
 Origin: North America
 Height of plant: 60-90cm
 Spacing between plants: 25cm
 Sowing period: September-October
 Growing period: Winter
 Flowering period: February-March
 Flower: Lavender-Mauve-Blue
 Other specifications: Perfect honey-producing flowers



Green manure

Green manure is a cover crop grown in orchard intentionally to adding organic matter, nitrogen, potassium and phosphorous, and other nutrients come from the decomposing organic matter after you dig the crop into the soil. All of these nutrients help to increase crop yields. Other substantial benefits include improved soil structure, decreased weeds, increased water-holding capacity and decreased soil erosion.

AUTUMN

Prepare the soil:

1. Surface ploughing
2. Install drip irrigation system
3. Plant the seeds of Phacelia each 25cm
4. Irrigate each 2-3 days

WINTER

Maintain the green manure:

1. Remove manually weeds
2. Irrigate each 2-4 days

SPRING

Incorporate green manure to soil:

1. Before flowering cut the Phacelia
2. Till and dig the Phacelia into the soil
3. Mix the green manure with soil



PHACELIA
Tanacetifolia

Author: Alicia Morugán Coronado

技术建立与维护：活动、投入和费用

投入和成本的计算

- 计算的成本为：每个技术区域（尺寸和面积单位：**0.2 ha**；换算为1公顷的换算系数：**1公顷 = 2 acres**）
- 成本计算使用的货币：**euro**
- 汇率（换算为美元）：1美元 = 0.85 euro
- 雇用劳工的每日平均工资成本：10€/hour

影响成本的最重要因素

The cost to establish and maintain this technology is relatively high but it is compensated with the monetary gains of her other productive orchard land.

技术建立活动

n.a.

技术建立的投入和成本 (per 0.2 ha)

对投入进行具体说明	单位	数量	单位成本 (euro)	每项投入的总成本 (euro)	土地使用者承担的成本%
设备					
tractor	piece	1.0	3300.0	3300.0	100.0
manual sowing machine	piece	1.0	200.0	200.0	100.0
drop irrigation pipe	piece	4.0	18.0	72.0	100.0
weed whacker	piece	1.0	14.0	14.0	100.0
draw hoe	piece	1.0	30.0	30.0	100.0
技术建立所需总成本				3'616.0	
<i>技术建立总成本, 美元</i>				<i>4'254.12</i>	

技术维护活动

1. Tillage (时间/频率: before plant green manure)
2. Planting (时间/频率: September - October)
3. Irrigation (时间/频率: after planting the green manure)
4. remove weeds (时间/频率: during the whole process)
5. cut the Phacelia (时间/频率: before seed formation (march))
6. mix the green manure with soil (时间/频率: march)

技术维护的投入和成本 (per 0.2 ha)

对投入进行具体说明	单位	数量	单位成本 (euro)	每项投入的总成本 (euro)	土地使用者承担的成本%
劳动力					
planting	person-hour	6.0	10.0	60.0	100.0
remove weeds	person-hour	24.0	10.0	240.0	100.0
cutting plants	person-hour	8.0	10.0	80.0	100.0
tillage and mix the plants into soil	person-hour	8.0	10.0	80.0	100.0
植物材料					
seed of Phacelia tanacetifolia	bag	20.0	13.0	260.0	100.0
其它					
Drop irrigation installation	person-hour	6.0	10.0	60.0	100.0
技术维护所需总成本				780.0	
<i>技术维护总成本, 美元</i>				<i>917.65</i>	

自然环境

年平均降雨量
 < 250毫米

农业气候带
 潮湿的

关于气候的规范

- 251-500毫米
- 501-750毫米
- 751-1,000毫米
- 1,001-1,500毫米
- 1,501-2,000毫米
- 2,001-3,000毫米
- 3,001-4,000毫米
- > 4,000毫米

- 半湿润
- 半干旱
- 干旱

以毫米为单位计算的年平均降雨量：365.0
 rainfall in autumn (october-november)
 18°C of average
<https://www.meteoclimatic.net/perfil/ESPVA030000003110C>

斜坡

- 水平 (0-2%)
- 缓降 (3-5%)
- 平缓 (6-10%)
- 滚坡 (11-15%)
- 崎岖 (16-30%)
- 陡峭 (31-60%)
- 非常陡峭 (>60%)

地形

- 高原/平原
- 山脊
- 山坡
- 山地斜坡
- 麓坡
- 谷底

海拔

- 0-100 m a.s.l.
- 101-500 m a.s.l.
- 501-1,000 m a.s.l.
- 1,001-1,500 m a.s.l.
- 1,501-2,000 m a.s.l.
- 2,001-2,500 m a.s.l.
- 2,501-3,000 m a.s.l.
- 3,001-4,000 m a.s.l.
- > 4,000 m a.s.l.

.....应用的技术

- 凸形情况
- 凹陷情况
- 不相关

土壤深度

- 非常浅 (0-20厘米)
- 浅 (21-50厘米)
- 中等深度 (51-80厘米)
- 深 (81-120厘米)
- 非常深 (> 120厘米)

土壤质地 (表土)

- 粗粒/轻 (砂质)
- 中粒 (壤土、粉土)
- 细粒/重质 (粘土)

土壤质地 (地表以下>20厘米)

- 粗粒/轻 (砂质)
- 中粒 (壤土、粉土)
- 细粒/重质 (粘土)

表土有机质含量

- 高 (>3%)
- 中 (1-3%)
- 低 (<1%)

地下水

- 表面上
- < 5米
- 5-50米
- > 50米

地表水的可用性

- 过量
- 好
- 中等
- 匮乏/没有

水质 (未处理)

- 良好饮用水
 - 不良饮用水 (需要处理)
 - 仅供农业使用 (灌溉)
 - 不可用
- 水质请参考：

盐度是个问题吗？

- 是
- 否

洪水发生

- 是
- 否

物种多样性

- 高
- 中等
- 低

栖息地多样性

- 高
- 中等
- 低

应用该技术的土地使用者的特征

市场定位

- 生计 (自给)
- 混合 (生计/商业)
- 商业/市场

非农收入

- 低于全部收入的10%
- 收入的10-50%
- > 收入的50%

相对财富水平

- 非常贫瘠
- 贫瘠
- 平均水平
- 丰富
- 非常丰富

机械化水平

- 手工作业
- 畜力牵引
- 机械化/电动

定居或游牧

- 定居的
- 半游牧的
- 游牧的

个人或集体

- 个人/家庭
- 团体/社区
- 合作社
- 员工 (公司、政府)

性别

- 女人
- 男人

年龄

- 儿童
- 青年人
- 中年人
- 老年人

每户使用面积

- < 0.5 公顷
- 0.5-1 公顷
- 1-2 公顷
- 2-5公顷
- 5-15公顷
- 15-50公顷
- 50-100公顷
- 100-500公顷
- 500-1,000公顷
- 1,000-10,000公顷
- > 10,000公顷

规模

- 小规模
- 中等规模的
- 大规模的

土地所有权

- 州
- 公司
- 社区/村庄
- 团体
- 个人, 未命名
- 个人, 有命名

土地使用权

- 自由进入 (无组织)
- 社区 (有组织)
- 租赁
- 个人

用水权

- 自由进入 (无组织)
- 社区 (有组织)
- 租赁
- 个人

进入服务和基础设施的通道

- 健康 好
- 教育 好
- 技术援助 好
- 就业 (例如非农) 好
- 市场 好
- 能源 好
- 道路和交通 好
- 饮用水和卫生设施 好

影响

社会经济影响

农业投入费用



High short term costs but low medium and long term costs expected

工作量



After green manure application less workload in medium and long term is expected.

社会文化影响

生态影响

土壤水分



Increasing water holding capacity of the soil is observed after green manure application.

土壤覆盖层



Covering the soil with Phacelia the soil surface is covered also after harvest of the main crops.

土壤压实



Less soil compaction due to better soil structure and due to the green manure application.

养分循环/补给



After first annual green manure in the soil the land user observed an enhancement of nutrient content in the soil.

动物多样性



With Phacelia the colony of honey bees and other insect species has been increased during the flowering period.

有益物种 (捕食者、蚯蚓、传粉者)



Honey bees are attracted to flowers for the pollen of Phacelia before cut the plant in seeding process formation.

场外影响

对邻近农田的破坏



No pollution by herbicides/pesticides.

温室气体的影响



Green manure or vegetation cover reduced greenhouse gas emissions.

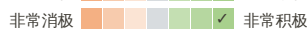
成本效益分析

与技术建立成本相比的效益

短期回报



长期回报

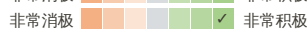


与技术维护成本相比的效益

短期回报



长期回报



The land user had problems to cope with the money input to establish the SLM technology at the beginning of the process, but in long-term it will be better.

气候变化

渐变气候

季雨量 增加



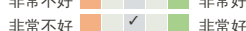
季节: 秋季

气候有关的极端情况 (灾害)

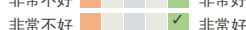
干旱



山洪暴发

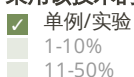


昆虫/蠕虫侵扰

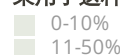


采用和适应

采用该技术的地区内土地使用者的百分比



在所有采用这种技术的人当中,有多少人在没有获得物质奖励的情况下采用了这种技术?



> 50%

51-90%
91-100%

最近是否对该技术进行了修改以适应不断变化的条件？

- 是
 否

什么样的变化条件？

- 气候变化/极端气候
 不断变化的市场
 劳动力可用性（例如，由于迁移）

结论和吸取的教训

长处: 土地使用者的观点

- Enhancement of soil organic matter
- Increase in honey bees colony during the flowering time, before plant cutting in seed formation period.

长处: 编制者或其他关键资源人员的观点

- Reduction of soil degradation
- Improve the soil structure

弱点/缺点/风险: 土地使用者的观点如何克服

- The high dependency on climatological conditions Pay special attention on soil structure
- The lack of funding to establish the technology The land user must to pay all the material with the income of other crop production

弱点/缺点/风险: 编制者或其他关键资源人员的观点如何克服

- The big amount money for this technology during a year without any crop production to sale. The land user needs another productivity orchard during this period to cope with the green manure expenses.

参考文献

编制者

Alicia Morugán-Coronado

Editors

审查者

Ursula Gaemperli
Alexandra Gavilano

实施日期: Oct. 18, 2017

上次更新: July 31, 2019

资源人

Alicia Morugán-Coronado - SLM专业人员

WOCAT数据库中的完整描述

https://qcat.wocat.net/zh/wocat/technologies/view/technologies_3219/

链接的SLM数据

不适用

文件编制者

- 机构**
- Agrochemistry and Environment Department, University Miguel Hernandez (UMH) - 西班牙
- 项目**
- Interactive Soil Quality assessment in Europe and China for Agricultural productivity and Environmental Resilience (EU-iSQAPER)

主要参考文献

- no:

链接到网络上可用的相关信息

- Web page of the organic farm: <https://verduresecologiques.com/>
- Biodynamic farming information: <https://warmonderhof.nl/>

This work is licensed under [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/)

