




When soil conservation meets water retention



Torino, September 12th 2014
Dr. José A. Gómez



Objectives

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- 1- Description of situation
 - 1- Comment about interactions between cover crops, a NW/RM, as multipurpose tool.
 - 3- Key results, interactions
 - 2- Applied to the case of cover crops in orchards in Mediterranean environments
 - 4- Challenges

Tree crops in Mediterranean countries

1- Approximately 7.6 Mha in Mediterranean EU. Roughly 80% are olives, grapes, almonds, and citrus.

2- Most of them, specially olives, almonds, and grapes, tend to occupy areas less suitable for field crops.

3- Rainfed or deficitly irrigated under limited water supply, Semiarid.

4- Management oriented to agronomy but not to environmental conservation.



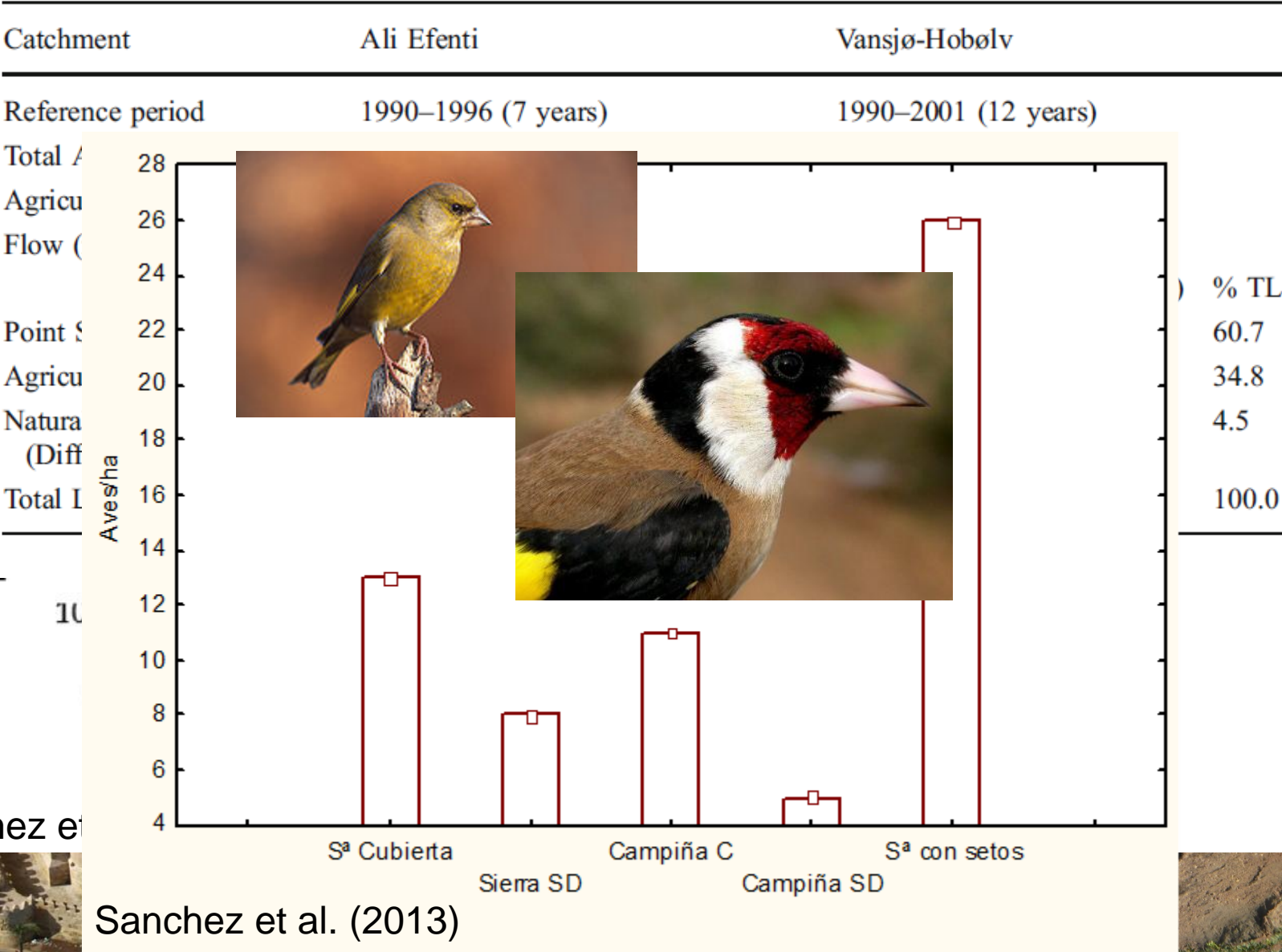
Tree crops in Mediterranean countries



2011/07/07

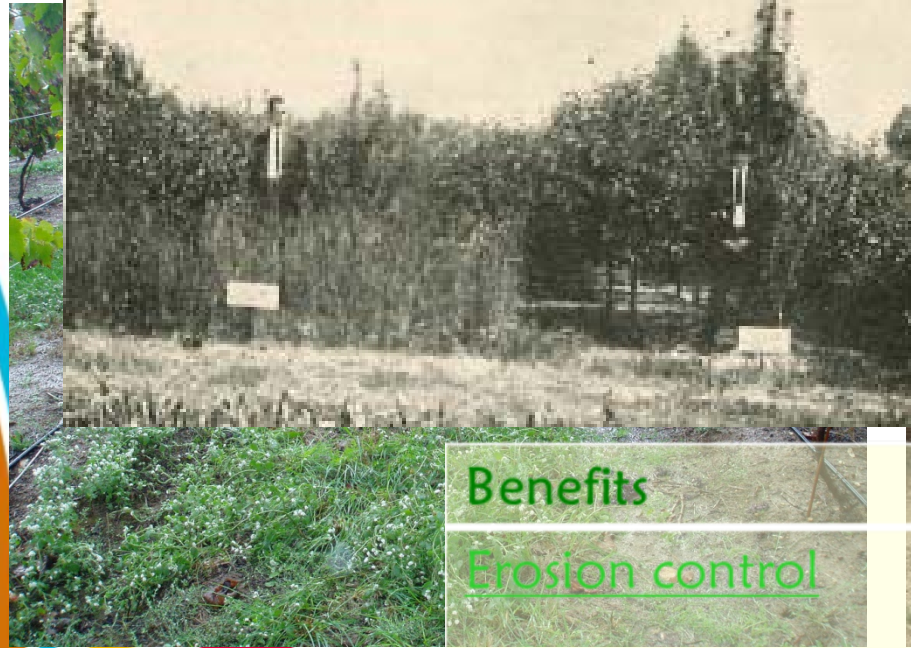


Table 5 Mean annual simulated nutrients in the catchments and source apportionment



Worthen, 1927. Farm Soils

terranean orchards



Benefits

Erosion control

Increase of infiltration,
OM and nutrient content
(N).

Occasionally pasture

Improved water quality

Trafficability

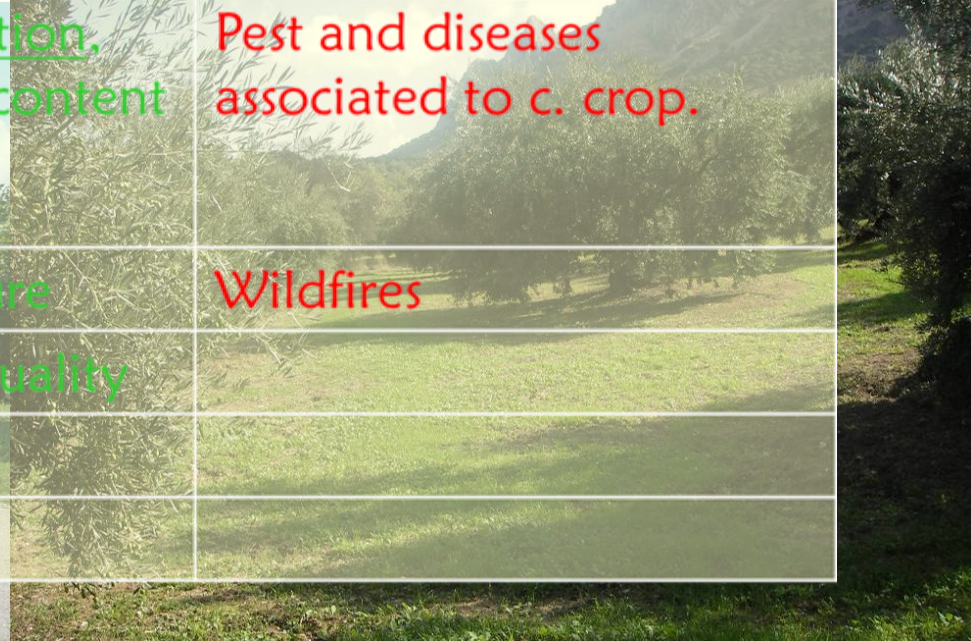
Biodiversity

Risks

Competition for water
with the tree

Pest and diseases
associated to c. crop.

Wildfires



Cover crops in Mediterranean orchards

Main o

Improv
of soil f

Grazing

Traffic

Explotación de olivares en asociación con trébol subterráneo

Por Joaquín Ruiz de Castroviejo^(*)

Existe una zona olivarera en la provincia de Córdoba, en su sierra norte, perfectamente diferenciada, con topografía accidentada y frecuentes terrenos cascajosos, comprendida, entre otros, por los términos municipales de Adamuz, Almodóvar del Río, Posadas, Hornachuelos, Montoro, Villanueva de Córdoba, Obejo, Pozoblanco y Villafranca. En su mayor parte están en la actualidad empobrecidas por la erosión, caduco el suelo y el vuelo, envejecido el árbol prematuramente además por un clima excesivamente subtropical, casi sin paradas invernal para sus exigencias. De ello da fe su escasa producción media, de unos seis kilogramos, aunque no faltan medianas y excelentes plantaciones, que con su pujanza enmascaran la penuria de la mayoría. Las precipitaciones son con frecuencia torrenciales y se producen en dos períodos de llu-



Detalle de la parcela experimental de la finca «La Viñuela», de Adamuz (Córdoba). Trébol subterráneo en su segundo año. Diciembre 1963

las hay, y por la formación de garras del diablo, cárcavas y barrancos en todas su edades y dimensiones.

Objeto del ensayo.

A mediados del año 1964, con ocasión de los trabajos de acondicionamiento de cárcavas y ordenación de labores que el Servicio de Conservación de Suelos venía realizando con olivares de la zona descrita (término municipal de Adamuz) se nos planteó la cuestión de encontrar una solución que al mismo tiempo de proteger el suelo, ya muy erosionado, aumentara la rentabilidad, muy menoscabada, de dichos olivares.

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Decision

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Agricultura, March 1969.



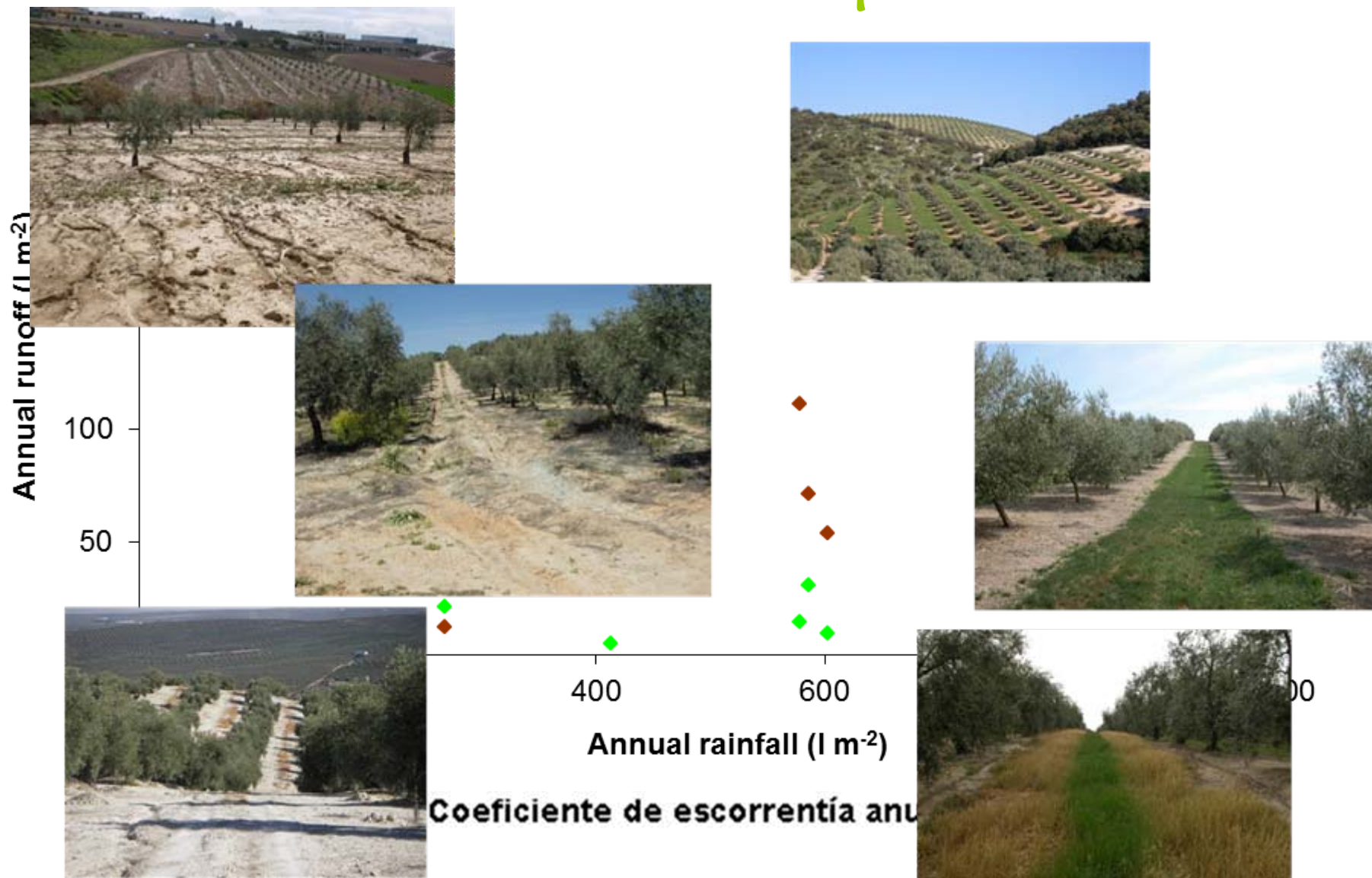
Results: Effects of cover



Gomez et al. 2011 (Soil Use and Management)



Results: Effects of cover crops on runoff



Results: Effects of cover crops on runoff

Table 6. Curve number (CN) values† based on the rainfall–runoff relationships obtained from the physically based model for 6-by 7-m tree spacing and tree canopy radii of 2 m for hydrologic soil groups A, B, C, and D.

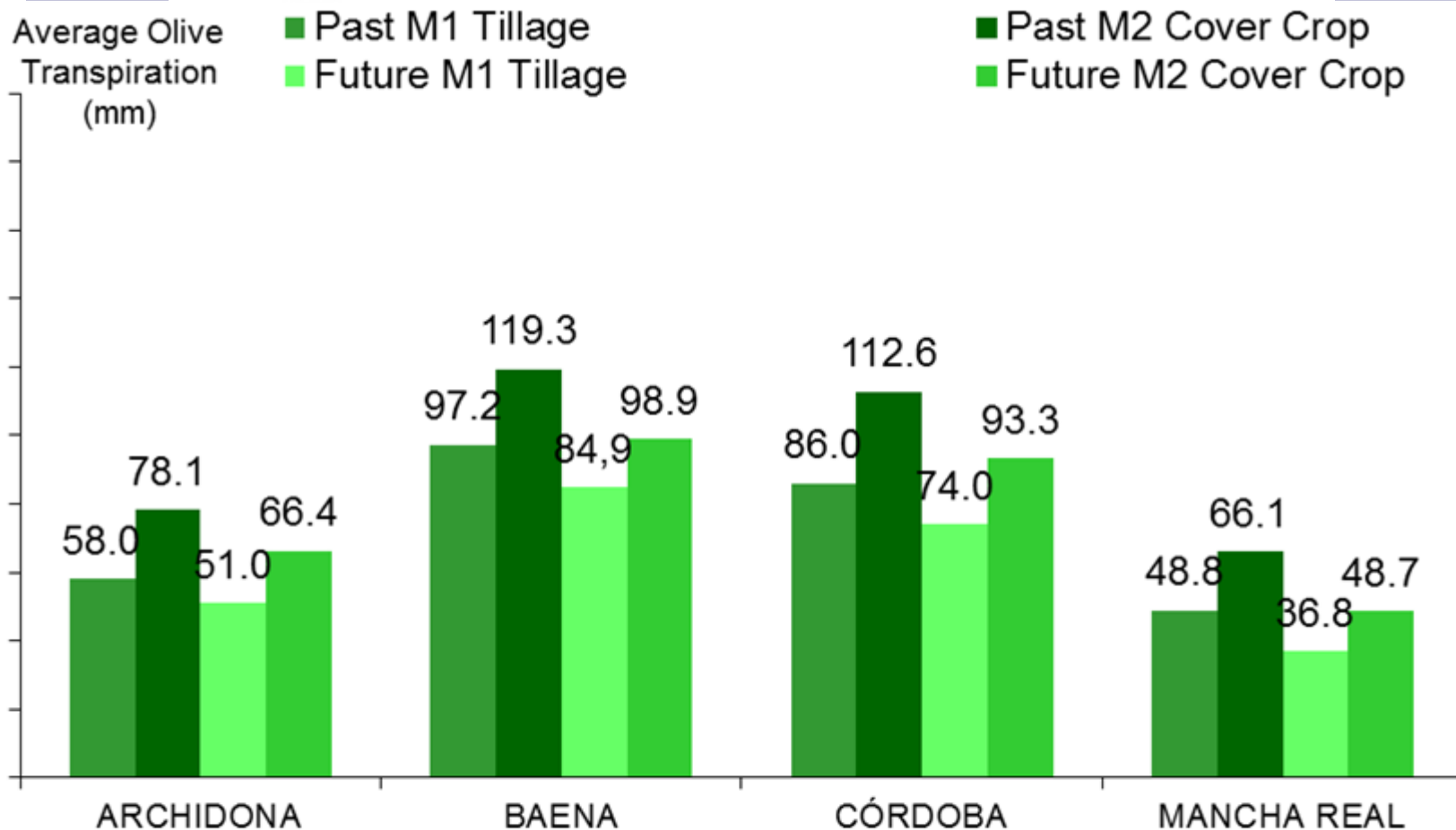
Soil management	CN values											
	A			B			C			D		
	CN _I	CN _{II}	CN _{III}	CN _I	CN _{II}	CN _{III}	CN _I	CN _{II}	CN _{III}	CN _I	CN _{II}	CN _{III}
Fallow	57	77	88	73	86	94	78	90	97	83	94	99
No-till, bare soil	53	72	81	70	83	93	76	89	96	81	93	98
Freshly tilled	46	57	62	60	71	79	64	76	83	66	80	87
Freshly tilled, plow pan	49	59	63	60	71	79	64	76	83	66	80	87
Degraded tilled	51	69	77	68	80	92	74	87	95	75	90	98
Degraded tilled, plow pan	53	70	78	69	81	92	74	87	95	75	90	98
Well-established cover crop, 70% cover	30	33	35	45	54	62	51	64	73	57	75	87
Well-established cover crop strip 3 m wide	33	37	39	50	61	69	56	70	78	62	80	91
Well-established cover crop strip 1 m wide	45	55	61	61	75	85	68	82	91	75	89	96
Degraded cover crop, 30% cover	51	69	78	68	80	91	74	87	95	76	90	98
Degraded cover crop strip 3 m wide	52	70	79	69	81	92	75	87	95	77	91	98
Degraded cover crop strip 1 m wide	53	71	80	70	82	93	76	88	96	80	92	98

† CN_I = dry antecedent moisture; CN_{II} = average antecedent moisture; CN_{III} = wet antecedent moisture.

Romero et al. (2007)



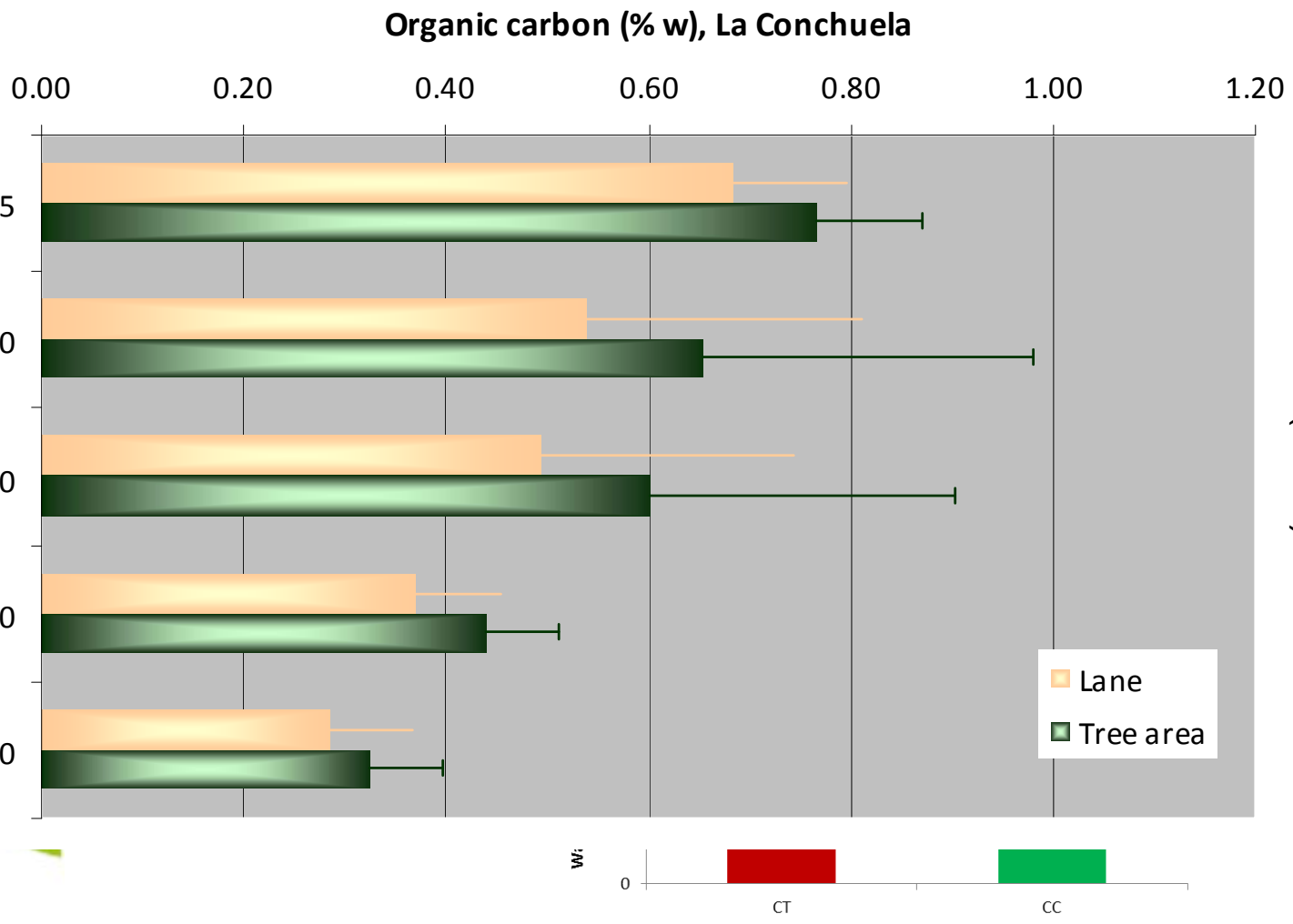
Results: Effects of cover crops on yield/w



Rodriguez Carretero et al. (2013)



Results: Effects of cover crops on soil properties

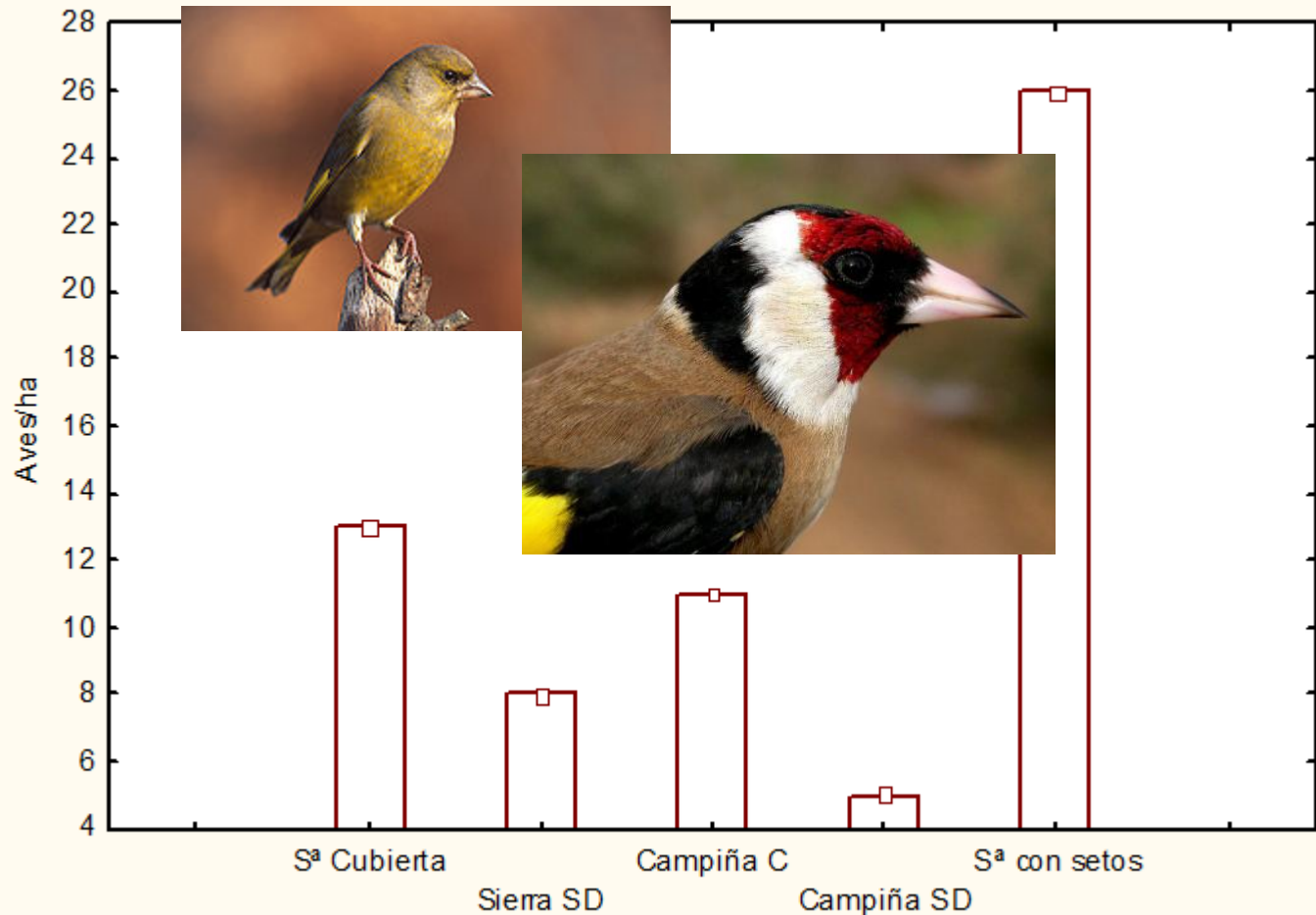
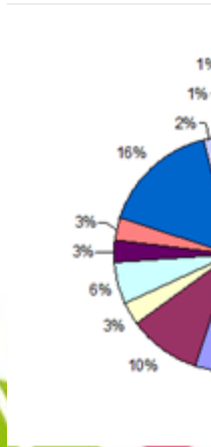


Gómez et al. (2012)



Results: Effects of cover crops on biodiversity

Biodiversity
management




GENIL
%
60.0%
8.6%
28.6%
2.9%

Sanchez et al. (2013)

Arce et al. (2010)



Summary

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- 1- Cover crops are a **key element** in achieving **sustainable** tree production in the Mediterranean.
 - 2- **Accelerated erosion** sparked interest in their R+D and use.
 - 3- They have a relevant role as **NWRM**, if properly implemented.
 - 4- They contribute to **mitigate** problems associated to large runoff events: **flood damages**, **offsite contamination**.



Summary

5- Its effective adoption is proving **challenging**.

Problems	Risks
Poor, uneven ground cover, placement	Non-seeded, or failed Ineffective
Farmers reluctance	Potential risk for yield. Cost, Technical complexity harvest/seed/control
Limited seed and machinery options	Loliums, barleys, ...

6- Example of NW/RM interacting with different technical and social questions

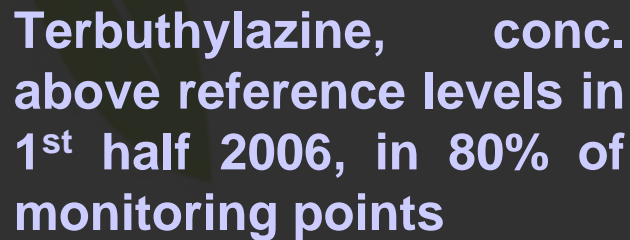


Thank you

<http://www.ias.csic.es>



**Agrochemicals (fertilizer, herbicide, pesticides)
contamination of water bodies (streams, reservoirs)
downstream of olive growing areas.**



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