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# RELATIVE CROP YIELDS OF EUROPEAN SILVOARABLE AGROFORESTRY SYSTEMS

Vladimir Ivezić and Wopke van der Werf



## **TWO APPROACHES IN ESTABLISHING NEW SILVOARABLE AF SYSTEMS:**

- 1. Introducing crops to a plot with trees (scattered trees or orchards)**
- 2. Introducing trees into a crop field**

**SEARCH EXISTING LITERATURE TO FIND ANSWERS TO SOME PRACTICAL QUESTIONS ON SILVORABLE AGROFORESTRY IN EUROPE**



## **SEARCH EXISTING LITERATURE TO FIND ANSWERS TO SOME PRACTICAL QUESTIONS ON SILVORABLE AGROFORESTRY IN EUROPE**

**What are the relative yields in European silvoarable agroforestry systems?**

*Is Agroforestry an opportunity for farmers to achieve higher yields and profit?*

**Does the crop yield changes based on the distance from the tree?**

*What would be the efficient(productive) design of silvoarable system in Europe (number of trees per ha, width of rows in alley cropping system...etc.)?*



## SEARCH PARAMETERS:

- Silvoarable agroforestry systems in Europe
- Cereals as an intercrop
- Data on relative crop yield (crop yields in AF/ crop yields in Monoculture)



# Introduction

MISCELLANEOUS

## Assessing Light Competition for Cereal Production in Temperate Agroforestry Systems using Experimentation and Crop Modelling

L. Dufour<sup>1</sup>, A. Metay<sup>2</sup>, G. Talbot<sup>1</sup> & C. Dupraz<sup>1</sup>

<sup>1</sup> INRA – L  
<sup>2</sup> Montpel



Available online at [www.sciencedirect.com](http://www.sciencedirect.com)



Agriculture, Ecosystems and Environment 123 (2008) 239–244

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Ecological Modelling 221 (2010) 1744–1756

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ELSEVIER

Implementation and calibration of the parameter-sparse Yield predict production and land equivalent ratio in mixed tree and under two contrasting production situations in Europe

A.R. Graves<sup>a,\*</sup>, P.J. Burgess<sup>a</sup>, J. Palma<sup>e</sup>, K.J. Keesman<sup>d</sup>, W. van der Werf<sup>d</sup>, C. Dupraz<sup>c</sup>, F. Herzog<sup>c</sup>, M. Mayus<sup>d</sup>

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<sup>e</sup> Centro de Estudos Florestais, Instituto Superior de Agronomia, Universidade Técnica de Lisboa, 1349-017 Lisboa, Portugal



*Agroforestry Systems* 63: 157–169, 2004.

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## Poplar (*Populus* spp) growth and crop yields in a silvoarable experiment at three lowland sites in England

P.J. Burgess<sup>1,\*</sup>, L.D. Incoll<sup>2</sup>, D.T. Corry<sup>2</sup>, A. Beaton<sup>3</sup> and B.J. Hart<sup>4</sup>

<sup>1</sup>Cranfield University, Silsoe, Bedford MK45 4DT, UK; <sup>2</sup>School of Biology, University of Leeds, Leeds LS2 9JT, UK; <sup>3</sup>Pot Common, Red House Lane, Elstead, Surrey GU8 6DS, UK; <sup>4</sup>Royal Agricultural College, Cirencester GL7 6JS, UK; \*Author for correspondence (fax: +44-(0)1525-863344; email: [p.burgess@cranfield.ac.uk](mailto:p.burgess@cranfield.ac.uk))

## Impact of evergreen oaks on soil fertility and crop production in intercropped dehesas

*Agroforest Syst* (2015) 89:365–381

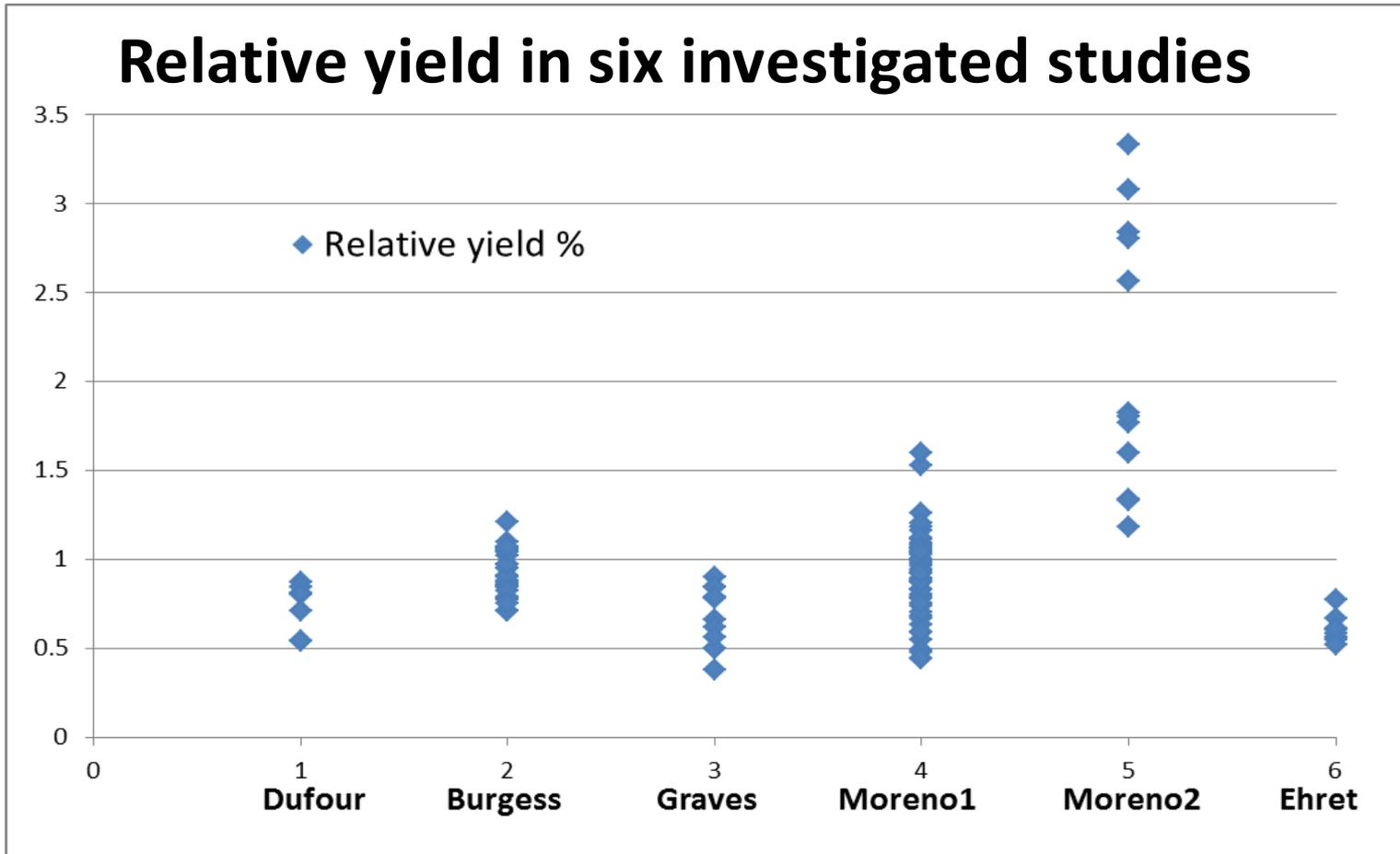
DOI 10.1007/s10457-014-9773-7

## Bioenergy provision by an alley cropping system of grassland and shrub willow hybrids: biomass, fuel characteristics and net energy yields

M. Ehret · L. Bühle · R. Graß · N. Lamersdorf · M. Wachendorf

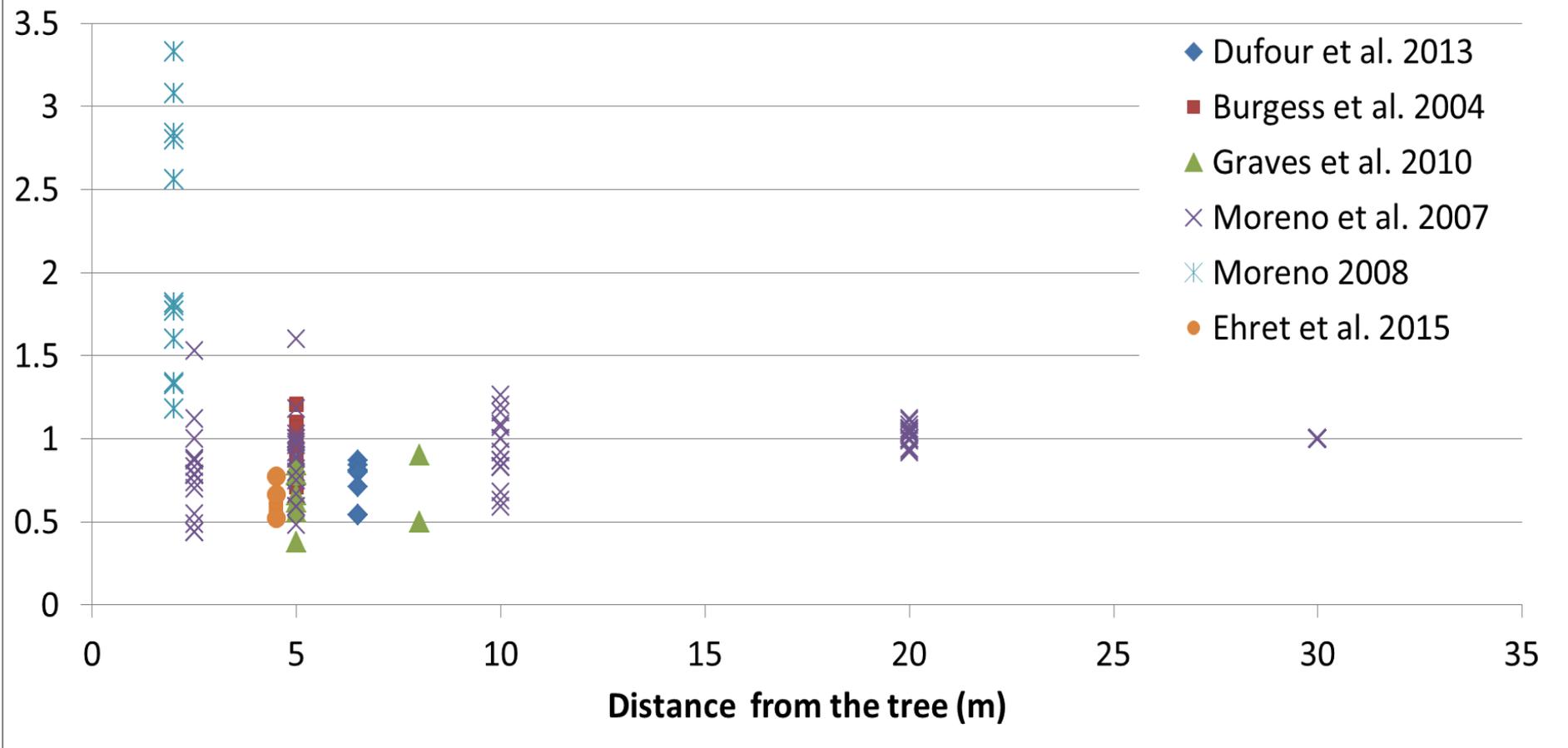
- The search identified **six publications** which had a minimum set of data required for analysis: crop relative yields, distance from trees, tree age, region, crop and tree species.
- 137 data points
- Manuscripts had different aims with various treatments investigating impact of shade or influence of fertilization for example – however each treatment had its own reference field in monoculture based on which the RY was calculated.

- Most relevant data came from alley cropping studies in France, the UK (Cirencester, Leeds, Silsoe), Germany (Cottbus) and traditional silvoarable agroforestry systems in the Dehesa area in Spain and Portugal
- Crop and tree species vary substantially among studies (crops: wheat, oat, grasses and legumes) trees: poplar, black locust, oak and willow.
- Modern alley cropping systems have more trees per ha (100-150) than traditional SAF, such as Dehesas (8-25). Alley cropping studies had a row width of 13m in the south of France and 10m in the UK.



Studies: 1.) Dufour et al. 2013, (Alley cropping, Wheat-Walnut); 2.) Burgess et al. 2004, (Alley cropping, Barley/Wheat-Poplar); 3.) Graves et al. 2010, (Alley cropping, Barley/Wheat-Poplar); 4.) Moreno et al. 2007, (Traditional AF, Oat-Oak); 5.) Moreno 2008, (Traditional AF, Grass and legumes-Oak); 6.) Ehret et al. 2015, (Alley cropping, Grass and legumes-Willow)

### Relative yield vs. distance from the tree (6 studies)





## Conclusion

- The results indicate that the relative productivity of SAF systems compared to sole crop systems depends on the region or part of Europe. Studies from Mediterranean region report high RY beneath the canopy shade, unlike the studies from other parts of Europe
- Light, and thus tree species, width of the alley (or distance from the tree), and age of tree stands could play a crucial role in achieving satisfactory crop yields.
- With only six retrieved studies containing primary quantitative information on crop yields in AF under European conditions, we conclude that there is a scarcity of such information. Additional studies focused on crop yields will be necessary to determine profitability and feasibility of SAF in Europe, if only crop is considered.

**THANK YOU FOR YOUR  
ATTENTION**