RELATIVE CROP YIELDS OF EUROPEAN SILVOARABLE AGROFORESTRY SYSTEMS

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INTRODUCTION

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
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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

- Silvoarable AF-Europe
- Cereals as an intercrop
- RY crop yield

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


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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
Results

• 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.
Results

- 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.
Results

Relative yield in six investigated studies

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)

- Dufour et al. 2013
- Burgess et al. 2004
- Graves et al. 2010
- Moreno et al. 2007
- Moreno 2008
- Ehret et al. 2015
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