Trees in fields for a competitive and sustainable European Agriculture
Whitehall Farm 104ha
52ha Agroforestry established 2009
Agroforestry drivers

- Multifunctional land use
- Cropping & enterprise diversity
- Conservation & Habitat creation
- Soil protection
- Towards ‘Climate smart’ agriculture
Soil erosion - a serious issue!
3m wide Nectar & Wild flower strip Under tree rows
Field scale machinery
Agroforestry is sustainable Intensification

- Orchards 1000-1500 trees / ha
- Agroforestry 90-100 / ha
- Our Farm - 4680 trees on 52ha = 90 trees / ha
  In tree rows of 4ha only = 1125/ha
- Cropping the “Extra Dimension”
Monoculture Crops grow 0 - 1 m above ground only

Monoculture roots grow 0 - 1 m below ground only
Improved use of sun & water

Crops grow 0 - 10m above ground

Improved root growth, nutrient use & reduced leaching
Structural & policy challenges

• **Farm Business Tenancy (15yr)**
  – agree terms with landlord pre establishment
  – Land Tenure is a major issue

• **Pillar I**
  – Fruit, nut, vines, nurseries eligible from May 2009 in UK
  – Timber not eligible in UK
  – Eligibility of tree spp. for Pillar I SPS

• **Environmental Schemes**
  – Pillar II funding eligibility ?
  – Only Organic farming support – No agroforestry support in UK
Comparison of species richness between agroforestry (AF) and monoculture (mono) at 6 farms in England 2009-2011.

Source: A Varah Reading University
Yields and economics

UK farmer experiences
Willow alley cropping at Wakelyns
Land Equivalent Ratio

Willow
SRC Plantation: 25 odt/ha every 3 years = 8.33 odt/ha/year

Agroforestry: 6.7 odt/ha every 2 years = 3.35 odt/ha/year

Winter wheat (organic)
Monoculture: 5 t/ha

Agroforestry: 2007-2011 average for Wheat 6.98 t/ha

Shaded area @ 50% yield = 0.13 ha (0.45 t/ha)
+ Non shaded area @ 100% yield = 0.67 ha (4.68 t/ha)
Wheat output = 5.13 t/ha
SRT coppice willow / wheat monocultures vs Willow – Wheat Agroforestry

<table>
<thead>
<tr>
<th></th>
<th>land area</th>
<th>yield</th>
<th>Value</th>
<th>Component Output</th>
<th>Total Output</th>
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<tbody>
<tr>
<td></td>
<td>%</td>
<td>ha/yr</td>
<td>£/t</td>
<td>£/ha/yr</td>
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<tr>
<td><strong>Monoculture</strong></td>
<td></td>
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<td>SRT Plantation Willow</td>
<td>100</td>
<td>8.33</td>
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<tr>
<td>Organic wheat</td>
<td>100</td>
<td>5</td>
<td>270</td>
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<tr>
<td><strong>Agroforestry</strong></td>
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<tr>
<td>Willow</td>
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<tr>
<td>Wheat 100%</td>
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<td>4.68</td>
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<td>Shaded wheat 50%</td>
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<td>0.45</td>
<td>270</td>
<td>121.5</td>
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**LER = 1.43**

Tree agroforestry yield + Crop or livestock agroforestry yield = 5.13
Tree monoculture yield + Crop or livestock monoculture yield = 8.33
Land Equivalent Ratio

LER = \frac{\text{Tree agroforestry yield}}{\text{Tree monoculture yield}} + \frac{\text{Crop or livestock agroforestry yield}}{\text{Crop or livestock monoculture yield}}

LER = \frac{3.35}{8.33} + \frac{5.13}{5}

LER = 0.40 + 1.03

LER = 1.43

i.e. 43% more land needed under monocultures to produce same yields.
Wheat / Apple orchard monocultures vs Wheat – Apple Agroforestry – at yr 5

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<th>Value £/t</th>
<th>Component Output £/ha/yr</th>
<th>Total Output £/ha/yr</th>
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<td><strong>Monoculture</strong></td>
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<tr>
<td>Apple orchard @ 1000 trees / ha</td>
<td>100</td>
<td>10.4 t</td>
<td>850</td>
<td>840</td>
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<tr>
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<tr>
<td>Apple @ 90 trees / ha</td>
<td>13</td>
<td>1.1 t</td>
<td>850</td>
<td>765</td>
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<tr>
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<td>5.0 t</td>
<td>270</td>
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**LER = 1.1**

i.e. 10% more land needed under monocultures to produce same yields
Nuffield Farming Scholarship

Global adoption of commercial agroforestry and its applicability to UK & temperate farming systems
Nuffield study travel 2011-2012
http://www.nuffieldinternational.org/reports/report.php

A Nuffield Farming Scholarships Trust

Award sponsored by
The NFU Mutual Charitable Trust

Agroforestry: a new approach
to increasing farm production

Stephen Briggs

June 2012
• Trees important for climate change adaptation

• 12% UK tree cover (16% target - well below the 37% EU av). Agroforestry could make a significant contribution to tree planting in agricultural landscapes

• Modern agroforestry is compatible with present-day agricultural techniques - tree densities of c.100 trees/ha allow alley crop productivity to be maintained

• Agroforestry can make the farm bigger and more productive if farmers crop the extra dimension – “above and below ground”
• Agroforestry increases nutrient cycling, reduces nutrient loss and soil degradation.

• Reductions in wind speed lower evaporation and water loss from crops

• The best combinations of tree : alley crop are short season grain crops i.e cereals combined with long season tree crops i.e later leafing trees

• land tenure is a big issue. Farmers renting land are less likely to want to adopt agroforestry practices – new models needed?

• Agroforestry is ‘climate smart’ agriculture - one of the few options with the potential to help reduce greenhouse gas emissions, help protect natural resources whilst at the same time producing more food and biomass