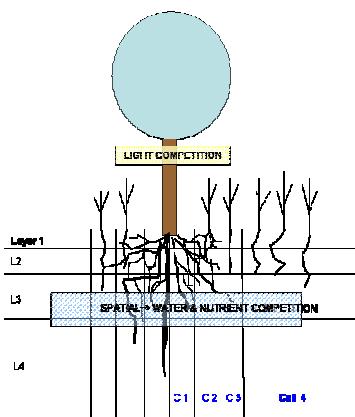


# Productivity in Silvoarable Agroforestry



An agroforestry system, where trees and crops are grown in association, is an environment where the two plant species compete for light, water and nutrients.



Previous research has indicated that if winter crops, such as winter wheat, are grown under poplar trees the competition for light, water and/or nutrients is not severe as the crops and trees put on most of their growth at different times of the year.

**Methodology** Trees of 4 poplar hybrids were planted in rows in 3 replicated blocks, 6.25 m between the trees within the rows and 10 m alleys between the rows. Crops were sown according to normal agronomic practice in half of the alleys, with the other alleys being kept fallow. Tree growth was measured annually, and yields of the crops were measured at harvest and were compared with crops grown in control areas. Land Equivalent Ratio (LER) = (intercropped crop yield/control yield) + (annual intercropped tree yield increment/annual control tree yield increment) based on an estimated wood density of 640 kg m<sup>-3</sup>.

DJ Pilbeam, LD Incoll, C Wright, F Agostini,  
M Eichhorn, P Burgess<sup>#</sup>, C Dupraz\*

School of Biology, University of Leeds, Leeds LS2 9JT, UK

# Institute of Water & Environment, Cranfield University, Silsoe, Bedfordshire, MK45 4DT, UK

\* INRA-SYSTEM, 2 Place Viala, 34060 Montpellier Cedex, France

Day of year	Year of measurement	Timber volume - continuously cropped alleys (m <sup>3</sup> /tree)	Timber volume - continuously fallow alleys (m <sup>3</sup> /tree)
87	1992		
356	1992		
25	1994	0.000	0.001
25	1995	0.002	0.003
339	1995	0.006	0.014
3	1997	0.015	0.033
20	1998	0.036	0.063
40	1999	0.070	0.115
48	2000	0.091	0.148
79	2001	0.129	0.193
80	2002	0.172	0.249
72	2003	0.221	0.314
91	2004	0.276	0.368

Table 1. Calculated timber volume (from height, diameter at breast height and a form factor) of four poplar hybrids in continuously-cropped and continuously-fallow treatments (values are means, n = 60).

Year of harvest	Crop	Sole crop yield (t ha <sup>-1</sup> )	Silvoarable yield (t ha <sup>-1</sup> cropped area)	Ratio of silvoarable to control yield
1992	Spring barley	6.34	6.62	1.04
1993	Peas	5.46	4.83	0.88
1994	Winter wheat	8.67	9.24	1.07
1995	Winter wheat	8.17	7.81	0.96
1996	Winter barley	7.68	6.92	0.90
1997	Spring mustard	4.17	3.56	0.85
1998	Winter wheat	10.55	9.55	0.91
1999	Winter barley	5.63	5.50	0.98
2000	Winter wheat	6.55	6.04	0.92
2001	Winter wheat	6.38	4.70	0.74
2002	Winter barley	7.86	5.39	0.69
2003	Winter oilseed rape	*	*	*
2004	Winter wheat	7.37	3.10	0.42

Table 2. Crop yield in control area of surrounding field, yield in the alleys and ratio of the two yields.

Economic analysis shows that under recent subsidy regimes this system is not as profitable as either poplars grown in farm woodland blocks or cereal monoculture. However, consideration of the LER shows that productivity per land area is higher, making this a good system both for carbon sequestration and for maximising yields per land area to free up agricultural land for re-wilding.

Year	1995	1996	1997	1998	1999	2000	2001	2002
LER	1.13	1.19	1.38	1.38	1.42	1.58	1.36	1.30



This research was carried out as part of the SAFE (Silvoarable Agroforestry for Europe) collaborative research project. SAFE was funded by the EU under its Quality of Life programme, contract number QLK5-CT-2001-00560.