

Establishment of a silvopastoral agroforestry system in Co. Wexford

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Introduction

Agroforestry, the cultivation of trees with crops and/or livestock on the same unit of land, is consistent with government policy to increase the forest cover from 10% of the land area to 17%. To date, planting targets have not been realized. The proposed E.C. Rural Development Regulation (EC, 2004) recommends supporting first establishment of agroforestry on farms. Eighty percent of farms in Ireland have cattle as a main enterprise (Connolly *et al.*, 2003). Silvopastoral systems incorporate trees and livestock. The current study aims to investigate the feasibility of establishing a silvopastoral agroforestry system with cattle and to also investigate the potential for Root Production Method (RPM) oak to be used in such a system relative to bare-root planting stock. RPM trees are grown in the nursery by a different process to bare-root trees, which enhances the root system (Lovelace, 1999).

Materials and Methods

A silvopastoral experiment was established in 2002 in *Lolium* dominated pasture grazed by beef cattle using *Quercus robur* L. in an alley design at Teagasc Johnstown Castle Research Centre in Co. Wexford. The experiment has five treatments and three blocks in a randomised complete block design. The treatments are: 1) Pasture control; 2) Bare-root silvopasture; 3) RPM silvopasture; 4) Bare-root forestry control; and 5) RPM forestry control. Trees in the forestry control treatments were planted at the Forest Service recommended spacing of 2m x 0.75m (6,600 stems Ha.⁻¹). Trees in the silvopasture treatments were planted in rows with 10m inter- and 2.5m intra-row spacing (400 stems Ha.⁻¹). Tree rows within the silvopasture treatments are protected by a double strand electric fence enclosing a 2.5m strip to allow for the growth of the trees as they mature, creating a 7.5m wide pasture alley between each tree row. The area of pasture within each treatment type is given below in Table 1.

Table 1. Pasture area within treatments

Treatment	Area of replicate (Ha.)	Pasture area (Ha.)
Pasture	0.126	0.126
Silvopasture	0.315	0.24
Forestry	0.063	n/a

Pastures receive fertilizer as per standard practice. Cattle rotationally graze the pastures within each treatment to an 8cm mean height before moving onto the next replication. Stocking density is managed to maintain cattle on a replicate for 10 days. The cattle are weighed upon entering the experiment and on leaving to ascertain the liveweight gain and periodically during the grazing season. Exclusion cages are used to allow the measurement of pasture dry matter production. Samples are taken at 8cm height on removal of cattle from a replicate. Stem diameter at 3cm above ground level and

tree height are measured during the dormant season. The data were analysed using MANOVA ($P < 0.05$).

Results and Discussion

The trees were successfully established and the cattle were successfully managed in combination with them.

Tree growth

After two growing seasons, there were no differences in height increment between RPM and bare-root or between silvopasture and forestry (Table 2).

Table 2. Tree height increment 2002-2004 (mm)

	RPM	Bare-root	Silvopasture	Forestry
Mean	229 ^a	223 ^a	221 ^a	229 ^a
S.E.	14.0	13.3	16.0	12.0

Means followed by the same letter do not differ significantly from each other ($P < 0.05$)

Mean stem diameter increment during 2003-2004 was greater for bare-root than for RPM and there was no difference between silvopasture and forestry (Table 3).

Table 3. Stem diameter increment 2003-2004 (mm)

	RPM	Bare-root	Silvopasture	Forestry
Mean	2.4 ^a	2.6 ^b	2.5 ^a	2.5 ^a
S.E.	0.09	0.09	0.10	0.09

Means followed by the same letter do not differ significantly from each other ($P < 0.05$)

Pasture dry matter production

There was no difference in pasture dry matter production (kg.ha⁻¹ of pasture) between pasture control, RPM silvopasture and bare-root silvopasture treatments during the 2003 or 2004 growing season.

Conclusions

To the authors' knowledge, the present study is unique in Europe, incorporating cattle in a newly established silvopastoral system and having an alley design as opposed to a square grid planting design for the silvopastoral trees. To conclude, silvopastoral systems incorporating cattle can be successfully established. RPM trees, which are a more expensive alternative to bare-root trees, offered no production benefit during the first two years after planting. A unique silvopastoral experimental resource is now available for future research at a time of increasing interest in agroforestry systems in the European Union.

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References

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