

# Establishment of a bovine/*Quercus* silvopastoral experiment in lowland Ireland

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## Abstract

A silvopastoral experiment was established at Teagasc in County Wexford, Ireland, in 2002 with oak (*Quercus robur* L.) in an alley design and bovines. The experiment includes some treatments with trees produced with an enhanced root system (RPM). The treatments are: (1) control pasture plots; (2) RPM agroforestry (400 stems/ha); (3) conventional agroforestry (400 stems/ha); (4) RPM forestry (6600 stems/ha); and (5) conventional forestry (6600 stems/ha).

The trees were successfully established and cattle were successfully managed in combination with the trees. In the first year, height growth of bare-root oaks was significantly greater in the forestry treatment compared to the agroforestry treatment and, overall, RPM oaks were taller than bare-root plants. Among the RPM trees, the agroforestry system resulted in a greater stem diameter than those in the forestry plots. Height increment was greater for RPM trees than for bare-root trees.

**Key words:** bovine, system design, *Quercus*

## Introduction

The planting targets in the *Strategic Plan for the Development of the Forestry Sector in Ireland* aim to increase the forest estate to 1.2 million hectares (17% of the land area) by 2030 (Anon, 1996). The level of the estate is currently 10%. Current afforestation rates are approximately 12,000 ha per year, most of which takes place on private farmers' land. Farmers in Ireland have not adopted agroforestry, possibly as a result of the lack of grant aid for agroforestry and the lack of knowledge and available information, though there are several recent reports which indicate the feasibility and advantages of silvopasture with sheep (e.g. Crowe and McAdam, 1999). Since over 70% of farms in Ireland have bovines as a main enterprise (Connolly *et al.*, 2002), we initiated a bovine silvopastoral experiment.

The objectives of the experiment are:

- To establish a viable silvopastoral experiment consisting of oak trees with cattle that may be used for production research.
- To compare the potential of agroforestry with conventional land use (pastoral and forestry).
- To collect baseline biological and soil data that can be used to describe and manage the systems.
- To compare tree growth at different planting densities.
- To compare the growth potential of Root Production Method™ (RPM) oak with bare-root oak.

The RPM oak trees are the same species and provenance as the bare-root trees but were produced in the nursery by a different process that resulted in a greater root:shoot ratio than those produced by conventional nursery practices (Lovelace, 1998). First season height and stem diameter results will be reported here.

## Materials and Methods

The 3.2 ha experimental site was established in County Wexford (54.27 lat., 6.50 long.), in the south-east of Ireland in March 2002. The land is at an altitude of 80 m and receives a mean annual precipitation of 1000 mm. The experiment has five treatments with three replications in a randomized complete block design (Figure 1). Plot dimensions are given in Table 1. The treatments are: conventional agroforestry, i.e. bare-root oak trees planted at agroforestry spacings (CAF), conventional forestry (CF), RPM agroforestry (RAF), RPM forestry (RF) and pasture control (P).

The RPM plants were 1 year old and the bare-root plants were 2 years old.

Trees in the forestry treatments are planted at the spacing of 0.75 m × 2 m (6600 stems/ha). The trees in the agroforestry treatments are in an alley arrangement at 2.5 m × 10 m intra- and inter-row spacing, respectively (400 stems/ha). Each tree row is protected by a double-strand electric fence enclosing a width of 2.5 m to allow for tree protection in later years (Figure 2).

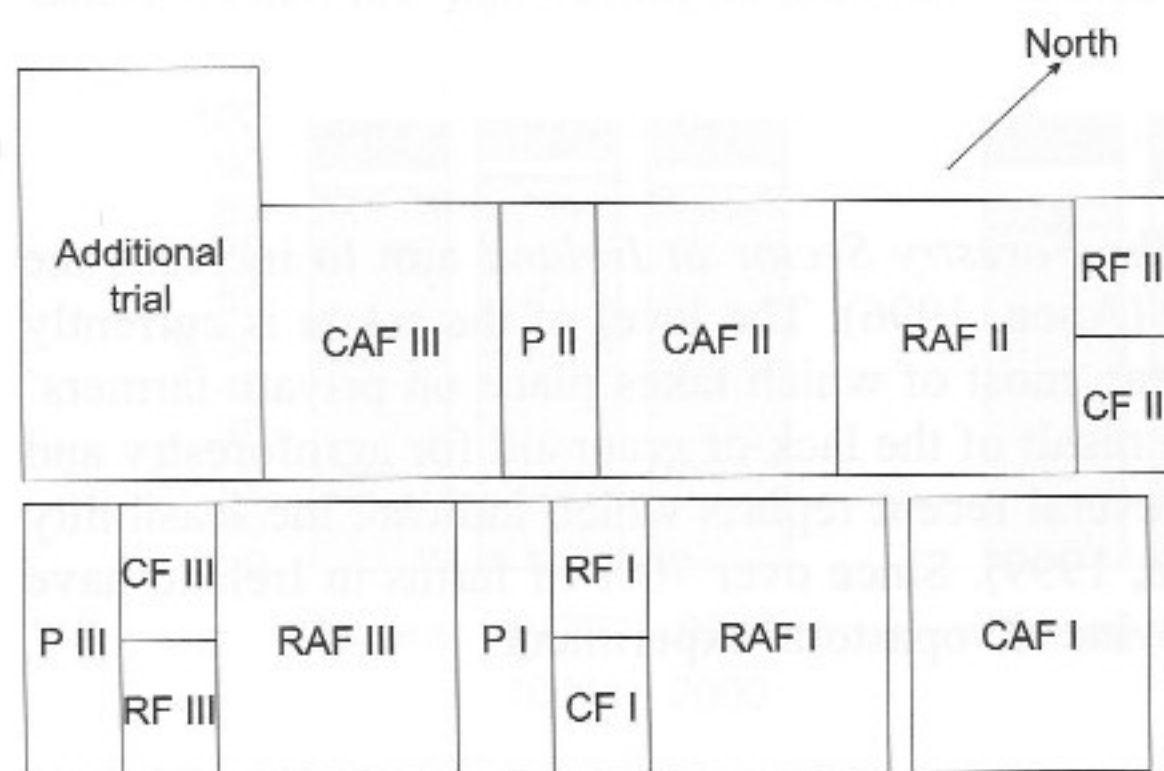
**Table 1.** Treatment dimensions and available pasture area.

System	Plot dimensions (m)	Plot area (ha)	Pasture area (ha)	Pasture area (%)
Pasture	21 x 60	0.126	0.126	100
Agroforestry	52.5 x 60	0.315	0.240	76
Forestry	21 x 30	0.063	-	-

## Results and Discussion

The trees were successfully established with > 90% survival rate and the cattle were successfully managed in combination with the trees except for one incursion into a tree row. Tree height and stem diameter of the RPM trees were significantly greater ( $P < 0.05$ ) than for the bare-root trees after the first growing season. Height growth increment of the RPM trees for the first growth season was significantly greater ( $P < 0.05$ ) than for the bare-root trees (Figure 3). The negative increment for the bare-root trees is as a result of dieback. The RPM trees were not as affected by dieback, possibly due to the enhanced root system or the planting media associated with them. Trees grown in the forestry treatments were significantly taller ( $P < 0.05$ ) than those grown in the agroforestry treatments after the first season, perhaps benefiting from intra-species sheltering or competition for light. Stem diameter of the RPM trees grown in the agroforestry treatment was significantly greater ( $P < 0.05$ ) than those in the forestry system after the first season (Figure 4). This may be due to less shelter relative to the forestry treatment resulting in increased stem flexing and the formation of more reaction wood. There was no similar significant difference between the forestry and agroforestry bare-root treatments.

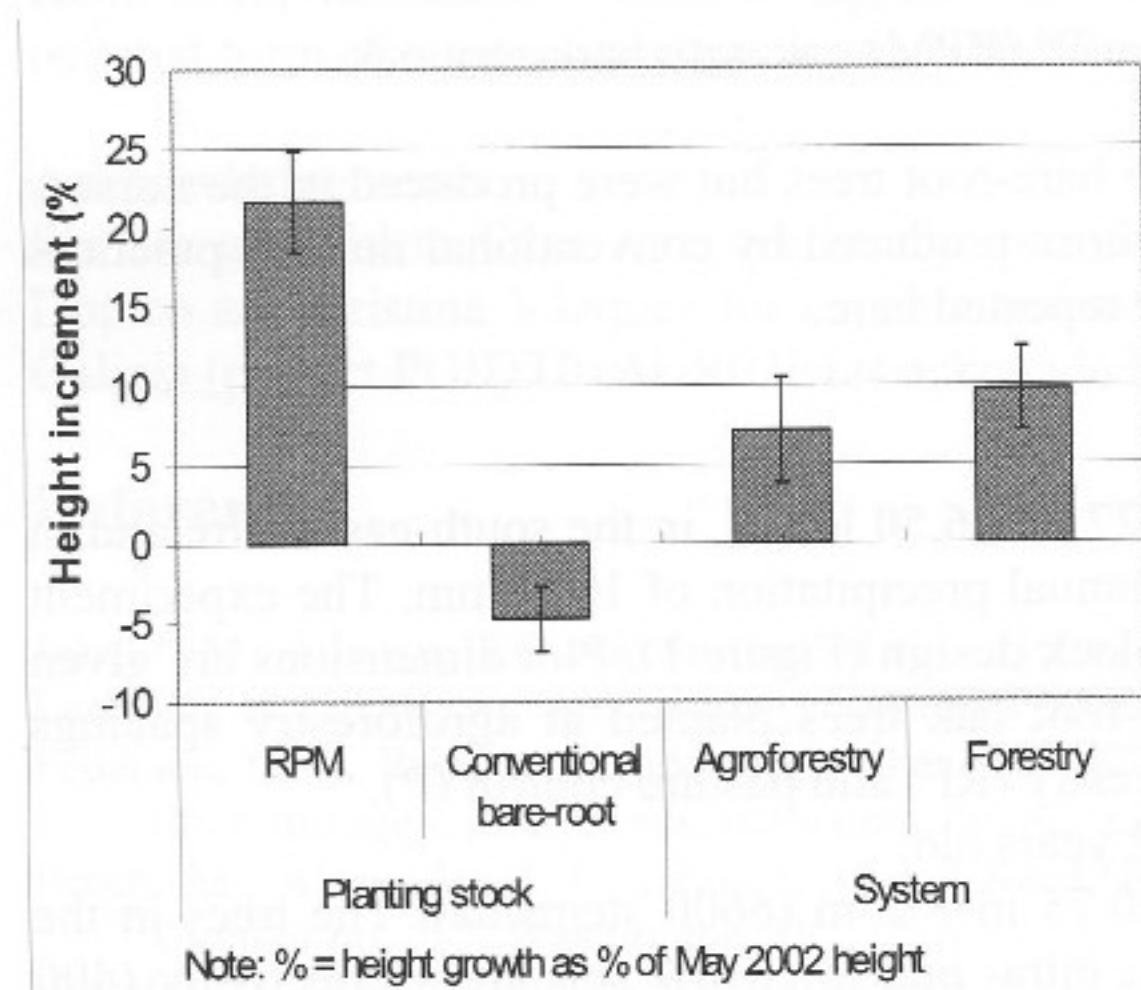
**Figure 1.** Site design.



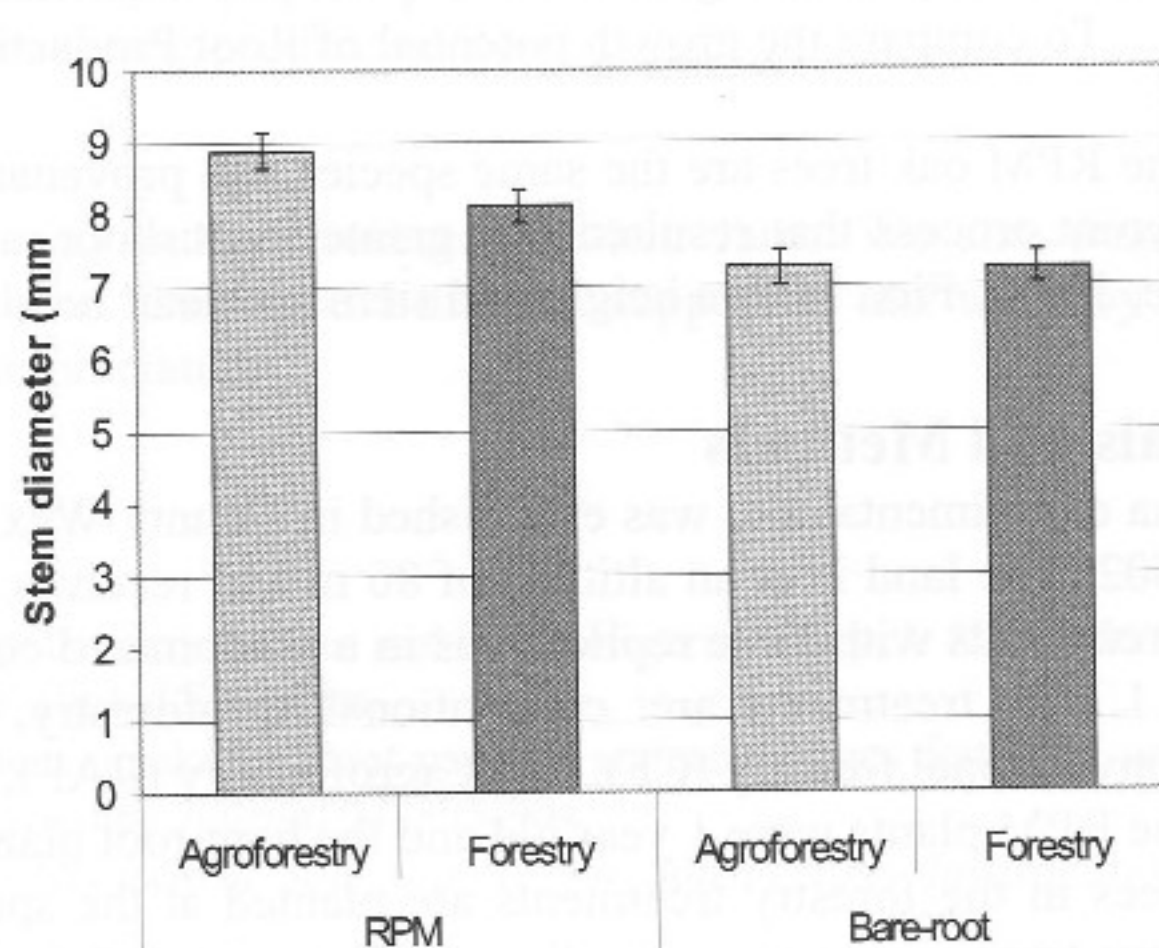
**Figure 2.** Tree row protection.



**Figure 3.** Height increment.



**Figure 4.** Stem diameter.



## Conclusion

*Quercus robur* plants produced by RPM technology can be successfully established in forestry and agroforestry spacings in Ireland. They show greater height increment and stem diameter than bare-root plants and should be further investigated. A bovine silvopastoral alley system has been successfully established and should continue to be investigated.

## References

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