Exploring the cherry yield of *Prunus avium* (L.)

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Introduction

Prunus avium (L.), the wild cherry, is widely cultivated across Europe. Present within the natural and semi-natural forests managed as a high value timber tree or within an orchard as a grafted cultivar for the production of cherries. The differences in management are as disparate as the product goals. Veneer production represents the main use of *P. avium* grown in forest stands, production requires branch free log lengths of 3m or more with mean mid underbark diameters greater than 40cm (see FIGURE 1b). On the contrary, the commercial production of cherries places no value on the timber. Tree form concentrates on providing a suitable, economical platform for the production of fruit (see FIGURE 1a). Known cultivars are utilised grafted atop dwarfing rootstocks, as this has been proven to be an effective method of controlling tree vigour and other tree attributes.

Modelling Cherry Yield

TABLE 1: Model output and regression coefficients

	β	SE	t	*p*	$F_{2,382}$	r	r^2_{adj}
					133.2	0.64	0.41
Intercept	-6.714	1.363	-4.925	<0.001			
Stem Diamter	1.594	0.136	11.741	<0.001			
Tree Age	0.568	0.197	2.879	0.004			

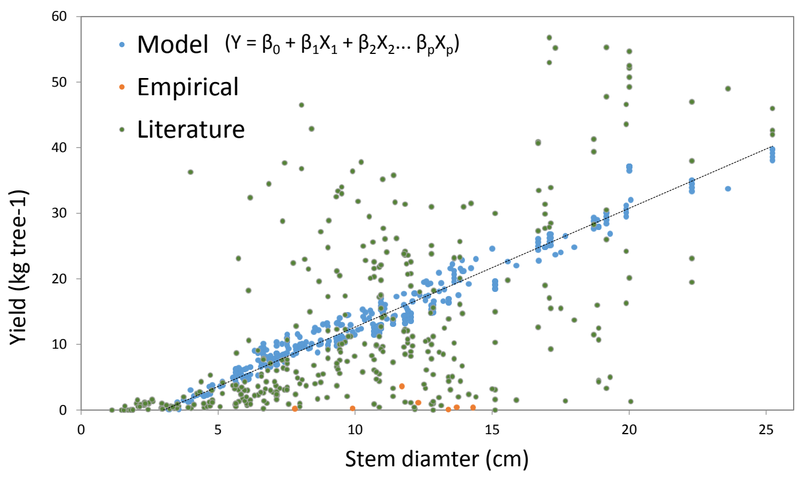

FIGURE 2: Yield values derived from the literature, predicted values and empirical values from forest trees.

Method

It is hypothesised that yield will be a factor of tree size. The age of the tree plus the density of individuals within a stand or plantation may have an effect on NWFP production. There is a distinct absence of yield models within the current published literature concerning the fruiting capacity of *P. avium* in forest stands. Therefore a meta-analysis of yield values derived from commercial cherry production (orchard stands) was conducted to frame the production potential of forest trees. Nevertheless, a large discrepancy of management treatments was seen between orchard and forest production systems but also within orchard management regimes. This was focused on pruning, tree density, fertilisation and weed treatment operations, for our purposes this was largely ignored. Furthermore, seven un-pruned *P. avium* were destructively sampled in June 2014 and the fruit yield enumerated. Modelling was carried out using standard multiple linear regression methods.

Results & Discussion

A meta-analysis of cherry yield data reviewed 384 data points across 16 publications [1-16]. Regression output can be seen in TABLE 1 and FIGURE 2. A wide spread of points can be observed, meanwhile, the model presents a relatively poor r^2_{adj} suggesting that the model reflects only 40% of the values derived from the literature. The low predictive capacity of the model can be attributed to the wide variation of management operations, particularly due to disparate pruning techniques [17,18] coupled with differences in productivity and precocity due to cultivar and rootstock combinations [15]. Furthermore, differences in stand density were also evident but not significant when considering cherry yield. The seven empirically sampled trees can be seen in FIGURE 2, here yield vs. stem diameter and tree age values lie within the range of values from the literature but are substantially lower than those suggested by the model, this may be attributed to the age of the trees (20 years) where full fruiting had not yet commenced (precocity), but more likely due to the fact that these trees are not optimised for cherry production, but for timber production. Nevertheless, no trend in yields vs. tree size/age could be seen within this small sample. It can be suggested that there is low potential for cherry production within forested systems. Other systems should be explored where individual trees can be managed for such disparate goals.

FIGURE 1: Schematic showing a generalised tree form of managed *P. avium* trees (not to scale) dependent on production goal: a) cherries, b) high value timber.

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