Plantation Diversity Boosts Carbon Storage

Plantations that use multiple species store more carbon than monocultures, according to a metastudy of forestry trials.

“People have assumed monocultures are the best way to go” to maximise carbon storage, says Dr Kristin Hulvey of the University of Western Australia’s School of Plant Biology. She found the evidence was otherwise, but when grouping studies by the number of species planted Hulvey found no clear pattern, indicating that more diverse plantations outperform those with just two species. No study she investigated used more than five types of trees.

An obstacle to Hulvey’s work is that many studies only measured above-ground biomass. While she says this usually correlates well with carbon stored in roots, “soil carbon is a big pool but hard to measure. It is debated whether above-ground carbon is a good overall proxy.” Hulvey believes that measurement techniques for soil carbon are improving, but are not yet widely enough applied for her needs.

“A better understanding of how tree diversity affects carbon storage will be useful for developing guidelines to design carbon projects that store high amounts of carbon and have additional benefits such as providing more habitat for wildlife,” Hulvey says. Hulvey has been unable to find much research that looked at animal diversity and carbon storage at the same time.

There are varying theories as to why mixed plantations might store more carbon than plantations that depend on the most efficient species. “Different species can find different niches,” Hulvey says. “Some grow tall, some grow wide, some like sunlight, some like shade.”

An alternative proposal is that larger trees benefit from the nitrogen-fixing capacity of acacias. “We pulled out the studies that used nitrogen-fixing species and found there was evidence of a difference, so this is part of the answer,” Hulvey says.

Mixed species systems are more resistant to pests than monocultures, and researchers arguing that forests are responsible for rain-bearing winds also believe this effect is enhanced by forest diversity. Hulvey says it is possible the same is true for resistance to fire or drought, but evidence is still scant.

The study, published in Nature Climate Change, did not examine the extra costs of planting more diversity so Hulvey says she cannot compare these to the benefits.