



Bioenergy Insight

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Member states still not doing enough

A lack of ambition, administration knowledge and trust is hindering progress in implementing National Renewable Energy Action Plans

Unfulfilled potential

Argentina has substantial biomass resources but insufficient projects to take advantage of them



Regional focus: bioenergy in South America

Trees have been grown and burnt for heat since the caveman days. While some environmentalists argue wood should be used for other means, those within the biomass sector see it as a sustainable and economic feedstock opportunity

Money really does grow on trees

by **Carmen Allan**

'Trees were meant to be harvested.' A bold and controversial view maybe,

but one held by many within the biomass sector.

David Nothmann is vice president of business and product development at ArborGen, one company that provides woody biomass for the bioenergy sector.

The company grows trees from seedlings in a controlled environment which in turn are sold to landowners to grow for use in equipment such as biomass boilers.

Woody biomass has reduced storage and inventory holding costs in comparison to other feedstocks such as switchgrass and miscanthus. It also has a minimised environmental impact because multi-year rotations allow for the trees to be regenerated in the same place with little disturbance to the surrounding area.

Also, a landowner has the flexibility to choose when to harvest and whether to use the feedstock as either a wood fibre or biomass.

ArborGen grows different types of trees depending on geographic fit and what the client requires, and uses Varietals Seedlings, which is a fertilised plant embryo from an ovule occurring through asymmetric cell division. This helps to produce a plant that is



resistant to diseases, making it uniform and consistent, and also minimises negative attributes such as forking.

'One of the benefits of this is that once we've identified a really good product that we want to sell then we can reproduce them in large

scale quantities so it's in a more manufacturing type of setting,' Nothmann says.

Through the use of different genetics on its breeding approach, ArborGen is able to increase its productivity, upping the yield on a tonne per acre basis with specific

trees. The silviculture regimes relating to the different species of trees depends on what type of tree is being grown.

For example, ArborGen grows pine trees in orchards, so it can ensure high quality seed production and grow

seedlings from the most advanced genetics. This in turn helps the company to better understand and improve the trees' genetics. There are two ways these types of trees can be grown. The first is to plant them in the ground and the second is to grow them within a container.

Nothmann explains: 'There are benefits associated with each. If you plant in the ground then your costs tend to be less but the benefit of using a container is that you can really optimise the growth and get the best out of it.'

A bare root system can also be used to cultivate the trees, where ArborGen lifts the seedlings out of the soil after they have been planted without a container. These can then be stored and packaged for later use making sure no trees are wasted.

When creating biomass, it is important to be able to cultivate the feedstock quickly and in some cases on demand. ArborGen's method is extremely productive and in some cases can be cultivated faster than other feedstocks.

Keeping options open

In terms of making a profit from tree growth, the FlexStand system designed by ArborGen is one way individual producers can make money from growing trees for woody biomass.

'What the FlexStand enables producers to do is to plant one row that is specifically for biomass which can be harvested if the market develops. It allows the landowner to have some flexibility because if the bioenergy market doesn't go towards biomass in 8-12 years then they can put it towards pulp instead,' says Nothmann.

'One of the benefits is that the landowner gets a revenue stream because if you plant at a higher density and you know you're going to take out just that row then you

can do so very efficiently. Then you can harvest your high value saw timber and make quite a profit.'

Studies have shown harvesters can pay for their establishment costs through biomass planting, harvesting and sale. Woody biomass as a feedstock is also more secure to grow than annual crops, which can be more sensitive to the external environment factors, such as weather and disease.

ArborGen is also innovating in other areas, and is currently developing its

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David Nothmann, VP of business and product development, ArborGen

hardwood trees, such as eucalyptus and poplar, with the intention of harvesting them within two to five years. This is a massive cut down on the normal growth time of some hardwoods which is up to 50 years.

'What we're talking about is improving biomass availability and creating an efficient supply of hardwoods, just through introducing populus and eucalyptus to get high fold, 10-15 green tonnes per acre a year for populus and 15-30 green tonnes per acre for eucalyptus or even more if you go on a short rotation,' Nothmann says. 'We're talking about going from 30-50 years to potentially two to five years rotation.'

Choosing the right location

The southeast US, where ArborGen is headquartered, counts for 64% of all hardwood trees harvested nationally.

'We grow our trees in countries that have a long history in forestry. A lot of the regions have strong pulp and paper backgrounds, such as in Australia and New Zealand where the market has a traditional supply and

also exports more and more to China,' says Nothmann.

Although ArborGen is present in most continents, it has not yet established itself in Europe. 'Many of the forestry locations are quite fragmented and it also can be difficult to do business there,' Nothmann says.

Through its developments on other continents, ArborGen is working to increase the tonnage of biomass it can produce via the use of new technologies and techniques. For example, it is optimising the feedstocks, enabling the

company to harvest in two, three, four or five years, or whatever suits the company's biomass clients best.

'On a pine plantation you might be able to get 4-6 tonnes an acre per year and if you were to use it for biomass with the techniques we've learned you could increase that to 8-11 green tonnes per acre per year,' Nothmann says.

'If you actually use the improved germplasm then you could go to 9-15 green tonnes per acre per year. If you went into a traditionally planted forest you would only get about a third of what you would if you planted it using ArborGen advanced genetics and knowledge.'

A germplasm is a collection of genetic resources in a plant which can be stored as a seed collection for future cultivation.

'By combining different genetics, ArborGen's breeding approach increases the yield on a tonnes per acre basis,' says Nothmann.

However, although the tonnage production may be high of the woody biomass, the moisture content in wood is higher than some

other purpose grown energy crops and this can sometimes pose a problem.

Depending on ambient temperature, humidity, wind speed, season, rainfall and tree species and size, the moisture content in woody biomass can vary. Drying the product can be expensive, as the product needs to be collected from the site and then transported. If the woody biomass is not dried at the same location it is grown, transportation costs are considerably higher.

Even though this is a distinctive drawback, Nothmann argues it is a 'manageable disadvantage'.

'It is about the only element relevant to trees that is a disadvantage. Unlike other feedstocks, you can store woody biomass on the site so you don't have to store it in other areas. It's very dense and because of that you decrease some of your transportation costs and you get the most from each haul,' he says. 'There are well-established harvest and transport technologies which help to move the woody biomass as well.'

There are many advantages for woody biomass, such as a lower content of ash and chlorine in the product in comparison to other feedstocks such as switchgrass. Trees are not as affected by other elements, such as weather, either.

Capitalising on these benefits, ArborGen has submitted a plan to the US regulatory agency for deregulation within the forestry and biotechnology industries.

'For example, currently our freeze tolerant eucalyptus tree is not a commercial product today but we are working with the government to make that a product available in the future. This will take a highly productive eucalyptus tree and expand its geographic reach further north,' Nothmann says. ●