Energy sugar beet to help boost biogas production

Specialist varieties of sugar beet and maize are being bred to increase anaerobic digester output, as James Andrews discovers

A n energy-specific sugar beet variety could improve the efficiency of anaerobic digesters producing electricity in the UK and open a new market for sugar beet growers.

The beet is the first variety to be launched from KWS’s energy-specific beet breeding programme, which hopes to produce varieties with high dry matter yields for optimum gas production, says Simon Witheford, UK sugar beet product manager.

“Conventional sugar beet is already the most efficient crop for biogas production, but we are working to enhance these attributes. Maize is currently the crop of choice for most anaerobic digesters producing electricity in the UK, but adding sugar beet can speed up the process and increase gas production.

It is hoped the variety, which is yet to be named, will be European listed by the end of the year meaning it can be sold in the UK, he says. “We will have a small amount of trial seed available next year and it could be sold commercially in 2012.”

Mr Witheford says seed will be marketed directly through KWS, or through a distributor.

Dry matter yield is higher than conventional sugar beet varieties to maximise methane production, he says. “In trials, yields topped 100t/ha and dry matter was, on average, 1.2t/ha higher than conventional sugar beet.”

Reinhard Lehrke, KWS European bioenergy manager, says conventional sugar beet produces the most methane per kg of dry matter of any biomass crop at just over 400 litres compared with maize at just over 300 litres.

“The energy metabolism of sugar beet is highly efficient and it’s the fastest raw material for biogas production.”

It takes just 11 days to break down in the digester, whereas maize takes 80-90 days, he says. “We would like to see a mono sugar beet plant as it is the most efficient feedstock, but we don’t know if this is possible.”

**MIX OF PRODUCTS**

“At the moment, the best idea is to have a mix of products to balance the bacteria in the digester.”

Mixing 70% maize and 30% sugar beet gives a 40-day retention time and increases biogas output, he adds.

Conventional sugar beet varieties have lower dry matter yields, but they can be used in anaerobic digesters, giving growers a new market for surplus beet, he adds.

High soil tares can be a problem, so some growers may have to wash beet before feeding it into the digester.

To ensure year-round supply, some beet will have to be ensiled, says Mr Lehrke.

One option is to ensile whole beet in a clamp with plastic at the top and bottom, but some growers have stored whole beet in plastic tubes and experimented with crushed beet in lagoons, he says.

When clamping beet it is essential to collect the juice and feed it back into the digester. It is a valuable, nutrient-rich feed stock for the digester and can cause pollution if not collected, he adds.

**CASE STUDY**

**Dirk Ernst**

**ALGERMISSEN, GERMANY**

* Adding sugar beet to his on-farm anaerobic digester has boosted electricity production by almost 15%, says Dirk Ernst who farms at Algermissen, south east of Hannover.

He started adding beet when he was getting a poor price for excess beet tonnage and has experimented with different quantities of beet in the feed stock.

He has found that adding 10% beet to the feedstock is enough to boost plant output by almost 15%.

At the moment, he is adding mixed maize and rye silage, rejected barley and sugar beet to the digester.

The plant was designed to have a 500KW output using maize silage, but from the first day of operation it produced 600KW, he says.

Since adding sugar beet this has risen to 680KW and he reckons he could boost output to 800KW plus if he devoted over half of the feedstock to beet.

He started washing beet before putting it in the digester, but stopped when he found his silty soils didn’t upset fermentation. The soil sits in solution and comes out with the digestate, he says.

**Butt boosts output by 15%, says Dirk Ernst.**

Sugar beet is the most efficient fuel for biogas production, giving high yields and fast fermentation.

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See our quick guide to on-farm anaerobic digesters at www.fwi.co.uk/biogas

See our dedicated renewables web page at www.fwi.co.uk/farmenergy
Hybrid forage rye produces consistently high yields, is quick to ripen and can perform well as a pre-maize energy crop in the UK, says KWS’s Raoul Buschmann.

The crop can reach 4-6t of dry matter/ha before being harvested in May, which leaves time to establish a following maize crop. Because the window for fresh-feeding the crop into the digester is short, it is necessary to ensile it.

Hybrid forage rye can be harvested up to mid June, but after this time lignin value increases rapidly, decreasing gas yield, he says.

Sorghum is very efficient in low moisture situations, but does not offer significant benefits over maize for most UK growers, he notes.

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