16%
Reused energy

59%
Renewable energy

Gråsten Agricultural College

The electric farm that harvests energy and captures CO_2

PROJECT ZERO
SONDERBORG

What if farming could go carbon neutral?

Producing food without leaving a carbon footprint is a bit like trying to plough without touching the soil – pretty much impossible.

But what if agriculture could electrify its machinery, power itself with clean energy, and even capture CO_2?

At Gråsten Agricultural College, that's exactly what they are working on – and much more.

Here, farming, energy production, and education are treated as parts of the same ecosystem.

"It's much more fun being part of the solution rather than the problem," as principal Bjarne Ebbesen says.

About Gråsten Agricultural College

- Location: Gråsten, Sønderborg Municipality
- Established: 1924
- Students: 250
- Land area: 240 hectares
- Livestock: 400 sows and 200 cows
- Strategy: Working towards CO_2 neutrality in production

Watch the case video

The dream of self-sufficiency

Denmark is the first country in the world to introduce a CO_2 tax on agriculture. Starting 2030, Danish farmers will pay around €16 for every ton of CO_2 they emit - a key step in reducing emissions from a sector that currently accounts for roughly one-third of the nation's total.

At Gråsten Agricultural College, they embrace this responsibility and are working to reduce their carbon footprint by cutting methane emissions from livestock - and by becoming self-sufficient in energy.

Solar panels on the roofs generate electricity, which is stored in a battery system. Manure from cows and pigs is converted into electricity at the school's biogas plant - a process that also produces excess heat used to warm the school buildings. This alone saves the equivalent of a 500-kilogram bale of hay every day, and in summer, the straw boiler can remain off entirely. Today, excess heat from biogas production covers 16 % of the school's heating needs. The rest is supplied by straw, but within a few years, they plan to replace the straw boiler entirely with electric heat pumps.

The school's latest addition is a CO_2 tank, where they capture CO_2 from the flue gas produced when the biogas is burned, after which it is stored in the tank. This is part of a three-year project exploring the potential of small-scale carbon capture in agriculture.

16% reused energy

Gråsten Agricultural College covers 16% of its heat demand with excess heat from electricity production at its biogas plant.

59% renewable energy

Gråsten Agricultural College covers 59% of its electricity consumption with rooftop solar panels and biogas.

From horsepower to kilowatts

Just a few decades ago, electricity on farms was mostly experienced by the cows when nudging the electric fence. Today, the scene looks quite different – especially at Gråsten Agricultural College.

Here, mini loaders, feed mixers, and milking and feeding robots all run on electricity, while students and staff charge their electric cars outside.

Electrification saves both fuel and CO_2. The school's electric feeding system alone replaces tractor work worth 40 litres of diesel a day.

This shift from fossil-fuel to electric farming naturally requires more electricity – which Gråsten Agricultural College produces themselves. The solar panels and biogas plant supply around 60% of the school's total electricity consumption, and a 215 kW battery stores power from both sources, ensuring energy is available whenever needed.

Throughout the school, digital displays show real-time energy production – much like the barn screens that track daily milk yields. A visible reminder that at Gråsten, they produce food *and* energy.

The next step is more solar panels on the unused roof surfaces and a solar-powered sowing robot, designed for precision seeding and further reducing fossil fuel use.

Growing green farmers of tomorrow

At Gråsten Agricultural College, the farmers of tomorrow are being trained with a circular approach. The students study a subject called Sustainability, which focuses on both economic and environmental sustainability - a theme that is reflected across the school's other subjects as well.

Students are actively involved in the school's energy production and gain hands-on experience with the biogas plant and other green initiatives on the farm. This way, they learn how to use local resources efficiently and integrate agricultural processes into a cohesive system.

The school has also hired a full-time gardener to make it self-sufficient in vegetables, allowing students to grow the food they later enjoy in the cafeteria.

One upcoming initiative is an agroforestry project, combining fruit trees with crops. This boosts biodiversity and makes cultivation more resilient to climate change.

Because the world is changing - but the need for food remains. In Gråsten, they showcase what a green transition in farming can look like. The solutions are already here.

About ProjectZero

ProjectZero is a public-private partnership between Sønderborg Municipality and the Bitten & Mads Clausen's Foundation dedicated to making Sønderborg's energy system carbon-neutral by 2029. We also aim to inspire other cities to take on their green transition for a stronger positive impact on our climate.

In Sønderborg, citizens, organizations, businesses, utility companies and the municipality work strategically together in a public-private partnership to find local solutions to the global climate challenge.

Since 2007, energy-related carbon emissions have been reduced by 79% and the municipality is on track to deliver on their 2029 target of a carbon neutral energy system.

ProjectZero is anchored in the ProjectZero office, where a small team of employees coordinates and monitors the journey towards zero and brings together the right people, ideas and projects.

Our recipe for a green transition not only has the potential to solve the climate challenge in Sønderborg. It can be used all over the world. We want to show other cities the way and inspire them to create their own transformation. Every year, we welcome decision makers and journalists from all over the world, who want to know more about our road to carbon neutrality.

Do you want to know more or plan for a visit?
Visit our website or contact us at
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