IMPACCT CASE STUDY No. 21

Integrated Management oPtions for Agricultural Climate Change miTigation

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This case study is based on a large (2273 ha) arable and dairy farm located in the Saxon Loess Region of central Germany. The south part of the farm is in the Central Saxon Loess Hills (Mittelsächsisches Lösshügelland - MSLH). Whilst the north part is in the Northern Saxon Loess Hills (Nordsächsisches Lösshügelland (NSLH). These two regions have very distinct terrains and the transition between them contains the hill region "Lommatscher Pflege".

The cropping enterprises are wheat (800 ha), winter barley (400 ha), corn silage (450 ha), canola (400 ha), sugarbeet (100 ha) and hops (50 ha). There is also a smaller enterprise of protected horticulture (1 ha of vegetables and flowers). The dairy enterprise is comprised of 3000 cattle (custom backcross of "Schwarzbunte" with "Holsteinfriesen") and 1550 dairy cows.

Location of the case study farm

The farm also has 102 ha of permanent grassland and 10 ha of farm woodland. There are also many wildlife habitats including hedgerows and trees. The farm also receives additional income from a farm shop and from renting out apartments and commercial space.

The Dairy enterprise

The farm is a member of the German Farmers Federation (Deutscher Bauernverband) as well as local and state Farmers Federations, central German cooperative association (Mitteldeutscher Genossenschaftsverband), hops utilization cooperative (Hopfen-Verwertungsgenossenschaft) and various other crop associations.

The farm has adopted many measures to save operating costs and mitigate climate change impacts. These include:

- In 2006 the farm installed an anaerobic digester that is fed from manure and slurry produced by the dairy enterprise and is used for on-farm heating. Approx. 4 million kWh/yr is produced.

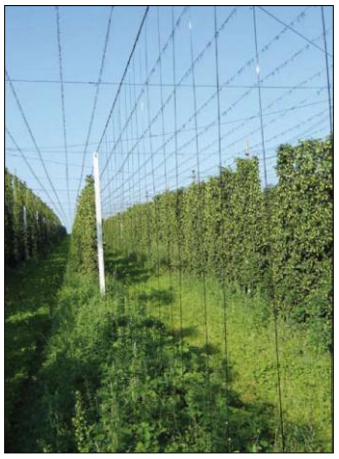
This has removed the need for 'oil to fuel' heating and reduced greenhouse gas emissions from fossil fuel combustion. A capital outlay of €1.3 million was needed but it did attract a 30% government subsidy.

- The farm also installed 2000m2 of solar (photovoltaic) panels during 2006. This installation cost €750,000 and the electricity produced (184 kWp) is delivered directly to the national grid providing income for the farm business.
- Farm buildings, the farm shop and office have been well insulated. This has decreased energy use for both heating and cooling and avoided the need for 'oil to fuel' heating and reduced electricity use, thus reducing greenhouse gas emissions. This did, however, require an initial financial investment and the old heating system had to be disposed of.
- The farm uses energy efficient lighting throughout all its buildings. This has reduced energy consumption and reduced greenhouse gases. However, the old lighting system needed careful disposal.
- Machinery use is optimised through planning and regular maintenance. Machinery across the farm, including that within the dairy, is regularly updated with the best available technology. This has reduced costs, fuel use and gaseous emissions. Equipment also has a longer life-span due to the improved maintenance programme.

- Computers are used to control automatic ventilation systems in all barns. This has improved animal health but slightly increased electricity consumption for the automated control.

The farm anaerobic digester

- The farm has also adopted conservation tillage on 75% of the land. This has reduced fuel consumption, reduced greenhouse gas emissions from its combustion, increased humus in the topsoil and thus carbon sequestration. There has also been a reduction in soil erosion. The impact on soil N_2O emissions is uncertain but there is a risk that this could increase.
- Recycling is practised throughout the company according to strict German guidelines. This reduces waste going to landfill and saves non-renewable resources and costs for disposal.
- A new well, 40m deep, has been installed such that water is closer to farm buildings. Prior to this installation water was pumped along a 4 km water pipe. The new well has reduced electricity use and generally lowered costs but there was a capital cost associated with the installation. Well water is also used for cooling in the dairy.
- Water efficiency measures are utilised including the use of drip irrigation for the hops. This has replaced ditch irrigation and reduced water use and the risk of leaching and runoff.
- The farm has increased its storage capacity for liquid manure and manure digestate from 6 months to 9 months such that it is now well beyond the legal minimum. This has enabled better plant utilisation of nutrients and enabled application timings to be optimised. It has also improved the farm carbon balance and reduced fertiliser costs. The process of optimising crop nutrition is aided by the use of software and regular soil sampling. The farm is working towards a closed nutrient cycle.
- Care is taken to ensure that the slurry tank is sealed by a floating layer in order to reduce greenhouse gas emissions. If necessary straw is blown over the top.
- Crop protection is aided by Integrated Crop Management approaches including the careful selection of crop varieties. Choice is based on varieties known to perform under local conditions such as the typical spring drought.



The hop trellises

- Heat from the anaerobic digester is used with aerated bins for grain drying. Harvest is also planned carefully to match the available drying capacity. This approach has reduced the need for 'oil to fuel' heating and reduced greenhouse gas emissions as well as costs.
- Year round silage feeding is utilised to avoid the typical problems with ration conversion in ruminants. Optimised feeding programmes are based on feed produced on-farm. This has reduced methane emissions and improved nutrient recycling. Animal health has also been improved as has milk production.
- Management of the environmental areas on the farm is supervised by farm managers and includes the maintenance of hedges and trees.

The greenhouse operations

Original case study content collated by Ingenieurbüro Feldwisch

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