

Globalisation and commercialisation are pushing grain farmers to optimise energy efficiency

Grain farm operating expenses have increased steadily over the last decade, with the high costs of inputs, including electricity, becoming one of the most serious challenges facing farmers - increasing production costs are squeezing profit margins and impacting competitiveness in local and export markets.

Diesel is the major energy source used in the agricultural sector, mainly because farm equipment, such as tractors, operate on diesel. Electricity is the second most-used source of energy in the sector. "Exploring alternative energy sources and reducing electricity costs are becoming increasingly pertinent for South Africa's grain farmers as a result of rising electricity tariffs and intensifying pressure from global customers to adopt greener practices.

"Millions are lost in the agricultural sector every year as a result of energy intensive or insufficiently maintained equipment and systems - optimising energy efficiency is, therefore, one of the most important steps grain farmers can take to reduce operating costs and remain competitive. Reassuringly, the sector has great potential for efficiency improvements, cost savings and numerous opportunities for alternative energy solutions," says Andrew Etzinger, Senior General Manager at Eskom's Integrated Demand Management (IDM) department.

Energy consumption in the grain sector consists of all direct and indirect uses on farms. Direct energy costs include electricity, and fuel to drive equipment and machinery used in crop production and grain drying, whilst indirect energy costs include transportation and the energy used to spread and apply mineral fertilizers - modern application techniques can help to reduce the amount of energy used by adapting the quantity of fertilizer and the number of applications to crops' needs.

Another significant energy efficiency optimisation measure, particularly in wheat production, is to improve the drying process - various factors can influence energy consumption including the type of drying process, for example, continuous or batch-type; the initial moisture content of the product and weather conditions.

Dryers differ in their efficiencies, and one of the best ways to reduce energy use in this process is to install dryers that are designed for energy efficiency. Moreover, fans and grain depth should be matched for optimum performance, whilst a higher drying temperature within the recommended range for the dryer could increase fuel efficiency. Dryers' moisture metres and temperature sensors should also be calibrated regularly to increase reliability and avoid over-drying.

Efficiency improvements can also be achieved by optimising process controls, maximizing heat recovery with heat pumps and reducing heat losses with thermal insulation.

Pumps (typically for irrigation), motors, driving fans and conveyors are amongst the most energy-intensive technologies used in grain farming and represent many opportunities for energy efficiency interventions.

“Of course, retrofitting energy efficient technologies and systems is by far the most effective way to reduce and control energy consumption by mechanical equipment on grain farms. However, farmers should invest in an energy audit before implementing retrofits, a vastly underused tool that can help farming operations to save energy and money,” says Etzinger.

An audit typically analyses bills, usage data, equipment and processes such as power units, drives, compressors, insulation, heat exchange, lighting and ventilation to accurately identify solutions aligned to the specific requirements of the farm. Likely recommendations for retrofits and upgrades of machinery and equipment could include:

- Lighting – replacing inefficient lighting systems with efficient alternates such as Compact Fluorescent Lamps (CFLs), Light Emitting Diodes (LEDs), T-5 systems, electronic control gear and daylight harvesting.
- Motors – replacing inefficient or over-sized motors with energy efficient alternatives, or installing vertical speed drives (VSDs).
- Pumps – retrofitting energy efficient pumps, which should be used with energy efficient and correctly sized motors and combined with vertical speed drives (when feasible) in an optimal configuration.
- Renewable energy – utilising alternative energy sources such as solar water heating, mini-hydro schemes or solar PV.

Indeed, the switch to energy efficient technologies depends on farmers’ budgets, the cost and availability of these technologies, the scale of an envisaged retrofit and its feasibility within the framework of a particular farming operation. However, Etzinger says, there are ways to elicit savings with a relatively low capital investment.

“As a starting point, farmers should ensure that their farms are on the correct tariff and that energy cost invoices are correct. Where possible, farmers should try to feed energy loads into off-peak tariff times - it is expensive to ‘ignore’ peak hour tariffs. Energy savings can also be achieved through the correct use of equipment and the implementation of effective equipment maintenance programmes.”

There are many case studies of South African farmers who have achieved measurable savings through the use of energy efficient technologies, from relatively small changes such as the implementation of variable speed drives on motors and energy efficient lighting retrofits, to more ambitious projects such as photovoltaic panel installations and hydro-electric schemes.

For example, the 300-year old, family-owned Vrede en Lust wine farm in the Western Cape has installed a 218 kWp solar power plant to augment the farm’s power generation requirements. The 816 solar panel installation, covering an area of 1 600m², is the largest to date on a wine farm in South Africa. The

PV panels supply 212kW, enough to meet the farm's energy needs. Another example is that of Senekal Boerdery in KwaZulu Natal, the largest private sugar estate in South Africa, which has cut monthly electricity costs by 30% with an overhaul of the estate's irrigation system.

Etzinger believes that the use of renewable energy sources is going to become more widespread and viable in the farming sector. For grain farmers in particular, biomass - organic matter used as fuel - will become more important as a source of energy for heat and power generation. "The advantages are that this energy source is renewable and can reduce the emissions of nitrogen oxide and sulphur oxide in power generation. If waste is used, the cost of fuel can be close to zero," he says.

Farmers are urged to get in touch with an Eskom Energy Advisor in their region – they specialise in offering advice on how to make the switch to energy efficient technologies and implement energy use behavioural change as a measure to reduce operating costs:

- Assessing the current and future energy needs of a farm –
 - ❖ Analysing the energy consumption of a farm or specific processes on a farm
 - ❖ Identifying areas of energy wastage
- Identifying the most cost effective and energy efficient technology solutions for a farm
- Advising on how and where to access the latest energy efficient technologies
- Assisting with the measurement and verification of energy use savings on a farm as a result of energy efficiency interventions.

Call 08600 37566, leave your contact details and ask that an Eskom Energy Advisor return your call.

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