OCTOBER 2022 • Vol 12 No 10

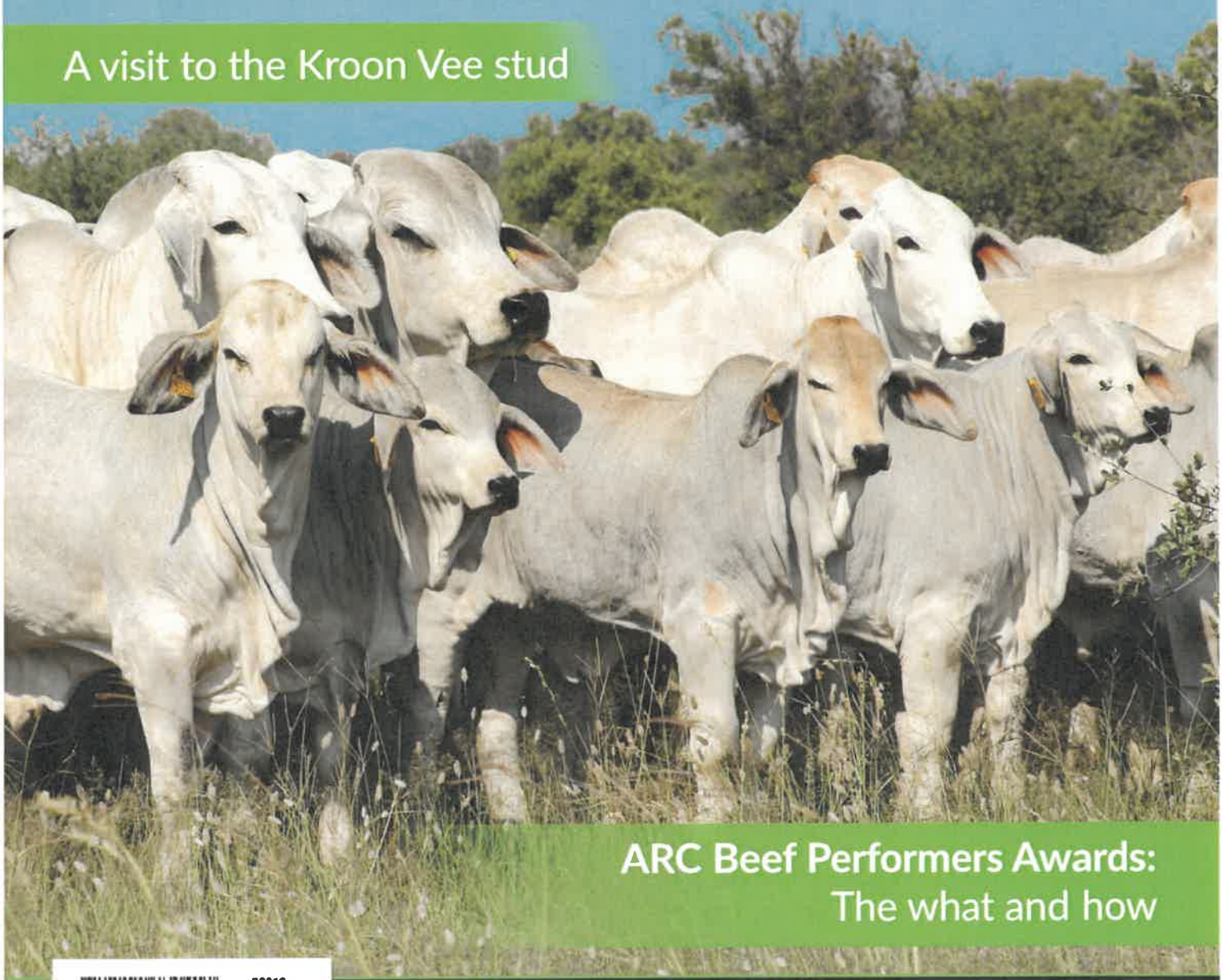
R30,00 (VAT incl.)
Other countries R26,09 (VAT excl.)
A product of Plaas Media

STOCKFARM

Content for the serious livestock producer

Regenerative farming and natural fibre producers

A visit to the Kroon Vee stud



ARC Beef Performers Awards: The what and how

9 772221 730417 22010

Heat stress • Lucerne • Salt intake • Trace elements • Ram breeding
Animal handling • Cryptosporidiosis • Lameness • Auctions

Renewable energy and energy management: A step in the right direction

By Primrose Magama, Siyabonga Gasa, Erence Manyako and Dr Idan Chiyanzu, ARC-Natural Resources and Engineering

Energy has become an integral part of modern-day intensive farming. Almost every part of the food value chain requires energy as input, from land preparation right up to the point of consumer consumption. Energy on the farm is consumed directly as fuel or electricity (e.g. for field machinery, irrigation, heating, cooling and transportation) and indirectly as fertilisers, chemicals and animal feed.

A major share of energy is spent on intensive livestock production. Electricity or fuel is used for feed processing, powering of machinery, automated milking, milk storage, water heating and pumping, lighting, ventilation, space heating and electrical fencing.

In South Africa, the two major sources of on-farm energy are electricity and diesel, both of which are primarily obtained from fossil fuels. The production and use of fossil fuels are one of the major contributors to climate change, which negatively affects agriculture.

The burden of over-reliance

Over-reliance on these two energy sources presents numerous risks to producers. South Africa's electricity supply is unreliable, as seen in *Figure 1*. Eskom battles to keep the lights on due to ageing power plants that need frequent maintenance, and the electricity demand is fast exceeding the utility's generating capacity.

There have been more than 46 cumulative days of load shedding in the first half of the year alone. In addition, electricity tariffs are increasing rapidly. *Figure 2* shows that the electricity tariff in the agricultural sector has increased by over 200% in the past decade. Diesel, on the other hand, suffers from price fluctuations driven by geopolitics and volatile currency exchange rates.

The agricultural sector has been severely affected by the frequent power cuts and fluctuating fuel prices (*Figure 3*) experienced in recent years. An article in *Engineering News* highlighted some of the challenges producers face due to

load shedding. This includes increased production and labour costs, damage to machinery and irrigation equipment, and disruptions to planting and irrigation scheduling.

Effects of supply interruptions

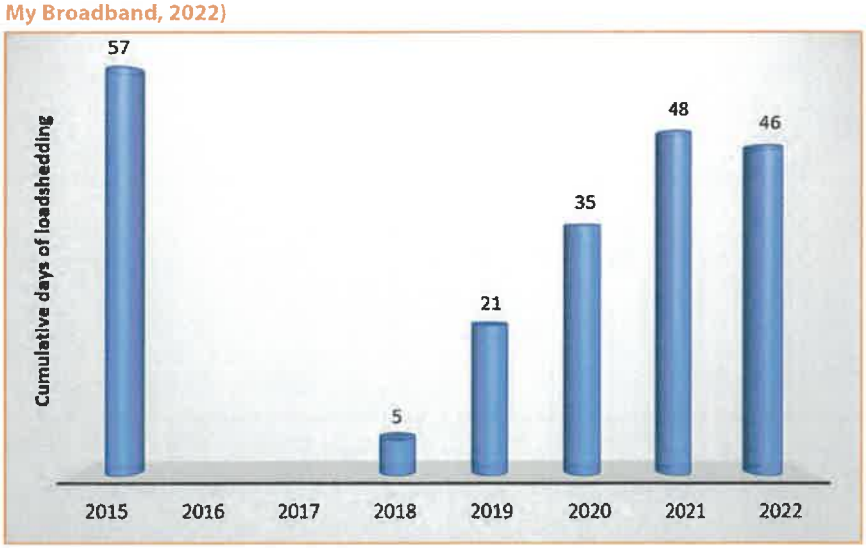
Post-harvest disturbances to the cold supply chain are detrimental to perishable produce since these incidents result in loss of quality, which lowers the selling price. In extreme cases, retailers reject the produce.

Furthermore, poultry producers have complained about losses caused by chickens dying due to lack of heating or slowed growth due to lack of lighting.

Minimising the impact

Although the energy situation in South Africa is far from ideal, producers can take some steps to minimise the impact

Figure 1: Number of days of load shedding (2015 to 2022). (Source: My Broadband, 2022)



of energy insecurity and rising energy bills. The Agricultural Research Council (ARC) recommends adopting renewable energy technology coupled with energy management. In addition, it is important to implement energy management prior to installing additional/alternative energy sources.

Renewable energy technologies ideally should form part of an overall energy management plan (*Figure 4*). Energy management is the practice of tracking and optimising energy performance on a regular, scheduled basis for a site or building. The objective is to manage consumption, identify energy-saving opportunities, and reduce the energy bill.

Energy management involves carrying out farm energy audits to determine energy consumption patterns, identify big energy users and critical loads, as well as establish the energy supply matrix. A tariff audit analysis, which is a free service offered by Eskom, is also a key energy management tool, since it assists a farm in selecting the most appropriate and cost-effective tariff suitable for its electricity usage profile. In some cases, incorrect tariffs lead to unnecessarily high energy costs.

Figure 2: Average tariff price (c/kWh) and annual percentage price adjustment for the agricultural sector (2011 to 2021). (Source: Eskom)

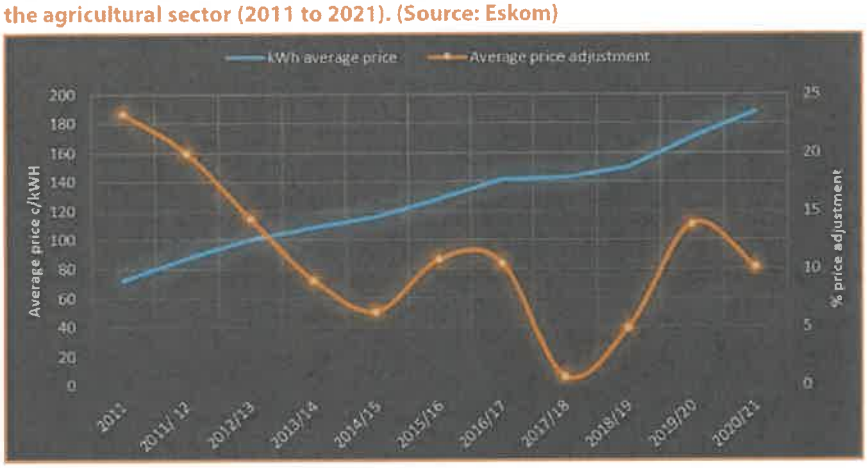


Figure 3: Monthly diesel prices from January to July 2022 and monthly percentage increase. (Source: South African Petroleum Industry Association)

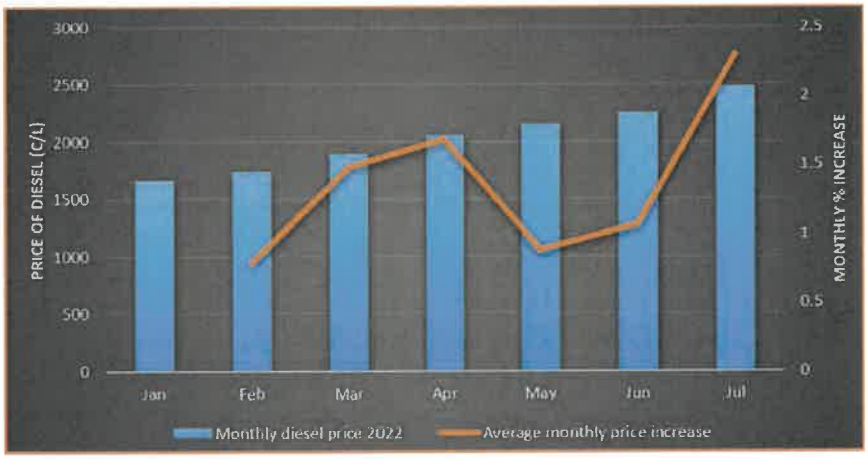
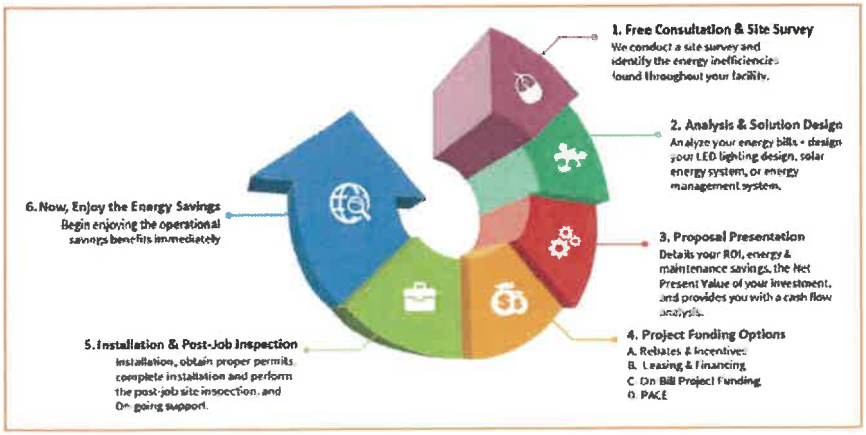


Figure 4: Typical steps in the energy management process. (Source: Efficient Power Tech)



Minimising energy consumption

Minimising energy consumption can take many forms, such as installing efficient technology, implementing simple maintenance routines, and sequencing or scheduling operational activities differently to ensure equipment and systems are using energy efficiently and effectively.

Another option is 'fuel switching' to replace uneconomical energy sources with those that are more economical for a given application (e.g. swapping electric geysers with solar water heaters).

Once the energy demand has been reduced and critical loads have been identified, additional or backup energy sources can be designed and installed. Fortunately, most farms can deploy a wide range of renewable energy technologies such as wind, solar and micro-hydro power due to their remote locations and availability of space.

In addition, producers can generate renewable energy using organic waste generated on the farm via waste-to-energy technology such as biogas digesters, pyrolysis, gasification and biomass pelleting. These renewable energy technologies can be installed as hybrid systems such as solar photovoltaic systems combined with solar thermal or biogas systems, which can supply multiple forms of energy to meet the farm's energy demands. SF

For more information or references, send an email to Dr Idan Chiyanzu at chiyanzui@arc.agric.za.