Renewable energy and energy efficiency paving the way to a low-carbon, energy secure future
FARMERS AND AGRI-BUSINESSES ARE BECOMING INCREASINGLY PRESSURIZED FROM EXPORT MARKETS AND CONSUMERS TO REDUCE CARBON EMISSIONS.
Energy is used at different stages of agricultural production and processing. The most significant sources of energy for agricultural activities are diesel and electricity. Diesel and electricity are mainly sourced from the national grid which has a strong reliance on coal. Diesel accounts for more than half of the energy consumed in the agricultural sector. It is used to fuel vehicles during the preparation of land as well as for the harvesting and transport of produce. Electricity is predominantly used for irrigation, processing and cooling.

Both diesel and electricity are mainly obtained from fossil fuels, which are major emitters of greenhouse gas emissions. The high reliance on these energy sources is consequently worsening the problem of climate change.

In recent years, there has been a significant rise in the cost of energy (electricity and diesel/petrol) and insecurity of supply as Eskom struggles to keep up with the rising demand. At the same time, farmers and agri-businesses are becoming increasingly pressurized from export markets and consumers to reduce carbon emissions and to offer low-carbon agricultural products.

The climate change projections for the Western Cape suggest an overall drying and increase in temperatures across the Province with the greatest increases expected inland. The projected changes for the 2040–2060 period include higher mean annual temperatures, higher maximum temperatures, more hot days and more heat waves, higher minimum temperatures, fewer cold days and fewer frost days. The drier and hotter climate will inevitably lead to rising energy demands for irrigation as well as for the cooling and storage of produce.

Alongside this concerning outlook, ample opportunities exist for the agriculture sector to build an energy secure future through renewable energy and energy efficiency. Both strategies, respectively, can lead to a reduction in the carbon footprint and reduce the cost of energy as an input. Renewable energy sources such as wind, solar and hydropower as well as biomass have the ability to replenish and are carbon neutral. Renewable energy enables farms and agri-businesses to produce electricity for self-consumption. In the near future, generating renewable energy for other users may become a vital additional income stream for farmers.

While solar is only one of the renewable energy sources available to farmers and agri-businesses in the Western Cape, it is used in this case study to demonstrate that generating and using renewable energy is not just a “do-good thing”. It also makes complete business sense. Likewise, it is important to highlight that shifting to renewable energy is just one (and not the only) essential ingredient for creating a more energy secure and climate resilient future. Energy efficiency and saving measures are as critical. By measuring, monitoring and understanding their energy consumption, early adapters, such as the wine farm featured in this case study, have been able to strategically plan and execute their transition into a low-carbon, energy secure future.
“Wine farming is a capital intensive business. High input costs exist because of irrigation needs, cooling, etc. At the same time, the South African wine industry has to be globally cost competitive. The adoption of renewable energy technologies can significantly help South African farmers in terms of lower and more reliable input costs and higher brand recognition through environmental sustainability recognition by retailers and customers.” - Simon Grier, co-owner of Villiera wines
VILLIERA WINES-
AN EARLY ADOPTER OF RENEWABLE ENERGY

Villiera Wines is a family-owned wine farm in the greater Stellenbosch region that has pioneered environmentally responsible vine growing and wine making. The wine estate spans a 400 ha property with 180 ha planted vineyards and 200 ha set aside as a wildlife sanctuary. Villiera is well known for their distinctive high quality wines and sparkling wines. They are suppliers to the UK retailer M&S and the South African retailer Woolworths. 70% of their wines are produced for the local market and 30 % for the international market. The average annual output is 1.3 million bottles of wine. The associated electricity consumption for the year 2013 was for example 589 701 kWh.
All decision making on the farm is guided by a strong environmental sustainability approach. For example, rather than using pesticides, Villiera uses natural predators to control pests such as mealy bug. Snails can be a big problem in vineyards, but they are contained by using a flock of Peking ducks that move around the vineyards eating the snails. To maintain healthy soils, Villiera uses winter crops to replenish nutrients. Water is recycled for irrigation purposes. To offset its carbon footprint, Villiera has planted over 100 000 indigenous trees and shrubs such as spekboom in its wildlife sanctuary.

As with many of its sustainability measures, Villiera has also been an early adopter of and champion for renewable energy. In 2010, Villiera established one of the largest private roof mounted photovoltaic installations in southern Africa. Villiera’s journey started when the tasting room was renovated in 2009 and Villiera opted to run the tasting room with solar energy. However, after receiving a very expensive quote for just the one room, it became clear that if Villiera undertook a much larger investment it would work out to be more cost-effective. The family therefore opted for a solar power system that could supply all of Villiera’s daytime requirements outside of harvest time. This includes electricity for staff housing, offices, kitchens, processing and bottling facilities, cellars, and cooling and irrigation systems in the gardens and vineyards.

Over the past 5 years the winery has been able to prove that renewable energy is a smart financial investment and part of an effective strategy towards a climate resilient and low-carbon agricultural future. For Villiera, going solar has become a low risk, high return investment opportunity. With life spans of about 25 years, solar panels are expected to ‘pay for themselves’ over the next seven to eight years. Tax incentives such as accelerated depreciation have also provided an additional incentive to undertake the investment.

**REASONS FOR VILLIERA BECOMING AN EARLY ADOPTER:**

1. Environmental sustainability is a critical element of Villiera’s business model.

   Villiera set themselves a goal of reducing energy consumption by 50% in 5 years from the year 2009 (before the installation of solar). In that year 1167825 Kwh were used, by 2014 consumption had been reduced to 621794 Kwh, a reduction of 47%.

2. Villiera had a very good advisor from Eskom who informed them of the looming energy crisis in 2005.
Solar energy system includes 900m² of solar panels [539 solar modules in total] mounted across cellar roofs. This capacity is producing a total of 726 kWh a day - around five hours at 140 kWp.

Villiera uses the Eskom grid to supplement demand in times of shortage, and a sink in times of excess production. At night and during the harvest season, the farm continues to rely on Eskom.

Valliera produces 240,000 kWh of solar and saves a further 360,000 kWh through energy efficiencies per year.

Electrical energy reduction results in a 600 t carbon footprint saving.

The project was outfitted by enerGworx, a Cape Town-based turnkey alternative energy provider, using locally designed and manufactured products:
- MLT Drives supplied the inverters, and two AfriSun70 systems
- The polycrystalline photovoltaic modules were procured from Solaire Technologies, a French-owned company with a local manufacturing plant in Cape Town.
RECOMMENDATIONS FOR PV SYSTEM INSTALLATION:

• Use a reputable company that can provide good references.
• Double check the reports (e.g. feasibility studies, current energy consumption).
• Make sure that what you install will last for at least 25 years (i.e. use companies that are able to provide enforceable warranties).
• Don’t overdesign your PV system. Only design for a system that matches your demands (i.e. try to utilize most of the energy that you are producing). As long as there is no business model for feeding back into the national grid, generating beyond your own energy needs is not advisable.
• Measure and monitor your overall energy consumption and the impact of your PV system. Do this by, for example, using the carbon footprint calculator tool available from Confronting Climate Change at www.climatefruitandwine.co.za.
• Complement the new system with energy efficiency and energy saving measures.

‘EMBRACING THE SUN’ IS NOT ENOUGH FOR AN ENERGY SECURE, LOW-CARBON FUTURE

At Villiera the installation of the PV system is only one step on the pathway to an energy secure future. The installation of the photovoltaic system at Villiera made it obvious to everyone working on the farm – family and workers - how much more Villiera could do in terms of energy savings.

VILLIERA’S ENERGY SAVING TIPS:

1. Measure your energy consumption:
   • Ask Eskom for a detailed report (if you are on Ruralflex tariff), or
   • Buy your own meter for about R5000 to measure & monitor your consumption, or
   • Ask a consultant to measure your consumption.
2. Reduce your energy by shifting the load:
   • Try to shift demand from high tariff periods to low tariff periods (for example from day to night).
3. Pump only when needed:
   • Use gravity dams or contour canals where possible,
   • Use variable speed drives (VSDs) that are adequate for your demand.
   • When replacing pumps switch from vertical pumps to horizontal pumps.
4. Consider the use of electrical cars
   • These are not very expensive and have a low maintenance cost.
   • They are very suitable for game drives, and also for inspecting vineyards.
5. **Optimize your cooling systems:**
   - Where possible, use high demand electricity systems in periods of the day where tariffs are low.
   - As soon as the weather is cold enough switch off the cooling system and open the doors.
   - Keep doors shut when the cooling system is switched on.
   - Place small doors in or next to large doors so that they are used whenever possible to reduce energy loss.

**OBSTACLES ENCOUNTERED BY EARLY ADAPTERS SUCH AS VILLERIA:**

- One of the biggest issues is the financing of new green / renewable technologies. Currently South African banks only offer short term loans and provide no suitable financial products that speak to the needs and constraints of various farming enterprises.
- Batteries are very expensive and not very efficient (loss of up to 20%).
- Eskom and the Department of Energy are not embracing new sustainable technologies. They still have a centralised approach to renewable energy instead of decentralised approach.
- The lack of trustworthy long term policies continues to be a major reason why many farmers remain reluctant to make costly long term investments into new technologies.

“The problem with Eskom providing cheap energy in the past decades is that it made us wasteful! - S. Grier
IN A NUTSHELL:

It is important to note that solar energy is not necessarily the right way to ensure an energy secure and sustainable future. Farmers and agri-businesses must choose the right energy source for their locations and production needs. Solar power might not be the most suitable renewable energy source for all farming systems and commodities. Hydro power, for example, can be a very good energy generation option for farmers located in mountainous areas that contain rivers.

A mix of energy sources (with emphasis on renewables) suitable for a specific farming system, coupled with innovative energy efficiency and saving measures, is often the most robust pathway for ensuring an energy secure future and a low-carbon footprint.

A comprehensive feasibility study or an energy audit can assist greatly in identifying whether a farming business is on the right rate/tariff and what type of energy system(s) are most suitable. Digital meters are also very precise and can help to unpack the existing energy consumption and to identify areas of energy wastage.

Several exciting initiatives exist that can assist farmers and agribusinesses to improve their energy efficiency. These initiatives provide guidance on how to reduce the Carbon Footprint of specific production and processing activities, and to increase the energy efficiency of particular agricultural practices. One of these exciting initiatives is the Confronting Climate Change Project (see Box below).

“Villiera uses the carbon calculator as a measure of our waste. By reducing our footprint we will pay a smaller tax if implemented in the future. More importantly, the lower our footprint the less we are wasting, thus reducing our production costs. This means less fuel, packaging, electricity, etc. and more recycling.” - S. Grier
A FREELY AVAILABLE CARBON CALCULATOR PROVIDED TO THE WINE AND FRUIT SECTORS

The Confronting Climate Change (CCC) project is a strategic industry initiative. It is aimed at supporting the South African agricultural sector to effectively respond to the challenges and opportunities provided by climate change. CCC currently focuses on the fruit and wine sector, and is planning to expand to the grain industry.

With the help of a freely available carbon footprint calculator (and technical training workshops on using of the tool) farms, pack houses, wineries and other entities across the supply chain can accurately measure their energy use and carbon emission intensity of their respective business activities. It becomes a powerful management tool for a business. The carbon footprint report provided by the calculator helps farmers and agribusinesses to evaluate where their major energy requirements and GHG emission hotspots are. It also provides critical information on how to move towards greater resource use efficiency, reduced emissions and long term sustainability.

To access the carbon calculator visit: www.climatefruitandwine.co.za

Another important objective of the CCC project is to develop robust and representative industry benchmarks of the carbon emissions of each major commodity. Against these benchmarks individual businesses can check and evaluate their own results. This process of benchmarking supports credible industry-level reporting. The process helps to identify opportunities for improvement and best practice at business level and to track performance over time.

FURTHER INFORMATION:

WESTERN CAPE DEPARTMENT OF AGRICULTURE WEBSITE: www.elsenburg.com

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Photo provided by Simon Grier

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