CONFRONTING CLIMATE CHANGE

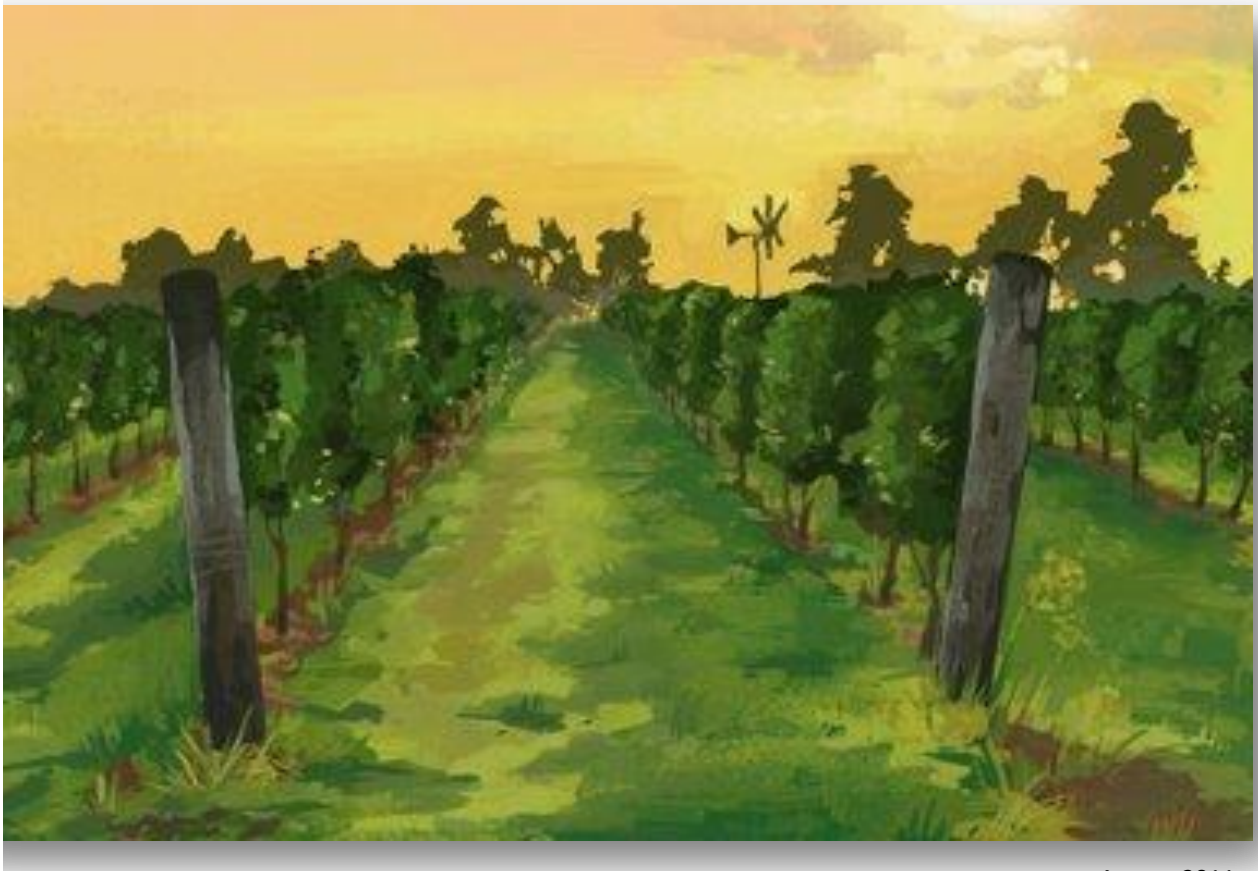
A SOUTH AFRICAN FRUIT & WINE INITIATIVE

GROWERS' INFORMATION RESOURCE

Top 10 mitigation options through the supply chain

This information document aims to offer practical guidance and tangible solutions to the South African growers on how to:

- lower your carbon footprint,
- move to a more efficient and sustainable way of doing business ,
- reduce your energy consumption, and ultimately
- mitigate some of the prominent climate change impacts.



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INTRODUCTION

The objective of this document is to provide the South African fruit and wine industry with a foundation of practical information on key relevant mitigation options. The information is sourced from international and national research, as well as examples that have been highlighted within the industry through the *Confronting Climate Change* and other similar projects.

It is the aim of the document to be short and yet informative, offering additional links and references should further details be required.

The key audience of this document is the producers and processing units (i.e. pack-houses and cellars) within the South African fruit and wine industry. Please log on to the website to find more information www.climatefruitandwine.co.za.

MITIGATION OPTIONS

What is MITIGATION?

To mitigate means to lessen, reduce or decrease. In the context of climate change, mitigation refers to any human action taken to reduce or permanently eliminate the amount of greenhouse gases (GHG) in the atmosphere. Internationally, land-use change and manure management supply the majority of the GHG emissions from the agricultural sector. However within the South African fruit and wine industry context, fossil-fuel based activities are the main source of GHG emissions, notably electricity and fuel (diesel) consumption. Mitigation therefore relates to actions aimed at reducing the emissions that are caused from business activities that are predominately fossil-fuel based. Depending on the scale of operations and management choices, these activities most often related to electricity-, fuel- and agrochemical-usage.

TOP 10 MITIGATION OPTIONS HIGHLIGHTED

Electricity usage from irrigation pumps is a major component of many growers' carbon footprint across the industry. This highlights a risk for growers not only as a result of the predicted water shortages (in the southern and western part of the country) and the resulting increased water prices, but also from expected increased electricity prices and potential electricity shortages in the short term. Implementing the following options will improve water use efficiency and reduce electricity usage, thereby lowering the carbon footprint and operational costs of the farm.

1.) **Regular monitoring of water usage and soil moisture content** will enable a better understanding the precise water requirements of your crops and can prevent excess water run-off, leaching of nutrients and downstream water pollution. This can be done by implementing technologies such as soil moisture probes within the vineyards and orchards that work with computerised irrigation systems. The probes frequently measure soil moisture at different locations (and in different soil conditions) within the farm, immediately relaying the information to the irrigation control which then updates the irrigation requirements according the current needs of the soil/plant. Although the initial upfront costs of installing such a system may be expensive, when the potential increased water tariffs and electricity prices are incorporated, together with the value of improved soil and plant health and reduced water usage, the pay-back period is relatively short. Risks related to water shortages are also significantly reduced.

2.) Utilizing **water distribution models of irrigation** best suited for the specific environment and crop conditions will reduce the amount of water wastage. Irrigation water loss through current agricultural irrigation practices in South Africa is recorded as high as 30-40%. This is higher than the global averages of 15% for on-farm distribution losses and 25% for on-field application losses[1]. Much of the water used in irrigation is not absorbed by the roots effectively and returns to the river systems by overland flow or return seepage. In addition, using renewable energy to meet the irrigation requirements, such as solar panels and gravity-fed irrigation techniques, can reduce the reliance on expensive and carbon-intensive grid-based electricity – saving money and reducing carbon emissions.

3.) **Improved water trapping and storage facilities and the reuse of grey water on site** will not only assist in increased water availability, but will decrease water pollution, thereby increasing water quality and decreasing the financial cost of fresh water supplies. Many wine farms in the Western Cape have water treatment facilities (such as effluent reed bed filtration systems) which recycle all the effluent and waste water from their wineries, homesteads, offices, workshops and restaurants. Once treated, the water can possible be stored in an irrigation dam and used when demand requires. Although initially capital intensive, implementing such a system makes financial sense when weighed against proposed increased water tariffs hikes and increased water availability risks. In addition improved waste water handling and cleaner production principles (as per IPW and Winetech Guidelines) can reduce both water and energy requirements.

4.) **Enhancing drought resistance in soils** through soil conservation techniques like improved soil organic matter (SOM) results in enhanced water and nutrient holding capacity and improves soil structure[2]. On-site organic waste (such as fruit skins, pulp, pips and stalks) can be incorporated into the soil through mulching and composting techniques, which not only improves SOM, but also reduces the reliance on fossil fuels for fertilizer and irrigation requirements. With the predicted increased frequency of droughts and extreme events such as flooding, increasing the soils capacity to capture and store water will go a long way in reducing run off and soil erosion. Studies have shown that when used in accordance with the soil nutrient requirements, an increase of just 1% of organic matter content can increase water storage capacity by 3.7% (equivalent to roughly 24,000 litres per hectare)[3]. Reducing the amount of exposed land through cover-crop and ground-cover utilization also increases the water infiltration rate while lowering soil water evaporation and enhancing the natural microbial activity within the soil. Together these techniques can greatly reduce the severity of drought and additional requirements of irrigation.

Electricity usage in post-harvest chain has similarly been highlighted as contributing significantly to producers' carbon footprints, particularly those with large-scale operations. In order to properly understand the efficiencies of your heating/cooling equipment an energy audit may be required. This kind of assessment usually examines the current operational processes, their energy requirements relative to efficiency standards and, based on the energy consumption baseline, makes recommendations on improving existing equipment or the installation of efficient technologies where necessary. Very often the improvements in energy efficiency need not involve high capital outlay, and can be a simple upgrade of the insulation in the heating/cooling exchanges, switching to CFL or LED lighting, or changing the time of day the energy is used (peak versus off-peak) which will result in a significant decrease in energy requirements, energy costs and carbon emissions.

[1] WaterWheel Paper, 2009. Available from the South African Water Research Commission: http://www.wrc.org.za
[2] Climate and Agriculture: A Just Response. Institute for Agriculture and Trade Policy Report. Available at http://www.iatp.org/iatp/publications
[3] National Sustainable Agricultural Information Services: www.attra.ncat.org

5.) Utilizing **alternative sources of energy**, for example solar, small-scale hydro or waste-to-energy conversions, will reduce the carbon intensity of the operations, as well as reducing the business risk of relying on expensive and sometimes unpredictably supplied grid electricity[4].

6.) In a local industry study[5], the **packhouse and cold storage facilities** were identified as the areas with most improvement potential. The influence of operational practices (utilization, loading procedures, etc.) and the control and application of major equipment (compressors, condensers, fans) in these facilities were typical examples of areas where actions can be taken to improve the energy efficiency.

7.) The time and energy spent cooling the fruit post-harvest is another area where **optimization of packing and cold storage operations** can significantly reduce the energy usage in the post-harvest chain. Examples include harvesting during the coolest part of the day, thereby allowing the fruit to start the post-harvest cooling process at a lower temperature, or ensuring effective insulation in the doors of the cooling areas and only opening/closing these main doors once or twice a day, can make large differences in the energy efficiency of the cooling process.

Over-and-above electricity usage, **reducing all other fossil-fuel based inputs** will not only significantly improve the carbon footprint of the business, but will result in substantial cost savings. Products that are based on fossil-fuels are often expensive and subject to price volatility as energy prices fluctuate. By reducing the reliance on such inputs, the business will be reducing risk as well as financial overheads. The following areas have been highlighted as having the most potential within the agricultural industry.

8.) *On the farm:* reducing the reliance and use of agrochemicals and **synthetic fertilizers.** Combining the use of cover crops and nitrogen fixing legumes between rows with improved composting and mulching will improve the soil health and reduce the agro-chemical and fertilizer requirements.

9.) *Post harvest:* the quantity and type of **packaging material** used contributes towards total carbon emissions among the product chain. This has been highlighted as an area where small changes can have a great impact in reducing packaging waste, costs and emissions. Sourcing material that is made up of recycled or bio-degradable content, together with recycling and re-using packaging as much as possible (such as crates, pallets and hard-wearing containers), will result in a reduction in input costs and packaging-related carbon emissions. Packaging is also the "face" of the product, and shifting to more environmentally friendly options can have an immediate marketing value to the retailer and end customer.

10.) *On the "road":* transport is a major factor for export producers, both in terms of carbon emissions and fuel costs. When looking at the whole supply chain, the distribution mode for the international leg – air freight versus shipping – has been found to be more important than the distance travelled to market. Investigating the most efficient **type of transport** (rail versus road, ship versus air) and the improving the **utilization and type of vehicles** (the size of vehicle and whether the vehicle is fully or partially loaded) will go a long way in improving the efficiency of product distribution.

[4] To find out more about Eskom's solar water geyser rebate log on to www.eskom.co.za/dsm, or call Eskom's solar help desk on 011 800 4744

[5] Contact Koos Bouwer of Koos Bouwer Consulting to find out more details - *koosbouwer@iib.ws*

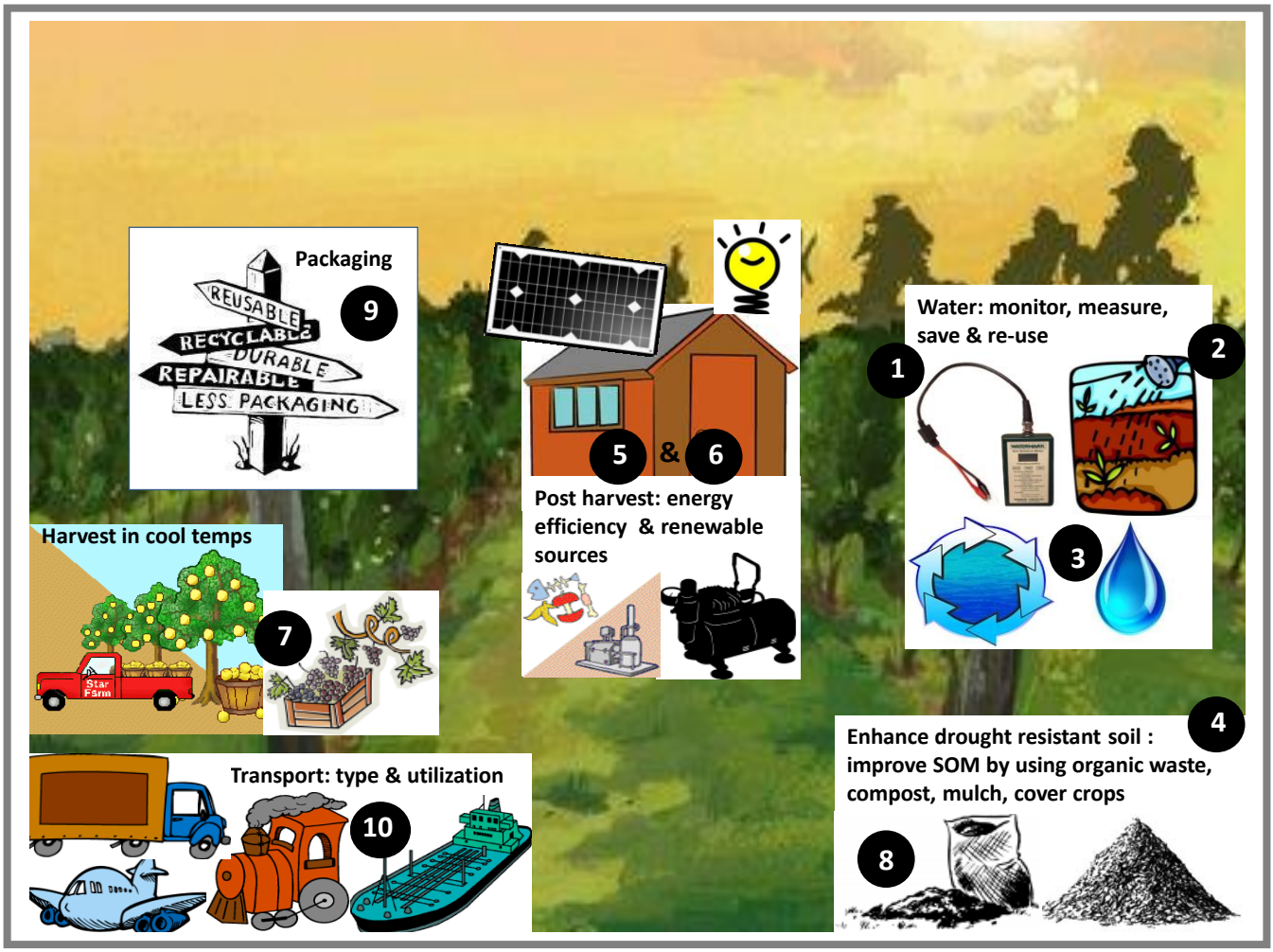

Figure 1: Summary illustration depicting the top mitigation options

The mitigation options listed above (summarised in Figure 1) have been selected from international and local studies and represent a variety of the most relevant and suitable options currently available to South African fruit and wine producers. Selecting which options are most applicable to your operations is dependent on the energy and emission profile of your business, which highlights specific areas within your supply chain that are energy and carbon intensive. To better understand what you profile will look like, log on to the *Confronting Climate Change* website (www.climatefruitandwine.co.za) and use the freely available online carbon calculator tool. It has been designed specifically for the South African fruit and wine industry, and is an ideal starting point to start identifying the priority areas within your business where interventions could lead to the largest costs savings and the most cost-effective reductions in greenhouse gas emissions.

Finally, changing behaviour is a long term commitment and there are no "quick fixes". However, encouraging staff involvement and incorporating social learning and skills development throughout the process will greatly assist the success and sustainability of the transition to a low carbon and financially secure business.

For more information, contact the project team or log on to the website: www.climatefruitandwine.co.za
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