CONFRONTING CLIMATE CHANGE

A SOUTH AFRICAN FRUIT & WINE INITIATIVE

South African Fruit and Wine Climate Change Program

Component 1 - A review introducing:

- What is Climate change and how will it affect the South African agricultural sector?
- How do agricultural activities play a role in global greenhouse gas emissions?
- A brief overview of the South African Fruit and Wine climate change program going forward

February 2009

INTRODUCTION

A global survey by McKinsey (2008) shows that consumers place trust and support in entities that actively address environmental issues, particularly climate change. In addition, action and advocacy at an individual level is leading to government support, legislation and incentives. The South African government is planning legislation that will penalise high energy consumption and reward emission reductions. In the Minister of Finance's budget speech to parliament this year (2008), tax breaks were proposed for farmers who decide to conserve biodiversity and natural habitats. Moreover, the Minister of Environmental Affairs and Tourism recently launched a progressive climate change policy including the introduction of a 'carbon tax' for industry. In general, climate change and associated environmental and economic implications have moved from being seen as a 'green agenda' a few years ago, to an accepted part of economic and business planning.

The primary and secondary agricultural sector plays an important role in South Africa's economy, generating 15% of the GDP and employing 940 000 people. Agricultural exports represent 8% of the country's exports that generates R 20 billion in foreign income. Maintaining and increasing South Africa's share of global fruit and wine markets is therefore important to the long-term economic well-being of South Africa, as well as providing valuable jobs and income streams in rural areas.

The agricultural sector does however contribute significantly to the greenhouse gas (GHG) emissions though the use of agrochemicals, liquid fuels such as petrol and diesel, as well as land-use change. As awareness of human driven climate change has emerged over the past decade, there is an increasing focus on the 'GHG footprint' of agriculture produce and in identifying opportunities to mitigate climate change through soil carbon sequestration and renewable energy technologies.

To preserve South Africa's competitive position in global fruit and wine export markets it is therefore crucial to develop a comprehensive, industry-scale response to climate change. There is a need for a credible, impartial and relevant information resource for the industry that:

- Provides and supports an industry-wide perspective
- Serves to highlight climate change issues, opportunities and threats
- Benchmarks the industry's GHG emissions with global competitors
- Enables informed and authoritative comment, debate and negotiation by stakeholders and policy-makers
- Enables the standardised measurement, reporting and comparison of individual farm and exporter emissions
- Creates an industry standard for GHG auditing and the communication of results
- Guides short and long term strategy formulation by decision-makers across the industry

The aim of this project is to fulfil these requirements through an interactive process involving interested and affected parties. This document serves to introduce the concept of climate change, its impact on the fruit and wine industry, and the South African fruit and wine industry initiative going forward. Efforts have been made to keep the document brief and links to key additional information have been provided at the end of the document. If queries exist with regard to the industry initiative or climate change in general, please feel free to contact Hugh Campbell, Tony Knowles or Shelly Fuller (contact details at the end of this document) or your own industry contact representative.

THE CONTEXT: CLIMATE CHANGE & AGRICULTURE

Climate change and what it means - Climate change is not a new phenomenon. Fluctuations in weather patterns over time are a natural occurrence. However, human generated greenhouse gas (GHG) emissions in the form of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) are resulting in changes to the climatic patterns beyond natural background rates. Recent reports authored by the world's leading scientists confirm that the increased rate of change is indeed human-induced, due to GHG gases released during fossil fuel use and land use change practices (Rosenzweig et. al., 2008; IPCC, 2007).

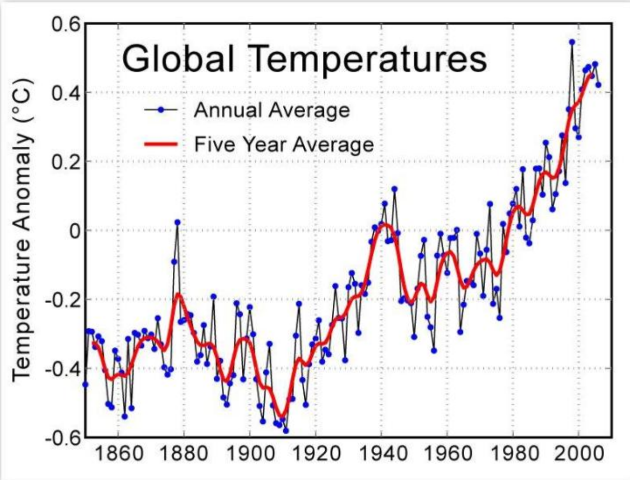

FIGURE 1: Mean Global temperature measured from Global NASA meteorological stations (Source: NASA 2007)

In natural quantities, these gases form a thin layer in the atmosphere and regulate the way the atmosphere absorbs and releases energy from the sun. This keeps the earth about 30 degrees Celsius warmer and allows life on earth to exist. However, since the industrial revolution, there has been an excessive build up of GHG. The result is similar to what happens in a greenhouse- heat is absorbed and 'trapped' causing temperatures and humidity to change - hence the term 'Greenhouse Effect' being used in the press.

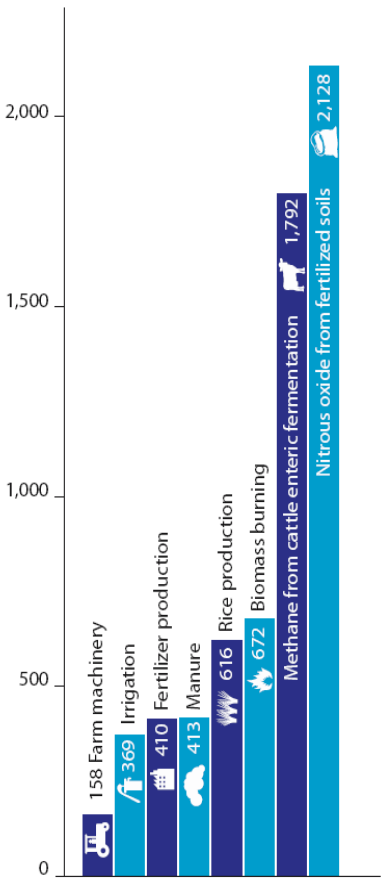

FIGURE 2: Sources of agricultural greenhouse gases excluding land use change measured in million tonne units of CO_2e per year (Greenpeace, 2008).

There is no doubt that a change in climatic patterns will affect fruit and wine production and such impacts are already being felt within the South African industry. The **direct impacts** include the physical changes in climate such as increased CO_2 levels and temperatures for example. Such changes affect the productivity, quality of yield, farming costs and suitable crop cultivars and have associated consequences for water resources and pest/disease distributions. Climate change also impacts **indirectly**, through the growing awareness amongst consumers and the corresponding demand for carbon-efficient business processes. In response to the market driven awareness, suppliers internationally are now being required to report on the greenhouse gas emissions that result from the farming and production processes. Several large international retailers have launched aggressive climate change and environmental programs in the past year. Such programmes are generally focused on reducing the greenhouse gas emissions throughout the supply chain. The South African export market has already felt this pressure from the international retailers, and this pressure is only going to increase in to the future.

Heavy emissions from agriculture – Globally, the agriculture and associated land use change sector is responsible for about a quarter of the CO_2 (through deforestation and soil carbon depletion, machine and fertilizer use), half the methane (through livestock and rice cultivation), and three quarters of the nitrous-oxide (through fertilizer application and manure management) emissions on a global annual basis (Rosenzweig and Tubiello, 2007). Figure 2 outlines the top sources of GHG emissions in the sector globally, excluding the land-use change. It is clear that on a global scale, incorrect fertilizer usage is causing the greatest emissions by far. Research has shown that the impact of climate change on farming will vary depending on the use of technology and the way the land is managed (Walker and Schulze, 2008).

Local studies estimate the agricultural sector to be responsible for approximately 9% of the total GHG emissions for the country, the majority resulting from enteric fermentation and manure management (National Greenhouse Gas Inventory Database). In general, electricity usage (Eskom power) and fuel consumption are the leading activities in terms of high emissions. By introducing energy efficient technologies and alternative energy sources will not only lead to a reduction in GHG emissions but also decrease reliance on Eskom for energy. Crop production methods that reduce energy requirements while maintaining output are important components of a sustainable agricultural system. A summary of simple, sustainable technologies relevant to a South African context include:

- **Water management** - Sustainable water utilization technologies and improved waste- and rain-water management practices would greatly reduce our food security and economic risk.

- Improvements in organic matter accumulation in **soils and carbon sequestration**[1] through integrated nutrient management, and effective cover crop and mulching practices would improve soil quality and lessen the nutrient input and water requirements.

- Pest, weed and disease control emphasising in-field **biodiversity** (i.e. genetic resources) and reduced pesticide use would enhance the crops natural ability to protect itself, thereby requiring fewer chemical inputs.

- Incorporating **social learning and skills development** in process forms a vital part of the success of the transition and long term sustainability of conservation agricultural practices.

THE PATHWAY FORWARD FOR THIS PROJECT

There are three broad stages to developing a comprehensive climate change response for the industry:

1. **An audit of current greenhouse gas emissions throughout the supply chain**
   This allows each entity to gain an understanding of GHG emissions resulting from their own activities and throughout the supply chain.
2. **The development of a comprehensive strategy including clear goals and costs**
   The information obtained from the GHG assessment will be used to strategically identify reduction opportunities and establish realistic goals and targets.
3. **An implementation plan**
   The plan will provide a clear pathway to achieving the goals and targets outlined in the strategy document. It will include a detailed description of opportunities, the process required to realise such opportunities, potential costs, and how to communicate climate change initiatives to stakeholders.

This project is divided in to three main components. This report serves as the first component- a general introduction to global climate change and climate change issues within the South African agriculture sector. The second component is the development of a standardized industry carbon footprinting protocol and tool. The tool will allow individual farmers to calculate their carbon footprint based on their data input and will be web-based and thus freely available. The first draft of this standard will be accessible in early 2009, with final version trailed and ready and publically available by mid 2009.

The third and final component of the project is the industry strategic framework, which will be developed using the data collected by the carbon calculator tool of Component Two. The framework will provide a clear context and guidelines for strategic decision-making around an effective response to the threats and opportunities posed by climate-change, including clear emission reduction targets and mitigation and adaptation opportunities. The strategic framework aims to be publicly available by the end of 2009. All processes will be reviewed annually and updated accordingly. Figure 3 illustrates the flow of the project processes.

[1] See Appendix for glossary of terms

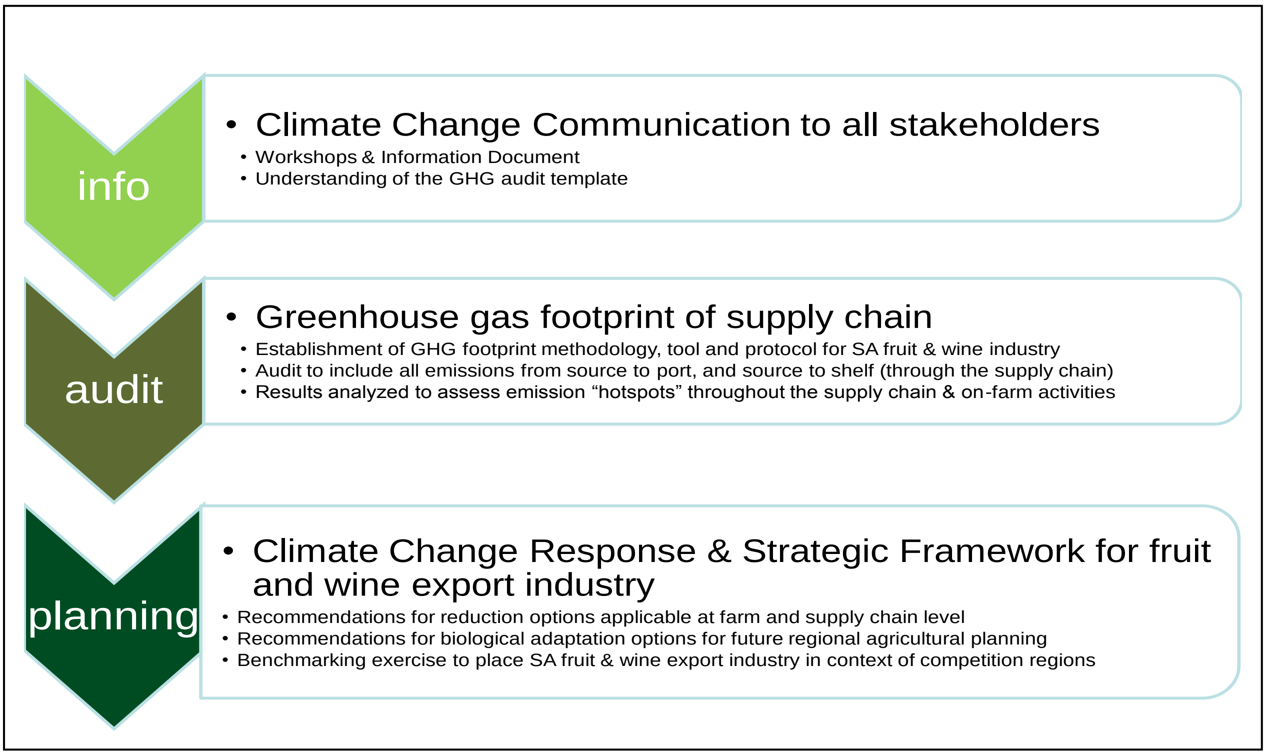

FIGURE 3: Schematic flow chart of the broad-level project processes

HOW CAN YOU BE INVOLVED?

The success of this project is highly dependent on industry involvement to ensure adequate representation and consultation throughout the process. This will take place through workshop engagements which will provide a platform where feedback, suggestions and progressive planning can be discussed. Aside from the strategic workshop sessions, communication is encouraged throughout the process. Please do not hesitate to contact any member of the project team (details below) if further information is required.

The structure of involvement is three tiered. The project will be directed by the steering committee, a ten person group representing industry stakeholders, funders and expert advisors. The role of the steering committee will include the following:

1. Set the scope of the project
2. Monitor and review the progress at set intervals throughout the project
3. Guide the project
4. Ensure the outputs are communicated to the various industries

A second tier of interaction with the project will be with the Interest and Stakeholder Group. This group will play a major role in communicating the progress and outputs to the sector. The third tier of interaction will be in the form of direct communications to the growers, processors, exporters and different role-players in the greater industry. This process will be further clarified by the steering committee.

<u>Contact Details:</u>

Project Co-ordinator: Hugh Campbell - Tel: 021 882 8470, email: hugh@dfptresearch.co.za
Project Leader: Tony Knowles, 021 465 6923, email: tonyknowles@gmail.com
Project Manager: Shelly Fuller (nee Vosse), 021 465 6923, email: shellyf@genesis-analytics.com

REFERENCES & KEY LINKS FOR FURTHER READING

Benhin, J.K.A. (2006). Climate Change and South African Agriculture: Impacts and Adaptation Options. Centre for Environmental Economics and Policy in Africa (CEEPA), Discussion Paper 21, University of Pretoria, South Africa. http://www.ceepa.co.za/docs/CDPNo21.pdf.

Clean Air, Cool Planet - Forum for the Future (2008). Getting to Zero: Defining Corporate Carbon Neutrality. www.cleanair-coolplanet.org. www.forumforthefuture.org.uk

Greenpeace (2008). Cool farming: climate impacts of agriculture and mitigation potential. www.greenpeace.org/raw/content/international/press/reports/cool-farming-full-report.pdf

IPCC. (2007). Intergovernmental Panel on Climate Change, Working Group II, Fourth Assessment Report: Impacts, Adaptation and Vulnerability. Summary for Policymakers. www.ippc.ch

McKinsey. (2008). The carbon productivity challenge: Curbing climate change and sustaining economic growth. June Newsletter.

Rosenzweig, C., Tubiello, F.N. (2007). Adaptation and mitigation strategies in agriculture: an analysis of potential synergies. Mitig. Adapt. Strat. Glob Change 12: 855-873.

Rosenzweig, C., Karoly, D., Vicarelli, M., Neofotis, P., Wu, Q., Casassa, G., Menzel, A., Root, T.L., Estrella, N., Seguin, B., Tryjanowski, P., Liu, C., Rawlins, S., Imeson, A. (2008). Attributing physical and biological impacts to anthropogenic climate change. Nature 453: 353-358.

The Carbon Trust (2006). Carbon footprints in the supply chain: The next step for business. www.carbontrust.co.uk.

Walker, N. J.; Schulze, R.E. (2008). "Climate change impacts on agro-ecosystem sustainability across three regions in the maize belt of South Africa." Agriculture, Ecosystems and Environment 124: 114-124.

<u>Figures</u>

Figure 1: NASA (2007) GISS Surface Temperature Analysis. Global Temperature Trends: 2007 Summation

Figure 2: Greenpeace (2008). Cool farming: climate impacts of agriculture and mitigation potential.

APPENDIX 1: GLOSSARY OF TERMS

Carbon sequestration
Carbon is stored in both plants and the soil. Through the process of photosynthesis, plants 'breath' in carbon dioxide on a daily basis. The plants break down the carbon dioxide in to carbon, which is stored in the plant, and the oxygen is released back in to the atmosphere. The absorption and storage of carbon is known as carbon sequestration and is most commonly used in reference to woody biomass and forests as wood is approximately 50 percent carbon. Through decomposition of plants, carbon and other nutrients are returned to the soil. Improvements made in the form of regeneration of forests or woodlands, and/or increased soil carbon storage through no tillage and efficient soil management practices, will lead to a net increase in stored carbon over time. If such improvements are in addition to the business-as-usual farm activities, and the resulting additional carbon sequestered can be quantified (as units of carbon stored or units of CO_2 sequestered), then these carbon units can be traded as carbon credits in the carbon market and become an additional revenue stream for the farm (Lal, 2004; Sauerbeck, 2001; Prentice et. al., 2001).

Carbon neutrality
An entity, be it an individual, a farm or an industrial complex, can be defined as "carbon neutral" when the sum of the atmospheric carbon dioxide emissions and reductions due to their activities equals zero. Carbon neutrality is usually assessed through a full life-cycle analysis that includes all potential sources and sinks of atmospheric carbon dioxide within predefined boundaries. Carbon neutrality is calculated over a defined period, usually a calendar year.

Carbon dioxide equivalent (CO2e)
It is asserted that the increased carbon dioxide (CO_2) emissions is the predominant cause of global warming and climate change. However other GHGs play a role, particularly methane (CH_4) and N_2O in the agricultural sector. To allow for an equal comparison between the different gases, scientists have defined multipliers for the gases in relations to their global warming potential (GWP), all relative to one CO_2 unit. For example, methane (CH_4) has a GWP of 25 and therefore 1 unit of CO_2 = 25 units of CO_2e (CH_4).

Emission factor
The average emissions rate of a given pollutant for a given source, relative to the intensity of a specific activity. Emission factors are used to derive estimates of greenhouse gas emissions based on various types of activities, such as the amount of fuel combusted, the number of stock in an animal husbandry, the distance travelled or on any industrial production process or similar activity data. The activity data is then multiplied by the emission factor to estimate the global warming potential of that activity, for example if a vehicle travelled 100 km and the emission factor for a petrol-based vehicle is 2.40 kg CO_2e/litre used then the GWP of the vehicle driving is 100 x 2.40 = 240 kg CO_2e.

Emission reduction
The term is used to define the quantity of greenhouse gases (GHGs) that are prevented from entering the atmosphere, usually measured as a unit (tonne) of carbon dioxide equivalent (CO_2e).

Global warming potential (GWP)
A measure given to estimate how much mass of a specific greenhouse gas contributes to global warming. It is a relative scale that compares the specific gas to that of the same mass of carbon dioxide (whose GWP is by definition = 1). The GWP is calculated over a specific time interval, more often over a 100 year timeframe. The global warming potential (GWP) of the seven main GHGs over a 100 year lifespan is:

- Carbon dioxide (CO_2) = 1 GWP
- Methane (CH_4) = 25 GWP
- Nitrous oxide (N_2O) = 298 GWP
- Hydrofluorocarbon (HFC) 134a = 1,430 GWP
- Perfluorocarbon (PFC) = 6,500 GWP
- Hydrofluorocarbon (HFC) 23 = 14,800 GWP
- Sulfur hexafluoride (SF_6) = 22,800 GWP