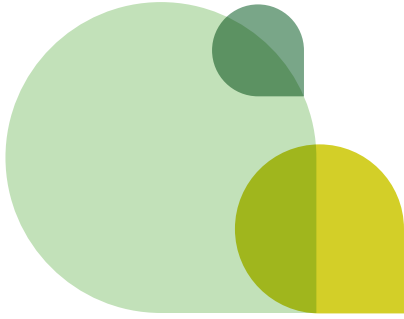




# A Status Quo Review of Climate Change and the Agricultural Sector of the Western Cape Province

Brief for Food Gardens and Food Security





## The SmartAgri project

Smart Agriculture for Climate Resilience (SmartAgri), a two-year project by the Western Cape Department of Agriculture and the Western Cape Department of Environmental Affairs & Development Planning, was launched in August 2014. SmartAgri responds to the need for a practical and relevant climate change response plan specifically for the agricultural sector of the Western Cape Province. By March 2016, the University of Cape Town's African Climate and Development Initiative (ACDI) and a consortium will deliver a Framework and Implementation Plan which will guide and support the creation of greater resilience to climate change for farmers and agri-businesses across the province. The project will provide real and practical information and support, and inspire farmers in a manner which optimizes their decision making and ensures sustainability at a local level.

***This brief was prepared for those involved in community and home food gardens (with a focus on vegetables) and also addresses the topic of food security.*** It summarises the findings of the Status Quo Review of Climate Change and Agriculture in the Western Cape Province. This study covers current climate risks and impacts and how these are expected to shift under a changing climate. It also considers how climate risks and impacts can be reduced and managed. This is approached in the context of provincial economic and social development goals, and careful use of scarce and valuable natural resources.

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# Community and home food gardens

Food gardens have been established in a wide range of local climates and soils. Many occur in very sandy and nutrient-poor soils, or in rocky soils, making it more difficult to manage these gardens and achieve good production levels. Water for irrigation is often sourced from municipal supply systems (an expensive source of water), but also from rainwater harvesting tanks, wells and groundwater. Usually, manual watering or simple irrigation systems are used. Since most food gardens focus on vegetables, the required growing conditions depend on the crop and the seasons of planting and harvest. Local conditions also determine the types of pests and diseases that may become problematic.

While food gardens exist across the Western Cape and are established for various purposes, they are concentrated in areas with high levels of food insecurity i.e. City of Cape and southern parts of the West Coast, Ceres-Witzenberg area, Swellendam-Riversdale area, Little Karoo, Southern Cape and southern parts of the Central Karoo.

How will the climate of these areas change into the future?



# Climate Change in the Western Cape

As a result of global climatic changes, the Western Cape faces a warmer future. This poses serious threats to food production in the province. Changes in annual rainfall as well as changes to the spatial distribution, seasonal cycles and extremes in rainfall are also likely, even if the extent and direction of these changes are still uncertain. The SmartAgri project is focusing on the planning and preparation needed in the agricultural sector in order to deal with this threat over the next 10–40 years.

It is highly probable that the western parts of the province will experience continued warming and reductions in winter rainfall. An important change in the climate system involves the shifting of the rain-bringing frontal storm tracks further south during winter. However, the influence of the mountains and ocean will lead to more complex results at local level, particularly for rainfall. Thus, in some regions, either increased or decreased future rainfall are possible. In the eastern parts of the province, some climate models show a possibility of increasing annual rainfall. Another aspect is the possibility of a shift in the seasonal distribution of rain, with more rainfall falling in autumn and/or spring.

Already, the weather data shows that warming has occurred (on average approximately 1.0 °C over the last 50 years), particularly in mid- to late summer. There has also been a decrease in annual rain days, particularly in autumn, and an increase in rain days in spring and early summer. As yet, there are no detectable trends in total rainfall during the winter season or annually.

Future increased temperatures are almost a certainty. The greatest increases are likely to be inland and the lowest increases along the coast, indicating a moderating effect from the oceans. Expected increases in mean annual temperature for mid-century are in the range of 1.5 °C to 3 °C. Both maximum and minimum temperatures will increase leading to increased heat stress for crops.

The Western Cape experiences regular flooding events, droughts and heat waves. These events have had significant impacts on farmers and food gardeners. Floods are the most common problem, causing the most damage and costs for response and recovery. An increase in extreme rainfall events is likely in the core of the winter season which could increase the risk of flooding in future. This is especially concerning for the Cape Flats area, where the high water table already leads to regular flooding in the winter following heavy rainfall.

Heat waves are expected to become more frequent. Figure 1 shows the monthly number of days exceeding 32 °C for Cape Town International Airport (representing the greater Cape Town area), and days exceeding 36 °C for Malmesbury, as well as projected changes in the same statistic for mid-century. This shows that under current climate, very hot days occur in the late summer months and that, under climate change, such occurrences will increase in future.

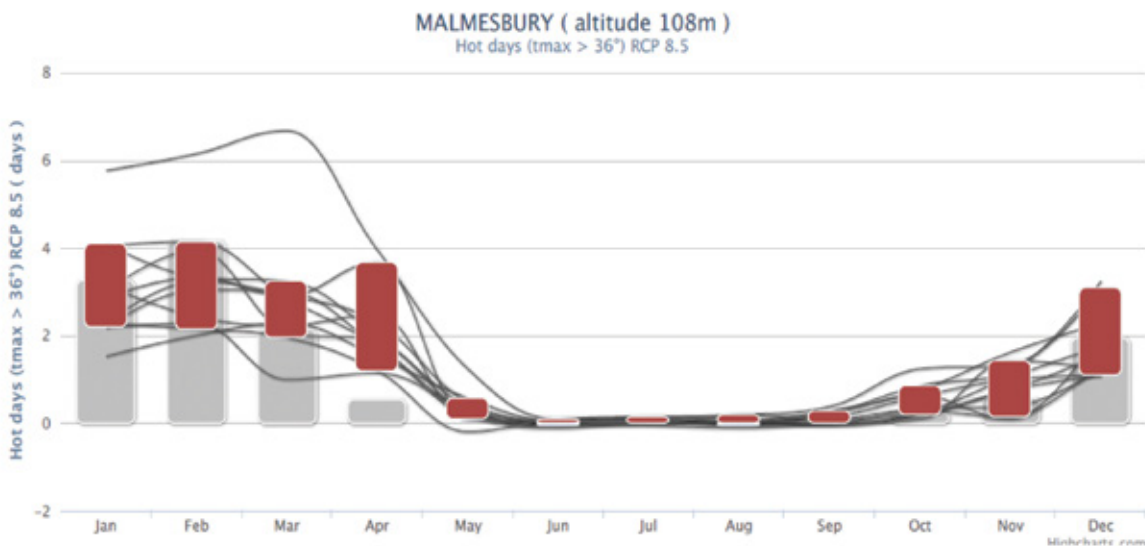
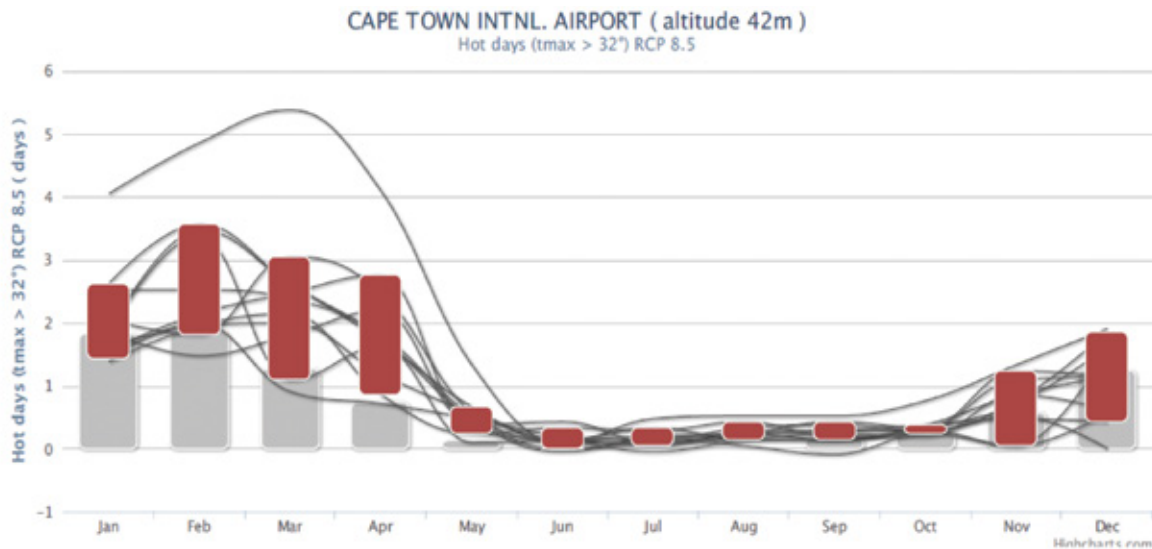


Figure 1. Observed (grey) and projected possible range of increase (red) in the number of hot days (> 32°C) per month for Cape Town International Airport weather station, and the number of hot days (> 36°C) per month for Malmesbury. Projections are for the 2040 – 2060 period and based on 11 different climate models. Height of the grey bars indicates median number of hot days from observed historical climate records. Red bars indicate the range of projected increases in number of hot days (10th to 90th percentile range) in addition to the observed (or current) values.

# Food security and the food system

Food security can be divided into four elements: food availability, food access, food utilisation and food stability. In the Western Cape (as for South Africa as a whole), food is always available, either grown in the province or imported from other regions. Almost everyone in the province purchases most of their food from a range of shops, markets, informal traders and fast food outlets. This means that income plays a major role in determining food security at household level. Access to sufficient and nutritionally diverse food is mostly limited by food prices. Food price shocks are caused by international food price fluctuations and weather disasters, as well as local market conditions leading to price spikes. Low local grain yields cause grain prices to rise sharply, and this leads to price increases in many foods such as bread, cereals and chicken.

South Africa is undergoing a 'nutrition transition' where stunting, wasting and undernutrition in young children is occurring alongside increasing levels of obesity and overweight in older children and adults. Some of these changing dietary patterns are due to urbanisation, the expansion of supermarkets and the availability of processed foods high in salt, fat and refined sugar.

A recent large-scale survey of household food security in South Africa indicated that, on a household level, 45.6 % of the population was food secure, 28.3 % were at risk of hunger and 26.0 % experienced hunger (were food insecure). While the Western Cape reported the highest rates of food security (57.9 %), 25.6 % of study participants were at risk of hunger and 16.4 % experienced hunger. A varied diet is needed to ensure an adequate intake of essential nutrients. A low dietary diversity has also been associated with low weight and stunted growth. In the Western Cape, 28.2 % of study participants had a low dietary diversity. Greater dietary diversity is generally associated with increased economic development.

There is a perception that food insecurity is more common in rural than urban populations but research indicates that this is not the case. In urban areas, however, food availability is seldom the key factor contributing to undernutrition. The urban poor are exposed to both acute and chronic problems of food access – often on an ongoing basis. It has been found that 68 % of the poor community in Cape Town are severely food insecure.

# The role of community and home food gardens

There has been a strong drive to help communities and households to establish food gardens, particularly in densely populated urban and peri-urban areas, but also in impoverished rural areas. These gardens are intended to contribute to household food security of poor communities. Many of these community garden projects are supported by provincial and national government departments, non-governmental organisations (NGOs) and community-based organisations (CBOs). However, there is also an increasing number of middle income households choosing to create food gardens as part of a healthy lifestyle choice, particularly in the Western Cape, where they appear to be the majority.

Research has shown that the participation rates of urban agriculture by poor households in Cape Town (5 % of households in 2007) and the province (2 %) are still very low in comparison to other provinces (e.g. 64 % in the Eastern Cape) and other large southern African cities (22 %). Some of the reasons why food gardens are so limited in poor urban communities include issues of land tenure, lack of available spaces, theft and gang violence, lack of time, lack of financial resources to buy inputs, and insufficient access to training and support.

The contribution of food gardens to household food and nutritional security needs more scientific investigation and research in relation to the urban and rural context. However, it appears that the primary benefit lies in the provision of healthy fresh vegetables with high nutritional value (e.g. spinach), as a supplement to the food that is purchased, and a greater awareness of the importance of dietary diversity and nutrition. In cases where surplus vegetables are produced, they can be sold to neighbours or informal markets, thus providing an additional source of household income.



# Climate change impacts on food garden vegetable production

Climate change will impact directly on food gardens through the resources that are needed (land, soil, water), changing threats of pests and diseases during plant growth and after harvest, the changing risks of extreme weather events, and sea level rise (in some areas).

In many urban areas there is fierce competition for land between housing needs and developers. Patches of land that are used for gardening are often sandy or rocky and infertile, and growing vegetables in such poor soils is challenging. In the future, access to more fertile soils for food gardening will become increasingly difficult as the value of land rises in response to scarcity, and good agricultural land in areas less negatively affected by climate change will become less accessible to poor communities.

The need for added soil nutrition (in the form of compost and organic fertiliser) is expected to rise with rising temperatures. Warmer soils lose their fertility more quickly than cooler soils. An additional threat to soils is the projected increase in heavy rainfall events, which can wash away the topsoil. Good soil management and conservation, including practices such as mulching, is a very important component of adaptation to climate change.

Across most of the Western Cape, water resources are already stressed. Climate change is likely to increase this stress through increasing evapotranspiration, more variable rainfall and increasing crop water demand. Food gardeners in the Western Cape are already relying on irrigation in some form or another, and will be increasingly less able to rely on predictable rainfall. The amount of water needed daily per plant will increase. Production methods should focus increasingly on maintaining a continuous organic soil cover. This not only protects the soil physically from erosion and contributes to fertility management, but also reduces the evaporation of water from the soil.

One of the most difficult challenges facing food gardeners is how to prevent and manage outbreaks of pests and diseases. These include belowground pests (e.g. cutworm, moles and dune rats), and aboveground pests (snails and slugs, caterpillars, red spider mite, aphids, mealybugs, beetles and weavils, amongst others). Diseases such as downy mildew and black spot, amongst other, can also cause major damage, such as downy mildew, black spot and other fungal diseases. Commonly grown vegetables such as potatoes and tomatoes are susceptible to many threats.

Increases in temperature, changes in rainfall amounts and seasonality, and higher humidity at critical times, caused by climate change, could increase the frequency and intensity of pests, diseases and weeds, leading to crop losses. Winters in the Western Cape are wet with mild temperatures, and are conducive to the development of a wide range of plant diseases. Gradually increasing winter temperatures are likely to allow some of the diseases to become even more problematic. It is also suggested that high rainfall during spring and early summer will have a pronounced effect on the invasion of weeds, and pests and diseases could increase their numbers more quickly in this period. In addition, some pests and diseases can be expected to become established in areas where they do not currently occur, and species not currently encountered in the Western Cape could migrate here from the north-eastern parts of South Africa as the climate changes. The costs associated with plant protection can thus be expected to increase.

Warmer and more humid conditions caused by climate change could cause freshly harvested produce to rot more quickly. This is particularly problematic for poorer communities who have limited access to cold storage facilities.

One of the most important risks of extreme weather to food gardening is heavy rainfall and flooding, often combined with driving winds. This is attributable to a number of factors which include the high water table in some areas (especially the Cape Flats), lack of drainage infrastructure in informal settlements, and the highly exposed nature of many of these gardens in areas with few trees and other plant cover. Climate change is also leading to sea level rise, which will increase the risks of flooding in some areas. The climate projections show that more heavy rainfall events can be expected across the province in future.

Another area of great concern is the threat of reduced access to water during droughts, or the increasing cost of water associated with the increasing scarcity expected in the Western Cape. Especially in the western parts of the province, decreasing rainfall is expected, which, together with increasing temperatures which cause greater evaporation, and this could reduce the supply of water to rural and urban users. It is to be expected that the cost of municipal-supplied water will rise, affecting the many food gardeners who rely on this source of water. Water quality is also becoming a challenge in some areas where urban pollution is impacting on groundwater.

Very hot temperatures and prolonged heat waves are projected to become more frequent and more intense in future. This poses a threat to many aspects of vegetable farming, since it disrupts the timing and speed of growth and reproductive processes (e.g. seed germination, fertilisation, time to harvest). Some produce, such as tomatoes, are also prone to suffering sunburn when extreme temperatures are experienced. Generally, the quality of produce is often compromised and it does not last long after harvest.

# Key actions which food gardeners can implement

What are key actions which community and home food gardeners can take to be able to respond effectively to existing climate risks and projected climatic changes? The following priorities can be highlighted:

**1. Best practice management of soil resources.** An organic approach to soil management can be highly suited and beneficial, since working with nature provides resilience to stressful conditions. This means that a permanent layer of organic material (mulch, or compost made from organic kitchen and garden waste) should always cover the soil. This provides nutrients, increases positive biological diversity within the soils (e.g. organisms which can increase soil fertility and control pests), and results in less water being lost through evaporation. Organic production is well suited to poorer communities since input costs are lower. Another important aspect is the establishment of a drainage system (even a simple system can be very effective) and good preparation of soils, before the crop is sown or planted.

**2. Management of pests, diseases and weeds.** The benefits of good crop rotations, as a way to manage pests, diseases and weeds, are well-known. In addition, gardeners should increase the monitoring of pests and diseases in order to take early steps to prevent whole-scale outbreaks. As far as possible, natural predators (e.g. ladybugs) should be encouraged to keep crop pests in balance. In some cases it may be necessary to use targeted chemical interventions, and there are now good organic products available for this purpose. Any new pests or diseases should be discussed with extension officers, non-governmental organisations (NGOs) and community-based organisations (CBOs) working in this area.

**3. Use non-municipal and sustainable sources of water and innovate with simple irrigation systems.** Food gardens can be irrigated using tanks for rainwater harvesting, preferably also connected to roofs. Other possible sustainable sources of quality water should be investigated, for example 'grey' water, as long as it is clean enough for use on vegetables. Water quality should be carefully monitored in areas where this is becoming a problem. Water should be used as efficiently as possible. Simple home-made drip irrigation systems can provide just the right amount of water to each plant at ground level, in accordance with its daily needs. These can be made using plastic bottles and tin cans. Shade netting is also effective in reducing the plant water needs.

**4. Try to prevent damage caused by extreme weather.** Food gardens should be protected from flooding in whatever way is possible in a given area. In some cases, residents should lobby for improved area-wide drainage infrastructure. If this is not yet feasible, structures can be built underneath and around the food garden to facilitate drainage of excess water, especially where this interacts with a high groundwater level. If possible, plant hardy trees around the garden to act as windbreaks and reduce the flow of run-off water. Shade netting can be very effective in preventing heat stress and sunburn, and reduce the water needed, but this can increase the incidence of pests and diseases which need to be carefully monitored.

**5. Take an active part in accessing information** and communicating regularly with those who can help, e.g. extension officers, other government agencies, NGOs, CBOs, and other experienced members of the community. Encourage these support groups and individual partners to find out more about climate change and how it is expected to impact on the area in which you live, and the crops you grow.

Further information on all these responses and opportunities, and others, can be found on the GreenAgri information portal: <http://www.greenagri.org.za>



## Key actions for government, NGOs and CBOs

Programmes initiated and conducted by government agencies, NGOs and CBOs to support the development of food gardens across the province play a very important role in helping poor communities become more food and nutritionally secure. There are many challenges facing these programmes and climate change is not often recognised as a priority. However, a successful climate change response for the agricultural sector of the Western Cape should not ignore the climate risks which food gardens are exposed to. The beneficiaries can be regarded as a vulnerable group, and as such deserve to be empowered with respect to becoming more climate-resilient.

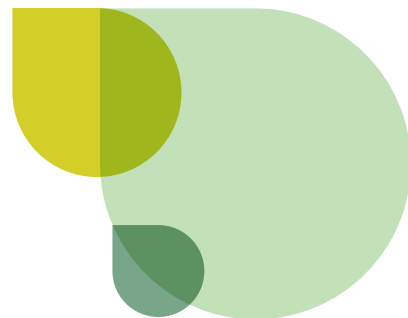
The most important action for government, NGOs and CBOs is the training of their staff to better understand the nature of climate change and how it represents a threat to food gardens and the communities who tend them. This training should be context-specific i.e. urban or rural, different agro-climatic zones, gardens of various sizes and for differences scales of production. Secondly, garden design and operation should incorporate the assessment of climate change and what steps should be taken in a particular context to provide protection. Many good practices, such as mulching and the use of compost, or the installation of rainwater tanks, are already becoming mainstreamed. However, more can be done. Finally, government, NGOs and CBOs should collaborate more, and share experiences of best practice. A common message should emerge around the need to establish food gardens which are climate-resilient and self-sufficient.

In the context of food insecurity and a dominant food system which currently does not work well for impoverished communities, a better understanding is required of the relationship between local commercial and smallholder food production, the need for subsistence agriculture (including food gardens), and the food system. A systems approach should be taken to ensure that the overall response to the threats and impacts of climate change is holistic and not limited to site-specific technological solutions for different farming systems.

Under the right conditions, food gardens can become an important component of a food security strategy under conditions of climate change, but this may not always be the case. In an urbanising South Africa, it is important to acknowledge that food gardens should by no means be the sole strategy for household food security. It is also critically important to protect arable land in areas within and close to city and town boundaries for the larger-scale production of vegetables. These peri-urban agricultural areas play a vital role in urban food systems by providing affordable and nutritious food to poor urban households.

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