Vulnerability and impact of climate change on horticultural crop production in the Western Cape Province, South Africa

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The Western Cape has been identified as highly vulnerable to projected climate change within a global and national context. Rising temperatures are already detectable and are predicted to increase by a further 1–2 °C within the next 30 years, together with decreasing rainfall especially in winter. Agricultural production will experience a primary impact with resulting socio-economic implications. Horticultural crop production, which includes stone and pome fruit, table and wine grapes, citrus fruit, and fynbos cutflowers and other fynbos products, contributes about 60% to total income from agricultural commodities in the province. Some of these commodities are reliant on irrigation whereas others are rain-fed, and some are more sensitive to increasing temperature than others. Agriculture is particularly sensitive to inter-annual climatic variability and the risks posed by extremes in rainfall and temperature. An analysis of possible impacts on horticultural crop production was conducted on a sub-regional basis throughout the Western Cape Province. Adaptation options were identified, and the most vulnerable crops and sub-regions prioritised. Needs and opportunities for further research were identified.

doi:10.1016/j.sajb.2007.02.142

Seasonality of precipitation and species distribution in a widespread North American ecosystem: Insights from ecophysiological studies

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Anthropogenic climate change is likely to alter patterns of precipitation globally. The consequent changes in seasonal moisture availability may have a large impact on species distribution and net ecosystem productivity. This is especially the case in water-limited ecosystems, where small changes in the water balance may have large ecological impacts. Currently there is little understanding of the mechanistic determinants of species sensitivity to seasonal moisture availability. An ecophysiological understanding is required in order to improve our predictions of species sensitivity to climate change. Using the widespread piñon–juniper woodlands of western North America as a model system, we examined the differential sensitivities of two dominant species: *Pinus edulis* (Colorado piñon), and *Juniperus osteosperma* (Utah juniper) to seasonal variations in moisture availability. Co-occurring *P. edulis* and *J. osteosperma* differed in their sensitivity to seasonality of precipitation. *P. edulis* utilized summer precipitation to a greater extent than *J. osteosperma*. Ecophysiological investigations indicated that the differential responses of these species could be explained by differences in (1) the hydraulic properties of xylem, (2) the regulation of water potential, (3) rooting distributions and (4) the ability to refill embolized root xylem following a moisture pulse. The different sensitivities of these species to seasonal moisture availability were correlated with their geographical distributions. This suggested that specific ecophysiological adaptations to seasonality of precipitation play an important role in species biogeography in piñon–juniper woodlands. Additionally, piñon–juniper woodlands are unlikely to respond uniformly to changes in seasonality of precipitation. Rather, the composite species will be independently affected as has been suggested by the palaeoecological record. This approach could be extended to other ecosystems to improve our understanding of species range changes, woody-plant encroachment and ecosystem productivity under altered climate.

doi:10.1016/j.sajb.2007.02.143

Trade, bulb age and impacts on *Merwilla plumbea*

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Bulbs of *Merwilla plumbea* (formerly *Scilla natalensis*) are harvested from the wild and commercially sold for use in traditional medical systems. In 2006, it was estimated that 2.1 million wild harvested *M. plumbea* bulbs were sold in the Durban and Johannesburg medicinal plant markets, with a local retail value of R3.87 million. This study shows for the first time that accurate age estimates can be derived from counting persistent bulb scales and that *M. plumbea* bulbs take at least 15 years to get to the preferred harvestable size. Where land and resource tenure is weak, frequent harvest has a high impact on *M. plumbea* populations. Although this endemic southern African species is still abundant along the Drakensberg Mountain escarpment in South Africa, there are conservation concerns about this species at the margins of its range in Swaziland and in Lesotho. With increasing trade in herbal medicines, the complex interplay of harvest impacts,