Section 17.5

PAPAYA: OPTIMUM GROWTH AREAS

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Background Information

- Papaya, or pawpaw (*Carica papaya*; **Photos 1** and **2**) is a tropical fruit grown widely between latitudes 32°N and S.
- High in Vitamin C, papaya is indigenous to tropical America (ARC, 2005).
- This fruit, initially brought to the attention of Europe around 1520, was introduced to South Africa in seed form by Jan van Riebeeck in 1652, but only grown commercially in the Lowveld of Mpumalanga for the first time in the early 20th century by a Captain Elphick (ARC, 2005).

Site Requirements for Papaya

- Papaya needs relatively little water in the rainy summer season in South Africa, but if irrigated every 2 weeks in the dry season it is well adapted to hot, dry areas as the fruit then matures early and is then highly palatable owing to its high sugar content (Smith, 1998).
- Papaya has high heat requirements, with average daily temperatures for optimum growth between 20°C and 30°C.
- Under such hot conditions the fruit is, however, prone to sunburn when leaf areas are reduced (Smith, 1998).
- This fruit is sensitive to frost, although it can tolerate light frost if protected from cold wind (ARC, 2005).
- Its growth is retarded when mean daily temperatures are below 12°C, and the average temperature of the coldest month should be > 8.5°C (Smith, 1998).
- Papaya trees do best in well drained loams with a 10 - 30% clay content and soil depths > 0.6 m.
- When soils are too sandy, more frequent irrigation applications are required, while in heavy soils root penetration is resisted (Smith, 1998).
- The trees are disease prone when soils are wet.

Production of Papaya in South Africa

- Papaya is cultivated commercially mainly in the Lowveld of Mpumalanga, which accounts for ~ 61% of the gross farming income from papaya in South Africa, and Limpopo at 37%, with the remaining 2% from KwaZulu-Natal (Statistics SA, 2002).
- Of the hundreds of varieties of papaya worldwide, the most important cultivars grown in South Africa are Af-1, Sunrise Solo (a papino), Tainung #1 and 2, FI-2 and Honey Gold, with the latter developed by horticulturalists at the University of KwaZulu-Natal.
- According to NDA (2005) total production is of the order of 20 000 to 25 000 t per annum - a production which has remained more or less unchanged since 1975.
- Approximately 70% of papaya finds its way to the National Fresh Produce Markets, down from ~ 75% prior to the 1990s (NDA, 2005).

Distribution Patterns over South Africa of Climatically Optimum Growth Areas for Papaya

Based on the overlapping areas of the maps of the four criteria when they were superimposed over one another, areas in KwaZulu-Natal, central Swaziland and the Lowveld of Mpumalanga/Limpopo are identified as

Determination of Climatically Optimum Growth Areas for Papaya in South Africa

Based on the expert knowledge of Bower (2005) and Moll (2005), climatically optimum growth areas were determined according to the following four basic criteria:

- *Criterion 1*: Heat units (base 12°C) should exceed 2 000 °days per annum;
- *Criterion 2*: Optimum areas should have a low frequency of 4 consecutive days with maximum temperatures > 36°C;
- *Criterion 3*: Monthly means of daily average temperatures in December and January should be 23°C - 30°C; and
- *Criterion 4*: Optimum growth areas should have a low frequency of 4 consecutive days with minimum temperatures < 17°C.

Using the 50 year time series of quality controlled daily maximum and minimum temperatures generated by Schulze and Maharaj (2004; cf. **Section 2.1**) at a spatial resolution of 1 arc minute (i.e. 1' x 1' of a degree latitude/longitude), the above four temperature based criteria were first mapped individually and then superimposed to determine the climatically optimum growth areas of papaya in South Africa.

climatically optimum growth areas. Rather unexpectedly, a significant potential growth area is identified in the North West province.

There is a high likelihood that the four criteria selected may be revised by experts in the near future.

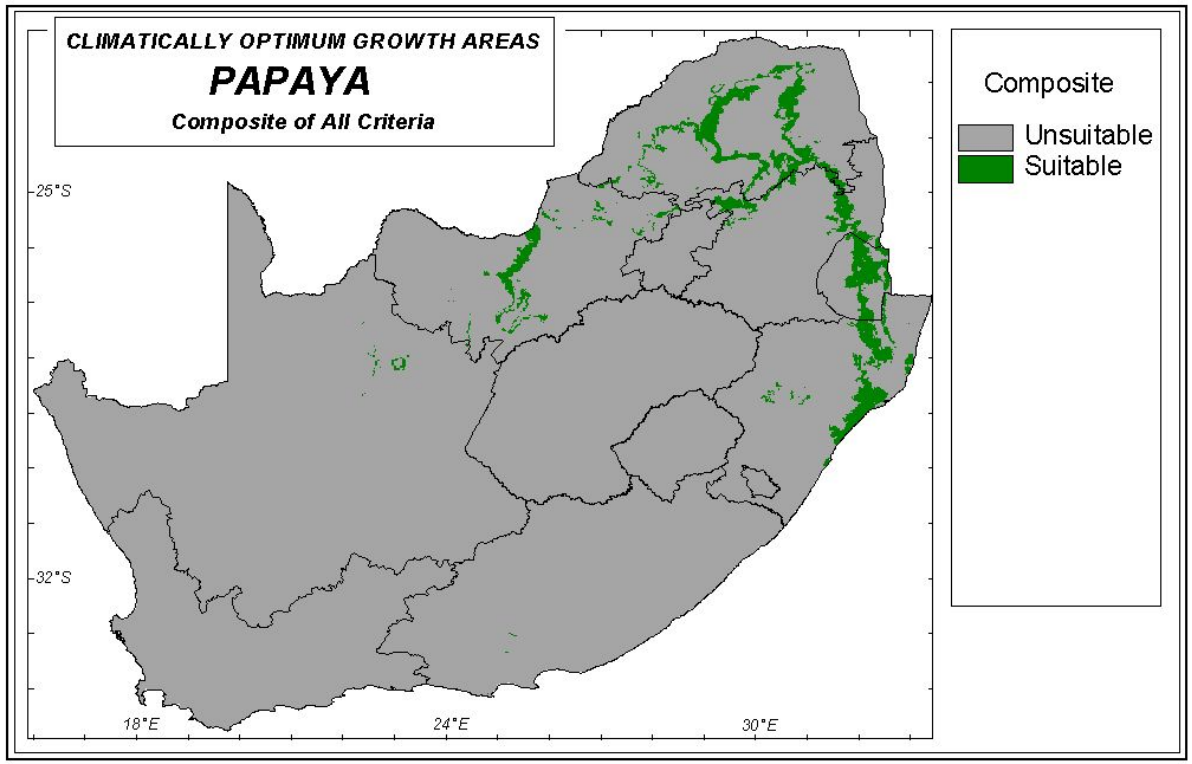
References (In the sequence in which they appear in this Section, with the full references given in Section 22)

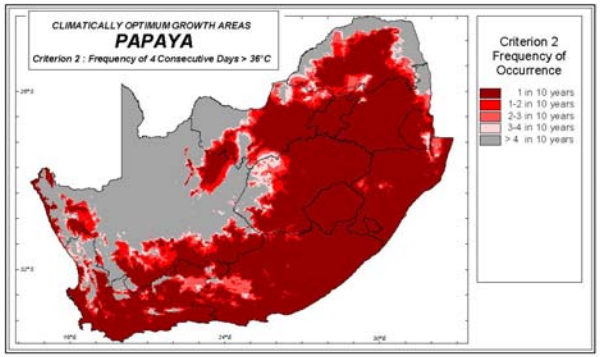
1. ARC (2005)
2. Smith, J.M.B. (1998)
3. Statistics SA (2002)
4. NDA (2005)
5. Bower, J.P. (2005)
6. Moll, J. (2005)
7. Schulze, R.E. and Maharaj, M. (2004)
Photo 1 - http://www.phytomania.com/papaye2comp.jpg
Photo 2 - http://www.vanheygen.com/Silhouette/images/papaya.jpg

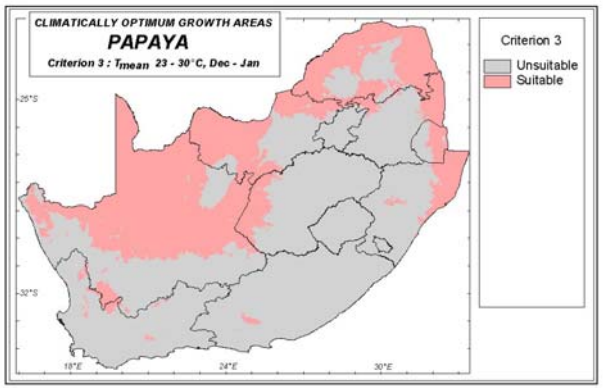
Citing from this Section of the Atlas

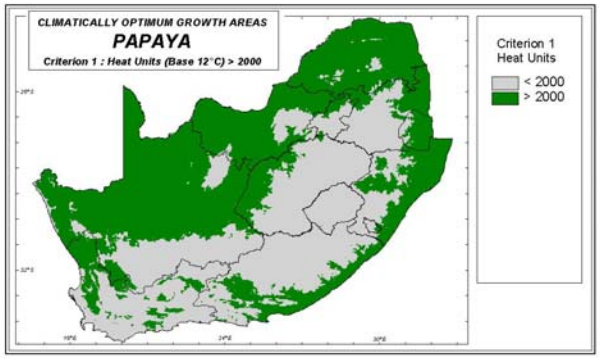
When making reference to this Section of the Atlas, please cite as follows:

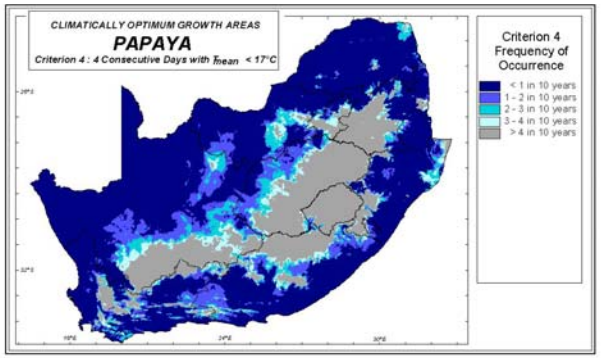
Schulze, R.E. and Maharaj, M. 2007. Papaya: Optimum Growth Areas. *In:* Schulze, R.E. (Ed). 2007. **South African Atlas of Climatology and Agrohydrology**. Water Research Commission, Pretoria, RSA, WRC Report 1489/1/06, Section 17.5.


CLIMATICALLY OPTIMUM GROWTH AREAS
PAPAYA
Composite of All Criteria
25°S
32°S
18°E
24°E
30°E
Composite
Unsuitable
Suitable


CLIMATICALLY OPTIMUM GROWTH AREAS
PAPAYA
Criterion 2 : Frequency of 4 Consecutive Days > 36°C
Criterion 2
Frequency of
Occurrence
1 in 10 years
1-2 in 10 years
2-3 in 10 years
3-4 in 10 years
> 4 in 10 years


CLIMATICALLY OPTIMUM GROWTH AREAS
PAPAYA
Criterion 3 : Tmean 23 - 30°C, Dec - Jan
Criterion 3
Unsuitable
Suitable


CLIMATICALLY OPTIMUM GROWTH AREAS
PAPAYA
Criterion 1 : Heat Units (Base 12°C) > 2000
Criterion 1
Heat Units
< 2000
> 2000


CLIMATICALLY OPTIMUM GROWTH AREAS
PAPAYA
Criterion 4 : 4 Consecutive Days with Tmean < 17°C
Criterion 4
Frequency of
Occurrence
< 1 in 10 years
1 - 2 in 10 years
2 - 3 in 10 years
3 - 4 in 10 years
> 4 in 10 years