

Forecasting Outbreaks of the Brown Locust Using Rainfall Estimates, NOAA Images and SPOT Vegetation Images

Harold Weepener⁽¹⁾, Margaret Kieser⁽²⁾, Anneke Thackrah⁽¹⁾

⁽¹⁾ARC-Institute for Soil, Climate and Water, Private Bag X79, Pretoria, 0001, South Africa.

WeepenerH@arc.agric.za

⁽²⁾ ARC- Plant Protection Research Institute, Private Bag X134, Queenswood 0121, Pretoria, South Africa. KieserM@arc.agric.za

Previous research into modelling outbreaks of the Brown Locust (*Locustana pardalina*) was conducted by the Agricultural Research Council (ARC) and Greenwich University from July 2000 to July 2003. The aim of this study is to present a clear outline of the model to define whether there will be a large outbreak or a plague and to benchmark the outcome of the model against additional actual reports.

The Brown Locust is endemic to the semi-arid Karoo areas of South Africa and southern Namibia, and population fluctuations are closely related to climatic and habitat variability. The high outbreak frequency zones of the Brown Locust in South Africa were first defined in 1937 by Faure and Marais and subsequently confirmed by Lea in 1958 [1]. Due to a significant westward shift in the eastern boundary between 1937/1958 and 2001, the area was redefined by Kieser in 2001. Brown locust feeds mainly on grasses and staple foods (maize, wheat) and have the potential to devastate agriculture throughout Southern Africa.

Rainfall estimate surfaces and vegetation condition surfaces are used to predict locust outbreaks in a long-term (18 month) scenario. The Normalized Difference Vegetation Index (NDVI), calculated from NOAA and SPOT Vegetation images, is used for vegetation condition. The model is based on four conditions that have to be true in order to have a large outbreak or plague.

Condition 1

If the quantity of vegetation was sufficient in the late summer, two years earlier, then there will be a plague condition.

Condition 2

If the winter rain two years earlier is too high, then no plague will develop.

Condition 3

If sufficient rain is received in the early summer of the current season AND there were plague conditions before, then a plague condition will develop.

Condition 4

If sufficient rain is received in the late summer of the current season then a plague will develop.

The model gave a correct forecast for 13 of the 15 years from 1992 to 2006.

References

- [1] KIESER ME, THACKRAH A. and ROSENBERG J, 2002, *Changes in the outbreak region of the brown locust in southern Africa*. Grootfontein Agric, Vol.4, 2002, pp 20-23.