

UNIVERSITÄT HOHENHEIM

INSTITUT FÜR AGRARTECHNIK
IN DEN TROPEN UND SUBTROPEN

Prof. Dr. K. Köller

Studienarbeit

Allgemeine Agrarwissenschaften

Fachrichtung Agrartechnik

cand. Bsc. Dirk Ansorge

Methods to Determine Drought Stress and their Suitability
for Application in Lychee Orchards

This work has been financed by the
Eiselen Foundation Ulm

SUMMARY

This Bachelor Thesis focuses on answering questions about the gas exchange values and leaf water potential in lychee. Investigations with respect to different irrigation methods, the variability in lychee orchards, the influence of measurements on leaves, and the suitability of the used measurement devices (CIRAS and Scholander Pressure Probe) in a lychee orchard close to Chiang Mai, Thailand were carried out. Measurements were done close to harvest.

In the course of six days gas exchange values and leaf water potential were measured on single trees exposed to different irrigation methods. To investigate variability in lychee 13 trees in different irrigation regimes were observed three times.

Daily gas exchange rates show an increase in the morning and afterwards a decline until sunset. Leaf water potential is correlated to air-to-leaf water vapor deficit. Leaf water potential decreases after sunrise until the early afternoon when maximum air-to-leaf water vapor deficit is reached. Afterwards it increases again.

Due to too much plant available water in the soil no differences between irrigation methods were detected. Within one tree there differences occurred between two days of measurement.

The lychee orchard showed significant variability in gas exchange values correlated with the individual tree, irrigation method, day of measurement, and exposition. All those except exposition had no significant influence on photosynthesis rate, too. However, the differences observed for different irrigation methods show patterns which can only be explained if the available water in reality has no clear connection to the irrigation methods, but rather depends on the time elapsed since the last irrigation.

Temperatures around 35°C did not affect photosynthesis rate and max photosynthesis rate was reached between 800 – 1000 $\mu\text{mol m}^{-2} \text{s}^{-1}$ photosynthetic active radiation.

The impact of regular measurements on the same leaf was shown with CIRAS in course of two days. Taking measurements in 45 min intervals on one leaf affects leaf response.

CIRAS was working properly, however an explicable grouping of data may possibly be caused by this device. The Scholander pressure probe always gave reasonable results and working with this device was really reassuring.