Tania Walisch
Environmental Sciences (Hons)
Matric. No.: 9358516

Report: Work experience at Rapolano Terme from July 14th to August 12th 1997

Brief description of the site and the ongoing projects

The site is located next to vineyards and sunflower fields in a valley in the vicinity of the small town of Rapolano Terme in Tuscany, Italy. The Institute of Agrometeorology and Environmental Analysis (IATA) in Florence, which is part of the Italian National Research Council (CNR) rents the site from a local farmer. There is a weather station that is connected to three data loggers kept in the trailer and in the 'barracone' to store the continuous and automatic record of data in the field. There were five projects going on in the field and one project in the farmer's vines right next to the field. Each project has an allocated space in the field.

Most of the experiments in the field involve free air CO_2 enrichment systems (FACE). Ambient air is drawn into a ventilator and enriched with CO_2 to nearly double the natural CO_2 concentration. The CO_2 is transported to the field in plastic tubes from a CO_2 source a few kilometres away. The CO_2 enriched air is blown into a plastic irrigation tube (pierced with holes) which forms a ring. The hypothesis is that inside the ring there is a constant uniform distribution of CO_2 enriched air. An infrared gas analyser is placed in the centre of each ring and measures the CO_2 concentration at regular short intervals. These data are transferred to and saved onto one of the data loggers in the field. In some of the rings the spatial CO_2 distribution over time is determined by an automatic record of the CO_2 concentration at several fixed, equally spaced locations. Besides the FACE rings there are the control rings which hold a natural CO_2 concentration. Monospecific crop stands are grown inside these rings. The aim of the experiments in Rapolano is to compare growth, development, leaf area index, photosynthesis and many other physiological factors of crop plants of the same species growing inside FACE rings and in control rings. The projects I assisted involved vine (*Vitis vinifera* L.), castor oil plant (*Ricinus communis* L.), wheat (*Triticum aestivum* L.), and two clones of poplar (*Populus sp).* The *Ricinus* project is part of the PhD research of a postgraduate at the University of Bayreuth. The CNR-IATA researchers are carrying out the other projects.

Furthermore a field trial of transgenic potato had been initiated. There are several transgenic potato types each producing a certain amount of fructans, a diabetic alternative to starch. The growth, development and physiology of these are being studied under a low and a high irrigation regime.

There was a permanent team of 4 people, Christina Mirenda, Fabio Piezini, Toufic from Florence and Frauke Muller from Bayreuth, working daily in the field. Fabio works on the poplars for Dr Raschi, Christina and Toufic are working on the potatoes for Dr. Franco Miglietta and Dr. Enzo Magliulo. They have just finished their degree in agriculture and they carry out regular measurements and do check ups of instruments as well as look after the plants. Other people would come for just one day every so often and take measurements. The Italian supervisor Dr. Franco Miglietta usually comes once per week to check the functioning of the FACE devise, discuss problems and organise the work schedule.

Outline of my work in the field

Ist week: 14/07 - 20/07

Acclimation to hot temperatures and insight into the projects through helping with various jobs:

-harvesting the wheat; each plant or each row was put in a separate paper bag, this for FACE and control rings
-weeding and watering the transgenic potato field
-assistance with Photosynthesis measurements (CIRAS) on *Ricinus communis* plants
-assistance with vine leaf counting on selected plants in FACE and control rings during one morning
-Familiarisation with the infrared gas analyser calibration
-visit to the CNR IATA centre in Florence and demonstration of how to use the LAI 2000 instrument for the determination of leaf area index and quick instruction on the use of the infra red gun for the measurement of leaf temperature

2nd and 3rd week: 21/07-3/08

The German assistant and I experimented with the LAI2000 on the *Ricinus* field and after having decided on a method for measuring LAI, we collected data in each ring at dawn of two consecutive evenings to avoid direct sunlight.

Dr. V. Magliulo, a researcher from Naples stayed for a few days in Rapolano. He wanted to compare the leaf temperature of FACE and control *Ricinus* and asked me if I could take 5 to 10 measurements with the infra red thermometer in each of the four rings five times a day at fixed times on sunny days only. I carried on doing this until the harvest of the *Ricinus* plants two weeks later.

The PhD student from Bayreuth arrived with an assistant. She came to finish off her experiment and I helped her team whenever I could. She came to collect phloem sap and leaf disc samples which were frozen immediately to be preserved until they would reach the laboratory in Bayreuth, where sugar content and secondary metabolites would be determined. Sample collection would be at regular intervals over a whole day. Then 5 plants of each plot were harvested. Each leaf, stem and inflorescence was cut and put into a separate paper bag for dry weight determination. Mid ribs of leaves were measured for growth analysis. The surface of each harvested leaf was measured.

I also helped with maintenance tasks such as watering, weeding castor oil plants, poplars or potatoes.

4th week: 4/08 - 12/08

I assisted Fabio with the growth analysis on the poplars, which involved measuring mid rib length of leaves and stem diameter at the ground, at one meter and at two meters of the selected trees in each ring.

I was shown how to use the pressure chamber and I assisted with establishing a pressure-volume curve for the example of poplar leaves.

Several poplars were harvested in each of the two rings. Leaf area was determined. Leaves were separated from stems for dry weight determination.

The harvested wheat was being weighed.

Personal comment

My experience in Rapolano was very positive. I got an insight into many measuring techniques and instruments used in Ecophysiology. My many questions were always answered and I felt I became part of the team very quickly. I appreciated the learning by doing method of instruction in the field. In fact after I had been shown something I was asked to do measurements which would contribute to the results of the experiment in question. I definitely enjoyed the experience of teamwork and learnt a lot from it. Finally I regret not having been able to stay longer than a month, which is definitely too short to get a full taste of project work and of a foreign country, its people and their way of life.

Many thanks to:
I want to thank Dr Graham Russell for his advice, Dr Antonio Raschi for having invited me to Italy and Anna, Christina, Fabio, Frauke and Toufik for their patience and their hospitality; Claudia Grimmer for letting me work with her project team, Dr. Vicenzo Magliulo for his private lecture on the significance of leaf temperature and Dr. Franco Miglietta for his jovial welcome. I also wish to thank the James Rennie Bequest for having contributed towards my travel expenses.