James Rennie Bequest Fund
Report of Travel

Salvador Hernandez
Ph.D. Student
Institute of Ecology And Resource Management
The University of Edinburgh

Visit to the Natural Resource Ecology Laboratory, Colorado State University at Fort Collins, CO. USA in October, 1998.

The aims of my visit were 1) to present my research project and get feedback from researchers in The Natural Resource Ecology Laboratory (NREL) and 2) to learn about the methods used to parameterise the CENTURY model. CENTURY is a simulation model of soil organic matter that was built in NREL to describe, predict and understand biogeochemical processes in ecosystems, including agroecosystems at time scales from one year to thousands of years with monthly time steps.

My visit took place between Oct. 17 and 29, 1998. During my time at Fort Collins I met Dr. William Parton, who is one of the project leaders, and some of his co-workers as well as PhD students who are involved in particular research projects regarding the characterisation of different soil organic matter fractions. I also spent time learning how to initialise the CENTURY model with site-specific input files for weather, crops and crop management according to my own research project. I developed a Schedule which is the file that indicate to CENTURY how to simulate a set agroecosystem. Preliminary runnings of the simulation model were performed and will be discussed with Dr. Parton once the information is complete and organised.

My meetings with Dr. Parton concerned the schedule of my visit, an explanation of my research and feedback and discussion on the use of CENTURY to simulate the long term soil dynamics of the system I am dealing with. We also exchanged ideas on root modelling and nutrient competition in inter-cropping and agreed to collaborate on using simulation models to investigate the potential of a tree-crop system to maintain and eventually improve soil productivity of grazed pastures. We hope to co-author a paper on this issue after further refinement of the initialisation of the model for the particular conditions of my research.

Other meetings during my visit were with: Dr. Denis Ojima, who also contributed to the development of the CENTURY model, he is currently working on modelling plant communities and effects of elevated atmospheric CO_2 concentration on biomes and ecosystems world-wide; Dr. Dan Binkley (nitrogen fixation and nitrogen assessment); Dr. Keith Paustian (modelling agroecosystems and the use of the CENTURY model) and the programmers who gave me advice during my work with the CENTURY model: Cindy Keough and Melanie Hartman.

With respect to laboratory methods, I met Romulo Menezes (PhD candidate, silvopastoral systems in dry tropics). He is assessing soil microbial activity based on the emission of CO2 during short and long term incubations. Core samples of soil are incubated in sealed jars from which samples of the air surrounding recovered and injected into a gas chromatography autoanalyser. The method is easy and allows large amounts of samples to be incubated simultaneously with no significant delay on readings. This method can be used in my research to produce some insights on the explanation for the distribution of roots in my experiment.

Serita D. Frey (PhD candidate, soil microbial activity) and Johan Six (PhD candidate, soil aggregates, meaningful soil fractionation). They are dealing with physical and chemical properties of soils that can affect soil organic matter activity. The effect of texture and clay mineralogy, as well as the presence of aggregates condition the mineralization of soil organic compounds. The techniques they use may not be of direct use on my research but are important on the understanding of soil biological processes.

Ana Salas (PhD candidate, Particulate Soil Organic Matter, nitrogen and phosphorus assessment). Ana is studying the dynamics of nitrogen and phosphorus in tropical oxisols, ultisols and andosol from the

central prairies in Venezuela. Hers research is on the use of crop residues to improve the availability of phosphorus to the crop by reducing P chelation y highly acidic Al/Fe rich soils. She separates the fraction between 500 and 52μm (which correlate with particulate organic matter); in this way it is possible to directly estimate an active fraction of soil. Different forms of N and P (organic, mineral, total) are assessed spectrophotometrically.

Based on the activities listed above, I consider that the objectives of my visit to NREL were achieved, for which I want to express my gratitude to the James Rennie Bequest Committee and to the personnel and students in the Natural Resource Ecology Laboratory for their support and the time they spent with me.

Sincerely

Salvador Hernandez
Ph. D. Student
Institute of Ecology and Resource Management
The University of Edinburgh, Scotland