PRESIDENTIAL EARLY CAREER AWARD FOR SCIENTISTS AND ENGINEERS

An NRI nominee received a Presidential Early Career Award for Scientists and Engineers in 1997. These Presidential Awards are intended to recognize the finest scientists and engineers who show exceptional potential for leadership at the frontiers of knowledge during the twenty-first century. This year's awardee from the NRI was Dr. Sara L. F. Sunden at the University of Illinois, Urbana-Champaign.

Dr. Sunden held research appointments at USDA/ARS/MARC and at the University of Iowa prior to her move to Illinois. Currently an Assistant Professor in the Department of Animal Sciences, Dr. Sunden received training in animal genetics at Iowa State University and at Texas A&M University. Dr. Sunden has identified a marker gene (one that is linked to the gene of interest) for the gene resulting in a carcass condition called "acid-meat". This marker gene is also linked to the positive characteristics of tenderness and rapid growth. The ultimate goal of Dr. Sunden's research is to sort the genetic components and isolate the genes associated with each of these economically important traits.

NSF/DOE/NASA/USDA JOINT PROGRAM ON TERRESTRIAL ECOLOGY AND GLOBAL CHANGE (TECO)

The goal of the TECO Program is to improve the understanding of how species, ecological characteristics and processes, and ecosystems are related to global change, and to enhance capabilities to predict consequences of multiple influences. Research is also sought that will increase the capability for extending experimentally-derived information to landscape and larger scales. Multidisciplinary proposals are encouraged involving companion experimental, retrospective, and modeling efforts in the following areas: 1) CO_2 and other trace gases related to climate change, 2) consequences of global change on ecosystems, and 3) ecosystem feedbacks to global change. All proposals were reviewed jointly by the participating agencies. The awards listed below were supported by the NRI.

9706396 Elevated CO_2 and Limited Water Supply Effects on Carbon Processes and Sequestration in a C4 Grass (Sorghum) Ecosystem

Leavitt, S.W.; Thompson, T.; Matthias, A.; Williams, D.; Ottman, M.; Roth, B. **Grant 97-35109-5065**

University of Arizona
Department of Soil, Water and Environmental Sciences **$505,700**
Tucson, AZ 85721 **3 Years**

Atmospheric CO_2 concentration has been increasing over the past 200 years, now about 30% higher than pre-Industrial levels. The response of plants and ecosystems to increasing CO_2 may account for some or all of the "missing" carbon sink in current global carbon cycle models and may help to slow or counteract the future rise of CO_2. Our Free-Air Carbon Dioxide Enrichment (FACE) experiment will explore response of sorghum agroecosystems in open fields to elevated CO_2 concentrations. Sorghum is representative of species with the C4 photosynthetic pathway that dominate many grasslands. Grasslands have large pools of organic soil carbon whose alteration could affect the global carbon budget. Sorghum is a major crop especially important in developing countries and high priority for global change research.

Experiments with sorghum (*Sorghum bicolor* L. Moench) using two CO_2 levels (ambient concentration and ambient+200 ppm) and two soil water levels (ample and limited moisture) will be conducted in 1998 and 1999. Four experimental replicate pairs of "enriched" and "ambient" CO_2 plots (25-m diameter) will be established with computer-controlled CO_2 distribution. Each plot will be further divided into high and low soil water halves.

Overall research will determine growth responses (e.g., biomass, grain yield, and development), water and energy relations (e.g., stomatal conductance, canopy temperature, evapotranspiration, soil water), emissions of soil nitrogen (N), and C-isotope discrimination during C4 photosynthesis. The C4 carbon isotopic composition of sorghum is distinct from organic carbon currently present in the soils and will permit tracing of inputs and losses of this new material in soil carbon pools.

9706390 The Globalization of Anthropogenic Nitrogen Deposition: Consequences for Nitrogen Biogeochemistry and Trace Gas Emissions

Matson, P.A. **Grant 97-35109-4935**

Stanford University
Department of Geological and Environmental Sciences **$381,966**
Stanford, CA 94035-2115 **3 Years**

Human activities have dramatically increased the inputs of nitrogen (N) to ecosystems worldwide. The sources of this new N are the production and use of N fertilizers, inadvertent fixation of N during fossil fuel combustion, and cultivation of N fixing crops, all of which are increasingly occurring in the less-industrialized, tropical regions. Thus, the sources and distribution of anthropogenic nitrogen are rapidly shifting from the more-industrialized temperate regions to a more global distribution. However, our scientific understanding of the consequences of anthropogenic N deposition, for within-ecosystem processes and for environmentally-important emissions of trace gases and leaching of nitrate, is based almost entirely on studies carried out in the temperate zone. In these temperate systems, plant growth is limited by N and there appears to be a time lag before chronic deposition leads to increased losses. Tropical ecosystems may respond quite differently to anthropogenic inputs of N compared to temperate ecosystems. Plant growth in many tropical systems is limited by other nutrients such as phosphorus (P) or calcium; these tropical systems may be less able to retain anthropogenic N and thus may have immediate losses of N to the atmosphere and aquatic systems. To evaluate this possibility, I will examine the responses of N-limited and P-limited forests in the Hawaiian Islands to anthropogenic N inputs. Using previously-established long-term fertilization studies, I will measure rates of soil N cycling, N gas losses, and N leaching in response to long- and short-term additions of anthropogenic N.