2003-4 BASIS CRSP Project Work Plan
August 2003

I. **Research Project Title:** Rural Markets, Natural Capital and Dynamic Poverty
    Traps in East Africa

II. **Collaborating Institutions and Researchers: Cornell University** (Ithaca, NY):
    Dr. Chris Barrett(principal investigator), Dr. Larry Blume, Dr. Bart Minten, Dr.
    Ben Okumu, Dr. Alice Pell; **FOFIFA** (Antananarivo, Madagascar): Dr. Jhon
    Rasambainarivo (co-principal investigator); **International Centre for Research in
    Agroforestry** (ICRAF, Nairobi, Kenya): Dr. Nelson Mango; Dr. Frank Place (co-
    principal investigator), Mr. Justine Wangila; **Kenya Agricultural Research
    Institute** (KARI, Nairobi, Kenya): Mr. Gatarwa Kariuki; Mr. Josephat Cheng'ole
    Mulindo; Dr. Festus Murithi (co-principal investigator), Mr. Collins Obonyo, Mr.
    Martins Odendo; Mr Wesley Ongadi; Mr. James Ouma; **University of Nairobi
    (Department of Agricultural Economics, Kabete Campus)**: Dr. Willis Oluoch-
    Kosura

III. **Dates Covered by Work Plan:** October 1, 2003 – September 30, 2004

IV. **Completion Date:** Tentatively expected to complete September 30, 2004,
    although there is a good possibility that we will request a no cost extension of six
    months to complete the work program, given delays we have experienced thus
    far.

V. **Support:** Core BASIS CRSP funding with matching funds from Cornell
    University and the Rockefeller Foundation. Supplemental funding of $35,000
    jointly from the Rockefeller Foundation and IDRC(Canada) to the University of
    Nairobi, about $5,000 from USAID-Madagascar's Ilo project with Cornell for
    qualitative research and training and field data collection of soil samples, and
    $1.688 million over five years from the National Science Foundation's
    Biocomplexity in the Environment special competition on the Dynamics of
    Coupled Natural and Human Systems to Cornell University and ICRAF for
    biophysical research in three of the Kenya sites and more in depth bioeconomic
    systems modeling.

VI. **Program Overview:** One fifth of the world's population lives on less than a dollar
    a day, and most of those ultra-poor live in rural areas and work in agriculture.
    So the poorest populations in the world rely disproportionately on the natural
    resource base on which agricultural productivity depends. Recent empirical
    studies using longitudinal data find that a disturbingly large share of these
    people suffers chronic rather than transitory poverty. Many appear trapped in a

state of perpetual food insecurity and vulnerability because their poverty and poor market access preclude efficient investment in or use of productive assets.

Furthermore, those caught in a poverty trap may have strong incentives to degrade natural resources, particularly the lands they cultivate and graze, in the course of their ongoing struggle to survive. Partly as a consequence, nearly two-fifths of the world's agricultural land is seriously degraded and the figure is highest and growing in poor areas such as Central America and Sub-Saharan Africa. Such degradation exacerbates pre-existing poverty traps, by discouraging capital-strapped smallholders from investing in maintaining, much less improving, the natural resource base on which their and their children's future livelihoods depend. The resulting degradation of the local agroecosystem further lowers agricultural labor productivity, aggravating the structural poverty trap from which smallholders cannot easily escape. These problems feature prominently today in Kenya and Madagascar and in discussions among policy makers, donors, and NGOs as to how best to design poverty reduction strategies.

The project "Rural Markets, Natural Capital and Dynamic Poverty Traps in East Africa," is being undertaken in collaboration with FOFIFA in Madagascar and with KARI, the University of Nairobi and ICRAF in Kenya with the goal of identifying best-bet strategies to help smallholders escape the interrelated problems of dynamic poverty traps and on-farm natural resource depletion. Degradation of soils and access to factor and product markets are the primary foci. Empirical analysis, based on panel data collection, qualitative (oral history and ethnographic) field work and soil sample collection in seven sites, five in Kenya and two in Madagascar, and context-driven simulation modeling will be used to determine the incidence, severity and causal linkages behind poverty traps, as well as to identify the most promising approaches to reducing the incidence and severity of chronic poverty, especially in ways that support agricultural productivity growth and repletion of degraded soils.

The project is engaging in active discussions with policy makers involved in the Poverty Reduction Strategy Program (PRSP) processes in each country, with the most senior levels of the agricultural research communities in each country, and with local communities about practical, science-based strategies for improving access to productive inputs (including soil nutrients) and markets necessary for poor people to be able to improve their livelihoods over time.

VII.   **Annual Work Plan:**

A. Integration of Activities with Long-Term Project Research Plan: As with the previous two years of this project, the 2003-4 work plan revolves around four classes of activities – data collection, data analysis, stakeholder consultations and training – that are each instrumental to the longer term objectives of the project.

Data collection: In the coming year, our team will collect additional survey data in several of our field sites in Kenya and Madagascar. In Kenya, we will collect further data from our sites in central and northern Kenya in order to maintain the established panel data, focusing in particular on understanding cases of success in asset accumulation in response to shocks and emerging market opportunities. In Madagascar, we will conclude our sampling of soils from each of our survey respondents' plots, creating a baseline of matched economic and soils data to enable future construction of an unprecedented matched panel of socioeconomic and biophysical measurements of continuous variables, and we will undertake a small survey on land contracting as it mediates productivity and poverty dynamics in rural Madagascar.

Data analysis: In the coming year we will complete empirical analysis of qualitative and quantitative data collected over the past two years to explore the core issues of the project: welfare dynamics and how these relate to households' initial conditions and access to markets and technologies, as well as associated changes in soil quality and land and livestock productivity. After a number of unforeseen delays, we have begun the descriptive analysis, including construction of poverty transition matrices, descriptive statistics on all variables, plots of income and asset dynamics and their relation to soil dynamics, etc. More sophisticated inferential work, drawing on both econometric and simulation modeling as well as qualitative case study analysis, has only just begun and will continue throughout the coming project year. Data analysis will generate a regular stream of written outputs in the form of policy briefs, papers submitted for peer-reviewed conference presentation and publication, and student theses. Our analysis will also provide the foundation for active discussion with communities, donors and policymakers about appropriate poverty-reduction strategies for rural Kenya and Madagascar.

Stakeholder consultations: This leads naturally to the third major class of project activities: consultations with stakeholders in the communities we are studying as well as with the policymaking and policy analysis communities at national level in both Kenya and Madagascar. Throughout the project, we seek to establish and maintain a productive dialogue with key decision takers so as both to improve the quality of the design and conduct of the research and to make findings available to interested stakeholders at the earliest possible opportunity for their use and feedback. We will continue the series of annual stakeholder meetings we have begun as well as the annual team meeting. We will also continue the policy research circle discussions that we launched this year with domestic policy researchers in the host countries.

Training: The fourth major class of activities revolves around degree and non-degree training. The project is investing in or leveraging Ph.D. degree training for students at the University of Nairobi (Justine Wangila) and at Cornell University (2 Kenyans: Andrew Mude and Paswel Phiri Marenya, 2 Americans: Christine Moser and Heidi Hogset, 1 Canadian: Marc Bellemare and 1 Malagasy: Jean Claude Randrianarisoa) We are also investing in non-degree training for professional staff in both countries' agricultural research communities, including ongoing web-based bioeconomic modeling instruction for team members and approximately one dozen other researchers from developing countries who have requested access to the course materials. We will deliver, for the second time on Cornell's campus, a two-week bioeconomic modeling course for visiting faculty from the Université d'Antananarivo (Madagascar). Finally, we are investing in post-doctoral training of one research associate (Ben Okumu).

B. Detailed Description of Planned: The accompanying table maps out the timeline for the work plan by activity class and the fiscal year quarter in which we expect to conduct the work.

Data collection: Our original project design called for panel data collection activities to be completed in the 2001-2 project year.   This has proved infeasible in our Embu (central Kenya) site, where we uncovered significant problems with the data set on which we had originally planned to build. This necessitated redesign of the questionnaire and survey methods, ultimately causing us to postpone the first round of data collection until August-September 2002 in that site. The completion of the baseline dataset in Embu took place immediately following the harvest of the short rains season crops, in March 2003. The panel will be formed by a similar exercise conducted in 2004-5, partially funded by the BASIS project. Quantitative surveys have been completed in all other Kenya sites. This includes soil sampling conducted in collaboration with a companion study focusing on soil management and dynamics, funded by NSF. In Madagascar, two data collection / entry activities remain. The final land contracts and productivity survey module will be implemented in the second quarter of the 2003-04 period. Soil samples, collected in September 2003 (from the NSF project funds), will entered and cleaned during the October –December 2003 quarter. All qualitative case study interviews will have been completed in the Madagascar and Kenya sites (except for Embu) by September 2003.

2003-4 Project Work Plan, by Fiscal Quarters

	First Quarter (Oct 1 – Dec 31, 2003)	Second Quarter (Jan 1 – Mar 31, 2004)	Third Quarter (Apr 1 – Jun 30, 2004)	Fourth Quarter (Jul 1 – Sep 30, 2004)
Data Collection	Madagascar soils data entry and cleaning	Madagascar soils data entry and cleaning Madagascar land contracts and productivity survey module	Madagascar land contracts and productivity survey module	Round 2 survey—Embu Data entry and cleaning
Data Analysis	Econometric work on welfare dynamics and relationship to natural capital dynamics Complete analysis of hh- and community-level qualitative data Bioeconomic model parameterization	Econometric work on welfare dynamics and relationship to natural capital dynamics Bioeconomic model parameterization	Econometric work on welfare dynamics and relationship to natural capital dynamics Bioeconomic model parameterization	Econometric work on welfare dynamics and relationship to natural capital dynamics Bioeconomic model parameterization
Consultations	Kenya policy workshop Kenya policy research circle	Annual team meeting (Kenya)	Kenya policy research circle	Kenya local workshops (Baringo, Vihiga, Embu) Kenya policymakers workshop Madagascar policy workshop Madagascar local workshops
Training	Ph.D. – Cornell (Bellemare, Hogset, Marenya, Moser, Mude, Randrianarisoa) Ph.D. – Nairobi (Wangila) Post-Doctoral – (Okumu) Bioeconomic Modeling Web-based instruction	Ph.D. – Cornell (Bellemare, Hogset, Marenya, Moser, Mude, Randrianarisoa) Ph.D. – Nairobi (Wangila) Post-Doctoral – (Okumu) Bioeconomic Modeling Web-based instruction Qualitative-Quantitative Methods wkshp in Kenya	Ph.D. – Cornell (Bellemare, Hogset, Marenya, Moser, Mude, Randrianarisoa) Ph.D. – Nairobi (Wangila) Post-Doctoral – (Okumu) Bioeconomic Modeling Web-based instruction	Ph.D. – Cornell (Bellemare, Hogset, Marenya, Moser, Mude, Randrianarisoa) Ph.D. – Nairobi (Wangila) Post-Doctoral – (Okumu) Bioeconomic Modeling Web-based instruction

Data analysis: The 2003-04 period will be focused mainly on econometric work on welfare dynamics and relationship to natural capital dynamics. Initial work will focus on identifying the appropriate way to capture welfare dynamics over time, and to establish the existence of poverty traps. This will be followed by empirical analysis of the explanations for the observance of poverty traps. That empirical analysis will employ mixed qualitative and quantitative methods of analysis, drawing not only on household level panel data but also on the household and community-level qualitative data we have been collecting under the project.

The second major area of data analysis will involve parameterization and calibration of the bioeconomic modeling tool, the Crops, Livestock, And Soils in Smallholder Economic Systems (CLASSES) model, we are developing under this project. This will involved considerable estimation of production functions, market participation equations, investment functions, etc. We are finishing the non-parameterized prototype CLASSES model in the fourth quarter of 2002-3. This bioeconomic modeling work will take advantage of our team's joint work in three of our Kenya sites (Baringo, Embu and Vihiga) with a team of outstanding biophysical scientists at Cornell, ICRAF and KARI under a new NSF biocomplexity grant (described below).

Stakeholder Consultations: We will continue to give much attention to dissemination of findings through stakeholder consultations. There will be national level workshops in both Kenya and Madagascar. In Kenya, advantage will be taken of the recently formed policy researcher forum (aided by the BASIS project in 2002-03) and it will be through this vehicle that the results of the project will be presented and discussed. Because a number of poverty studies have been recently made in Kenya, a high level audience would be expected to attend a meeting related to rural poverty. There will also be a local feedback workshop in the W. Kenya site. Our project is targeted toward informing debate on high profile policy questions highlighted in the new Kenya Rural Development Strategy (KRDS) and the Poverty Reduction Strategy Paper (PRSP) processes in both Kenya and Madagascar. In both countries, the PRSP has identified agricultural and rural development as top priorities towards poverty alleviation and economic growth. The KRDS has emphasized problems of risk and vulnerability, market access, and smallholder empowerment as central to agricultural and rural development. The USAID missions in each country are actively addressing these issues through their own program of work (e.g., USAID-Kenya mission SOs 6 and 7). Toward that end, we are in regular, ongoing contact with USAID missions and local officials and plan national

policymaker workshops to be held in both countries in the latter part of the project year.

    We will continue our program of District or community-level consultations with at various times throughout the year. We will also convene the key members of the project team from Kenya, Madagascar and the United States for our annual team meeting in Kenya in March.

Training: Degree training at Cornell and Nairobi will continue. Justine Wangila is doing Ph.D. dissertation research under the direction of Dr. Willis Oluoch-Kosura in the University of Nairobi's Department of Agricultural Economics based on fieldwork done under this project in our western Kenya sites. Andrew Mude is doing a Ph.D. in economics at Cornell, writing a dissertation on poverty traps and coordination failures in our central and northern Kenya sites. Sharon Osterloh is completing her M.S. in agricultural economics, writing a thesis on microfinance and nonpastoral enterprise investments in our northern Kenya sites. Heidi Hogset is doing a Ph.D. in agricultural economics, writing a dissertation on technology adoption, social insurance and groups and poverty traps in our central Kenya site. Paswel Phiri Marenya began a PhD degree at the University of Nairobi in Agricultural Economics, but in August 2003, moved to Cornell's graduate program in Agricultural Economics with funding from the Rockefeller FoundationMarc Bellemare is beginning a Cornell agricultural economics Ph.D. project on Madagascar and Jean Claude Randrianarisoa began the Cornell agricultural economics Ph.D. program in August 2003, where he plans to study soil fertility dynamics and poverty traps in Madagascar. The Cornell students are all working under the direction of Chris Barrett, as is Dr. Ben Okumu, the post-doctoral researcher on the project who is training in empirical methods while playing a lead role in the bioeconomic modeling component of the project.

The project considers the non-degree training activities of equal importance to degree training. Professional staff the national agricultural research institutes in each country have had little or no prior training in methods for the analysis of the coupled dynamics of human and natural systems. We are therefore investing heavily in training key staff in FOFIFA, KARI, the University of Nairobi and Université d'Antananarivo in our new bioeconomic modeling tool, the CLASSES model, in order that they can subsequently help refine the CLASSES model, who can use it for ex ante impact assessment of new technologies or policies at their home institutions, and who can subsequently help train others in use of the CLASSES tool (i.e., training the trainers). The bioeconomic modeling course began during the 2001-2 project year with a 2-day introduction module, held in Nairobi in June, the subsequent launching of web-based instruction (see the course web

site at http://courseinfo.cit.cornell.edu/courses/aemspecial/), and a two-week residential course at Cornell from October 28-November 9, 2002. This course enrolled ten students, six of whom (three each from KARI and FOFIFA) were funded by the project, and three of whom (one from ICRAF, one from the University of Nairobi, one from the LDI project in Madagascar, and one from Alemaya University in Ethiopia) were funded by collaborating institutions. Web-based instruction will continue in the new project year. A second two-week course is being run at the request of colleagues at the Université d'Antananarivo August 25 – September 13, 2003.

   The final non-degree training planned for the coming project year is a workshop on "Integrating Qualitative and Quantitative Methods of Poverty Analysis in Kenya," to be held in Nairobi in March 2004, coorganized by the University of Nairobi and the Institute for Policy Analysis and Research, with cosponsorship by USAID's SAGA cooperative agreement and, we expect, the World Bank.

C. <u>Links to Other Projects</u>: In Kenya, we have strong links to three other USAID-funded projects. We share our Baringo and Marsabit sites with the USAID Global Livestock CRSP Pastoral Risk Management (PARIMA) project that is funded through September 2006. PARIMA has enabled us to leverage data collection in our northern Kenya sites significantly, to our mutual benefit. The BASIS project on "Building Assets for Sustainable Recovery and Food Security" also works in this same Baringo site.   We keep each other informed on efforts there and cooperate in data collection and interpretation. The Strategies and Analyses for Growth with Access (SAGA) cooperative agreement, based at Cornell, includes Kenya as a core country in exploring "bottom-up" approaches to growth with access. The consortium of Kenyan collaborators under SAGA includes each of the major economic research institutes in the country and are heavily represented in the KRDS and PRSP advisory processes in the government. The SAGA program in Kenya is pursuing two interrelated projects that link nicely to our BASIS project: "Reducing Risk and Vulnerability in Rural Kenya" and "Empowering the Rural Poor".   These will culminate in a major, high-level policy workshops in July 2004 that will significantly improve the visibility of BASIS research in Kenya.

   Our project is most closely linked in Kenya with our team's five-year $1.7 million National Science Foundation biocomplexity grant entitled "Homeostasis and Degradation in Fragile Tropical Agroecosystems," which has just completed its first year. The NSF project augments the BASIS social science research with in depth biophysical field research and modeling in our Baringo, Embu, and Vihiga sites to pursue frontier modeling of complex dynamic systems.   This project involves leading animal, atmospheric and soil scientists in addition to sociologists and economists. The NSF project

also involves four Kenyan Ph.D. candidates – a GIS specialist, two soil scientists and a rural sociologist - whose programs at Cornell are funded under the Rockefeller Foundation's African Food Security and Natural Resources Management program at Cornell and complement the BASIS project, especially in our Embu and Vihiga sites. This adds considerable capacity in understanding processes of ecological degradation.

Our project is also closely linked with two other project directed by ICRAF. One is a DFID funded project on assessing the impact of agricultural research on the poor, coordinated by IFPRI, with ICRAF directing the case study work in western Kenya, in our Siaya and Vihiga sites. That project has officially ended (in mid-2003) but the analysis is still ongoing and several dissemination activities continue (e.g. at the annual meetings of the CGIAR system in October 2003).A second one is a Rockefeller funded project that is led by TSBF (of CIAT) with ICRAF as a collaborator. It aims to better understand within farm soil fertility gradients and to identify optimal soil management practices for farmers facing these gradients and a host of constraints in obtaining various nutrient sources.

Linkages to other projects are likewise extremely strong in Madagascar. Cornell has just concluded a substantial three year policy analysis and capacity building project (the Ilo project) funded by USAID-Madagascar. BASIS team member Bart Minten was the Ilo project chief of party in Antananarivo. Cornell is also a part of USAID-Madagascar's Landscapes Development Initiative (LDI) project run by Chemonics International, and Madagascar is (like Kenya) one of the seven core countries under the USAID/Washington SAGA cooperative agreement. These projects share complementary interests, in the case of Ilo and SAGA, in welfare dynamics and public policy and in the case of LDI in sustainable agricultural systems for smallholder producers. Ilo has helped fund the social and soils analysis components of BASIS' data collection, while LDI and Ilo have both contributed background data to BASIS analysis of poverty traps and rice technology adoption.   SAGA will help integrate BASIS findings into a broader policy dialogue about Madagascar's poverty reduction strategies and into training of economic researchers in the country.

D. <u>Relationship Between Activities and Key Findings</u>:   The project's data collection and data analysis activities are explicitly aimed at proving a sound characterization of the incidence and severity of poverty traps in rural Kenya and Madagascar, as well as identification of key causal factors at household and community level and prospective project- or policy-level interventions that might help those seemingly trapped in poverty lift themselves beyond crucial asset thresholds. The project's design emphasizes in particular questions of factor (e.g., interseasonal credit) and product market access as well as agroecologically appropriate technologies and natural resource

management practices. Relationships between human behavior and welfare, on the one hand, and natural capital (here reflected in land and livestock *quality* as well as *stock quantities*), on the other hand, typically elude standard analytical methods. We are therefore both exploring these relationships econometrically and developing an improved bioeconomic modeling approach based on systems dynamics methods in close collaboration with an outstanding team of biophysical scientists at Cornell, ICRAF and KARI. Indicators of success in these endeavors will include peer-reviewed conference presentations and publications, citations of this work in research and policy documents, in Kenya and Madagascar or elsewhere, web site hits, attestations by local and national policymakers as to the usefulness of the work for informing the design of rural development and poverty alleviation strategies, and add-on funding received for extensions of the project's research.

The project's consultations and training activities are aimed at facilitating access of key decision-makers in the private and public sectors to emerging findings from the project and of the project's research staff to the insights and reactions of this primary audience, and at building capacity for dynamic welfare analysis and research on coupled dynamics of human and natural systems among national research teams. Key indicators of success in these areas will include the project's effective adaptation to new suggestions and opportunities, others' bootstrapping off this project's activities (e.g., NGO or other research teams' funding proposals that build on our work, documented contact with and attestations by local and national policymakers and agencies, student evaluations of training activities, web site hits, and add-on funding for training.

E. <u>Anticipated Outputs</u>: During the coming year, we anticipate a variety of outputs through which we will disseminate project findings. Anticipated publications include

- (i)   Several more policy briefs: we plan to release briefs offering comparative perspectives on different sites, on poverty and activity/technology choice, on inter-site and inter-household variation in poverty-resource linkages, and on characterization of poverty traps and identification of their key causal factors in Kenya and in Madagascar.
- (ii)   A set of "Voices" briefs based on intensive, qualitative, oral history research with households in our samples.
- (iii)   A detailed report on socio-economic dimensions of poverty processes at household and community level, based on our qualitative research.
- (iv)   An applied economic theory paper on activity choice and poverty traps

(v)   A paper on bioeconomic modeling of poverty traps in western Kenya

(vi)   A paper on comparative analysis of poverty and resource dynamics across our sites

(vii)   A paper on fractal poverty traps

(viii) A paper on bioeconomic modeling of rural welfare dynamics in Madagascar's central and southern highlands

(ix)   a Cornell MS thesis on microfinance and nonpastoral enterprise development in northern Kenya

(x)   trip reports from international travelers under the project

(xi)   informal team memos on findings and methodologies

We will post all these materials and regularly the project web site (http://www.aem.cornell.edu/special_programs/AFSNRM/Basis/) on which we post all project outputs.

We also anticipate disseminating the CLASSES (Crop, Livestock and Soils in Smallholder Economic Systems) model to applied researchers in Kenya and Madagascar for their own virtual policy experimentation. We hope to find funding for one week workshops in each country for prospective end-users.

F. Problems and Issues: The main problems faced in the 2002-3 project year concerned (i) considerable delays in data entry in Embu, (ii) delays in getting the CLASSES model working well and calibrated, and (iii) political disruptions in both countries that delayed work and have made it more difficult to secure the attention of policymakers and senior analysts in each country.

Problems with the Embu baseline data necessitated significant revisiting of our objectives and field research strategy in Embu, which delayed the commencement of data collection until September 2002, with a second seasonal round in April 2003. This set us back about nine months in the field work in Embu and reduces our capacity to undertake the full range of welfare dynamics analysis in that one site. We will revisit sample households in the coming project year to construct a proper panel. This loss has been partly offset by the fortuitous opportunity to add a similar site in western Kenya (Madzu, Vihiga District) in which the University of Nairobi had collected detailed household survey data in 1989. Remarkably, we managed to track down 89% of the respondent households 13 years later, creating an unusual low frequency (and low attrition rate) panel data set that we are presently exploiting.

Delays in constructing the CLASSES model have been entirely internal to the team. The programming has proved more complicated than originally

anticipated and we suffered a number of unproductive months' work on the model. As a consequence, we are unfortunately nine or so months behind schedule on this component of the project.

   The 2001-2 political crisis in Madagascar has had lingering effects that have caused minor delays here and there in our work. The December 2002 presidential election and handover of power in Kenya have created similar delays. Travel bans related to terrorism threats have caused additional delays and added to international travel costs for project team members traveling from the United States.

VIII. **<u>Budget</u>**: Per instructions from ME, no new budget is required with this work plan.