2002-3 BASIS CRSP Project Annual Activity Report
October 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), Mr. Marc Bellemare, Dr. Larry Blume,
    Ms. Heidi Hogset, , Ms. Erin Lentz, Mr. Paswel Phiri Marenya, Dr. Bart Minten,
    Ms. Christine Moser, Mr. Andrew Mude, Dr. Ben Okumu, Ms. Sharon Osterloh,
    Dr. Alice Pell, Mr. Jean Claude Randrianarisoa; **FOFIFA** (Antananarivo,
    Madagascar): Mr. Victor Rakotoniaina, 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. James Ouma; **Syracuse University**: Dr. John McPeak; **University of Nairobi
    (Department of Agricultural Economics, Kabete Campus)**: Dr. Willis Oluoch-
    Kosura.

III. **Project Dates:** October 1, 2001 – September 30, 2004

IV. **Support:** Core BASIS CRSP funding with matching funds from Cornell
    University and the Rockefeller Foundation. Supplemental funding (about
    $35,000 over the coming year) provided by the Rockefeller Foundation and by
    IDRC (Canada) to the University of Nairobi and by USAID-Madagascar's Ilo
    project with Cornell for qualitative research and training, and ($1.688 million
    over five years) by 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.

V. **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, ICRAF and the University of Nairobi 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 and follow-on qualitative (oral history and ethnographic) field work 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.

VI.   **Discussion of Annual Activities:**

A. Specific Activities Undertaken and Related Accomplishments:
   1. Household-Level Panel Data Collection (McPeak, Ouma, Rasambainarivo, Randrianarisoa, Rakotoniaina, Hogset, Murithi, Place, Wangila, Teklu, Barrett and Okumu): Our project workplan called for continued data collection activities in our Embu (central Kenya) site, which were completed as planned. We also completed surveys in our western Kenya (Madzuu) and Madagascar (Fianarantsoa and Vakinankaratra) in the first quarter of 2002-3. Data entry has likewise been completed in each site. Initial data cleaning has likewise been completed for each site and a

password-protected web-based FTP site has been created through which team members can access the project data sets.

2. Qualitative Field Work (Mango, Kariuki, Ongadi, Mulindo, Oluoch-Kosura, Murithi, Place, Rasambainarivo, Rakotoniaina, Barrett, McPeak): Initial meetings with stakeholders in 2001 highlighted the need to complement the planned quantitative analysis with increased qualitative social science analysis in order to understand better the processes involved in inhibiting or promoting improvements in rural households' welfare and the potentially complex relationships between welfare dynamics and those of soils and other natural capital possessed by rural households. We therefore sought and secured additional funding necessary to undertake qualitative research at community and household levels to complement the survey-based research taking place in six of the project's field sites: Dirib Gumbo (Marsabit), Embu, Madzu (Vihiga), and Ngambo (Baringo) in Kenya and Fianarantsoa and the Vakinankaratra in Madagascar. In Kenya, this work is supported by supplementary grants from IDRC (Canada) and the Rockefeller Foundation to the University of Nairobi, in collaboration with ICRAF and KARI. In Madagascar, this work is supported by Cornell University's Ilo project funded by USAID-Madagascar. The basic design of the qualitative work follows the "sequential mixing" design of integrated qualitative-quantitative poverty analysis, and is described in the general terms of reference reproduced in Appendix 1 to this work plan, around which experienced rural sociologists and anthropologists were recruited early in FY2003. All of the qualitative survey work was completed in the Madagascar sites in FY2003 and most of the Kenya work was completed, although it has spilled over into FY2004. Reports from initial community meetings in each of the Kenya sites have been completed.

3. Data Analysis (Barrett, Hogset, Marenya, Minten, Murithi, Ouma, Place, Randrianarisoa, Rasambainarivo): The project began data analysis with the estimation of transition matrices for each site. These were a cornerstone of discussions at the annual team meeting (see below) and for the design of the qualitative data collection through community-level focus group meetings and oral histories of selected households chosen from the constructed transition matrices. The transition matrix results appear to confirm our initial hypotheses about the depth and extent of poverty across sites stratified by market access and agroecological potential, and seem to confirm meager economic mobility among our survey populations. More sophisticated econometric analysis of poverty dynamics was begun over the year, including a few results in Barrett's plenary paper at the triennial IAAE meetings (see below). Considerable time was spent in working out appropriate estimation methods, which the Cornell-based team (Barrett and

Hogset) communicated to the rest of the team through detailed methodology memos.

4. Development of Crop, Livestock and Soils in Smallholder Economic Systems (CLASSES) Model (Okumu, Barrett, Blume): A first, conceptual version of the bioeconomic modeling tool was developed using VENSIM systems dynamics software. This continues to have significant bugs and is under ongoing, substantial refinement. This has been the biggest source of delays in the project to date. Parameterization and calibration of the model are continuing, and we continue to revise the basic architecture of the model so as to get it to handle the full range of behaviors we seek to model. This has involved regular, extensive meetings within the team and with modelers in related agricultural sciences at Cornell, ICRAF and Wageningen (Netherlands).

5. Bioeconomic Modeling Course, Two-Week Course at Cornell, offered in October-November 2002 and August-September 2003 and Supplementary Web-Based Instruction (Okumu, Barrett, Blume, Rasambainarivo, Rakotoniaina, Randrianarisoa, Wangila, Obonyo, Odendo, Ouma, Phiri, Oduol, Oluoch-Kosura): The project considers the non-degree training activities of equal importance to degree training. Professional staff at 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 have therefore invested heavily in training key staff in FOFIFA and KARI in systems dynamics methods and software that underpin 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 first bioeconomic modeling course began during the 2001-2 project year with a 2-day introduction module, held on the ICRAF campus in Nairobi in June 2002, and the subsequent launching of web-based instruction (http://afsnrm.aem.cornell.edu/Bioecon/). This was followed by a two-week session in Ithaca that ran from October 28 to November 8, 2002 and included three students fully funded by non-BASIS funds, one paid by ICRAF, one from the University of Nairobi on a grant from the Rockefeller Foundation, and one from the USAID-Madagascar Landscapes Development Initiative (LDI).

The course was offered again from August 25 to September 5, 2003 to two scientists from the Université d'Antananarivo. The participants raised the funds necessary to travel to Ithaca and partake in the course. Dr. Ben Okumu was again the instructor.

The restricted-access course web site, developed last year, continues to be actively used by enrolled students and a few others who have been authorized access. There are 27 users for the website and we have had about 1000 hits. Ten graduate students and scholars from developing countries have requested and were granted access to the web-based course materials in order to extend further the impact of the course.

A course description is attached as appendix 2 and summaries of the student evaluations of the October 2002 and August 2003 courses are attached in appendix 3.

6. IAAE Learning Workshop on "Analytical and Empirical Tools for Poverty Research" (Barrett): Chris Barrett and Csaba Csaki (World Bank) co-organized a learning workshop on August 16, 2003, immediately prior to the 25th triennial meeting of the International Association of Agricultural Economics in Durban, South Africa. The program (attached as appendix 4) aimed to familiarize participants, especially practitioners and researchers in developing countries, with state-of-the-art methods and theories of poverty analysis. The program included the BASIS CRSP Director, Professor Carter, and other leading scholars in this general area of research, and was attended by the USAID/Washington BASIS CTO, Lena Heron. More than 110 participants from at least 22 different countries attended the learning workshop, including economists and other poverty researchers or program managers from line ministries in various African governments, universities from six continents, USAID, the World Bank, CGIAR centers, and other national and multinational organizations. The program drew very positive reviews from participants. Indeed, it was seen as so valuable that the IAAE is now considering replicating this event biennially in developing regions around the world. All the presentations have been posted to a web-site (http://aem.cornell.edu/special_programs/AFSNRM/workshop/), which is accessible via the BASIS project site.

7. Degree Training (Mude, Hogset, Moser, Teklu, Phiri, Osterloh, Bellemare, Randrianarisoa, Lentz, Barrett, Oluoch-Kosura): The work plan called for Ph.D. training of one Kenyan (Andrew Mude). Through co-financing from host institutions and other projects, we were able to help support training for five Ph.D. candidates this year. Andrew Mude (Kenya) was mostly funded by BASIS (with co-funding from Cornell) in the Cornell Economics program. Heidi Hogset (Norway) and Christine Moser (USA), both Agricultural Economics Ph.D. candidates at Cornell, were funded for part of the summer by BASIS for work in Kenya and Madagascar, respectively (with co-funding from Cornell). Amare Teklu (Ethiopia), a Ph.D. candidate in Natural Resources at Cornell, received logistical and field data collection support from BASIS, although he was wholly funded from other

sources. Marc Bellemare (Agricultural Economics Ph.D. candidate at Cornell) and Sharon Osterloh and Erin Lentz (both Agricultural Economics MS/Ph.D. candidates at Cornell), contributed to BASIS research but were wholly funded by other sources at Cornell. Jean Claude Randrianarisoa began his training towards an Agricultural Economics Ph.D. at Cornell in September 2003, partially funded by BASIS CRSP. Finally, the project supported the field research of Paswel Phiri (Kenya), an Agricultural Economics Ph.D. candidate at the University of Nairobi under the direction of Professor Willis Oluoch-Kosura. Student Training Reports have been submitted under separate cover.

8. Post doctoral training (Okumu, Barrett): Dr. Ben Okumu, the post-doctoral researcher on the BASIS project, is training in empirical methods while playing the lead role in the bioeconomic modeling component of the project. Barrett supervises Okumu's training, which included field visits to Kenya and Madagascar, leading the development of the CLASSES bioeconomic modeling tool and the associated bioeconomic modeling course, preparation of a manuscript submitted to a journal, and presentation at the conferences in Japan and South Africa.

9. Stakeholder Consultations (Rasambainarivo, Randrianarisoa, Place, Murithi, Barrett, Mulindo, Kariuki, Mango, Ongadi, Okumu, Barrett, Obonyo, Ouma, Odendo, Minten, McPeak): A national level stakeholder meeting was convened at the Hotel Panorama in Antananarivo on March 11, 2003, drawing representatives from the government of Madagascar, other research institutions, and various stakeholder groups with an interest in the project. The conference drew the attention and praise of not only the Ministry of Agriculture (and the Minister himself) but also of the Office of the President and President Ravalomanana himself. They requested the full proceedings and background maps on CD and sent an email of praise and thanks to Dr. Bart Minten, the Ilo chief of party and BASIS team member.

The core annual BASIS project team meeting was held in Antsirabe on March 12 and 13, 2003, with USAID/Washington BASIS CTO Lena Heron in attendance. The team meeting included productive site visits to two different BASIS survey villages in the Vakinankaratra, one survey village in Fianarantsoa, and constructive meetings with FOFIFA-Antsirabe and the USAID-supported Landscapes Development Initiative (LDI) project based in Fianarantsoa. Details are available in the March 2003 trip report on the project web site.

A workshop to discuss "Agriculture and Rural Sectors in Economic Growth and Poverty Reduction in Kenya" was held on March 18, 2003 at the University of Nairobi. The purpose of this event was to present key issues in agriculture and rural development for consideration in the new Economic

Recovery Strategy of the newly elected government of Kenya. This was of key importance because many development researchers believe that agriculture was not being given proper attention in the new government. While government invitees did not attent, an issues paper was drafted.

A workshop on "Poverty, Economic Development and Service Delivery" was hosted by INSTAT and Programme Ilo in Antananarivo on June 11, 2003 to disseminate research findings to policy makers. Jean-Claude Randrianarisoa presented findings on the impact of political crisis on the rural poor.

ICRAF, KARI and the University of Nairobi hosted a Feedback Workshop with Kenyan farmers in Vihiga on June 13th, 2003. Researchers presented the preliminary results of the first phase of the Dynamic Poverty Traps Study and introduced the second phase. An open discussion ensued and farmers were able to generate solutions to gaps or inconsistencies in the study's findings. A report was written based on sub-group discussions on issues concerning the social aspects of dynamics of poverty traps.

Another Farmer's Feedback workshop and community level focused group discussions was held the following month in Baringo Discrict, Kenya, again hosted by ICRAF, KARI and the University of Nairobi. On July 22, Dr. John McPeak shared the results of a recent study and farmers were able to confirm his results and fill in gaps through focused group discussion. On July 28, farmers generated results based on questions asked in the Social Aspects of the Dynamics Poverty Traps and a report was later written.

Another workshop was held at Hekima Nursery School, Dirib Gombo on 3 September 2003 as part of the Collaborative Research Support Project on Broadening Access and Strengthening Input Systems. It was organized by Gatarwa Kariuki and Katero Galgallo, with initial contact made by John McPeak. The purpose of this workshop was to collect, from the community, data that would be used to complement quantitative data already collected at the household level. The idea was to get the community's perception on issues related to poverty: how people get into poverty, and some of the coping mechanisms that different household types use to get out of poverty. There were 38 participants, 8 women 30 men.

10. Field Visits (Barrett, McPeak, Blume, Mude, Hogset, Okumu):
The BASIS team (Barrett, Blume and Okumu from the US) conducted field site visits Madagascar in March. Unfortunately, because it was the rainy season and they were a relatively large group, their time was limited and they were confined to visiting only 5 relatively accessible villages among the 18 in our sample. They conducted daily field site visits to survey households in three villages in Vakinankaratra on March 12 and 13 and traveled to a village field site in Fianarantsoa on March 14 and 15th.

Dr. Chris Barrett and Dr. John McPeak visited field research sites in northern Kenya in early August 2003. In Dirib Gombo, Dr. McPeak presented findings from his research, followed by an open discussion with approximately 40 farmers. Dr. Barrett and Dr. McPeak also visited Logologo and held similar discussions with farmers. Dr. McPeak held a similar meeting with farmers in Ng'ambo location (Baringo) in July with Dr. Nelson Mango and Mr. Josephat Mulindo.

Ms. Heidi Hogset left for field research in the Embu and Madzuu sites in August. She will remain in the field for approximately 12 months conducting dissertation field research linked to the BASIS project but wholly funded from other sources (NSF biocomplexity project, Social Science Research Council, and Cornell University). Mr. Andrew Mude left for dissertation field research in central Kenya in early September. He will remain in the field for approximately four months conducting research linked to the BASIS project but wholly funded from other sources (USAID SAGA cooperative agreement and the Rockefeller Foundation).

11. Policy Briefs (entire team): The workplan called for the release of three briefs in FY03. We only released one, on "Education, Nonfarm Income, and Farm Investment in Land-Scarce Western Kenya". We drafted another brief, a comparative analysis of patterns in central and western Kenya. But in summer the BASIS CRSP ME asked for further revisions to this before publication. Those revisions have not yet been completed.

12. Project Team Meeting: A team project meeting was held in March 2003, in Antananarivo, Antsirabe and Fianarantsoa, Madagascar. The meeting included daily field site visits to survey households, presentations and group discussion of preliminary findings, presentation of the bioeconomic modeling work and a discussion of the CLASSES model, and agreement on a detailed outreach plan for the coming year. There was also extensive discussion about the qualitative field work to follow up on the quantitative survey work and a decision to modify the sample selection criteria.

B. Additional Activities Not Anticipated in the Work Plan:

1. We offered a second session of the bioeconomic modeling course for a husband and wife team from the University of Anananarivo who where unable to secure funding in time for the original course in Ithaca in October 2002. This session took place in August-September 2003 and followed the outline from the original course. This installment of the course was perhaps a little more intense for the participants as the student to instructor ratio was 2:1. This second course extends the reach

of the CLASSES model, providing more feedback for Dr. Okumu and disseminating the methodology to another two researchers in Madagascar.

2. Christopher Barrett gave a plenary address on poverty traps to the annual USAID Global Livestock CRSP global conference in Washington, DC, in October 2002.

3. Christopher Barrett gave a presentation at Nature, Wealth and Power symposium with USAID at World Resources Institute, November 15, 2002, which was attended by 50-60 people, including many USAID staff from different Bureaus, and senior researchers with IFPRI, the World Bank, World Resources Institute.

4. Christopher Barrett sat on a brownbag panel on poverty and development policy hosted by the International Resources Group in Washington, DC, on December 5, 2002. The brownbag was attended by a range of development practitioners from the Washington area, including a number of USAID staff.

5. Frank Place accepted an invitation to participate in the October 15th 2002 KARI-MOARD stakeholder meeting on food security in Kenya. GOK has committed KSH360 million and is raising additional funds from FAO and other donors for a program emphasizing agricultural technology and innovation within rural communities. The Ministry (in particular, the Director of Agriculture, Dr. Wanjama) will coordinate the process and is very receptive to our project's message on poverty traps. KARI is actively involved (Dr. Kiome presented on best bet technologies for food security). The program emphasizes partnerships to achieve impact on the ground, with an emphasis on income generation and productivity improvement. Some of the planned work will explore how the poor interact with markets and the resulting prospective impacts of different technologies. Marsabit and Vihiga are priority districts.

6. A roundtable for researchers involved in agricultural and rural development in Kenya, held at University of Nairobi on December 17, 2002.

C. <u>Problems and Issues</u>: The main problems faced in FY2002 concerned (i) delays in data entry and cleaning, especially in Embu, (ii) significant delays in development and release of the CLASSES bioeconomic model due to modeling challenges and personnel issues, and (iii) general delays in data

analysis due to competing time demands on project staff. We are presently running probably six months behind our original schedule.

VII. Collaboration With Other Projects: In Kenya, we have strong links to three other USAID-funded projects and to a new National Science Foundation research project We share our Baringo and Marsabit sites with the USAID Global Livestock CRSP Pastoral Risk Management (PARIMA) project. PARIMA has enabled us to leverage data collection in our northern Kenya sites significantly, to our mutual benefit, as BASIS funding enabled expanded thematic coverage of the households being surveyed under PARIMA. The BASIS project on "Building Assets for Sustainable Recovery and Food Security" (PI: Peter Little) also works in this same Baringo site.   We keep each other informed on efforts there and cooperate in data collection and interpretation. The USAID Strategies and Analyses for Growth with Access (SAGA) cooperative agreement 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 (IPAR, KIPPRA and Tegemeo)) 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", and coordination has been explicit between BASIS and SAGA. Our project is most closely linked in Kenya with our team's new 5-year $1.7 million National Science Foundation biocomplexity grant entitled "Homeostasis and Degradation in Fragile Tropical Agroecosystems." 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 began September 1, 2002, and involves extensive biophysical field research over four-plus years with involvement of 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 Baringo and Vihiga sites. This adds considerable capacity in understanding processes of ecological degradation and will ultimately improve the quality of the bioeconomic modeling product from this project. The need to coordinate with the NSF team has, however, caused added delays in our progress on the CLASSES model.

Our project is also closely linked with two other projects 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. ICRAF has another related

DFID-funded project, on Voices of Poor Livestock Farmers in the greater Lake Victoria basin, which likewise includes our western Kenya sites.

Linkages to other projects are likewise extremely strong in Madagascar. Cornell has just completed a substantial, multi-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 and Barrett, Moser and Randrianarisoa were actively involved in the research under that project. 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 analysis component 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.

Finally, our BASIS project has been closely linked to initiatives of the Rockefeller Foundation and USAID/AFR/SD in the past year. This BASIS project played a significant role in the *Nature, Wealth and Power* strategy document released by USAID/AFR/SD for the World Summit on Sustainable Development in Johannesburg in August 2002. Barrett and Moser were invited to coauthor the economics component of *Nature, Wealth and Power* and to participate actively in the discussions that shaped the final content. *Nature, Wealth and Power* is AFR/SD's summary statement of lessons learned about sustainable development in rural Africa, has been widely distributed worldwide, and was the topic of a major public forum held in Washington in November, 2002, featuring the heads of both EGAT and Africa Bureaus, as well as the Directors General of the International Food Policy Research Institute and the World Resources Institute.

VIII. Outputs

1. BASIS Publications Series: This year we published one policy brief:
    a. "Education, Nonfarm Income, and Farm Investment in Land-scarce Western Kenya" by Paswel Phiri Marenya, Willis Oluoch-Kosura, Frank Place, and Christopher B. Barrett. February 2003, 4 pages. (Basis Brief no. 14)

2. Other Print Outputs: In FY2003, the project produced a number of chapters, articles, workshop presentations, trip reports, proposals, etc.

a. Christopher B. Barrett and John G. McPeak, "Poverty Traps and Safety Nets," September 2003.

b. Christopher B. Barrett and Brent M. Swallow, "Fractal Poverty Traps," September 2003 revision.

c. Christopher B. Barrett, "Rural Poverty Dynamics: Development Policy Implications," prepared for invited presentation to the 25th International Conference of Agricultural Economists, Durban, South Africa, September 2003 revision.

d. Christopher B. Barrett, "International Trip Report Kenya and South Africa" 3-20 August 2003 (16 pages)

e. Christopher B. Barrett, "Smallholder Identities and Social Networks: The Challenge of Improving Productivity and Welfare," July 2003.

f. Christine M. Moser and Christopher B. Barrett, "Le Systeme de Riziculture Intensif a Madagascar: Situation Actuelle et Perspectives," (in French) prepared for "Agriculture et Pauvrete" conference, March 2003, in Antananarivo, Madagascar.

g. Christopher B. Barrett, "International Trip Report Madagascar" 9-22 March 2003 (27 pages)

h. Andrew G. Mude, Christopher B. Barrett, John G. McPeak and Cheryl R. Doss "Educational Investments in a Spatially Varied Economy" BASIS Working Paper, July 2003

i. Marc F. Bellemare and Christopher B. Barrett "An Asset Risk Theory of Share Tenancy" BASIS Working Paper, June 2003

j. Christine M. Moser and Christopher B. Barrett "The Complex Dynamics of Smallholder Technology Adoption: The Case of SRI in Madagascar" BASIS Working Paper, June 2003

k. Christopher B. Barrett, Christine M. Moser, Joeli Barison and Oloro V. McHugh "Better Technology, Better Plots or Better Farmers? Identifying Changes in Productivity and Risk Among Malagasy Rice Farmers" BASIS Working Paper, June 2003 revision (Prepared for presentation at the annual meetings of the American Agricultural Economics Association, July 27-30, 2003, Montreal, Quebec, Canada.)

l. B. N. Okumu, N. Russell, M.A. Jabbar, D. Colman, M A Mohamed Saleem and J. Pender "Technology and Policy Impacts on Economic

Performance, Nutrient Flows and Soil Erosion at Watershed Level: The Case of Ginchi in Ethiopia" BASIS Working Paper, May 2003

m. Frank Place, Paul Hebinck, and Mary Omosa "Chronic Poverty in Rural Western Kenya: its identification and implications for agricultural development" BASIS Working Paper, April 2003

n. Ben Okumu "The Impact of High Yielding Varieties of Wheat on Economic Performance, Nutrient Flows and Soil Erosion in the Ethiopian Highlands: The Case of the Ginchi Watershed" BASIS Working Paper, December 2002 (Paper Presented at "The Workshop on the Green Revolution in Asia and its Transferability to Africa," in Tokyo, Japan, December 8 - 10, 2002)

o. Marieke Huysentruyt, Christopher B. Barrett and John G. McPeak, "Social Identity and Manipulative Interhousehold Transfers Among East African Pastoralists," October 2002 revision.

p. Frank Place, Christopher B. Barrett, H. Ade Freeman, Joshua J. Ramisch, Bernard Vanlauwe "Prospects for integrated soil fertility management using organic and inorganic inputs: evidence from smallholder African agriculture systems" BASIS Paper, Forthcoming in Food Policy.

3. <u>Non-Print Outputs</u>: The project continues to maintain a substantial web site, ran two courses on bioeconomic modeling including a web-based extension of the modeling course, and made three presentations at conferences and seminars outside the BASIS CRSP.

a. Dr. Chris Barrett presented "Qualitative and Quantitative Poverty Appraisal: Maximizing Complementarities, Minimizing Tradeoffs" at the Learning Workshop of the 25th International Conference of Agricultural Economists on August 16, 2003 in Durban, South Africa.

b. Dr. Chris Barrett presented "Rural Poverty Dynamics: Development Policy Implications" at the 25th International Conference of Agricultural Economists on August 2003 in Durban, South Africa.

c. Dr. Chris Barrett presented "Smallholder Identities and Social Networks: The Challenge of Improving Productivity and Welfare" at the AAEA annual meetings in July 2003 in Montreal, Canada.

d. Two two-day bioeconomic modeling short courses held at Cornell
University attended by twelve persons (10 enrolled in the first course
and two in the second course) plus instructors Ben Okumu (lead
instructor) and Chris Barrett. See Appendix 2 for a program
description and Appendix 3 for student evaluation results.

e. BASIS CRSP Project Web Site: Maintenance of a project web site at
Cornell, containing project publications, presentations, photographs,
participants' listings, information on the bioeconomic modeling
course, and links to other relevant sites. Maintenance of a separate,
restricted-access web site for the bioeconomic modeling course.

IX. **Key Findings and Results**: The project has begun to generate some findings
on poverty traps that are attracting attention.

a. **Economic mobility** appears significant in the short-run as a share of
income, with considerable transitory income shocks and measurement
error between periods. In the longer run, however, these shocks and
measurement errors appear to cancel out, leading to considerable
concentration around zero real per
capita income growth in our sites.
This suggests that risk management
plays a significant role in
understanding long-term growth
patterns and that panel data with
short intervals may lead to
overestimates of long-term growth
rates.
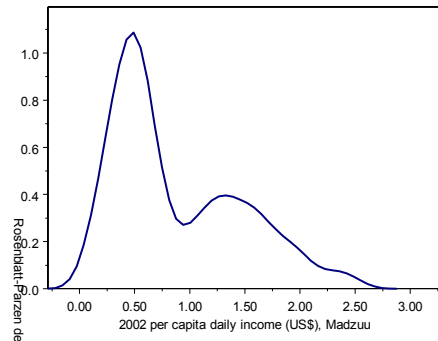
b. These economic mobility findings are consistent with preliminary
evidence favoring the hypothesis that **poverty traps** indeed exist.
Indicators of this have been uncovered in cross-sectional distributions
that reveal multi-modal distributions consistent with the existence of
multiple dynamic equilibria (see graphic at right), as explained in
detail in Barrett's plenary address to
the 25th triennial meetings of the
International Association of
Agricultural Economists. These
poverty traps manifest themselves
in nonadoption of high-return
technologies – as in the case of SRI
rice production in Madagascar and
tea and dairy cattle production in

Figure 1: Expenditure/Income - Herd Size Relationship
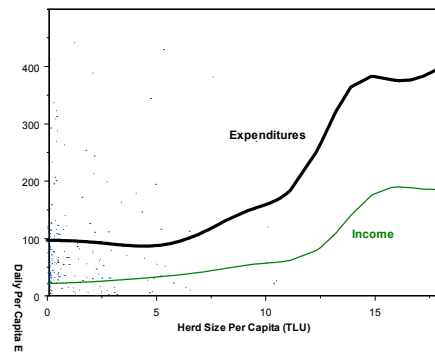
western Kenya – by poorer households in medium-potential households and as generalized poverty in our poorest communities. They also reveal themselves in a welfare-wealth relationship that exhibits increasing returns over the medium-to-upper ranges of the wealth distribution among pastoralist households in our northern Kenya sample, as depicted in the graphic to the right. For example, in Madagascar's southern highlands, our Fianarantsoa sample suffers generally very low real per capita incomes and these fell significantly

following the national political crisis of 2002, as depicted by the leftward shift in the year-specific income distributions depicted at right. The project has also worked on connecting observations of poverty traps at these multiple levels of households and communities, as reflected in the Barrett and Swallow working paper on "Fractal Poverty Traps".
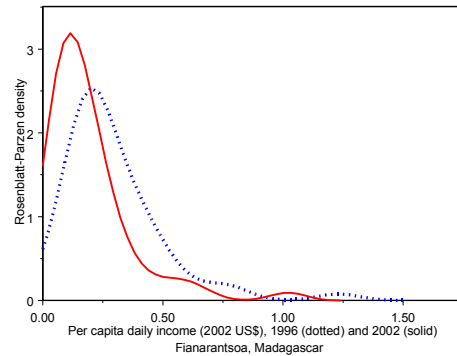
c. The preceding points on stochastic transitory income that leads to much short-term variability in incomes and the existence of poverty traps leads directly to a third important finding. As posited by Zimmerman and Carter (2003), we find evidence in our northern Kenya survey households of **wealth-dependent consumption smoothing** patterns. At the lowest wealth levels, households undertake little or no consumption smoothing. Indeed, consumption

seems more variable than income, consistent with Zimmerman and Carter's asset smoothing hypothesis, that desperately poor households will knowingly destabilize consumption in an effort to conserve productive assets on which future survival will depend. As wealth – as proxied by

Figure 4: Wealth-dependent risk management

herd sizes, reflected in the graphic to the right – increases, the coefficient of variation of expenditure falls while the coefficient of variation on income increases. This reflects the empirical regularity that because of better financial liquidity and wealth-dependent risk preferences, richer households take on higher-risk/higher-return
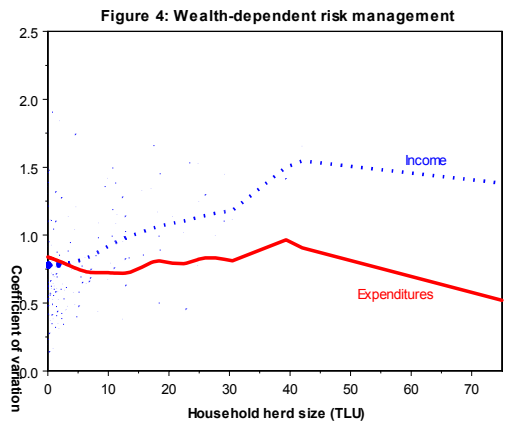
livelihood strategies, while also signaling that consumption smoothing appears to be a normal good, increasingly accessible as households become wealthier.

d. One of the key explanations for poverty traps appears to be **education**. First, secondary school completion -- better, a university degree – appears necessary, albeit by no means sufficient, to obtain stable, remunerative non-farm employment. In areas where farm or herd sizes are shrinking due to land scarcity, one needs an alternate pathway to livelihood security. Educational attainment is strongly correlated with both the level and stability of expenditures in our northern Kenya sites. Nonfarm employment enabled by education also provides steady cash income that can be invested in profitable agricultural intensification. It also provides a superior alternative to unskilled farm labor for households lacking sufficient land or livestock to fully employ their household's labor. We find evidence of these relations repeatedly: in semi-arid and arid sites in northern Kenya, where the educated build up their herds; in central and western Kenya, where education is strongly, positively correlated with adoption of dairy cattle and use of mineral fertilizers; and in Madagascar, where education is positively correlated with capacity to invest in and propensity to adopt improved rice cultivation practices. Financing education is a serious constraint, however, especially in the wake of policy reforms aimed at "cost recovery" in education. In western Kenya, for example, secondary level school fees have increased tenfold in the past 13 years, to more than 200% of the average annual income of households in the poorest quartile. We find as well that although households espouse interhousehold transfers and loans to pay for education, remarkably little such informal financing of education takes place.

We have developed a formal theoretical model to explain how, in particular, spatial inequality in infrastructure that affects labor productivity can induce rural-to-urban migration that will restrict the educational attainment of intellectually able children from poor families because migration options foreclose options to borrowing. This model was motivated by survey-based observations in our northern Kenya sites showing that lending and transfers in support of educational investments were – surprisingly and contrary to popular rhetoric – nearly nonexistent. This creates an important mechanism by which poverty gets transmitted intergenerationally in less favored areas.

e. **Access to financial services** (insurance, credit, savings) seems to play a major role in avoidance of poverty traps. Households with access to credit, liquid savings, or steady off-farm cash or commodity (e.g., tea, dairy) income appear better able to afford investments in productivity-enhancing crop inputs, in health care for both livestock and family members, in education for children, and in fixed costs of participation in remunerative entrepreneurial businesses and commercial markets. Households without such access meet their needs for credit, savings and insurance through distorted transactions in other markets, distortions that come at a significant economic cost. This was graphically illustrated for us by one Malagasy farmer, Mr. Robson Andratraimahamaina, in the survey village of Iandratsay. He doesn't terrace much because of insufficient labor availability. As a result, his fields suffer erosion and fertility is declining. He has to hire seasonally for rice cultivation (land preparation, transplanting, weeding and harvest) and simply cannot afford to hire labor for constructing soil conservation structures as well. Because there's no credit available, he pays for this labor by selling maize and some rice and from proceeds from the small store the household has in which they sell simple foods and household basics (sugar, oil, salt). This gentleman's use of the rice market for quasi-credit typified rice marketing by net rice buyer producers (remarkably, most of Madagascar's rice producers are actually net buyers of rice). He sells paddy at FMG1000/kg to a local collector in the commune who evacuates the paddy by ox cart to a wholesaler elsewhere (probably Betafo). He has a 3 month soudure during which he buys rice from the same fellow at FMG750/kapoaka (a Nestle condensed milk tin, used as a local retail measure) using proceeds from groundnuts and maize. This is equivalent (once one adjusts for units of account and milling losses) to about FMG1850/kg paddy-equivalent. So he effectively buys back in January the rice he sells the preceding June at a premium of 85% … this is best understood as the implicit interest rate (including storage losses) on seasonal quasi-credit. The core lesson is that when the financial markets fail, people find alternative means of engaging in intertemporal arbitrage, even when it proves very costly (in this case due to storage losses, transport costs and the transactions costs associated with multiple physical exchanges). We have seen this pattern repeatedly manifest in various market transactions. Households lacking access to formal credit or insurance find costly ways to secure quasi-credit, which significantly decreases the returns to their activities relative to those of households that do not have to use such costly financing mechanisms.

f. In the presence of poverty traps, **short-lived assistance** can make a lasting difference by changing households' accumulation paths. This is nicely demonstrated by the history of one of our better-off Malagasy farmer households. Mr. Rajaonarison lives in the village of Ambatomainty in the Vakinankaratra region of Madagascar. He has 1 improved cross-breed cow, 3 other Zebu cows and 2 traction animals … a large herd by local standards. He received his first milk cow from a government development project about 20 years ago and he has continued to grow his herd with assistance from FIFAMANOR, a Norwegian-funded agricultural development agency operating in the Vakinankaratra. The initial grant and ongoing assistance have made a great difference, he says; he doubts he could have done this without the initial push. Now he sells milk each day to Tiko, the private milk processing firm founded by the nation's new President. Tiko sends trucks each day to collection points along the roadsides in the area around Antsirabe, underscoring how proximity and accessibility to market matters. As we found later, farmers a couple of hours out on the same highway did not enjoy access to the Tiko collection routes and thus had little incentive to keep dairy cattle.

g. **Change in soils quality** varies markedly across sites and appears strongly correlated with economic opportunity. In our Embu study site with better market access and agroecological conditions in central Kenya, farmers perceive soil quality to be improving at decadal scale, as shown in the top histogram depicted at right. By contrast, in the poorer market access study site (Madzuu) in western Kenya, farmers overwhelmingly perceive soil quality to be declining, as shown in the bottom histogram at right. The differences at community scale seem to reflect differences due to (i) increased investment

Farmer Perceptions of Soil Quality Change Over Past 10 Years, Embu
(1= much better, 3=same, 5=much worse)

Farmer Perceptions of Soil Quality Change Over Past 10 Years, Madzuu
(1= much better, 3=same, 5=much worse)

incentives due to proximity to the major urban market (Nairobi), and (ii) far more widespread participation in cash-oriented, year-round dairy and tea markets. Moreover, households' perceptions of ordinal
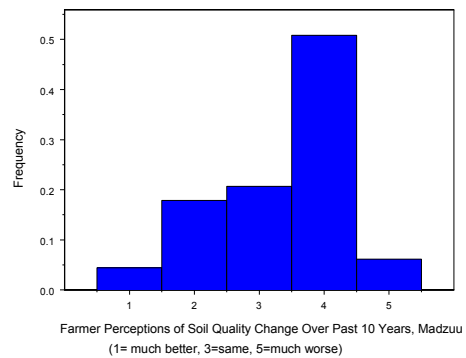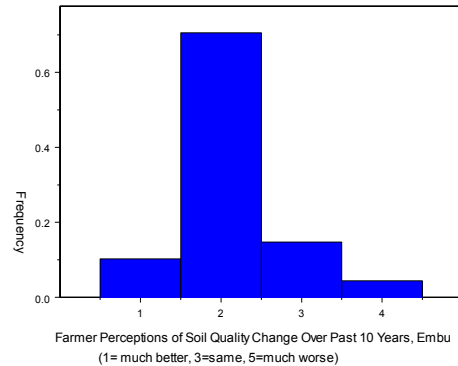
soil quality dynamics indicate that soil quality changes are largely common across plots controlled by the same household, suggesting that household characteristics (e.g., wealth, income, education, labor availability) rather than plot-specific characteristics (e.g., location on the toposequence, drainage or plot cultivation and fallow history) drive ordinal change in soil quality at decadal scale. Only 17.6% of households had different soil quality experiences across plots (i.e., at least one plot deteriorating in soil quality over the previous decade with one or more not deteriorating).

X. Photos, Illustrations, or Other Graphics: The following pages include a few digital photos from our March, 2003 USAID BASIS CRSP Team Meeting in Antsirabe, Madagascar as well as from out field visits in Madagascar.

Third Annual USAID BASIS CRSP Team Meeting, Arotel-Mascar Inn, Antsirabe, Madagascar, March 11-13, 2003.

Betsileo Hamlet near Mahsoabe (photo by Chris Barrett)

Boys in swimming pond, Tsararivotra. (photo by Chris Barrett)

Mother carrying child through rice in Tambohoivo. (photo by Chris Barrett)

Woman headloading in Ambatomainty (photo by Chris Barrett)

Charrette driver, Iandratsay. (Photo by Chris Barrett)

Appendix 1

Social Aspects of Dynamic Poverty Traps: Complementary Studies to Survey Analysis

General Terms of Reference, Updated March 2003

1. Background

Cornell University, the International Centre for Research in Agroforestry (ICRAF), the Kenya Agricultural Research Institute (KARI) the University of Nairobi (UoN), and FOFIFA of Madagascar have recently been funded by the Broadening Access and Strengthening of Input Systems (BASIS) Collaborative Research Support Program (CRSP) of USAID to undertake a study of rural poverty traps in East Africa. The research intends to build on existing quantitative datasets to undertake econometric analyses of the determinants of poverty traps and to build simulation models to assess the impacts of alternative technological and policy interventions on alleviating poverty. Initial meetings with stakeholders and potential clients have highlighted the need for increased social analysis in order to understand better the processes involved in inhibiting or promoting welfare enhancement by rural households.

The project has secured additional funding necessary to undertake qualitative research at community and household levels to complement the survey-based research taking place in five of the project's field sites: Dirib Gumbo (Marsabit), Madzu (Vihiga), and Ngambo (Baringo) in Kenya and Fianarantsoa and the Vakinankaratra in Madagascar. In Kenya, this work is supported by supplementary grants from IDRC (Canada) and the Rockefeller Foundation to ICRAF and the University of Nairobi, respectively. In Madagascar, this work is supported by Cornell University's Ilo project from USAID-Madagascar.

2. Objectives

The principle objectives of this social component of the project are:
1. To characterize, identify, and analyze dynamic poverty processes using social and historical methods, with particular attention being given to the effects of shocks on welfare dynamics and the relationship between natural resources management practices, changes in natural capital (soils, forests, water) and human welfare dynamics.
2. To identify existing and potential strategies for households to escape from poverty traps and to understand the constraints in employing them.

These objectives are highly similar to those in the rest of the BASIS project, contributing both to the understanding of poverty traps and the simulation of the impacts of potential beneficial interventions.

3. Sampling Method
The objective is to understand household-level changes in well-being and natural resources management. So *it is important to minimize the number of villages visited* so as to minimize the between-village variation in the household-level case studies. Households interviewed in the qualitative work are to be selected from the quantitative survey sample households. Using the poor-nonpoor transition matrices we have constructed off the panel data on per capita household income, for each site the researcher is to choose two sample households each from the (i) poor-nonpoor and (ii) nonpoor-poor cells of the transition matrix for the site. Then choose two households each from the poor-poor cell who (iii) enjoyed an increase in income per capita between the two survey periods, (iv) experienced no significant change in income per capita between the two survey periods, and (v) suffered a decrease in income per capita between the two survey periods. Then do the same for the nonpoor-nonpoor cell, covering two households each who (vi) enjoyed an increase in income per capita between the two survey periods, (vii) experienced no significant change in income per capita between the two survey periods, and (viii) suffered a decrease in income per capita between the two survey periods. Assuming there exist at least two households in each of the eight categories just identified, this will yield 16 households each per site for the qualitative survey. If there are

not at least two households in each of the eight categories, the number of households covered by the qualitative work will be reduced accordingly.

Households need not be randomly selected. Indeed, it is preferable that household for the qualitative survey work be purposively selected for the cooperativeness of the household (e.g., their availability to visit with you and the apparent willingness to share details of their story with you) and the added insights their history can provide. Select households with whom you feel you can get good and truthful information that will help explain the quantitative data, offer key insights on the root causes of poverty traps or paths out of poverty, or both.

It is advised that the researcher begin with the nonpoor-nonpoor and the poor-nonpoor households, so as to be able to identify strategies that have been effectively employed by households in getting and/or staying out of poverty. Then the researcher can explore with households in the poor-poor and nonpoor-poor categories why they have not been able to access those strategies effectively as some other households have.

4. Activities

The activities will involve qualitative techniques, beginning with focus group consultations to understand the range of important concepts related to poverty processes. This will be followed by case studies of selected households to construct social-historical profiles of distinct household types and by key informant interviews to corroborate and expand upon key issues and details emerging from the focus group and household interviews. The data to be analyzed include that on household livelihoods, vulnerability to economic and health risks (including HIV-AIDS), risk coping mechanisms, management of assets, investment strategies, gender relations, social capital and networks, natural resources management practices (especially regarding soil fertility and soil and water conservation) and the role of off-farm activities. Particular attention will be paid to understanding the historical context that underpin household strategies to improve their welfare. Following preliminary analyses of the case studies, focus group consultations will once again be held to discuss analyses and confirm the opportunities and limitations of strategies for poverty reduction.

(1) The work in each community should begin with community-level focus group interviews. The objective of this exercise, along with the key informant interviews (see (3) below), is to secure a better understanding of factors common to households within the community that affect the level and change in well-being (e.g., location and access to markets, existence of local coops or farmer groups, etc.).

Questions to be asked include, but should not be limited to:
- What defines poverty in this community and what are therefore the best indicators as to who is poor? Where does the poverty line lie in this community? The objective of this particular line of questioning is to establish local conceptualizations of poverty, identify appropriate variables measured in the surveys and the threshold point(s) at which one transitions from being poor to not poor. Then do a wealth ranking to establish which households are poor and nonpoor (as a check against the survey-generated transition matrix).
- Do you think a greater, smaller or the same share of people in this community live in poverty today as compared to ten years ago? Why? Twenty years ago? Why?
- Are poor people treated better, worse, or the same by others in the community relative to how they were treated ten years ago? Why? Twenty years ago? Why?
- Do you think a greater, smaller or the same share of people in this community are wealthy today as compared to ten years ago? Why? Twenty years ago? Why?
- In the past, how did the poor escape poverty, or did they escape it at all? Are those strategies still accessible to the poor here today? If not, why not? Have new strategies become available in the past ten years for the poor for escape poverty?
- When people become poor today, does it take them less time, more time, or about the same to pull themselves out of poverty? Why?

- What are the primary risks that threaten to cast people who are not poor presently into poverty? Have these risks changed over the past ten or twenty years?
- What mechanisms exist for avoiding these risks before one suffers a shock? Have these changed in availability or effectiveness over the past ten or twenty years? Who has access to these risk avoidance mechanisms?
- What methods exist to cope with shocks after they occur? Have these changed in availability or effectiveness over the past ten or twenty years? Who has access to these risk coping strategies?
- How have land use patterns changed over the past ten years? Why? What effect, if any, has this had on agricultural production patterns (crop choice, cultivation practices and productivity)? What effect, if any, has this had on livestock production patterns (species choice, husbandry methods, and productivity)?
- What are the most popular natural resources management practices today? Why? Has this changed over the past ten to twenty years? If so, why? Are there past practices that were effective but that are no longer feasible or desirable for some households? Explain.
- What sort of informal self-help, marketing, credit, natural resources management or other such groups exist in the community? How do these originate? Who can participate in the group(s), who cannot and why?
- What sort of formal self-help, marketing, credit, natural resources management or other such groups exist in the community? How do these originate, in particular did these arise within the community independent of outside interventions or were they created or encouraged or even financially supported by an outside development agency? Who can participate in the group(s), who cannot and why? Which ones have been effective, which have not, and why? Which groups previously existed but have disbanded (especially if they disbanded due to failure) and why?

(2) The second activity, following the community-level focus group discussions, is household-specific interviews to explore household-specific histories of welfare and NRM dynamics.. Ask the same questions as found for the community-level focus group interviews, but now with an emphasis on the respondent household so as to be able to identify the household-specific factors that account for the level of and change in welfare (as distinct from the covariate-level factors common to households in the community, which is the objective of the focus group interviews.

Emphasize the following sorts of household-specific questions.
- Have you ever been poor?
  - o If yes, what caused you to be or become poor? Were most of your clan or neighbors in a similar situation or was your situation different from others'?
  - o If yes, were you able to climb out of poverty?
    - ▪ If yes, how long did it take you to climb out of poverty? How did you do it? What were the essential opportunities or forms of assistance you had? Were others in similar circumstances able to climb out of poverty faster or slower than you and why?
    - ▪ If no, how long have you been poor? Were others in similar circumstances able to climb out of poverty and why or why not?
  - o If no, how have you managed to avoid becoming poor? What have been the key strategies, opportunities, or forms of assistance that have enabled you to stay out of poverty?

(3) Finally, interview key informants (local elders, extension agents, agricultural traders, mission or development group officials) to check into the answers given in the household-level and community-focus group interviews. A key objective in the key informant interviews is to get a sense of what interventions have been tried in an area previously, which were successful, which might have proved successful with a slightly different design or management (and explain what changes would have been necessary), and which were failures from which one can learn.

The local investigators will be provided with a camera for use, either a borrowed digital camera or a disposable camera. They are to take photos of all respondent households under activity 2 and of focus group meetings under activity 1.

5. Outputs

The output of this activity will consist of a written report to be published for local distribution and on the BASIS project web site. The report will describe for each site the socio-economic dimensions of poverty processes at household and community level, with explicit attention given to whether welfare dynamics relate to changing natural resource conditions and, if so, how. The emphasis in this report should be on the dynamics (changes) in welfare at community and household level and the related dynamics in natural resources management. The report should explicitly identify strategies pursued by households that have enjoyed increases in income and should explicitly identify barriers faced by households that have not pursued those successful strategies (or that have done so unsuccessfully). The report should include about a one-page write-up on each household, followed by a summary of the common (covariate) experiences in a community. These outputs will subsequently be synthesized across the project sites in Kenya and Madagascar in collaboration with the BASIS project leaders and the project will publish a few one-page "Voices" briefs -- in the style of the *Voices* series put out by the CGIAR's Alternatives to Slash and Burn (ASB) program (copies of which are available through ICRAF). The report from this activity will also have important intermediate impacts on the project's econometric and computer simulation work.

The suggested structure of the report for each site should therefore be along the following lines (adapt as needed):

I.   Introduction

II.   Description of Research Methods (should follow methods described above closely, but be sure to note any changes and include as an appendix a copy of the interview guidelines used in the site).

III.   Site Description
        Describe general area (e.g., in Embu, Fianarantsoa and Vakinankaratra, where several villages are involved) and specific village characteristics, including location, agroecological characteristics, cultural/economic factors (e.g., ethnic groups represented, existence of stores, banks, coops, etc.)

IV.   Community Level Factors Affecting Welfare Change
        Discuss covariate shocks (e.g., drought, political crisis) or structural changes (e.g., new road or clinic created) and how, if at all, these appear to be linked to natural resource management at community level.

V.   Household Level Factors Affecting Welfare Change
        Discuss household-level (idiosyncratic) factors that account for within-village differences in welfare and natural resources trajectories. This section should explicitly identify strategies employed by households that have successfully exited or avoided poverty and any barriers poor households face to following these strategies. This section should include an approximately one page description on each of the households interviewed for the site (see section 3, above, for description of the 16 different households to be interviewed in each site).

VI.   Synthesis of Site-Specific Results
        This section should synthesize all the findings from specific sites and households, with the objective of providing an improved overall understanding of the causal factors behind welfare and natural resource management and quality changes, the

sorts of livelihood strategies that are most effective in enabling households to become and remain nonpoor, and what obstacles exist to poor households becoming and remaining nonpoor.

6. Timeline

The social analysis will take place following the completion of the quantitative surveys in each site and the production by the rest of the BASIS team of the transition matrices necessary for doing the household-level oral histories. A report will be written by the team and submitted to Cornell, ICRAF, KARI, FOFIFA and the University of Nairobi by June 30, 2003.

7. Budget

To be established separately for each site.

Appendix 2

BIO-ECONOMIC MODELING COURSE

Cornell University Dept. of Applied Economics and Management in conjunction with USAID BASIS CRSP project "Rural Markets, Natural Capital and Dynamic Poverty Traps in East Africa"

Course description

This course is being offered for scientists at FOFIFA, ICRAF and KARI who have responsibilities for policy and technology analysis. Students will be trained in principles of systems dynamics analysis, and in the design and use of the Crop, Livestock and Soils in Smallholder Economic Systems (CLASSES) integrated bioeconomic model of east African rural systems dynamics being developed under the USAID BASIS CRSP project "Rural Markets, Natural Capital and Dynamic Poverty Traps in East Africa." The course consists of two sessions of classical instruction – a two-day session in Kenya in June 2002 followed by a two-week session in the United States in October 2002 – and electronic consultation between the students and course staff prior to and following the first session, culminating in each student's design, calibration, validation and sensitivity analysis of a variant of the CLASSES model. Students will be provided with their own copies of two core texts and a license for the VENSIM software used in the course.

Course outline

TWO DAY COURSE IN NAIROBI (June 2002)
Day 1
1. Basic principles of system dynamics
2. Review of system dynamic models and their application
3. Introduction to system dynamics simulation software

Day 2
4. Review of basic mathematical concepts
5. Units of measurement and their importance in building meaningful models
6. Experimentation and building of simple simulation models

TWO WEEK COURSE AT CORNELL (October 2002)
Week 1
1. Day 1: Introduction to the CLASSES bio-economic model - (structure and content)
2. Day 2: Building a simple bio-economic model
3. Days 3, 4, and 5: Adding behavioral and interdisciplinary features to the simple model, incorporating the human decision making component

Week 2

1. Days 1 to 2: Review of Course material covered in Week 1. Students embark on and complete a bio-economic modeling project
2. Day 3: Evaluation and discussion of individual modeling projects
3. Day 4: Model testing, calibration and validation. Running sensitivity analyses
4. Day 5: Conclusion of the course and award of certificates

COURSE OBJECTIVES

The objectives of this course are to:

➢ Impart skills to students that will enable effective use and modification of the integrated bio-economic CLASSES model for policy analysis. These skills will enhance students' understanding of how the structure of rural systems affects system performance in the wake of various interventions, equip students to adapt the model structure in order to simulate unique features of their specific environment, and facilitate more accurate and sophisticated ex ante impact assessment.

➢ Stimulate systems thinking by the students in order for them to better appreciate the complexity of most systems that arise not from the complex subunits but rather from their intricate linkages. Such systems thinking helps policy analysts anticipate how interventions in one part of a complex system commonly result in responses from the other parts of the system, thereby helping to mitigate undesirable unanticipated consequences of policy and project interventions.

COURSE REQUIREMENTS

Students must possess

a) a minimum of a bachelors degree in agricultural science, biology, statistics, mathematics, or social sciences (economics, sociology, anthropology etc.), with significant post-degree research experience. A masters degree is strongly preferred.
b) strong quantitative and analytical skills
c) proficiency in English (all instruction and applications are in English)
d) significant experience with quantitative microcomputer applications such as spreadsheets, relational databases, econometric or mathematical programming packages, or basic computer programming languages (e.g., C+, BASIC, FORTRAN).
e) experience in policy simulation and management of agricultural systems is highly desirable but not prerequisite.

COURSE STAFF:

Dr. Bernard N. Okumu, (lead instructor)
Dr. Christopher B. Barrett (project director)
Dr. Lawrence E. Blume

DETAILED SYLLABUS

TWO DAY INTRODUCTORY SESSION IN NAIROBI, KENYA

Day	Morning topics	Afternoon topics and homework assignments	Readings
1	1. A highlight of the system dynamics concepts, debates and evolution. Their usefulness and application to real life problems 2. Understanding patterns of growth, the law of unintended consequences and counterintuitive behaviour of social systems 3. Causes of policy resistance 4. Why simulation is essential 5. Principles and steps for successful use of system dynamics	1. Common modes of behaviour in dynamic systems (exponential, goal seeking, S-shaped growth, oscillation, growth overshoot and collapse) 2. Understanding the forces behind common modes of behaviour Attempt exercises in Ford Ch. 1 p 12. No. 1,2 and 3 Challenges in Sterman Ch. 1- 4	- Ford Ch. 1, 2 and 3; - Sterman Ch. 1, 2, 3 and 4; (Students would be expected to have read and comprehended these chapters prior to attending the course)
2	1. Introduction to system dynamics simulation software 2. Review of mathematical concepts 3. Incorporating units of measurement	1. Demonstration of system dynamics modeling package 2. Designing and running of simple system dynamics models Undertake model building exercises in Ford chapters 3 and 4 and follow up examples in the system dynamics software user manual.	- Ford appendix A & B - System Dynamics simulation software manual - Sterman appendix A

TWO WEEK SESSION IN ITHACA, NEW YORK, USA

Day	Morning topics and discussion	Afternoon topics and homework assignments	Further Readings
Mon	1. Introduction to bio-economic models- structure and art of formulation 2. Illustration of the	Exercises in problem articulation, hypothesis formulation and defining model boundaries based on model objective(s) or	1. Relevant examples from the Ford text 2. Sterman Ch.3 parts 3.4 to 3.6

	CLASSES bio-economic model especially integration of various disciplinary components 3. Key steps in building bio-economic models	purpose (use Sterman tables 3-1 and 3-2 on page 86 and 97 respectfully as reference)	
Tue	1. Building a simple bio-economic model with a few stocks, flows and feedback loops 2. Introducing the dynamics of growth inherent in the CLASSES model both linear and nonlinear and using both analytical and numerical approaches	1. Experimentation with different types of causal loops and nonlinear relationships based on exercises and material in Sterman Chs. 4 and 8 (S-shaped, exponential and oscillatory growth patterns) 2. Application of knowledge gained so far in modeling or adding behavioral features to the simple bio-economic model built earlier on in class	1. Sterman chs. 4, 8 and 14 2 Also refer to figure 7-6 in Sterman 3 Ford ch. 4 (Modeling the Mono lake basin), ch. 15 (The Kaibab deer population) 4 Read the CLASSES model documentation material
Wed	1. Expanding the simple model to include fairly complex, disciplinary based biophysical components of the system (e.g. fertilizer, manure) – crop yield response functions, herd dynamics, animal mobility, animal nutrition, soil erosion and HIV epidemic issues etc.	1. Attempts to model the static version of the CNCPS model, the EPIC (erosion potential impact calculator) or the USLE (universal soil loss equation) model and the SIR model(i.e. susceptible population, infectious population and the recovered population model)	1. CNCPS documentation material 2. Printouts of relevant soil, animal science and human health material 3. Sterman ch. 9 sections 9.2 more specifically 9.2.7
Thur	1. Introducing the human decision making procedures (bounded rationality), delays, market structures and the conditioning economic, social and policy environments 2. Introducing human response to risk and uncertainty	1. Group discussions to come up with observed human behavior in specific localities 2. Attempt to model such human behaviors 3. Optional: attempt Sterman exercises/ challenges in ch. 13 4. Attempt ch. 15 challenge on policy design in the market growth model parts 1, 2, 3 and 4.	1. Sterman ch. 13: - Finding formulation flaws - Goal formation with external and internal inputs - Modeling floating goals - Resource allocation 2. Sterman ch. 15: - Modeling habit, routines and rules of thumb in human decision making processes 3. CLASSES model documentation material on human decisions

Day			
Fri	Review course material covered so far Hand out of project topic and material for the following week	1. Revision of topics not well understood by most or some of the students	Read project material for the area to be modeled Review material already covered in the course
Sat - Sun	(Cultural visit, shopping, etc)		
Mon - Wed	Hands on class project begins for the next three days Students are allowed to ask questions and seek help as they see fit . Further review of problem areas may be done in the course of the project period	1. Students given further references based on their specific areas of need	Relevant chapters in Sterman and Ford as well as documented material on existing bio-economic models
Thurs	-Collection and evaluation of each individual's project model - Students are given another chance to firm up on areas of interest	1. Students with persistent problems are given extra tutorials	- Reference to selective reading material based on individual needs
Fri	Model testing, calibration and validation Sensitivity analysis and wrap up and consolidation of the training course Agree on areas for further follow up when away from Cornell	1. General discussion with students on their modeling experience and on how they would benefit further from the course through distance learning	
Sat	Conclusion of the course	Award of certificates	

Appendix 3
Bio-Economic Modelling Short Course Evaluation Summaries

October 2002: Bio-Economic Modeling Course Evaluation Results

Summary

About 80 % of the students attending the course found their background in statistics / maths to be satisfactory for this course while 20% felt it was more than satisfactory. Similarly, 70 - 90 % felt their background in policy analysis was adequate while only 10 % felt it was unsatisfactory. All the students cited the desire to learn the subject as being the most motivating factor in attending the course. Attendance of the course was extremely good as non of the students missed any of the lecture sessions. A fairly good amount of reading was done. Thus 20% of the students read all the course material, 40% read half, while 20% read less than half the material. A good reason for this mixed performance would be the amount and difficulty of comprehending the advanced modeling material over a short period of time. About 70% of the students found the material covered complex but could be grasped with home study while 30% found it to be straight forward with home study. In terms of the pace at which the material was covered in class, 60% 0f the students found it to be quick (but they could keep up) while 40 % found it to be a bit more slowly than they would have liked. Overall, about 60% of the students wanted the course material taught to remain the same while 80 % of them wanted more real life examples from their domain of expertise. Again 60% found the discussion of concepts and methods in class to be clear while 30% found the discussions to be well paced too. About 10% of all the students found the discussions too slow, 10% found it to be too abstract while 10 % admitted to getting confused at one point or another. There was very limited use of other material outside that provided in the course i.e. 80% of the students didn't consult or use material outside the course. In general, all students found the course very challenging and useful. On a 1 to 10 scale of poor to excellent, most course participants scored on average an 8 for the course structure, a 9 for the type of textbooks used, an 8 for the non text readings study guide, a 10 for the instruction and a 10 for instructor availability. Comments on the course are attached at the end of the evaluation sheet.

Course Evaluation Fact Sheet

Q 1. Would you consider your background in statistics/ maths coming into this course…
- Unsatisfactory?
- Barely satisfactory?
- Satisfactory?   80%
- More than satisfactory?   20%

Q2. Would you consider your background in policy analysis coming into this course…
- Unsatisfactory?
- Barely satisfactory?   10%
- Satisfactory?   70%
- More than satisfactory?   20%
-

Q3. Are you taking this course …
- It is required by your employer?   10% of all the students
- Want to learn the subject?   100%   "
- Heard it was a good course?
-

Q4. What portion of the assigned readings did you do?
- All   20%
- Most   40%
- More than half   20%
- Less than half   20%
-

Q5. What portion of the lectures did you attend?
- Almost all   100%
- Most
- More than half
- Less than half
-

Q6. Has the material covered in this course so far been…
- too complex to understand?
- Complex but can grasp with home study?   70%
- Straightforward with home study   30%
- Too easy?
-

Q7. Are we covering material in this course…
- too slowly to keep you interested?
- A bit more slowly than you would like?   40%
- Quickly but you can keep up?   60%
- Too quickly to keep up

Q8. What balance of in – class activities would best facilitate your learning this material? Please recognize that checking more for some activity requires checking less for another

	More		Stay Same	Less
Review of concepts from readings	50%	of all students	50%	0%
Discussion of real-world applications	80%	"	20%	0%
Solving problems from text	10%	"	60%	30%
Group Project	30%	"	60%	10%

Q9. Do you find the discussion of concepts and methods in class…
- Clear   60% of all students
- Well paced   30% of all students
- Too slow   10%   "
- Too abstract   10%   "
- Just about right   10%   "
- Confusing   10%   "
- Too quick   0%   "
- Insufficiently participative   0%   "
- Over simplified   0%   "
-

Q 10. If you have made use of any other material, person(s) outside this course, have you found them useful?
- Haven't consulted any person(s) and or material outside this course   80%
- Not very helpful   0%
- Modestly helpful   0%
- Very helpful   20%

Q 11. Overall, are you finding this course…
- Challenging and useful   100%
- Challenging and not very useful   0%
- Easy but still useful   0%
- Neither challenging nor useful   0%

Q12. Overall, how would you rate the quality of this course design, materials and instruction? (Poor = 1, Excellent = 10)

	Mean ratings
Course structure	8
Text	9
Non text readings study guide	8
Instruction	10

Instructor availability   10

COMMENTS ON ANY ASPECT OF THIS COURSE:

1. The course was very interesting. I think vensim is applicable on any domain you want to develop. But for social aspects, I am asking if vensim will be able to be developed. Try is not so bad. Special thanks to you. Chris and Ben.

2. We now need to proceed and have access to the actual "CLASSES" vensim model. A second stage of the course preceeded by firming up of what we have already learnt should concentrate on a hands building CLASSES. A second part in Cornell (Cornell has excellent facilities) may be very desirable.

3. Since this course is "new", it would be useful to try it out in the field and have a second phaseof the course to share experiences and concretize concepts.

4. It would be helpful to repeat a similar course next year and cover some of the grounds - we did not cover. Especially the application of principles to some of the work we are currently doing. More so, in the light of the fact that the speed of the course was too quick. Also next time, for people who are coming from the tropics, such a course should idealy not be in such a cold time of the year.

5. Since we now have some idea about model development, I feel a second phase at Cornell would do us good especially that we are in the process of data collection and would like to use these data to simulate models at cornell which has excellent facilities

6. A follow-up course wherein we will discuss and present a model built up by our own to address specific real world issues would be excellent. Thus a followup course would be extremely helpful. I should thank you for a job well done!

7. Need follow-up training and/or networking for sustainability

8. Need more assignments on what may be ClASSES

August-September 2003: Bio-Economic Modeling Course Evaluation Results

Summary
About 50 % of the students attending the course found their background in statistics / maths to be satisfactory for this course while 50% felt it was more than satisfactory. Similarly, all the students felt that their background in policy analysis was adequate and cited the desire to learn the subject to be their most motivating factor in attending the course. Attendance of the course was extremely good as non of the students missed any of the lecture sessions. A good amount of reading was done too. Thus all the students read all the course material. A good reason for this was the professional background of the students (University Professors). Thus despite their French background, they easily learnt the subject matter fast. This was quite a feat given that the course instruction was 100% in English and was covering very advanced modeling material and within a very short period of time. All students found the course material to be straight forward. In terms of the pace at which the material was covered in class, they all found it to be quick (but they could keep up with home study). Overall, all the students wanted the course material taught to remain the same. They also found the discussion of concepts and methods to be clear. There was no use of other material outside that provided in the course i.e. 100% of the students didn't consult or use material outside the course. In general, all students found the course to be very challenging and useful. On a 1 to 10 scale of poor to excellent, all course participants scored an average of a 9.5 for the course structure, a 9.5 for the type of textbooks used, a 9.5 for the non text readings study guide, a 10 for the instruction and a 10 for instructor availability.

Course Evaluation Fact Sheet

Q 1. Would you consider your background in statistics/ maths coming into this course…
- Unsatisfactory? 0%
- Barely satisfactory? 0%
- Satisfactory? 50%
- More than satisfactory? 50%

Q2. Would you consider your background in policy analysis coming into this course…
- Unsatisfactory? 0%
- Barely satisfactory? 0%
- Satisfactory? 0%
- More than satisfactory? 100%

Q3. Are you taking this course because …
- It is required by your employer? 0% of all the students
- Want to learn the subject? 100% "
- Heard it was a good course? 0% "

Q4. What portion of the assigned readings did you do?
- All 0%
- Most 100%
- More than half 0%
- Less than half 0%
-

Q5. What portion of the lectures did you attend?
- Almost all 0%
- Most 100%
- More than half 0%
- Less than half 0%

Q6. Has the material covered in this course so far been…
- too complex to understand?   0%
- Complex but can grasp with home study?   0%
- Straightforward with home study   100%
- Too easy?   0%

Q7. Are we covering material in this course…
- too slowly to keep you interested?   0%
- A bit more slowly than you would like?   0%
- Quickly but you can keep up?   100%
- Too quickly to keep up

Q8. What balance of in – class activities would best facilitate your learning this material? Please recognize that checking more for some activity requires checking less for another

	More		Stay Same	Less
Review of concepts from readings	0%	of all students	100%	0%
Discussion of real-world applications	0%	"	100%	0%
Solving problems from text	0%	"	100%	0%
Group Project	0%	"	100%	0%

Q9. Do you find the discussion of concepts and methods in class…
- Clear   100% of all students
- Well paced   0% of all students
- Too slow   0%   "
- Too abstract   0%   "
- Just about right   0%   "
- Confusing   0%   "
- Too quick   0%   "
- Insufficiently participative   0%   "
- Over simplified   0%   "

Q 10. If you have made use of any other material, person(s) outside this course, have you found them useful?
- Haven't consulted any person(s) and or material outside this course   100%
- Not very helpful   0%
- Modestly helpful   0%
- Very helpful   0%

Q 11. Overall, are you finding this course…
- Challenging and useful   100%
- Challenging and not very useful   0%
- Easy but still useful   0%
- Neither challenging nor useful   0%

Q12. Overall, how would you rate the quality of this course design, materials and instruction? (Poor = 1, Excellent = 10)

	Mean ratings
Course structure	9.5
Text	9.5
Non text readings study guide	9.5
Instruction	10
Instructor availability	10

Appendix 4

"Analytical and Empirical Tools for Poverty Research"
Learning Workshop of the 25th International Conference of Agricultural Economists
Durban, South Africa, Saturday, August 16, 2003

Organizers: Chris Barrett (Cornell University) and Csaba Csaki (World Bank)

8:00-9:00   **Workshop/Conference Registration**

9:00-9:05   **Introductory Remarks (Chris Barrett and Csaba Csaki)**

9:05-10:05   **Michael Carter (University of Wisconsin-Madison):** Poverty dynamics:
                 An overview of theory and empirical methods using panel data

10:05-11:05   **Chris Barrett (Cornell University)**: Integrating quantitative and
                 qualitative poverty analysis tools

11:05-11:30   Coffee/tea break

11:30-12:30   **Steve Younger (Cornell University):** Welfare comparisons across
                 different measures: multidimensional poverty concepts and methods

12:30-1:45   Lunch

1:45-2:45   **Berk Ozler (World Bank, presented by Steve Younger)**: Poverty
                 mapping: integrating survey and census data to generate more spatially
                 comprehensive poverty assessments.

2:45-3:45   **Stefan Dercon (University of Oxford):** Dynamic vulnerability analysis
                 using panel data

3:45-4:15   Coffee/tea break

4:15-5:45   Panel on current thinking on poverty reduction policy and rural
                 development: **Jock Anderson (World Bank), Gershon Feder (World
                 Bank), Peter Hazell (IFPRI), Kei Otsuka (Foundation for Advanced
                 Studies on International Development, Japan), Tom Reardon
                 (Michigan State University)**

5:45-6:00   **Closing Remarks (Csaba Csaki and Chris Barrett)**