

# DECISION SUPPORT SYSTEM SEMINAR

## Environmental and Economic Options and Consequences of Climate Change, Reforestation and Improved Soil Management in Kenya

Nairobi, Kenya, May 4, 2004

A one-day seminar for decision-makers was held in Nairobi, Kenya, on May 4, 2004 by scientists of the Texas A&M Center for Natural Resource Information Technology (CNRIT). The seminar was supported by the U.S. Agency for International Development (USAID) through the Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program (SANREM CRSP).

The seminar showcased the potentialities of an integrated set of economic, environmental, and biophysical models that CNRIT scientists have developed and applied in East Africa for the past seven years. These models provide a quantitative means of assessing the consequences of policy and management decisions that affect sustainable food production to meet expanding future needs. In the past year, these models have been used to address three high priority policy issues facing the Government of Kenya: (1) the impact of climate change on food security, (2) options and alternatives for reducing the impact of deforestation, and (3) options and alternatives for reducing the impact of macronutrient and organic matter depletion in soils. Seminar presentations addressed these themes (see below), illustrating actual and potential applications of the models to policy decisions. The program agenda is shown in Attachment 1.

About 30 participants, including CNRIT scientists, Kenyan government officials, and researchers from national and international institutions operating in Kenya and in East Africa attended the seminar. Participants were invited to evaluate and use the Decision Support System models and databases presented for their future analytic needs. The list of participants is shown in Attachment 2.

The full reports of these studies are being made available on the CNRIT website (<http://cnrit.tamu.edu/cnrit/sitemap.html>) and will be linked to the SANREM website (<http://www.sanrem.uqa.edu>).

### **Priority policy issues**

#### ***Impact of climate change on food security***

The changes in temperature and precipitation patterns associated with projected climate change will adversely affect agriculture, especially in low latitude regions where most developing countries are located, thereby posing a threat to sustainability of food production systems and food security. The integrated suite of economic, environmental, and biophysical models comprising the CNRIT Decision Support System were used to assess the impact of climate change in Kenya and neighboring East African countries as well as in West Africa. These studies provide quantitative estimates of climate change

impact on food production and evaluate several options for modifying production systems to mitigate these effects. The results of the Kenya study were compared to those in other countries and general conclusions were proposed as a function of geographic characteristics. In general, Kenya is expected to become hotter and drier over time. Projections show that current technology will be unable to ensure the sustainable food production needed to meet increased demands by the year 2030.

### ***Options and alternatives for reducing the impact of deforestation***

The upper Tana River Basin is strategically one of the most critical resource areas of Kenya, providing water and hydroelectric power for 65% of the nation. Unregulated deforestation and expansion of cultivation onto marginal soils in the basin has resulted in significant reservoir siltation and more erratic downstream flows. Working with key government institutions, this study was designed to evaluate the impact of meeting the national goal of reforestation of 30% of the deforested lands in the upper basin, along with implementation of new agro-forestry practices and land tenure laws. Hydrologic and economic models were used to estimate the impact of these interventions. Results addressed the reduced siltation of the reservoir and the impacts of changing land use on agricultural production in the region. Quantitative estimates of the effect of reforestation on reduction in sediment load in the reservoir as well as the contributions of sediment by the several streams flowing into the Masinga reservoir were presented. The presentations generated active interest on the part of the Ministries of Agriculture, Forestry, Environment, and the Kenya Power Generation Company. The possibility was raised of acquiring new data and conducting additional analyses to further inform decision makers on this key basin and reservoir.

### ***Reducing the impact of macronutrient and organic matter depletion in soils***

The CNRIT (SANREM) Decision Support System comprehensively addresses the interrelated economic, environmental, and biophysical consequences of alternative policy and management scenarios affecting food security. However, its full application requires considerable skill and training in several disciplines. During the last year, a more user-friendly interface to the systems was developed and evaluated. The method allows analysts with limited modeling experience to use the system to evaluate practices that reduce the impact of loss of soil macronutrients and organic matter on food production.

### **Future Application of the Decision Support System**

The DSS provides a suite of models that have been developed and successfully applied to pressing natural resource management problems in Kenya and other parts of East Africa. The multiple databases that are required to use these models have been acquired and organized for future application. Methods to access and apply dynamic and changing input data have been developed. The Kenya Agricultural Research Institute (KARI) has established a DSS laboratory with specialists trained in its use. The specialists will install the DSS and begin its application to relevant problems in the area. KARI and the Texas Agricultural Experiment Station recently executed a memorandum of agreement wherein KARI will seek funding to continue its training in the use of the DSS with CNRIT's help. The Director General of KARI aspires to make the DSS laboratory a regional center for policy and decision analysis serving East Africa.

Attachment One

**DECISION SUPPORT SYSTEM SEMINAR**

**Environmental and Economic Options and Consequences of  
Climate Change, Reforestation and Improved Soil Management  
in Kenya**

**Nairobi, Kenya, May 4, 2004**

Texas A&M Center for Natural Resource Information Technology  
USAID - SANREM CRSP

9:00-9:15	Welcome, review of objectives of the symposium	Dr. Romano Kiome Dr. Neville Clarke
-----------	---	--

9:15-9:30	Summary of past impact assessment studies in Kenya – Implications and Applications	Dr. Neville Clarke
-----------	--	--------------------

**Impact of Climate Change and Options for Mitigation**

9:30-10:30	Introduction and methods of climate change study	Mr. Jay Angerer
------------	---	-----------------

10:30-11:00	Tea/Coffee	
-------------	------------	--

11:00-11:30	Environmental impacts of climate change	Mr. Jay Angerer
-------------	---	-----------------

11:30-12:30	Economic impacts of climate change	Dr. Jeff Vitale
-------------	------------------------------------	-----------------

12:30-2:00	Lunch	
------------	-------	--

## **Environmental and Economic Consequences of Reforestation in the Upper Tana River Basin**

2:00-2:10	Purpose and Objectives of Study	Dr. Robert Kaitho
2:10-2:40	Methods and Models	Mr. Jay Angerer
2:40-3:00	Environmental Consequences	Mr. Jay Angerer
3:00-3:15	Economic Consequences	Dr. Jeff Vitale
3:15-3:25	Policy Implications	Dr. Robert Kaitho
3:25-3:55	Assessing the Effects of Macronutrient and Organic Matter Depletion in Soils: Biophysical and Economic Perspectives	Dr. Jeff Vitale
3:55-4:30	Discussion of Implications for Future Applications of Decision Support System	Dr Neville Clarke Dr. Robert Kaitho Symposium participants

## Attachment Two

### Participants

<b>Name</b>	<b>Institution</b>	<b>Address</b>
Daniel Kimani	KENGEN	P.O. Box 47936 Nairobi
Richard Nderitu	KENGEN	P.O. Box 47936 Nairobi
Joseph Ochieng	KARI	P.O. Box 57811 Nairobi
David Kallavi	TARDA	P.O. Box 47309 Nairobi
Ralph van Kaufmann	FARA	P.O. Box 30709 Nairobi
James Oduor	MOA	P.O. Box 30028 Nairobi
Bridget Ochieng	Tegemeo Institute	P.O. Box 20498 Nairobi
Gatarwa Kariuki	KARI	P.O. Box 57811 Nairobi
Christopher Oludhe	UON/DMCN	P.O. Box 30197 Nairobi
S.N. Njoroge	NEMA	P.O. Box 67839 Nairobi
Louis Verchot	ICRAF	P.O. Box 30677 Nairobi
Simon Mbugua	Ministry of Water	P.O. Box 49720 Nairobi
Samuel Muchemi	Kenya Meteorological Department	P.O. Box 30259 Nairobi
Irene Ndavi	TARDA	P.O. Box 47309 Nairobi
Patrick Kariuki	DRSRS	P.O. Box 47146 Nairobi
Monica Waiganjo	KARI	P.O. Box 220 Thika
Maingi Maundu	Ministry of Planning and National Development	P.O. Box 30005 Nairobi
Festus Murithi	KARI	P.O. Box 57811 Nairobi
Ephraim Mukisira	KARI	P.O. Box 57811 Nairobi
Jane Wamuongo	KARI	P.O. Box 57811 Nairobi
Peter Maingi	KARI	P.O. Box 57811 Nairobi
Daniel Mbithi	Forest Department	P.O. Box 30513 Nairobi
Robert Kaitho	CNRIT	2129 TAMU
Jay Angerer	CNRIT	2130 TAMU
Jeff Vitale	CNRIT	2131 TAMU
Neville Clarke	CNRIT	2132 TAMU