NJORO TRIP REPORT - SUMAWA PROJECT

JULY 29-AUGUST 8, 2003

To: Shivoga, Miller and Lelo
From: Mimi Jenkins
Date: August 12th 2003

Trip Objectives:

1) Review socio-economics (SE) and stakeholder involvement (SHI) components progress to date and remaining work for this year
2) Provide support on data management and data flow across components
3) Discuss project activities and research ideas for next year
4) Review Kiragu's and Wilkister's proposals and provide training support for their water, sanitation and health research activities
5) Initiate discussions on water resources engineering evaluation and planning tools and research activities, and data collection needs with Gichaba's team.
6) Initiate contact with water resources engineering faculty
7) Review SHI reports and discuss arrangements for writing stakeholder involvement paper
8) Advise Tim K. on his research proposal and field methods

The trip objectives were mostly well achieved, except for 3) and 7). Very limited discussions were held on planning work for next year in the SE and SHI components and minimal work was done on the stakeholder paper. Given the SHI and SE team leaders' available time, it was more important to concentrate attention on the critical tasks and outputs left to do on this year's scope of work, namely the survey and completing the PRA's.

Substantive discussions were held and progress made with the watershed hydrology team in identifying and planning research tasks and priorities for the next and subsequent years. Formats and protocols were elaborated from various data management needs. A collection of journal papers, books and other materials was shared with several researchers and students and copies left for the project (with Mary or in the electronic form in the folder "FROM MIMI" on the SUMAWA office computer and on one of the student computers).

Follow-up Items and Suggestions:

1. Wilkister:
    a. Initiate paper work to put me on her research committee, also Kiragu's?
    b. Investigate options for Wilkister to get training in epidemiology of infectious diseases, public health interventions, and statistics.
    c. Identify a public health/epidemiologist professor in Kenya (Egerton or Moi?) with strong quantitative skills to join Wilkister's committee.
2. Arrange so that students can communicate easily via email (attachments sent thru Mary) with Mimi, Scott, Tracy, and others in US.
3. Njeri Muhia to join SHI team in Chiuri's absence

4. Dr. Shem Ouma (moving to WECO affiliated with Moi U.) to join SE team to help accelerate completion of the baseline household survey
5. Gichaba's team to produce maps and official estimates of 1999 watershed population by sub-location for whole team to use, esp. for as sampling frame for SE household survey.
6. Gichaba's team to provide official Table Format, required Information Fields, and official protocol to all SUMAWA team for collecting, identifying, and entering point location data for the project.
7. Give a very high priority to finishing the PRA work in remaining 4 communities of Nessuit and Ngata for this year.
8. All team members would benefit greatly from reading the PRA's that are available, even in draft form. They provide critical context for interpreting and planning research activities and questions across all components.
9. Define minimum set of required courses for each Research Activity SOW and use as basis for screening students for coming year
10. Consider recruiting students from water engineering with stronger quantitative backgrounds into the project for coming year
11. Research activities for next year should include some design, implementation, testing, and evaluation of various interventions (e.g., school environmental outreach program, behavioral trials, demonstrations, other educational activities, exposure trips, etc.) with stakeholder participation.
12. Revive the original plan for a SUMAWA-wide orientation to GIS and PRA to support better data flow and linkages across components and research efforts.

Summary of Meetings:

The following meetings were held during my trip:

1) Dr. Ouma Sr. (head of the SE team)

Topics:

- Progress to date
- Team composition and activities
- Dr. Shem Ouma (young PhD in economics) to joint the team to help with the household survey
- Subsequent joint meeting to discuss purpose, design and tasks for household baseline/monitoring survey (see next point)

2) Full SE team with leaders and members from the 3 other components

Topics: (power point presentation)

- Purpose, scope, & design of household survey, next steps and tasks
- Data linkages across components for interdisciplinary analysis
- 3-year project goal and purpose, examples of interventions
- Horizontal collaborations and data sharing/exchange across components

3) Dr. Chiuri and Njeri Muhia (PRA staff member)

Topics:

- Status of SHI work, remaining tasks for Sept. 30th
- Njeri's role after Chiuri's departure

- Stakeholder paper on PRA, stakeholder, and policy outputs

4) Dr. Lelo and Steve Huckett

Topics:

- SHI progress, status of outputs, remaining tasks and reports to be submitted
- Arrangements for Njeri to joint SHI team during Chiuri's absence
- Prioritize completion of PRA work in the field before working on stakeholder paper
- School-based pilot outreach program of watershed awareness clubs (like 4-K), with themes for learning activities (e.g., rainfall data collection, water quality and health, soil erosion, tree nursery, etc.) as major project outreach activity for 2003-2004

5) Dr. Gichaba and Dr. Onyando (3 meetings held)

Topics (see details below under Watershed Hydrology Section):

- Basic structure for hydrologic data management protocols and formats (e.g., point data locations vs. time series data)
- Mapped some examples of data flow and linkages across components
- Protocol of required information fields for point data sets to be distributed to all SUMAWA team the other components so they can be managed in GIS
- Urgent priority to develop and distribute to all components a map of sub-location boundaries with basic geographic landmarks and estimate the 1999 population and # of households located within the portion of each sub-location falling within the watershed boundaries
- Discussed and prioritized a list of watershed hydrology data collection and analysis tasks for next year as a foundation for subsequent years, and initiating school clubs for rainfall monitoring in the upper watershed
- Discussed use of course-requirements as a criteria for selecting students with stronger quantitative skills for coming year

6) Dr. Shivoga and Dr. Lelo (several short meetings)

Topics:

- Wilkister's PhD proposal and budget needs (to follow-up), adding me to Wilkister's committee, travel and training abroad for Wilkister
- Financial logistics for new members like Njeri and Dr. Shem Ouma (Jr.) joining team
- Output-based pay for 4th quarter of this year, in preparation for next year
- Data integration and flow across components would greatly benefit from some kind of orientation workshop to GIS and PRA for all team members (planned but never held)
- Developing a list of required classes (e.g., statistics and probability, quantitative hydrology, etc.) to select and screen students for the project

7) Dr. Chemelil, Chair of Agricultural Engineering and Mr. Kimani, Faculty of Engineering

Topics:

- Potential future collaboration with UCD Civil and Environmental Engineering in water resources engineering research
- 7 water engineering faculty, several working on modeling runoff in Lake Naivasha watershed
- Possible future support and students for Module 2 if funds become available

- Strong research interests in applying WEAP (someone in their group has worked with it already) in the region and need in Kenya for developing other water resources evaluation and planning tools to support the new GOK efforts to revive the River Basin Development Authorities to improve integrated water development and planning
- Dr. Chemelil's PhD thesis (1995 Loughborough U. UK) on rainfall-runoff modeling of historic changes in land use on streamflow in the Njoro River watershed

8) Kiragu and Wilkister (5 sessions held)

Kiragu is the MSc Student in the SHI team who is collecting health center data on diarrhea diseases (DD) and typhoid in the watershed. Wilkister is an incoming PhD student and will be a member of both the Ecology team (water quality testing) and the SE team (water consumption and hygiene behaviors in households). She is developing her research proposal on domestic water supplies and public health in the watershed to identify watershed conditions and appropriate interventions for improving human health and productivity.

Three meetings where held jointly with Wilkister and Kiragu to provide background theory and recommend literature on relevant topics, develop a coordinated set of research activities, and train them in use of Epi Info 2002 software. Discussions focused on the epidemiological understanding of DD and other fecal-oral diseases, the need to collect data and analyze disease patterns by age, sex, season, and residence in order to identify "hot spots" of transmission and likely environmental conditions and behavioral risk factors for these diseases.

Kiragu's data and MS will provide useful foundation for proposing project interventions for stakeholder discussions and complement Wilkister's initial research task on evaluating fecal contamination of domestic water supplies, followed by in-depth analysis of the determinants of household water consumption and hygiene behaviors. The data set that Kiragu is constructing of 5 years worth of all DD and Typhoid case records (back to 1997) at several health clinics in the watershed can be updated each year to monitor water-related population health and support stakeholder decisions over the course of the project. Methods were also discussed to estimate the economic costs of the burden of these diseases in the watershed which Kiragu will plans to include in his thesis.

Accomplishments:

- Reviewed and modify Kiragu's data collection protocol and research proposal
- Worked with Wilkister to revise her proposal, methods, and background literature
- Inventory of Delaqua Kit and reviewed fecal coliform counts with Wilkister
- Provided extensive background literature and materials to SUMAWA library on water, sanitation, hygiene, and public health in developing countries.
- Training given on EPI Info 2003 software for data entry and analysis of epidemiological data

DETAILS of PROGRESS/STATUS by COMPONENT

SHI Component

Team members:

1. Chiuri – departed team July 31, for 1 year
2. Lelo - Leader
3. Njeri Muhia – (f) Lecturer, MS in Economics, very sharp, leading the PRA activities in several communities, involved in the 4 country PAPPA study.
4. Lelo's PRA team who have helped with SUMAWA PRA:
   - Mr. Ayieko (Deputy Coordinator of PRA)
   - David Njeremani
   - Stella
   - Omolo
5. Student:
   - Kiragu – Gathering clinics case registration data to analyze disease patterns and identify environmental and behavioral risk factors for population sub-groups in the watershed

Three separate meetings were held. The first with Dr. Chiuri and Njeri Muhia (PRA team member and Lecturer in Economics), to discuss what has been done, what is left, and who is best placed to fill-in for Chiuri while she is gone for 1 year. The next short meeting was with Lelo and Steve, and the last was a brief exchange with Njeri. Unfortunately, it was not possible to have a meeting with all members of the team at the same time, due to Lelo and Njeri's tight schedules and commitments.

Decision: Njeri will join the team on a task-output basis (model for involvement starting Oct. 1st), to fill-in for Chiuri in her absence. She will help Lelo complete this year's tasks and next year's planning and implementation. Lelo and Shivoga will finalize arrangements with Njeri.

Work left to do to complete 2002-03 Outputs::

1. Conduct remaining PRA activities in Nessuit and Ngata and write up 4 more PRA reports (2 in Nessuit and 2 in Ngata)
2. Finalize draft reports for completed PRA's in Rumwe, Mwigito, and Barut communities.
3. Write "PRA Synthesis Report", summarizing the individual PRA's (basis for a research brief)
4. Write "Stakeholder Assessment Report". This report will inventory all the stakeholders and institutions in the watershed, and identify the issue or problem areas they care about, and the spatial domains where these occur in the watershed. This report will be based on the April stakeholder workshop, but will require some additional information and possible informant interviews with those stakeholder interest groups who did not participate in the April workshop (e.g., large commercial farms, large land owners, industries, any others missing at the workshop?).
5. Write "Policy Analysis Report". Get comments from Steve and Mimi, and revise summary of government policies that impact watershed resource management. Would be important to add details and analysis of how laws are enforced in practice, and specifically in Njoro

Watershed, and to assess their potential for supporting sustainable watershed management by stakeholders.

Paper on "Stakeholder perceptions and priorities in the Njoro River Watershed"
Discussed this paper as the ultimate goal for the SHI team for this year, with Chiuri, Njeri, Steve and Lelo. This paper would synthesize the three key outputs (see # 3, 4, & 5 above) and assess the opportunities and challenges for sustainable watershed management of Njoro River watershed. Since we were unable to meet as a team, there was not a lot of progress made on the paper. Njeri/Lelo and I can work up an outline, assign sections to different team members to draft, and then Lelo/Njeri compile a first draft for circulation to the rest of us.

SE Component

Team members:

1. Dr. Ouma (senior) – has limited time for active research due to heavy load of administrative tasks as senior member of his department, expressed need for additional PhD, with quantitative modeling to assist in directing research tasks.
2. Proposed addition of Dr. Shem Ouma (not related) who recently got his PhD in economics.
3. Students –
    a. Charity – looking at tree farming/agro forestry in upper watershed; has been developing a household questionnaire which she is planning to administer to households in upper watershed. Her main interest is agro forestry, however, this limited survey is getting confused in peoples heads with the baseline survey for project monitoring. Discussion underway to get Dept. of Forestry, Charity's employer, to let her keep working with SUMAWA after she finishes.
    b. Ndonye – interested in how land tenure issues affect watershed conditions … he doesn't yet seem to have a clear idea of what his research will be about and how it will tie into the project

Accomplishments:
1. Livestock appraisal – get copy of "brief" presented by Dr. Ouma at Eldoret, Moi U. meeting in May. It is conceptual and generalized in form. Would be good to complete report with estimates of populations, and specific types, locations/ magnitudes of livestock impacts and get data on historic trends in populations. Identified and GPS's 15 watering points along the Njoro river where cattle are watered; talked to herder boys about amounts and patterns of water use at some of the points (Made suggestion to use structured observations at water points from dawn to dusk to count number of livestock visiting in each 15 minute interval, inventory behaviors of livestock that have impacts on riparian zone and on water quality, e.g., number of times defecation observed, number of times urination observed, damage to riparian zone, etc.)

2. Some archival material (past reports) from Dept. of Agriculture, Njoro Division Office, have been gathered. These have useful information and are available in the SUMAWA Office. Dr. Ouma is holding on to them for future uses, as need arises. (Suggestions: Someone in SE team should exploit these reports, to compile statistics and write up a report on past trends related to agricultural and livestock production, health, inputs, yields, etc. and in the watershed. There is also good trend data in Mathew Chemelil's (not chair of EU Ag engineering) 1995 PhD thesis on effects of human induced

changes on streamflow in the Njoro River – see documents at end of this report)

3. Have begun drafting a household questionnaire, but there is a need for better understanding of the purpose for this survey as the baseline and monitoring tool of changes at household level across the whole watershed. PRA reports should be exploited in drafting survey to identify household income sources and practices that are linked to natural resources and the river, issues in each community, and actions that are being planned as interventions. (Addressed in meeting Aug 5th with SUMAWA team.)

Watershed Hydrology Component

2002-2003 Tasks discussed:

1. Data Acquisition
   - rainfall, other meteorological, streamflow

2. Data Management
   - Prepare a workbook for each type of hydrology data – ONLY raw data
   - Structure of workbook (sheet 1 contains information a table of data on each station for which any data has been, each subsequent sheet is unique to the data for one station, use standardized information header and format for storing any time series of data for that station in raw form)
   - Apply GOK National Water Department's official station identification labeling system to all gauging and meteo stations, whether SUMAWA created or otherwise
   - Provide a table format and formal protocol to other groups on how they must prepare their point data if they want WH to plot it and make maps
   - Estimate 1999 population in watershed and provide map of sub-location boundaries to components to use for their field work.

2003-4 and Future Planning Ideas/Needs:

1. "Community Outreach for Environ. Awareness and Educ. through school-based SUMAWA clubs" New Project Pilot Activity – Top Priority:
   - Approach government partners in Njoro Division: Health, Ag Ext., Forestry, and Education Officers in Njoro to see if they will collaborate in design and implementation, provide personnel to set up and run activities in clubs
   - Draft up a concept proposal with SHI to leverage funds from Action Aid, Care Kenya, other NGO's interested in environmental education, for teacher training, transport, materials and other field costs for the pilot project
   - Recruit an Egerton MSc Student in Education and one in Ag Extension to design, manage, run, and evaluate this as a one year pilot test, with support from government partners and SUMAWA technical team
   - Start-up activity theme – rainfall monitoring
   - Possible Club Activity Themes on:
     1. Rainfall monitoring (operating rain gages at each club)
     2. Hydrology of Njoro River
     3. Riparian zone
     4. River water contamination, quality, pathogens, and diseases
     5. Water, hygiene, and sanitation at home

6. Soil fertility and soil erosion
7. New farming practices
8. Trees and the environment

- Sub-activity specifically for WH group – recruit a BS 4th year student to do his/her project on the feasibility, validity, and usefulness of collecting rainfall data by voluntary school clubs (They would help set up and train clubs on using rain gages, collection data from them, supervise and support, and do quality control to evaluate the rainfall data at end of first year.

2. Stakeholder outreach to large-scale farmers in the basin to support historic and on-going hydrologic a meteo data collection
   - (rainfall, meteo, borehole water level fluctuations, quality)
   - need for help from SHI group to facilitate the outreach

3. Building a groundwater model of groundwater in Njoro River Watershed (3-year goal broken down into step-by-step MS student projects):
   - assessment and monitoring of temporal and spatial fluctuations in groundwater levels in Njoro basin (MS student project)
   - characterization of hydrogeology for groundwater modeling parameter estimation (MS student project)
   - estimating groundwater usage and extraction rates at operating boreholes (MS student project)
   - developing and calibrating MODFLOW for Njoro River groundwater (PhD student project)

4. Inventory and evaluation of pollution impacts of point sources in the watershed
   - SW discharge points
     - Livestock water pts
     - Human bathing/washing pts
     - Sewage effluent disposal pts
     - Commercial and industrial effluent disposal pts
     - etc.
   - GW pollution point sources
     - Small-area analysis - Household domestic waste (pit latrines, septic tanks, soak pit densities)
     - Larger area analysis – wastewater (humans and animals) evaporation, disposal or infiltration ponds
     - Others?

5. Agricultural non-point sources of pollution – AGNPS
   - soil erosion from on-plot, nutrient loadings etc off of ag. land surfaces
   - pesticide applications

6. Sediment loading (nutrients) into the river
   - contributing sources??
     - Riverine processes of bank collapse along the riparian corridors
     - On-plot farming soil-erosion +
     - Farm boundary small waterways created by farmers

    - Roads and footpaths
    - Cattle paths and overgrazed areas
- Analysis of sediment loading rates – individual MS student research tasks:
    - On-farm processes of soil erosion and evaluate potential conservation measures to control soil erosion (PhD)
    - Grazing areas and cattle impacts (MSc)
    - Foot paths and roads (MSc)
    - Stream network - Riverine erosion processes (MSc)
    - Watershed-wide modeling of all sediment loading processes (PhD)
- Estimation of nutrient loadings in the catchments – initial assessment of contributing sources and magnitude?

7. Watershed-wide Water Resources Evaluation and Planning Models:
    - Step 1. water balance of the basin using simplifying assumptions to identify data gaps and further research needs for data collection (MSc) Priority for 2003-2004
    - Step 2: evaluation of the WEAP model for use in the Njoro Watershed (MSc)
    - Step 3. develop a multi-purpose simulation model of Njoro basin surface and groundwater resources to evaluate water allocation and availability for different water demands in the system under different management and infrastructure alternatives and current and future conditions (with WEAP) (PhD)

8. Rainfall-runoff modeling
    - high priority
    - need to be elaborated in consultation with Scott for input

Theses and Other Useful Documents Available in SUMAWA Library

1. Mathew Chirchir Chemelil (1995) *The Effects of Human Induced Watershed Changes on Streamflows.* (Njoro River Study) PhD Dissertation, Civil Engineering, Loughborough University, Loughborough, UK.

(IN SUMAWA library; Dr. Chemelil is the Chair of Agricultural Engineering at Egerton)

2. SAPS (Special Assistance for Project Sustainability) Team for Japan Bank for International Cooperation (JBIC) January 2002 "*Final Report for Special Assistance for Project Sustainability (SAPS) for Greater Nakuru Water Supply Project in The Republic of Kenya*" Part A. For Official Use Only

Nakuru – 289,000 in 1999, 4th largest city in Kenya after Nairobi, Mombasa, and Kisumu. Japan funded 1987 loan for "The Greater Nakuru Water Supply Project" completed in Feb. 1997. This document follows up on an ex-post evaluation of impacts conducted in 2000, to look at pollution sources and loadings from Nakuru Municipality to Lake Nakura and long-term environmental impacts. (In SUMAWA Library)

3. Caroline Anyando (2002?) *Awareness and response by small holder women farmers to soil erosion. A case study of Njoro, Kenya.* MSc Thesis, Faculty of Environmental Studies and Natural Resources, Egerton University, Njoro, Kenya.