



**IFAR 2008 Professional Development Program
Completion Report
[800 words]**

Instructions:

Please submit the completion report by email, using this form, through the sponsoring CGIAR Center to ifar@ifar4dev.org within three months after the completion of the fellowship.

Evaluation of the magnitude and geographical distribution of ecosystem services, value of agricultural production and Malaria in the face of climatic variability in Western Kenya Highlands

Please check if Thalwitz Scholarship

No .It is IFAR Small Grant

Name of Applicant **Mr. Thomas Yatich T.B.** -----

Sponsoring CGIAR Center: **The World Agroforestry Centre (ICRAF)**

I. Work Program goals achieved (maximum length: 200 words)

This study explored the links between rainfall fluctuations and impacts on land use patterns, balances and overlaps of food provisioning and regulating services and their subsequent links to malarial re-surgence as an indicator of ecosystem and human well-being. To achieve these we have realized the following objectives:

- i) Financed on advanced analysis and change detection on the land use and land cover classes including percentage change in area and analysis of the replacement and disappearance of major agro-ecological zones over decades;
- ii) Finalized spatio-temporal climatic variability using principal component analysis-now understands: a) the spatial and temporal characteristics of rainfall, and temperature, b) the trends and periodicity of rainfall of rainfall and temperature and c) undertook the delineation of the 2 river basins into homogenous rainfall and temperature; and
- iii) In 2008 I already with other team members published a paper on *“Tradeoffs among ecosystem services in the lake Victoria Basin”* under a project which is linked to this fellowship on, *“Sustaining the Values of Ecosystem Services in Lake Victoria Basin”* and
- iv) Training- trained an undergraduate student studying geospatial and space technology (Univ. of Nairobi) as well as 1 Environmental planning student from Kenyatta University, Kenya.

I. Plans for follow-up (maximum length: 200 words)

As part of follow-up to finalize the components of this study, I have already obtained additional funds amounting to USD 24, 971 from UNEP. These funds will be used to finalize and undertake further analysis on:

- i) Establishing trends and periodicity of malaria cases and linking this to spatial and temporal climatic variability;
- ii) Understanding the evolution of malaria outbreak;
- iii) Produce a map on malaria risk areas and levels of risk within the two river basins;
- iv) Establish a long range prediction model for malaria based on rainfall and temperature; and
- v) Finalize at least 3 publications as promised:
 - a) *Spatio-temporal variability of rainfall and its influence on the magnitude and geographical distribution of ecosystem services;* ii) *Influence of trade-offs on ‘hotspots’ of ecosystem services;* and iii) *Climatic variability and association with highland malaria.*

Additional information: Data on malaria prevalence took a long time because of problems associated with medical data. We have now obtained the requisite data and analysis is ongoing.

- vi) Undertake more detailed tradeoffs analysis using a case study approach and hold a workshop to share the study results

We plan to submit all the papers and other associated outputs to IFAR before the end of 2009 as per 2008 call.

III. Report budget utilization including whether budget was spent as planned (maximum length: 100 words)

Funds obtained through this fellowship were utilized as per the Fellowship but with few changes as:

- i) US\$1000-purchase relevant literature/books
- ii) US\$ 1,500-purchase of data from Ministry of Water, Meteorological Department and DRSRS as well as malaria data from Division for Malaria control and at facility level;
- iii) US\$ 2000-facilitation for field data collection;
- iv) US\$ 1000- local transport costs;
- v) US\$ 1,000-proponent's living expenses including accommodation during field work;
- vi) USD 1,000 for reporting and publication of outputs;
- vii) USD 1,500 used for training; and
- viii) US\$ 2000-professional services

After assessment of needs there was need for acquisition of more skills on modeling-this is why I reallocated US\$ 2000 which enabled me to acquire skills on wavelet analysis technique (using Matlab software) for periodicity analysis. So far I have US\$ 500 balance remaining under this grant and wish to request to be allowed to use this with matching funds from UNEP for reporting as well as publication.

IV. Assessment of the fellowship experience and general comments. (Maximum length: 300 words)

I wish to take this opportunity acknowledge support from IFAR. It really gave me some level of independence but also increased my workload during the period of implementation. Support from my direct Supervisor, Dr. Brent Swallow and links with Universities have enabled me to promote and benefit from collegiality. Students who also worked with me learnt new skills like krigging using principal components of 13 rainfall stations to produce maps depicting spatial variability, learnt how to use SYSTAT to undertake principal component analyses and now we are moving on with wavelet analysis technique for periodicity analysis of malaria and how this links to rainfall and temperature. Funds were however not enough to organize a training workshop for relevant government departments. In early 2010 I will use some of the matching funds provided by UNEP towards the implementation of some of the project activities to organize a training workshop and expose participants to new and novel approaches for analyzing links between climatic variability, ecosystem services, health and land use and cover change. I will organize this training with the universities. Data and results from this study will therefore be used in the training. When the time comes I will request IFAR to participate in the training as it first planted a 'seed' for this study to be undertaken.

As I started the study it became clearer to me that there was need to expand the study and adopt an integrated approach. Therefore extra elements of the variables have been considered and hence expanding the scope of the study to include:

- i) Periodicity analysis using wavelet analysis;
- ii) Forecasting-coming up with a long range prediction model for malaria based on rainfall and temperature;
- iii) Understanding the evolution of malaria; and
- iv) Generating malaria risk indices for the various land use land cover classes

During the study period I had several discourses with colleagues on the approaches for achieving different objective for the study. I learnt a lot and this also widened my understanding of the different variables I was dealing with.

Given the links between this small grant and ICRAF-led project on “Pro-poor rewards for Environmental services in Africa” which I am the Research Coordinator, I am sure to leverage funds and synergize activities. This Fellowship will also enable me publish high quality papers in refereed journals-expanding publication opportunities as well as areas of expertise. This project has enabled me to secure more funds to continue with work and therefore I think is rather an update report because I will submit a update towards the end of this year.