Evaluation

of

SIMA:
System-wide Initiative on Malaria and Agriculture (103694)

for

IDRC

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EVALUATION OF SIMA: SYSTEM-WIDE INITIATIVE ON MALARIA AND AGRICULTURE

CONTENTS

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I INTRODUCTION

Background to the Evaluation

According to its website, SIMA as "a CGIAR[1]-Future Harvest system-wide initiative (was) created to bring together the expertise of the Group's 15 agricultural research centers…. an international programme, open to participation of all interested parties with a stake in the malaria and agriculture realm"[2]. Supported in principle and, to a modest extent, in funding from several donors including IDRC, SIMA was intended specifically as a vehicle that would contribute to:

i) the study of the complex linkages among the socio-cultural, economic and environmental factors of malaria;
ii) the reduction of malaria, leading to improved health and well- being, increased agricultural productivity and poverty alleviation; and
iii) encouraging CGIAR centres to pay more attention to potential linkages between natural resource management and health issues.

Toward these ends, SIMA was expected to involve a range of activities, including

- *research* on the interactive impacts of agricultural production and malaria and on malaria control innovations;
- *development of local capacities* to conduct such trans-disciplinary research; and
- *research dissemination* to the health, agricultural and development user communities in malaria-endemic countries.

As a system-wide initiative, SIMA had no permanent place within the CG structure, but rather was housed in, and expected to be "championed" by, one of the centres -- in this case, the International Water Management Institute/IWMI -- on the basis of its perceived relevance to that centre's water, health and environment programme.

For a variety of reasons to be elaborated through this evaluation, the IWMI effectively ended its support to SIMA at the end of 2005, while giving its co-ordinator and other stakeholders a one-year transition window during which to try to find another home: presumably in one of the other CG centres if it was to retain its status as a system-wide initiative, or in another type of organization if in some reconstituted form.

[1] Consultative Group on International Agricultural Research
[2] System-wide research programmes began in the CGIAR in the 1990s, "focused around a particular research theme and problem common to all or a group of Centres", some involving an eco-regional approach and others "communities of practice" around a shared topic (Science Council, 2006: 1). SIMA, one of the latest system-wide programmes to be developed, appears to have been a combination of both.

Purpose of the Evaluation

IDRC continued to support the research projects it had funded under the SIMA umbrella to mid-2006, ending somewhat before the studies were completed. It subsequently offered teams the opportunity to develop small (approximately 6-month) "knowledge translation" bridging grants to both keep them in the field until a determination of potential follow-on support to a SIMA-type programme arrangement and their further phases could be made. This present evaluation will serve as input to the consultative process leading up to this determination.

Following requirements of the TORS and discussion with IDRC, the evaluation aimed at documenting and assessing the implementation and results of SIMA from two distinct, but closely integrated, perspectives:

a) that of the parts → the activity inputs, implementation and outcomes *of a group of five research projects* funded by IDRC and other donors through the SIMA secretariat; and

b) that of the whole → the activity inputs, implementation and outcomes of SIMA *as a network of researchers, projects and other stakeholders*. In broad terms, the evaluation was, therefore, expected to contribute to:

i. *a more comprehensive and evidence-based picture* of the progress being made in realizing the transdisciplinary approach pursued by EcoHealth, and the specific contribution of the SIMA-supported projects to that approach;
ii. *a better understanding* of the viability, effectiveness and resource needs of the network mechanism in strengthening regional and local capacities to undertake effective and use-oriented transdisciplinary research integrating agriculture and malaria; and
iii. *recommendations* for the reorientation of SIMA structures, strategies and activities as input to thinking on the future of both "the emerging network" of malaria and agriculture research in sub-Saharan Africa" and the "current and future support" of EcoHealth to that activity.

Design and Methods of the Evaluation

The evaluation was conducted by two evaluators, a professor of tropical hygiene with expertise in malariology and a social scientist with a background in organizational change and networking, through two sets of fairly *loosely-framed on-site case studies* of (a) the five selected SIMA research projects in four East and Southern African countries: Kenya, Tanzania, Uganda and Zimbabwe[3]; and (b) the SIMA co-ordination and network mechanism, at regional and local levels. Travel took place over a 4-week period, through separate and joint evaluator missions.

Specific issues addressed in the case studies are detailed in the data presentation and analysis sections below, but in general focused on the strengths and weaknesses of SIMA in terms of:-

[3] Scheduling problems and travel constraints resulted in Zimbabwe not being visited in person by the evaluators; data were collected through phone interviews and document review. The four research teams in the other three countries were visited by both evaluators.

(i) the degree to which its initial mobilizing and design assumptions as a system-wide initiative and network have been validated;

(ii) the quality of, and extent to which, planned research activities have been implemented and the technical merit of their outcomes; and

(iii) the scope, reach and likely sustainability of both its research and network outcomes.

Based on existing analyses of SIMA progress, the still-evolving status of the research projects, and the experience of complex development interventions generally, the final pictures looked for were not ones of success or failure per se. Rather, the evaluation looked at varying degrees of SIMA progress to date in terms of the quality, effectiveness and sustainability of work done across the different research projects and within the overall network; focused on assessing progress according to the varying perspectives of SIMA stakeholders; and tried to recommend "ways forward" that would present viable and acceptable balances between and among stakeholder perceptions of priorities and resources. If funding was to involve additional sources as well as IDRC, a series of questions of scope and priority would arrive, and these issues are also explored.

Data collected for the evaluation were both qualitative and quantitative. Assessment of the research projects themselves, as largely biological and vector management investigations of malaria prevalence, prevention and control, included considerable quantitative measures. Assessment of the SIMA co-ordination and networking was strongly oriented toward qualitative data in looking at process and progress indicators and outcomes. Principal methods used for both sets of assessment were chiefly ethnographic: field-site observations; individual and group interviews with relevant stakeholders, scientists, peer and donor agencies, and selected staff of the CGIAR and IWMI in person and by phone; and documentary analysis of SIMA, IDRC, IMWI and other donor materials as well as relevant research studies and evaluation reports. Quantitative data were collected also through project technical reports.

Limitations of the Evaluation

The evaluation was limited chiefly by the relatively small number of days allocated for the activity, coupled with the fairly intense, two-dimensional nature of the assessment focus, the wide geographic spread of SIMA projects to be reviewed and the separate locations of the evaluation team members in the UK and Canada, respectively.

In terms particularly of the second "SIMA as a network" focus of the evaluation, there were limitations also in the lack of detailed documentation of the evolution of programme implementation, in either formal or informal materials. The evaluation was further limited in that it did not have access, for logistical and travel reasons, to SIMA Secretariat and IWMI files, often an especially good source of data in illustrating the nuances of backstage thinking, negotiations, decisions and adaptations underlying complex interventions like SIMA.

Several steps were taken to help mitigate these data collection limitations:

- use of a common and agreed set of data collection tools (analytical themes and interview questions) to increase efficiency and focus;

- a mix of joint and individual evaluator travel, enabling shared and independent perspectives on both the network and the projects "in context";

- regular communication by the evaluators through email and phone; and

- extended on-site interviews with a reasonably broad range of SIMA stakeholders, allowing some degree of triangulation in the network analysis.

II SCIENTIFIC ANALYSIS OF THE 5 SIMA RESEARCH PROJECTS

A. The Projects as Individual Research Initiatives

The projects are described and assessed individually. Because they in fact constitute a research programme there follows a trans-project summary addressing some of the key questions in the terms of reference. Some other key institutional aspects of the projects are then analysed comparatively and conclusions drawn. Because the work was commissioned by IDRC there is an emphasis in the projects review on the role of IDRC, although other agencies, particularly IWMI, very much determined the context within which they operated.

i. The Project Evaluations

In evaluating the specific projects there are many aspects that have to be taken into consideration: the degree to which they bring malaria and agriculture together; the way in which they tackle the environmental and ecological aspects of malaria and its control (the 'Eco' in Ecohealth); the emphasis in methodology upon transdisciplinary working, equity and community participation; and the actual advancement of science, public policy and the health of communities achieved by the work. When listed in this way it is apparent that the research workers are attempting many things at the same time, with budgets that would be considered by most funding agencies as very restricted.

It is also necessary to bear in mind that, with the exception of the Mwea site, which has received four years of funding for two phases of the project, each project has been funded for two years of baseline research, much time has been spent on building up relations with communities and other stakeholders, and therefore the review is looking at the initial descriptive phase of the work, about a year of field data collection, at each site. At this stage one would usually be simply monitoring progress in a project and the first major evaluation would come 4-5 years into the projects (e.g. as in the large Swiss NCCR Programme which has similar methodological approaches and concerns, though different research objectives).

At the present stage of the work (except in Mwea) one can therefore:

- assess the particular features of each site and its appropriateness for in-depth work on malaria-agriculture interactions and likely capability to yield useful results,
- consider the objectives of the research and aspects of the objectives that can be tackled by cross-sectional surveys,
- observe the team that has tackled the baseline work at each site and the various reports they have provided, and

- review their methodology and see how far the results so far provide a base for an intervention or intervention trial phase, for ongoing applied work, and for building capacity at all levels
  - in ecological and environmental aspects of malaria and agriculture,
  - in intersectoral work,
  - in Ecohealth and
  - in transdisciplinary research.

In practice we are also able to assess actual research capacity building in Ecohealth as this has progressed rapidly in several projects.

ii. Kenya: MWEA

Mwea has a special place in the series of SIMA projects. It is older than the others and in many ways the archetype. Here Clifford Mutero first applied the Ecohealth approach, having reached a similar position as a result of his own experience. The Mwea project was always at least one phase ahead of the other projects. Moreover Dr. Mutero and the Mwea staff advised those developing the other projects. It is also the only project that has been in action long enough to have a series of published outputs and where the work has really developed far enough to be usefully evaluated. A good deal has been achieved and written up.

Mwea is a large irrigation scheme, primarily directed towards rice cultivation but also supporting a substantial cattle population. It therefore combines two major aspects of the interaction of agriculture and malaria: irrigation and livestock. Because the local malaria vector is the more zoophilic member of the *An. gambiae* complex, *An. arabiensis*, the interaction of livestock, which provide alternative blood meal sources for the mosquitoes, and irrigation water that facilitates year-round breeding of the mosquitoes, provides an interesting ecosystem for malaria transmission.

The first phase admirably studied all the likely determinants of malaria in the four villages, giving a multidimensional picture of the process. However, the design, with limited resources, is inadequate to determine the relative roles of the different factors involved. Because there are only four villages in the study, and many of the variables are at community level, the sample size for two of the most important suspected determinants is one (a single village for each possible combination of the attributes rich/poor and irrigated/not irrigated).

Therefore, the key issue for which Mwea is widely known: the inverse relation of livestock keeping to malaria, is far from proven. The change in mosquito density is but weakly associated with an undramatic gradient in cattle-keeping, and as a possible intervention this has not been followed up. The original principal investigator would like to see a change in the irrigation scheme rules, permitting as lawful the keeping of livestock, particularly cattle. But the data are scarcely adequate to act as a basis for policy in this way, and in any case the ban on cattle is openly flouted on a large scale and is probably dead.

The second thrust, reducing the duration of standing water in the rice fields, does not link closely to the rather clear inverse relation of mosquito density and malaria prevalence. In particular, the highest malaria prevalence was in a village far from the irrigation area, so that it is far from clear how mosquito reduction within the formal irrigation scheme will impact the malaria problem. Murinduko is indeed not far from surface water, but that is not part of the

irrigation scheme. The question then arises as to how far the inhabitants for this poor and unirrigated village, Murinduko, come into contact with the irrigation scheme. Since those who live on the scheme must surely be more in contact with the local ecology, and yet are found to have a much lower malaria prevalence, there are questions about the sources of local transmission. That the village clean-up operations have been accompanied by a massive fall in prevalence in Murinduko suggests that there might have been local breeding of vector anophelines. This requires further investigation. The observed differences between the villages in malaria initial prevalence rates are far from trivial.

The work so far has shown large local differences in malaria prevalence, has described the complex environmental and social dynamics possibly causing these differences, and has apparently shown that community-based activities can reduce the malaria level where it is high. These findings are important but only indicative. If these findings are to be more widely applicable, and if we are to understand what are the key components needed to change the malaria levels, it will require larger scale studies and community randomized trials of interventions, as much to understand the biological and social system as to measure the success of the interventions.

Draft publications on community aspects of knowledge about malaria and bed net use, and about vector control practices have been prepared. The descriptive material is useful, but the analysis does not focus on the key questions that need answering if transferable findings are to emerge from the work.

There are three main issues that arise in relation to future work. First, there can be little doubt that a major contributor to the success of the project has been the numerous, committed, and dedicated inputs by the senior project staff. This is as it should be, but it raises questions of appropriate inputs for scaling up the various interventions, and the need for estimates of their cost.

Second the pre-intervention prevalence data show a major difference between the village remote from the irrigation scheme (38%+) and other villages (<2%). Moreover there was a dramatic fall to zero after bed net introductions. Surely this needs both confirmation and explanation.

Third, a difficulty with the otherwise admirable Ecohealth practice of collecting large amounts of contextual data is that highly important findings are sometimes not followed up and rigorously tested, because the burden of descriptive data is so great. Obvious ways of taking this forward are to look at other neighbouring villages, to collect incidence data as well as prevalence, to push both the vector abundance/malaria scarcity and the cow abundance/malaria scarcity hypotheses much harder: we really need to be sure about the answers as they may be the keys to understanding malaria in the area.

None of this is to criticize what has been achieved, but rather to emphasize the need for long enough time for these questions to be addressed. Also, so far as malaria is concerned, there is need to move into a more focused hypotheses-testing mode from time to time. This also raises problems of cost of studies of adequate statistical power when variance is between communities rather than between individuals.

iii. Uganda I: SANGA

The Ugandan SIMA I project is addressing malaria problems of settling nomadic pastoralists. This is a new area for research and of considerable interest. Because the process of settlement is ongoing, the topic can be addressed, initially at any rate, by a cross-sectional approach which allows controlling for many independent variables.

The research question was defined by the community in an overt manner. Over 15 years ago, the formerly nomadic Hima pastoralists of SW Uganda were put under great pressure to settle, not only by the Ugandan Government but also by the President of Uganda, who happens to be a Hima himself! Over the next decade settlement gradually took place, so that by 2002 about 40% were fully settled, a comparable proportion were static but living in the manner of nomads with slightly improved housing, and far fewer were still nomadic. The people now complained to the President that they had done as had been requested, but the consequence for the settled group was that they had much worse malaria than the nomadic people, and that their children were dying of the disease.

The researchers suggested a hypothesis to explain the mechanism by which the people's statement could have been generated. If the chief local malaria vector were *Anopheles arabiensis*, the zoophilic member of the *An. gambiae* complex, not only would the malaria change be due to changing agriculture, there would also be a potential control measure by applying insecticide to the skin of livestock.

The Sanga project is much more closely linked to a specific field facility than has been the case for the other projects. This has been its great strength. The way that all students stayed there for the baseline year was above all responsible for the highly interdisciplinary work and research capacity building. Because the IDRC project formed the core of that work, while at the same time ancillary projects, funded from other sources, were being put in place (e.g. to meet related community health needs and to do research on water policy in relation to malaria and on artemisinine treatment linked to near-patient diagnosis at both community- and facility–based levels), the abrupt removal of the possibility of a continuing phase II created substantial linked problems. Because the Sanga project was not using the facilities, they became unusable for the other linked projects. These now are going elsewhere, to mutual disadvantage.

The Sanga project was essentially tackling a new question, which had not been addressed previously in Africa and had received little attention globally. The consequences of nomad sedentarization are not well understood, and the specific effects upon malaria were unstudied. The broader questions of zooprophylaxis have been much more studied, especially in South Asia and other areas with highly zoophilic vectors. If the initial contention by the community, that nomads who settle get more malaria than those who continue to be nomadic, had proved true, then the hypothesis that this is due to reduced deviation of *An. arabiensis* away from children by cattle was open to rigorous testing and again is relatively original as a question. The project showed it did not happen; An. arabiensis was absent. Had it been present, the proposed intervention of applying pyrethroid residual insecticide to the cattle (in place of the usually applied acaricides that the people apply weekly) would have been relatively novel for Africa. There has been some experimentation in Pakistan and the idea was mooted for use in Kenya where might also have a role in future research in Mwea.

The more general statement of the problem: 'What are the health consequences of nomadic pastoralists settling?' is of broader relevance, though SW Uganda is unusual in that settlement by nomads who continue to farm livestock is a possibility. The *consequences of settlement, for both the environment and for the whole life of the pastoralists, are so complex that an Ecohealth approach is by far the best way to start,* as is even clearer with hindsight than it was at the start. The close interaction of the two main perceived problems of the people there, water and malaria, has meant that a whole series of issues has arisen needing study.

→ Indeed it has been clear at each site that starting from an Ecohealth approach uncovers a vast and expanding series of questions needing investigation, posing difficult problems of resource availability for the research.

Prior to the main first phase of research, a detailed 'community diagnosis' was undertaken, involving the extended research team as well as facilitators from outside. A great deal of material was collected, using rapid rural appraisal techniques, and much effort was put into the report of this, which took up much time. There was substantial overlap of this approximate information with the more careful house-to-house socio-economic survey of over 400 households in Phase I, and the latter data were much more useful as they could be linked to epidemiological and ecological data at the individual and household level.

While with hindsight, less time could have been spent on writing up the community diagnosis, the main function of this diagnosis was to involve the community and other stakeholders, and this it did very effectively. It also brought together the various disciplines and started off the pattern of transdisciplinary work, which was crucial to the project.

The issues of gender equity were also on the table from this Phase: the LCI (local council at village level) structure already made formal provision for women to be represented, and women were not shy to make their views known in the various public meetings, though detailed gender roles gradually emerged from both the community diagnosis and the baseline surveys of phase one. A more difficult aspect of equity concerned the more complex separation of pastoralists and cultivators, a longstanding layering of society which is changing in subtle ways and is taking several years to understand.

The community diagnosis and subsequent activities involved other stakeholders in health generally and in agriculture at district, sub-county and academic levels; malaria control staff at national level were involved in the field research design and early activities and were kept informed of progress throughout. Several other funded malaria studies were about to be added to the project when the unexpected stop in IDRC core funding completely disrupted this.

The Phase I research built upon the community diagnosis, and upon a workshop where senior team members from Mwea shared their experience and expertise. Since the key research question was about the effect of sedentarization upon malaria, detailed studies of 8 villages with some 4,000 people, including nomadic, transitional and settled households, were undertaken. The pressures on time of senior staff from the (then) two Universities of Makerere and Mbarara meant that continuity of fieldwork was maintained by two of the senior research team, with intermittent inputs by several others.

Two key decisions for this phase were (i) to use MSc students in their research year to be the core of the field survey activities, and (ii) to base the research in a previously derelict research station at Sanga in the centre of the project area. Although shortage of resources prevented this being done as fully as intended, residence of the students in the research centre, and the

staff where possible, had the consequence of extreme transdisciplinarity. The students (veterinary, sociology, vector ecology, molecular biology, anthropology), technicians and staff lived together for the year and each became thoroughly conversant with each other's work to the point where external assessors felt that each understood the whole project. *This was a particularly useful piece of serendipitous research capacity building in Ecohealth and, given some infrastructural rehabilitation, the Sanga Centre could become an inter-institutional research residential training centre*.

Also, there was daily interaction with the local administration (LC3 Chairman and others), with the veterinary extension officer, the sub-county health officer and the people of Sanga. The two final reports on Phase I were written so that the narrative report could be given to members of the local communities and the scientific report to professionals in the area. The two gaps in funding: one where the NCRST had mismanaged some funds and the other, when the funders stopped after Phase I, were extremely difficult to handle, since the community felt that that the project appeared to be unreliable.

In reflecting on the first phase, all the staff closely involved felt that the Ecohealth approach had opened new doors for them, that the community felt it was their programme, and that the staff had not done things that way before. One senior veterinarian said that he realised he had not really understood the pastoral community very well before the project. The tradition in Uganda has been for very individualistic research, with a focus on the problem and study, often neither seeing the problem context nor the community. Both staff and graduate students, with 4 months of training, experience of participatory methodology, and the fieldwork, felt they knew much more about the community. In the work there had been much freer information flow with the community. They were also particularly grateful to Canadian IDRC staff and also SIMA staff who had carefully directed them to the wider picture.

People had found that the knock-down house catches showed them far more mosquitoes than they had believed could be in their houses. It was found that people did not link mosquito larvae in pools to the adult mosquitoes, so children were given larvae in a container to take home so that everyone could see pupation and the emergence of adult mosquitoes. The immediate examination of blood slides was appreciated, though the laboratory burden on technical staff was heavy. Field trials of near-patient dipstick tests had been planned to accompany Phase II, but may now have to take place elsewhere. One staff member who moved to the new Gulu University took the final reports with him to the new Vice-Chancellor and there is already a multiplier effect.

Another of the research staff, from Makerere Department of Gender Studies, also found the highly integrated way of working new and helpful. While the work had initially focused on the social impact of malaria, there were major issues of resource reallocation and vulnerability as a result of the settlement process, with moves towards mixed farming, effects of a more cash-related economy on the balance between men and women over access to resources, and effects on the family. The links between various environmental features fostering malaria and the household, and distances from household to health care facilities, are being elucidated in greater detail by a combination of GIS and the gender data.

One area that emerged as needing attention is that of HIV/AIDS, where pastoralists are severely neglected, but the project has not become involved in that area as it clearly requires continuing involvement once begun. This is an example of the kind of unique challenge the Ecohealth approach faces: once a community is engaged in identifying real problems, what are the ethics of a research team – and donor – backing out?

The interim "bridging" proposal gave a full summary of the findings of Phase I with a good balance between the biological and social science results so far. The proposal for the four months is phased to cover, first, the transfer of the results to the community and involving the community in developing a research agenda for Phase II, building capacity for both research workers and the community; and second, institutional capacity building for execution of the intervention trials of Phase II. As with the other projects, this bridging proposal is predicated on the occurrence of a second phase. If there is not to be a further catastrophic gap in activity, an extremely rapid response mechanism by the funder of Phase II will be essential. Probably an outline proposal is required now, with the details of interventions to be added as the bridging work is carried out in the field and the community makes its needs clearer.

iv. Uganda II: BUSHENYI

Bushenyi District in SW Uganda is a relatively prosperous agricultural area which has in recent years had a massive increase in malaria burden. Malaria surveys of 1965-67 showed a very low prevalence and the area was classified as hypoendemic with epidemic potential. The situation is now very different, with malaria as the highest priority disease. This is part of a general increase observed in south-west Uganda, but more pronounced. It has been suggested that the increase of fishponds in Bushenyi may be contributing to the levels of malaria transmission being seen, and more generally that much of the malaria may be linked to agro-environmental change. The projects aimed to assess, in an Ecohealth context, the importance of fishpond management to malaria vector breeding, with a view to using environmental management in malaria control there. The project has a particular strength in spatial data (and GIS).

The role of fishponds in vector-borne disease, and especially malaria, is an important issue, tackled in many countries, but it is highly country-specific and within countries depends on the species of mosquitoes and local environmental features. Since the very serious increase of malaria in Bushenyi is not fully explained the project is fully justified. Moreover since rather similar studies are being undertaken in Kenya (unknown to the investigators and to the reviewers until a few weeks ago) there will be considerable comparative interest in the findings.

The project has followed the standard Ecohealth approach involving research workers from several relevant disciplines, and extensive interaction with the community and local officials. Relations with the community were clearly good in the field, partly because of material assistance to the health centre but also as a result of the regular field work. The ponds were quite numerous and several villagers visited had developed pond systems substantially. One master's student, who had worked on the malaria economic aspect of the project, hopes to do a much fuller study on the potential for fishpond development. The roles of women were studied and it was found that malaria prevalence was significantly higher in women.

The research team suffered some disruption, partly due to the departure of the medical officer and some other staff changes. Though they were replaced with more able people at the senior level, there was perhaps a less close-knit team than on some projects. The formal administrative arrangements were carefully made.

The vector surveys showed breeding of anophelines at a variety of sites. Results in the report showed a great preponderance of *Dracaenia* and yam leaf axils as breeding sites. Small collections of water on fallen banana leaves were also important. These three sites were responsible for two thirds of all anopheline larvae found, whilst fish ponds, in the sub-county

where they were common, only yielded 1.5% of the total number of larvae. A reviewer was able to see and confirm the breeding at these sites. However, the calculations relating larval yield to total area or volume of the different habitats were not seen and these data should be checked before publication. As the yams (whose leaves are used to feed the fish) and *Dracaenia* (used to demarcate boundaries) are agriculture-related, the data so far indicate a preponderance of anopheline breeding related to agricultural activities.

Such vector hazard as there is in Bushenyi from fishponds, appears to be largely due to anophelines breeding in disused fishponds. This has obvious policy implications, if this can be confirmed. Short-term interventions to stop breeding in these disused ponds can be undertaken, possibly involving a comparison of *Bacillus thuringiensis* and a chemical larvicide, to both determine practicable methods of larval control and also quantify the role of these ponds in overall malaria transmission. These should be feasible in a Phase II. The very high local productivity of small tree-hole and banana-leaf breeding sites may outweigh the role of ponds but needs confirmation. There are significant similarities between the Bushenyi results and those from other groups in Western Kenya, suggesting that the *findings so far are more than of local relevance*.

Since another outcome of Phase I is a strong interest of one of the researchers to continue with an in-depth look at the economics of developing fishponds more extensively in the area, this provides an opportunity to also study the longer-term ways to ensure that disused fishponds are not enabled to persist in the area.

The epidemiological evidence showed a high level of parasitaemia, averaging 60% in the poorer sub-county with ponds and 40% in the other. The clinical observations undertaken at the same time are seriously discrepant, with spleen rates of 2.5% and 0.8% respectively. Levels of jaundice of 11.8% were reported from the richer sub-county and are hard to believe.

Preliminary studies showed a fall in malaria incidence by household with increasing distance from fishponds (which also represent the main location for yams. Further spatial analyses are planned and should be of great interest. Observations on the duration of disease per month show what may be artefactual differences between the sub-counties.

The vector ecology, spatial analyses and work on fishpond ecology are of real interest. The socioeconomic data are harder to interpret, and with only 45 minutes per household head for completing a 16-page questionnaire there may be some misinterpretation of questions. There are some important findings in phase I but, compared to some projects, there is less the feel that one investigator has the time to understand, critique and integrate analyses for the whole project.

The proposals for interventions follow logically from the findings of phase I, though some of them may prove more complex to implement than the investigators imply. They are also expressed in a somewhat top-down manner and may require substantial joint exploration with farmers if they are to succeed.

v. Tanzania: MVOMERO

The interest of the project particularly derives from its agricultural base. The project is a collaboration between the National Institute for Medical Research of Tanzania, which has a particular emphasis on malaria in its work, and the former Agricultural University of Morogoro, now known as SOKOINE University. It is founded upon a longstanding acquaintance between

the two leading investigators from the two institutions, and the field work is situated less that an hour's drive from Morogoro. An area has been located where a 65 km road transect passes through 6 types of agricultural production from sugar cane on a large and small scale, irrigated rice, rice and maize, through to livestock rearing, all on a relatively gentle gradient and without dramatic climatic differences. Thus the major variable is the type of agro-ecosystem and its consequences for livelihood, economy and behaviour.

The work so far has been aimed at determining the relation between agro-ecosystem type and malaria transmission and burden. The study has therefore been primarily a comparative cross-sectional survey of seven villages from the different agricultural systems, measuring the levels of malaria parasitaemia in approximately 1100 people per village on each of 4 rounds during a year, but also investigating many behavioural variables relevant to malaria and carrying out KAP studies of malaria-related topics. Vector ecology and agronomic studies were also made. The comparative approach is interesting, especially the variety of agronomic practices, and this is relatively original work for Africa. A limitation has been the single village for each system so that there is no measurement of within-ecosystem variation, but it is hard to see how this could have been avoided without a larger budget, as spreading the samples over several villages for each agro-ecosystem would have created a great deal more work and reduced interaction with each community.

Since the descriptive work is at too early a stage for specific hypotheses, it is hard to comment on the originality of the research as such. The methods are standard ones. The molecular typing of the *An. gambiae (sensu lato)* has not yet been reported and is crucial for planning next steps. There are two paradoxes in the results so far which need further elucidation: (1) the village with much the lowest malaria prevalence, 7.4%, had by far the highest calculated EIR, of 168 infectious bites per year. If there are no calculation errors, one needs an explanation of the very low prevalence rate as it could be important for planning control; (2) there is a contrast between the very thorough knowledge about malaria plus statements in the KAP study about its priority, and the explanations in the community discussions of why it has a low priority. As results were incomplete at the review some of the statements made are provisional. Substantial bodies of data on economic activities and from a KAP study about malaria have been collected, but critical analyses have not yet been made.

There is a need to think through the baseline data with great care in planning Phase II research. The malaria prevalence rates in children are, except for Mtibwa, over 20% and up to 76%, which is consistent with the EIR of over 15 and up to 100 per annum. This suggests a high degree of transmission which is relatively unlikely to be controlled by environmental methods alone. It may be more productive to use the social science data to optimize application of National control methods and then to assess the added value from incorporating environmental methods. The intervention study design for this may be epidemiologically difficult and need to be of a relatively large size. The specific contributions of working in rice production (especially bird scaring at night) can be more precisely assessed and methods to reduce biting that are locally appropriate can be developed.

During the field visits it was clear that very good collaborative relations with local government at the grass roots level had been made. Within the study area at Mkindo was a farmers' field school, a well run organization that had people from all over Tanzania coming there for courses. This provides a very good means of disseminating knowledge of the project and its results, as well as helping to get agricultural extension workers involved in health promotion (a recent course had clearly been giving attention to HIV/AIDS as the flip-chart outputs on the walls showed).

The strong involvement of the agricultural university staff among the research team in the malaria work was very apparent. From every aspect this was a good feature of the project. There is a danger that they may be over-optimistic about what can be achieved by modification of agricultural activities (this is crucially dependent on the baseline transmission level) in malaria in these localities, and advice to the community should not run ahead of data, but the enthusiasm of the Morogoro staff is really encouraging, and provides a long-term future for integrating agriculture and health issues in Tanzania because of their key role in educating scientific farmers. The undergraduates already visit the study area during their field classes. This situation supports the view that it makes sense in the medium term, if the malaria projects flourish, to extend the project scope to other vector-borne diseases. Moreover the presence of Masai pastoralists in the southern part of the study area may provide issues in common with the Sanga project.

The epidemiological surveys also included data on filariasis, urinary schistosomiasis and hookworm. We have looked at correlations with malaria by village (Figure 1), finding R^2=0.72 for filariasis (which makes good sense if they share a common vector), R^2=0.46 for hookworm and 0.06 for *Schistosoma haematobium.* The project team have analysed the pattern of polyparasitism in an interesting way, but their interpretation that treating other parasites might reduce the frequency of malaria does not follow from the data.

There is general enthusiasm for the Ecohealth approach among both parts of the team and due attention has been given to all its principles. The sites are interesting, though more malarious than is good for seeing an impact of environmental management. Further investigation of the highest and lowest villages for malaria prevalence is needed. There will need to be a combination of creativity and rigour in designing phase II. The institutional bases are excellent. Ecohealth is well placed to influence both medical (and especially malaria) applied research and agricultural education nationally.

vi. Zimbabwe: ZUNGWI

This study of a small rural area of Zimbabwe, where changes in cultivation appeared likely to produce breeding sites for malaria vectors, could not be visited for logistical reasons[4]. However, the final report on the project was particularly carefully written and detailed, and there were photographs of the quite small study site. For these reasons, it was possible to get a detailed view of the study. Curiously, the actual description of the site, its dimensions and morphology, was the one weakness in the documentation, but there were photographs available.

Vleis are valley bottoms that hold water, with or without a visible stream, and they provide grazing, water sources, fruit and some cultivation. It is possible to develop irrigated agriculture there, but in the study site this could only be achieved for a subset of the people. The study was undertaken to determine the effects of the cultivation upon malaria transmission whether due to environmental or socio-economic changes. It then aimed to see how malaria might be controlled in that situation. Once some of the results were obtained and also after the community had expressed its priorities, three additional questions were studied: the effects of hydrological variables upon mosquito species, the conflicts related to vlei

[4] The researchers were not going to be available in Zimbabwe at the times when it would have been possible to visit

cultivation, and the role of HIV/AIDS in the community. The last two of these were each studied by a graduate assistant as part of an MPhil programme.

The methodology was largely descriptive, as might be expected for Phase I work, and substantial effort was devoted to interdisciplinary development of questionnaires to cover the three areas of socio-economic interest to the study; livelihood and gender analysis, conflicts over resource use, and community perception of diseases. A variety of social science methods was used in addition to individual questionnaires, including focus group discussions, social mapping, narratives, diaries and observations. The focus groups were usually separated by gender. The basic demography is not recorded in the reports, so it is often difficult to relate samples or subgroups to the whole. By contrast, both soil and water environmental details were recorded, and the 'community diagnosis' involved a wide range of methods.

It was clear that the study meticulously followed Ecohealth principles and involved staff with the community very fully. The study was very responsive to the issues that emerged from this interaction – internal conflicts and HIV/AIDS – and handled them very well by augmenting the study but without losing the focus on malaria and agricultural change. Gender roles were carefully examined. The physical micro-environment was studied in a more systematic and rigorous manner than in the other studies. This study gave the impression, more than the others, of careful thought being continuously given to each of the results as they emerged, so that new aspects were added and others discontinued along the way, in a productive and thoughtful manner. There was a very good combination of disciplines and approaches (but with the usual lack of medical epidemiological input) and the reports showed a high degree of transdisciplinarity in the analysis and the synthesis of the results. Attention was drawn by the principal investigator to the high costs, in time and funds, of this type of research and particularly the high investment of time at an early stage.

Very few mosquitoes were found, and there was little objective evidence of local malaria transmission, although it was perceived by the population as a major health problem. The reasons for this discrepancy were not fully determined, in spite of thoughtful analysis of the various data sources. Such malaria cases as occurred might have been exogenously acquired. Prevalence surveys revealed no cases, and there is doubt over the validity of 'clinical malaria' at the nearby health centres. A suitable dipstick test might clarify this. The project has made arrangements for microscopy on clinical cases.

Further studies were put in place to elucidate the malaria situation, and detailed work on hydrology and mosquito breeding has been set up. These need to be supported in Phase II to give a rounded picture. The overall Ecohealth approach has been used to such good effect that we feel the request for continued support is well justified, subject to IDRC receiving a good proposal, as the returns will be great, even if less relevant to malaria control.

This detailed study of a small community has led to a well-rounded picture of health and agricultural aspects of a changing society which is of both local and more general interest. It was carried out in a very difficult political and economic environment. As a body of work it is both original and meticulous.

B. Trans-Project Summary Analysis of the Research Programme

i. Integration of the Ecohealth approach into SIMA-supported projects

All the projects reviewed have been following the Ecohealth methodology in their background data collection during phase one of their work, and the Mwea project has applied them similarly in its second phase. The other projects have not reached their second phase due to resource constraints.

It is very clear that in the first, descriptive, phase the Ecohealth approach has been very helpful in providing a broad view, full examination of context and close interaction with stakeholders at all levels. The research workers themselves have hugely benefited from this as they all readily state. It has meant, however, that there are large amounts of data which are indicative of many relevant issues, but collected too rapidly on a small budget for one to be able to rely heavily on counter-intuitive findings. The research workers are left in some doubt, therefore, as to how far to devote much time to the full analysis of very detailed socio-economic data, since conclusions arising from that analysis will require confirmation, and this has resource implications. What it certainly does do is to provide enough information to allow specific questions to be formulated for later phases and to allow students to make the necessary calculations for study design for the trial of proposed interventions.

The more difficult questions will concern the extent of Ecohealth-type inputs into the second phase: clearly community participation in that phase will be crucial in the development and implementation of interventions. However, the assessment of the selected interventions will require substantial resources and rigorous design if valid conclusions are to be reached, the more so if both environmental and mainstream interventions are to be implemented concurrently.

ii. SIMA projects as facilitating the Ecohealth approach within IWMI and other CGIAR organizations.

So far as the five component projects of SIMA are concerned, it is doubtful that any, apart from Mwea, have had any impact upon IWMI or the other CGIAR organizations as yet. It would be quite extraordinary if they had.

These are small teams, beginning very modest projects, in sites remote from the main offices of IWMI, (which had received a negative appraisal of an earlier different plan for SIMA even before the projects started). It is notoriously difficult to influence the CGIAR centres towards health. Major international organizations such as WHO have struggled to do so over many years with very limited success. The one major field project on malaria and agriculture under CGIAR auspices in (West) Africa, lasted only as long as one particular research director and a sympathetic director-general remained at WARDA. Health as a whole in IWMI has been probably ‘sidelined by being mainstreamed’ within that organization.

Moreover, allocation of funds from the centre to the CGIAR centres is effectively by competition between them for limited resources, so that what is espoused by one will tend to be ignored by others. ICIPE, the home-base of Mwea, is not strictly a CGIAR centre and is both less well funded and more liable to internal competition between projects. Hence it would be highly unlikely for the SIMA projects to have had an influence on CGIAR as yet. All this is not a criticism, but a statement of reality.

In fact, the one project that has reached Phase II (Mwea) **has** been able to interest a CGIAR Centre in its agricultural innovations using soya as an inter-crop. Once the projects have research outputs in the agricultural area, the CGIAR Centres will begin to show real interest.

The research outputs and the expertise of the staff, gained in generating those outputs, have a reasonable hope of affecting CGIAR in the longer run. The project teams have spent the baseline period in learning how to operationalize Ecohealth concepts and to work in interdisciplinary terms, with great success. Over the next decade, given continued support, the senior staff will become recognized for their work in agriculture-health interactions. When, for example, agriculturalists with health expertise are needed for the governing Boards of CGIAR institutes, they will get appointed and be able to influence policy. The same process is likely to apply in relation to WHO expert committees, FAO and other international agencies, and to the board of ICDDR, B, which is the one field-based international health research organization.

Similarly, at the research project level, post-doctoral workers who have learned their research philosophy as graduate students on the SIMA projects, will presumably carry those ideas into the various research institutes and other organizations that subsequently employ them. These ways of affecting the CGIAR Centres form a serious and worthwhile approach that requires – as do all worthwhile research strategies – effort sustained over decades. It bears remembering that the insecticide-treated mosquito net approach to malaria control had an efficacy trial in 1983 and only now are we getting the national programmes and seeing treated net use measured in tens of millions.

iii. The projects as contributors to the Evolution of Concepts and Practice of the Ecohealth approach.

Thanks to the various materials and conferences provided at the time of grant-writing, and the subsequent advice from the Mwea team to those finalizing or revising their proposals, the SIMA projects have closely followed the Ecohealth pattern as provided to them. All the principal investigators have clearly interiorised this and applied it in practice. Their staff and students have done the same, rather in proportion to their involvement in the fieldwork. All now have experience, and a practical as well as a received understanding of the Ecohealth approach.

The project staff have, as yet, not begun to help the further evolution of Ecohealth as a concept. They have not had the time or experience, except at Mwea where the most senior staff have helpfully acted as propagators of the concepts, but have not, as yet, developed the theory further.

If the work in the field continues for several more years, and the pressures of fieldwork are not so heavy as to drown out reflection, *we believe it is likely that there will arise from the researchers - probably the younger ones rather than the principal investigators - critiques of Ecohealth and development of ideas that will contribute to its evolution at the theoretical level.* This would be the highest form of success. Again, comparative examples are useful. In the Swiss NCCR programme which started from a rather comparably sophisticated conceptual basis, on ‘syndromes of global change’, it took six years before two sets of critiques that moved thinking along arose from the postdoctoral workers involved, driven by Latin American and European workers. The pragmatic approach is so strong in East and Central Africa, however, that it could take longer. That said, with a facilitated network and some

encouragement, evolution might be faster and give an indigenous voice to the development of Ecohealth and transdisciplinarity theory.

iv. Capacity Building

The field projects have shown diverse, complementary, and serious attention to research capacity building and also to local capacity building. Although this area was not explicit in the terms of reference, it is implicit in Objective 1.3 and we believe it deserves the explicit attention given to it by the project teams, most particularly by team members from Universities and Institutes of Higher Education, for whom teaching is as important as research. If a key aim of the projects is to disseminate Ecohealth ideas and methodology, the use of masters' students on this scale is an effective way to do it.

At the research capacity building level, institutions have followed their customary patterns. Thus the Mwea project improved the capacity of a few members of ICIPE staff and also provided a niche for a productive MSc student and possibly others in the second phase.

The Zungwi (Zimbabwe) project, based at the Lake Kariba research station with strong University ties, made greater use of graduate students for the fieldwork, both for the main malaria-related studies and for special studies, requested by the community on HIV/AIDS, and one which arose from the irrigation work on conflict resolution in relation to water use. The project thus should provide 2 MSc and 1PhD degrees from the first phase of the work.

Both the Ugandan SIMA projects tended to use MSc students in their second (research) year as the key field workers. Five such students were involved in the Sanga project and six in the Bushenyi project. These two projects also aim to use graduate students in the intervention phase, preferably working for their doctorates.

As noted earlier, a particularly effective base for strengthening research capacity occurred in the Sanga project, which was located in an abandoned rural research station in the centre of the study area. Very basic board and lodging was provided for all the 5 MSc students in the rather dilapidated buildings and was fully utilized. It had the consequence that they exchanged experiences and expertise continuously for a year. External reviewers at one review were, indeed, impressed that all understood the whole project and that it was not possible to tell who was originally a vet, an anthropologist, or a molecular biologist. It is still hoped to build on this experience in later phases of the work and to develop the research station as an interdisciplinary and intersectoral research training centre; though the Centre is at great risk of being irretrievably lost due to the break in field work

As the leader of one Ugandan project is now also the Dean of Science in the University in N. Uganda there is a further opportunity to pass on the Ecohealth Concepts.

The Tanzanian project, run by the National Medical Research Institute is well placed to influence capacity building in malaria control there. It is also of particular research capacity strengthening interest because of the partner institution, the Sokoine University in Morogoro, which is a specifically agricultural university and also is relatively near to the field study site. Three of the Morogoro senior staff are involved in the project and have already gained an interest in and growing understanding of malaria. This has major implications for education of agricultural graduates and farmers. The students will visit the field site (they already do so for agricultural training) and gradually gain an understanding of the interaction of malaria and agriculture as part of their education.

v. Summary of key strengths and research potential of each project.

The key strengths and opportunities shown by each project reviewed are summarized, in the context of their future research potential, and as a basis for developing the Programme.

i) At ***Mwea***, the key achievements are the comprehensive study of the situation, very thorough development of community participation, apparent success of community-based interventions in the village with a high malaria prevalence, and a mature group with a history of working very well together (even though there have been recent strains). The cattle hypothesis to explain the low parasite prevalence on the irrigation scheme is suggested but not proven by the currently available data; and more longitudinal data are needed on the effectiveness of the community interventions aimed at control, as well as the transmission epidemiology distant from the irrigation scheme.

The site is an example of irrigated rice cultivation at an altitude where malaria can be a substantial problem but where the malaria prevalence appears much lower than in surrounding areas. It also has a well-documented long and complex history (Mwea was a model for irrigation schemes in the early post-colonial era), and continued studies are potentially very productive.

The excellent work on soya-bean cultivation as an intercrop needs to be taken to the level of operational implementation. It is important to determine rigorously the explanation for the low prevalence of malaria on the scheme; and the sustainable efficiency of the control at the remote village must be determined, as if the excellent mosquito net results are maintained, and this can be related to the degree of community involvement, this would be of importance.

The capacity building experience and strength of Mwea is particularly in relation to training of trainers (TOT), both at village level and local professionals (school teachers) as well as developing the overall context of capacity building outside the research community.

ii) The Uganda I or ***Sanga*** project tackled the problems of changing rural livelihoods and environments in relation to malaria. In particular the community had asserted that malaria had become much worse as the formerly nomadic pastoralists had settled. Such a change could have resulted from reduced deviation of mosquitoes towards cattle, consequent upon small herds housed away from people. This would be expected to result if *Anopheles arabiensis* were the primary vector. The baseline research showed that the settled pastoralists had a comparable malaria burden to their nomadic neighbours and that *An. arabiensis* was not present. The complex consequences of settlement for surface water supplies emerged as a major source of increased mosquito breeding, and a large body of data was gathered on many aspects of the livelihoods of the pastoralists.

The site is of particular interest as in an area of formerly low malaria transmission which has increased, it is undergoing massive environmental changes due to human activities and livelihood change, settlement of nomads and incipient urbanization; it has populations of people, livestock and wildlife interacting closely. Major water resource changes are taking place. Population density is uneven, and there are some relatively isolated households.

In Phase II a group of environmental interventions aiming at reducing vector populations breeding in new water bodies, and at reducing resting mosquito populations within traditionally thatched huts, will undergo trial. Separately funded work on water policy, water and

diarrhoea, and on both community- and facility-based diagnosis and prompt treatment, will address other priorities of the community and interlock with Phase II.

This site has demonstrated a specific advantage for research capacity strengthening. The previously discussed research station centrally located within the study area with laboratories, offices, accommodation of various types and in need of refurbishment, showed its potential in Phase I when the 5 masters' students doing much of the field work lived there and by the end of their work each student had a grasp of all aspects of the project, so that external reviewers were unable to decide on the initial discipline of the students. With appropriate rehabilitation of the facilities this site can be an outstanding interdisciplinary research station.

iii) The key finding to date from the ***Bushenyi*** (Uganda 2) study is that the vector hazard from fishponds appears to be largely due to anophelines breeding in disused fishponds. This has obvious policy implications, if this can be confirmed. Short-term interventions to stop breeding in these disused ponds can be undertaken, possibly involving a comparison of *Bacillus thuringiensis* and a chemical larvicide, to both determine practicable methods of larval control and also quantify the role of these ponds in overall malaria transmission. These are feasible in Phase II. The very high local productivity of small tree-hole and banana-leaf breeding sites needs to be appropriately compared with the role of ponds. It may outweigh them, or it may not. There are significant similarities between the Bushenyi results and those from groups in Western Kenya, suggesting that the findings so far are more than of local relevance.

Since another outcome of Phase I is a strong interest of one of the researchers to continue with an in-depth look at the economics of developing fishponds more extensively in the area, this provides an opportunity to also study longer-term ways to ensure that disused fishponds do not persist in the area.

iv) The ***Mvomero*** project in Tanzania has adopted a comparative approach, with a series of villages along a 45 km road transect which passes through 6 different agricultural ecosystems. The initial work has been a comparison of malaria prevalence rates, backed up by descriptive material on the agriculture, livelihoods, and socio-economic circumstances of the communities. This project was later in starting than the others (and was separately funded), so that data are still being analysed. The malaria results show a large variation of the prevalence between agroecosystems, with very low rates in organized sugar-cane areas and much higher levels under rice irrigation.

The site covers a range of agricultural activities at an altitude where transmission is variable and possibly open to manipulation by changing cultivation. It is within an hour's drive of the Agricultural University.

The strength of this project's capacity building is its close link with the Agricultural University of Morogoro and the strong participation of the faculty there. This gives an opportunity for influencing many agriculture students there with Ecohealth principles.

v) The **Zungwi** project in Zimbabwe has adopted the most comprehensively Ecohealth approach to a very small area and the findings are carefully interlinked. A deep insight into community dynamics and conflicts was obtained early. Future plans for this site sharply pose some of the priority issues raised in section IVAa below. Malaria is found not to be a substantial problem, but HIV and social conflicts are. While the absence of malaria can be further investigated, community problems are in other directions, yet need attention.

vi. The quality and usefulness of the research outputs so far.

The projects examined have, even at this very early stage, cast much light on the local malaria situation at the various sites studied. In several cases the malaria levels have been lower than expected on general climatic grounds, and these justify careful causal analysis. In some others the infection rates are high and one could doubt that any agricultural interventions will have a substantial effect on malaria transmission.

What all of the projects have done is to provide a richly contextualized account of the local malaria situation. These can and should be used to dissect out issues that need attention, both there and more widely, both to optimise the agriculture to limit malaria transmission and to work out locally important aspects of implementation if the standard malaria control methods are to work in the locality. For example, the human behaviour patterns of residence in temporary shelters by the irrigated rice fields, in order to scare birds, may make the presence of insecticide-treated mosquito nets at home inadequate to protect against transmission and additional measures may be required. These study sites, and the work begun at them, will therefore have an important role in complementing the 'mainstream' interventions that are being so intensively studied throughout the world.

While extensive bodies of socio-economic data have been collected in most projects, they have not usually yet been examined critically and analyses have sometimes taken them too much at face value. More basically, almost all projects have had trouble with database design for the very large amounts of data collected by an Ecohealth project, and could have made good use of assistance at crucial times.

In most of the projects, the epidemiology was relatively weaker than other aspects (e.g. the community-based analyses, vector ecology and GIS). This was due to several factors, including the difficulty of obtaining medically qualified researchers within the project budgets, the scarcity of epidemiologically skilled doctors, and the costs of working with quantitatively adequate population samples to test hypotheses.

The projects have largely coped with these problems in the baseline phase by using parasite prevalence rates as the measure of malaria transmission. Careful analysis of the age-prevalence curves will be needed and has not yet always been done. No team has attempted serious collection of incidence data because of personnel and resource constraints, but these are likely to be needed for assessing interventions. Calculation of the entomological inoculation rates have sometimes been done, on the basis of limited data, and these calculations were not always correct – some (hopefully all) will be revised and checked in the process of preparing manuscripts for publication.

vii The added value of natural resource management based interventions

The natural resource management interventions are more controversial, but the scientific and public health situation is more fluid than it was. In the narrow sense, an NRM approach has a limited role in the highly endemic areas of Africa. However, malaria is more heterogeneous in intensity than is generally believed and there are large populations in East and Central Africa lying near to the altitudinal limit of malaria transmission (Table 1), and in southern Africa near to the southern latitudinal limits to transmission, where natural resource management becomes important again.

There is however a changing scene in malaria control in East Africa. Due to recent controversies over modes of insecticide use, there has been a move towards combining all available control measures. While this may lead to economic problems, it has a holistic tendency and, where agricultural methods of transmission control are of low cost or are self-funding they may be favoured as part of the 'integrated' control programme.

viii Institutional Aspects of a continuing Programme

a. Funding and Constraints on Activity

There are significant differences in the way that research programmes affect the income of investigators in universities and in international research institutes involved in the research projects. In the latter, staff are paid at a reasonable rate (full time or part time) and the financial pressures are primarily at an institutional level: the institution will find large well-funded projects more attractive in terms of their viability, overheads and scientific production relative to administrative burden, in general terms.

Universities in East Africa do not pay their staff adequately. Consequently a research project is viewed not only as a scholarly and scientific opportunity, but also as a way to provide necessary income, whether in terms of field allowances, honoraria or other direct benefits. Good staff will either have a single large grant with a substantial honorarium or will be juggling a number of projects, each of which provides smaller allowances. However one may deplore this system, it cannot be ignored in designing any research and particularly an interdisciplinary project. Using local consultants is a more up-front way of operating, but it does not have the key benefit of involving students and of research capacity strengthening.

The resources available for research differ between universities and international research institutes. The latter usually have a pool of well-maintained vehicles and sometimes drivers, and a variety of laboratory and field resources, with also skilled support staff. By contrast, the universities often lack adequate transport, financial and other support staff are poorly trained by comparison with those in international research institutes, and procedures may be very slow. Yet the universities have access to students early in their careers, when they are most open to inspired leadership and when their value systems in research are being developed.

In summary, therefore, staff in international research centres tend to have the facilities and support, adequate time for research and a supportive context, but are under strong pressures to publish in well regarded journals of a disciplinary type. By contrast the universities usually have much less favourable support and contexts, much less time because of teaching commitments, but rather less discipline–oriented pressures, good access to other disciplines if they choose to take them up, and even better access to students of various levels.

An ideal programme needs a mix of research centre and university work. Enlightened differences and flexible arrangements in funding patterns can get the best out of each.

There is a sharp limit in the extent to which able research workers will initially commit themselves to Ecohealth research projects. For example, the approach:

- requires a heavy investment of time and effort in activities which will have a low pay off in short run,
- will lead to publications in less prominent journals,
- is not conducive to rapid promotion, and

- requires continual effort on the part of those with different viewpoints, disciplinary approaches and value systems to understand.

Nevertheless it is possible to recruit outstanding researchers to research of this type provided that funding is adequate to meet these extra costs; that there is a prospect of continued support in the medium term, provided that the research quality is high; and that there is sustained commitment by funding agencies with this orientation.

There are important differences between International Research Centres (IRC), National Research Organizations (NRO), and Universities (UNI) that are not fully recognized in relation to conducting Ecohealth research[5]. Ecohealth is about mode of work and about process, more than just about output.

There is a gradient from IRC and through NRO to UNI, in terms of research support --logistics, well found laboratories, time of staff available for research. The IRC end is high cost, quantitatively productive, capable of higher research training, possesses relatively well developed facilities. But they are resource-hungry, tend towards disciplinary foci (unless directors work hard to push the other way) and are highly directed toward visible research productivity in the scientific literature. NRO are more closely allied to practical aspects of control, have an ability to transfer results into practice, but vary by country and have less of an educational role.

These pressures are less at the local university end (except in long established universities) where local processes are towards practical involvement. Ability to influence undergraduate students is great and in the newer universities cross-disciplinary collaboration is easier. But resources are miserable, teaching takes most of the available time, logistics are difficult. However, on the other side, ability to change the way students think is at its greatest here.

Responses to gaps in funding for specific projects elicit different responses: IRC's switch to better-funded topics; NRO's tend to tackle simpler projects and lose morale; universities return to teaching and the commitment to research falls.

b. Continuity of Activity

The abrupt cessation of the opportunity of continuing IDRC funding to the projects that had only completed their baseline studies had a disastrous effect on the research progress, the morale of staff and the trust of the community. Only in Tanzania where the research group were from the National Research Institute was it possible to get some rapid local support for continuation. This was not possible for the University-based teams.

The teams had difficulty in understanding the sudden change. It did not appear to be necessary; there was no direct link between the IWMI-based overall SIMA project and the individual field projects with their separate funding. The reviewers do feel that IDRC has ample experience to know that if a community is heavily involved in a project, sudden policy changes for reasons which these communities cannot be expected to understand will have an intensely negative impact. This is likely to result in the field research workers being blamed unjustly; making restarting of the work a much larger task. It was clear that IDRC staff were also distressed by the policy change.

[5] Indeed to research of all types to a lesser degree, so far as developing countries are concerned.

→ Unfortunately, this now means that IDRC has an uphill task to restore faith in it by communities, researchers and some government agencies. There will be a view that, if this is what Ecohealth means in practice, it is worse than ordinary top-down research that takes little notice of what the community thinks. We believe that, had the research continued, the problems over IWMI and the central co-ordination could probably have been solved more easily.

More generally, and even in the absence of the various recent problems, there was a gap between phases I and II of the Mwea project. In Ecohealth projects there needs to be a mechanism whereby proposals for a further phase of work are evaluated in good time so that funds are in place (and indeed in the research account in the developing country institution) by the date at which the preceding phase ends. Also, in the event that either the research funding source is going to cease or it is decided not to fund the next phase, one year's advance notice is needed. There are two reasons for this:

- firstly, the community needs to know in good time so that things can be wound down in an orderly way; and
- secondly, there needs, in the case of the E. African Universities, to be time set aside for data analysis.

The situation is unlike that in countries where adequate salaries are paid, and once research is done there will be time in subsequent months to write and disseminate papers. In the case of the SIMA projects, the researchers will need to immediately switch to other projects if the project funds cease, so making writing up very difficult.

There are undoubtedly great administrative difficulties for IDRC as for other funding agencies in the way of maintaining continuity of funding, but this could be made easier by the following change in procedure, which also has wider relevance.

We recommend that, in future, IDRC give careful thought to planning for a 3-year first phase for projects of the type being reviewed here. IDRC has found it difficult, for various good reasons, to maintain continuous funding for community projects in East Africa. Even if the first phase collects most of its data before the end of year two, the process of analysis and writing up will take over 4 months in any worthwhile project; the results then have to be digested and turned into a full proposal for the next phase.

Whilst a concept note for Phase II can often be drafted from preliminary results, a detailed proposal for an intervention trial of any sort is going to require the detailed results, taking at best another 2 months. If IDRC then takes 6 months to process the application (and this is in practice doing well for any agency), it will mean a total of 12 months from cessation of fieldwork to the go-ahead for the next phase of the project. If this is budgeted, including continuing to work with the community in the third year of Phase I, the necessary continuity can be maintained. To quote from Bopp's careful 2002 evaluation of 3 Ecohealth projects in Africa. "In participatory work, timing is important and maintaining momentum is critical".

ix Conclusions and Lessons learned from the Projects

The Projects. At the time of the November 2005 conference, that brought together all the projects, and many of their staff, to present their work to each other and discuss it as a group, it appeared that much had been done with limited resources and that many issues and

opportunities had been opened up. Experience during the present review has served not only to confirm but also to strengthen this view.

We conclude that the various projects have achieved a great deal in a relatively short time in terms of baseline studies, that each of the projects has a site which raises many relevant and significant questions concerning malaria in agricultural communities, and that these are sufficiently diverse that the current projects comprise a research programme.

The array of projects at present included in the programme includes a good diversity, not only of agricultural situations but also of types of research organization, disciplines and combinations of disciplines, and ecological contexts. There are also diverse approaches to capacity-building. This has two consequences: one is that it makes for a well-balanced programme (even on this small scale) and the other is that there are great opportunities for comparative meta-analysis of issues. There are sufficient questions arising in common across the programme that networking opportunities can now be very effective in both summarizing the experience of the group on various topics and formulating steps for further study. This latter potential is only now ready to be tapped and this comparative approach should be very well developed in parallel with phase II in most of the projects.

Malaria. The work has shown up significant issues that involve both agriculture and malaria, and these are set out in section IVAb below.

In all malaria control, implementation – especially in the longer term – is a much more complex task than is generally assumed and it is going to be crucial to have a set of sites at which a holistic understanding of livelihoods, environment and behaviour is available so that implementation of any combination of control measures can be achieved in a sustainable way. The SIMA projects provide just such an array of sites.

Research Support. The actual levels of funding have been low for the scale of work expected, and the funding agency has not adequately taken into consideration the different types of organization represented among those executing the projects. The gap in funding between Phases I and II has been highly disruptive of the research and especially of relations with the communities, which IDRC has claimed to emphasize. As shown by the one project that had already reached Phase II, the majority of the benefits, to both science and the community, begin to be apparent only in Phase II. It therefore makes little sense to delay a second phase.

Community based interdisciplinary work, if it is to become established as a sustainable activity, requires deep changes in both research and community behaviours, and they will take a substantial period to become established; especially as such work puts researchers at a disadvantage compared with their peers in the short run. The benefits will become apparent and habits established in a period of 6-8 years.

If an Agriculture/Malaria research programme is to make a significant contribution and to establish an Ecohealth approach, it will work best with a rather larger group of projects than in the present portfolio. Even with five or six projects as at present, and with adequate funding, an annual spend of 1 million dollars is needed; with a full set of projects over a ten-year period the total funding would be 10-20 million dollars. This is a very small proportion of the current global malaria research budget. If it exceeds the investment that IDRC is prepared to commit, it will be necessary to form a group of donors and this will necessitate a rather larger remit

than has been the case so far, and greater clarity on aims, as discussed elsewhere in the report.

The preliminary broad phase has provided an admirable perspective for the researchers and community to get a deeper understanding of their malaria problems. But, as they move on to Phase II, attention has to be paid to Medawar's comment, that "the task of the scientist is to solve problems, not merely to grapple with them". And although we would wish to replace 'the scientist' with 'the community and scientists together' the remainder of the statement holds true, and the problem of moving to interventions but having a design able to evaluate the effectiveness of those interventions will be considerable, especially as the interventions of most interest to the IDRC are at community level and also may need to be assessed concurrently with other more conventional control methods.

III ORGANIZATIONAL ANALYSIS OF SIMA

A] SIMA as a CGIAR System-wide Initiative

Evolution of SIMA in Three Stages[6]

Though not water-tight, the evolution of SIMA can be roughly divided into three eras: IWMI-managed 2001/2; IDRC as principal funder 2003/5; and wind-down 2006. Some progress was made during the first and more in the second. The third, however, confirmed the dilemma of SIMA from the outset: a potentially important innovation in integrated malaria research that never received the level of purposive and sustained attention necessary to establish a clear rationale and coherent mandate. Recognized as neither a stable research programme nor an open-source R&D network, SIMA has remained ambiguous both conceptually and structurally, effectively proving non-fundable and, ultimately, orphaned.

SIMA was not created as a project of IDRC. However, it came to be perceived by many, both inside and outside the arrangement, as falling to a large extent under its aegis – a function of its failure to take root as a CGIAR mechanism and to attract wider donor support, coupled with the relatively significant "presence" of the ecohealth conceptual umbrella and funding provided by IDRC. The details and implications of this apparent evolution of SIMA from a CG initiative to an IDRC programme of research underlie much of the following section of the evaluation.

2001-2002

Beginning in a relatively straightforward way as a system-wide initiative of the CGIAR concerned with the relationship between malaria and agriculture, SIMA was expected to evolve as "a joint research effort of two or more Centres with a limited number of external partners …. to foster partnerships and close links with global strategic commodity/subject matter research …. a tool for the Centres, at their own initiative, to build around relevant

[6] The purpose of this overview of SIMA's evolution is not to present a complete chronological history of the Initiative, but rather to try to capture what seemed to be critical factors in determining – and to a large extent undermining – its potential success in realizing its goals as a co-ordinated research programme-cum-network. Because there appear to be very few formal materials detailing its history and the evaluator did not have access to the files (and thus the often most illuminating data of implementation and decision-making processes), the points made here are almost entirely based on the recollections and perspectives of facts, opinions and motivations of those interviewed.

research topics common to more than one (and which would) foster synergy and enhance efficiently and effectiveness"[7]. It was from this perspective that IDRC initially began contributing funding and professional support to SIMA, its goal not "the establishment of a new system-wide initiative" – a task recognized as belonging to the CGIAR itself, but rather to engage with SIMA "as the context in which EcoHealth's support (would) take place"[8].

Initially, there appears to have been broad consensus both that the research focus of SIMA was relevant to filling a knowledge and practice gap in malaria control; and that the selection of IWMI to host it under the rubric of its priority water, health and environment programme was appropriate given its credibility with decision-makers and scientists in the agriculture community and its reach into the farming community – both key to the application of SIMA research findings. The good practice model generated through results of IWMI-supported research on malaria in irrigated rice farms in South Asia resonated also with the health community, including WHO. According to IWMI management, the beginnings of SIMA were "auspicious"; some project and activity funding was generated and donors, it seemed, remained interested.

Unfortunately, the clarity of its official SWI definition belied the difficulty of its operationalization, and this first IWMI period appears best described as one of increasingly dissipated energy and disappointed expectations. Several factors appeared to contribute to this.

1. First, and perhaps most basically, efforts to establish a firm footing for SIMA appear to have been undermined from the outset by the nature of the system-wide mechanism itself: essentially, a strategic concept or virtual programme with neither the structure nor confirmed resources needed to ensure application. As little more than a "promising idea", SIMA needed to *convince* people to act, since it could not compel them. To do so, it needed in some way to be defined, packaged and marketed to prospective users and funders in ways that made clear its relevance and potential benefit to them.

This did not, it seems, happen and a major contributor to SIMA's continuing struggles appears to have been that, in these early days, its fragility as a *notion* was not effectively recognized and managed. There was little in the data to suggest other than a general failure on the part of SIMA initiators adequately to work through:

- what the *substance* of SIMA might and should be;
- the demand for such research or the potential to fill it;
- whether SIMA constituted a research-cum-intervention platform that was ready to be exploited, or one that needed still to be built; or
- which CG centres and other agencies were likely to engage with either task, and under what conditions.

To the extent these issues were not addressed, SIMA appears to have been launched without a net; undertaken without adequate due diligence.

2. **A second** "mistake" noted by several early observers of, and participants in, SIMA in this respect – and one with direct implications for IDRC in deciding how to move forward -- was strategic: the decision on the part of IWMI quickly to pursue large-scale grants and a broadly

[7] CGIAR Science Council. 2006. "Criteria for Assessing Proposals for new System-wide Programmes". SC Secretariat: 1

[8] Noted in correspondence from IDRC in response to the first draft of the evaluation.

case agenda rather than moving more slowly, incrementally building a funding base through smaller grants as the concept was developed, best practice lessons drawn and research outcomes "…able to prove the case. We should have looked for like-minded donors such as Rockefeller Foundation and Carnegie, ones with more interest in capacity building and progressive development, not magic bullet technological solutions".

3. A third and related impediment to establishing SIMA was the assumption that "more than one" CG centre would automatically link it to their own research agendas without ensuring quality of the match and, especially, availability of the funding. There was, apparently, even some initial confusion among CG centres as to which direction the funds were intended to flow, several looking to SIMA as itself a source of income, rather than a research agenda to which they were expected to contribute. If true, it was a reasonable mistake. CG centres are continually in quest for donor support.

It proved also inaccurate to assume that centres would work together on a common SIMA research platform. The CGIAR umbrella notwithstanding, centres often compete with one another for funding, a reality that not simply limits collaboration, but can expressly prevent it. According to several sources, while centre scientists may be interested in cross-pollinating research, their managers are determinedly less interested in such collaboration particularly in the face of increasingly restricted funding. The result: "we have a culture that rewards those of us who can attract resources and punishes those who try to share them".

In a programmatic sense, too, the assumption that centres would collaborate proved unfounded insofar as both policy and structure discourage cross-cutting initiatives. Important for SIMA, for example, although human health is on the agenda of all centres, it is as a secondary theme for many of them. It is expected to be addressed, not as a point of departure (as SIMA would have required), but from the perspective of the sector e.g. the consequences of plant or animal production practices to farmers as an issue of occupational health. Reinforcing the singularity of research implied by this, centres have reportedly been urged by the CG Science Council to concentrate less on operational research (the kind most conducive to inter-disciplinary designs) and more on realizing the technical credibility of the basic sciences in their specific sector areas.

4. A fourth contributing factor to SIMA's failure to find solid ground concerned its leadership and management structure – or, more accurately, the lack thereof. An essentially unformed programme dependent on the voluntary participation of disparate agents to give it progressively more shape and substance, SIMA required the committed and sustained energy of a strong "hand at the helm", making its case and building a consistent core support group of some form. SIMA, it would appear, lacked such a catalyzing centre -- IWMI management itself suggesting that "perhaps we took a too hands-off role".

A number of observers agreed, describing as overly limited the vigour, reach and duration of IWMI support to the tasks of defining a coherent and compelling agenda and mobilizing funding partners. Early, reasonably promising, efforts did not extend much beyond the point where other resource development priorities - such as the CG Challenge Programme – started to become more dominant. Embryonic steering committee/advisory group support proved, in the opinion of one member, "too minimally active" to build sustainable lines of communication with potential researchers and donors, leaving SIMA more or less adrift with "no clear institutional framework".

5. Also part of the management structure of SIMA, but a distinct and **fifth** factor, the co-ordination position created to run the Secretariat was, in retrospect, probably overly ambiguous and under-designed given the requirements of building a convincing SIMA case within the CG structure. There were – and continue to be – no questions concerning the need for relevant technical competence in the position (and that the person appointed in fact more than met that criterion). It is less clear, however, that adequate consideration was given by either IWMI or the co-ordinator himself to the kinds and levels of support that SIMA would need for its further conceptualization, marketing and resource mobilization; who would be responsible for these functions; and how capacities and procedures for realizing them would be ensured.

Some questioned the congruence between the goals of SIMA and the complicated super-structure of IWMI; "SIMA got lost in the matrix arrangement; nothing seemed to progress through the multiple reporting grid". "We did not need such a heavy structure" and oversight; it would have been "better to have made SIMA a more lean machine – to do the groundwork, do good research, get some results out and get them discussed".

One indication that these issues were not sufficiently addressed was, in a sense, the lack of evidence that conceptualization, marketing and resource mobilization functions had been fulfilled to any meaningful extent. Another was the conclusion of the 2002 evaluation of IWMI that SIMA, as a system-wide initiative had critically missed its mark and was in serious need of repair. That, as "designed and currently presented" SIMA (which at that time had but one project on the ground)

> *"… requires substantial reengineering, re-branding and reappraisal. The chances of any success and impact are limited as conceived in the proposal, as it lacks focus, is over ambitious, lacks credibility of partnership arrangements, and scientific and managerial leadership in the context of African malaria research and control"*[9]*.*

While many, even those who agree with its general point, consider the assessment to have been unfair in judging SIMA through an overly biological lens, it nevertheless suggests the Initiative had done far too little by that point to create a clear or convincing identity. And this perception appears to have been shared, even from within: the evaluation had an impact probably beyond the technical case it made insofar as it coincided with IWMI management's own dissatisfaction with the programme and the decision to reduce its hosting role. With this added justification, the restructuring of SIMA began.

2003-2005

At this point, IDRC's role as donor became much more pronounced through mobilization of an ecohealth-framed competitive grants process, to be funded under the SIMA umbrella. Though still housed within IWMI, SIMA appears in large measure from this point on to be defined, if not as a network, at least as a research programme of IDRC and its EcoHealth Programme Initiative. For two reasons, the labelling was not unwarranted. Following selection of the eventually four projects in the East Africa region[10], IDRC was effectively financing the bulk of SIMA's research activities; and, in terms of SIMA realizing its initial research goals, the focus and level of IDRC support and (as detailed above) the quality of research it has begun to produce, have been significant.

[9] Molyneux, D and J Utzinger. 2002: 2
[10] One more was funded by the Netherlands.

That said, neither the example of a major donor supporting research under SIMA, nor the efforts of SIMA supporters to undertake its restructuring, precipitated the CG centres and other malaria-active donors to engage. Again, there appeared to be several factors impeding buy-in.

The majority of opinion suggested **a quite passive response**: SIMA had "fallen through the cracks" of agency priorities and, eventually, it simply "went from the radar". According to one, "*I'd hesitate to label it a failure; hard work was done and some capacities were built. It got off to a good start, but then it just disappeared".*

Why this was the case was less clear, though two management factors appeared to persist: the lack of IWMI attention as champion of SIMA within the CG framework; and the limited outreach role played by the SIMA Secretariat and its advisors. In the case of the latter, the functions of SIMA as a coordinated structure within IWMI were considerably more defined following the 2003 restructuring, and included both a steering/management committee (SC) and a "scientific and technical advisory panel" (STAP) made up of senior international researchers and donor scientists[11]. Despite this, however, the human resource base available to make the marketing case for SIMA continued to prove inadequate to kick-starting and sustaining an energized, coherent identity capable of mobilizing the attention of donors.

More nuanced reactions concerned specific policy or programme mismatches: between what some considered an over-emphasis by SIMA on basic research as opposed to the operational piloting of proven interventions; between SIMA's restricted focus on a single vector-disease and a limited geographic base in Africa as opposed to theirs on multiple vectors and a global application. According to one donor that had initially funded SIMA, it was *"too scattered, diffuse. (We) hoped it would focus on specific interventions that would lead to specific reductions in malaria. But it has never shown the ability to provide interventions that could be taken up and inform policy".* Another opinion was similar: "*I didn't see where SIMA added value or complemented other agendas in ways that filled gaps or cooperated with other work. It seemed to run in parallel and didn't show value for money. Where are the documents produced? The results being realized?"* Though he worked regularly in the field in Africa with reference to community health and the environment, SIMA "never appears on my radar".

Such comments reflected to a major extent, of course, **issues of time and dissemination**, donors jumping too quickly to conclusions of inadequacy before the research could display the results they are only now beginning to realize. That said, and as suggested elsewhere, SIMA's failure to keep potential funders better abreast of the implementation details of what was happening with the projects left a lacuna easily filled by misplaced assumptions.

Directly relevant to this was the matter of **the substantive focus of SIMA**. According to several long time observers, from the outset and, especially, as it moved more expressly into EcoHealth, SIMA was inherently "a hard sell" in combining health and agriculture, and each donor "had its own story" as to why it could not fund it. SIMA was, however, "not able to accommodate these effectively" and "*there was absolutely no follow-up with them or other CG*

[11] In fact, as detailed in the 2003 "Framework Document", prepared by IWMI for the CGIAR, the mandate of SIMA, tasks to be undertaken and mechanisms and procedures for implementing them were very extensive, and based on the apparent failure of most of them to realize observable results – and perhaps to be implemented – far too extensive for the lightly-cast structure, limited human resources and largely still just "anticipated" funding base on which they depended.

centres….We needed a clear framework and consistent pursuit", neither of which happened[12]. With respect specifically to Ecohealth, some felt that the complexity inherent in a transdisciplinary design was "*not well enough understood; that it would take longer, be harder to do and would not enable researchers as easily to get the professional kudos they need…".*

Ironically, perhaps by funding the country projects on its own without explicit reference or practical links to the current agendas and future plans of other actors in the health and environment donor community, **IDRC unintentionally took on too much of the SIMA mantle**. Certainly, by 2005, no one else had and IDRC was effectively the only donor involved. SIMA as a programme of the CGIAR had effectively terminated, and most of its activities were being initiated and co-ordinated by the Secretariat on a bilateral basis with the five research projects. The research teams conducting the projects continued to recognize SIMA in terms of this co-ordination, and as a short-hand reference to the ecohealth approach to integrated malaria-agriculture research they were using.

Beyond that, however, there appeared to be little if any sense of SIMA as such as a coherent and directed malaria and agriculture research platform broadly welcoming to a wide range of donors or their funding interests. Unfortunately in the opinion of some, while IDRC *had* the major defining role in SIMA by this point, it did not sufficiently *play* it. According to one member of the STAP, "*it was the classical donor, gave the money and occasionally met, but did not really take responsibility for the quality of the management. This was understandable, but still a problem. SIMA needed to be managed, and no one took up that task".*

2006

While acknowledging that system-wide initiatives are "always complicated as informal gatherings of CG centres with one champion", in the opinion of IWMI management those responsible for steering, advising and working to advance SIMA, in essence, did not try hard enough. These arrangements *"are essentially groups of partners doing things, generating actions and generating funding. At some point, those responsible needed to take these things on and produce products, but this didn't happen (and) IWMI was left holding the bag".*

This situation ended effectively at the end of 2005 when IWMI gave SIMA -- theoretically all stakeholders, but practically only the Secretariat – until the end of 2006 to make other arrangements for managing its programme of work. Somewhat surprisingly to a number of observers, no specific process was put in place systematically to garner support of project teams and like-minded donors to co-ordinate a focused campaign or mobilize a strategic plan of action to deal with the issue, and the task of re-housing SIMA fell more-or-less to the individual efforts of the Co-ordinator to identify and contact potential institutional candidates. Not surprisingly, it proved a less than satisfactory way forward from most perspectives.

[12] In one case, a perception that SIMA was insisting limiting support only to fully ecohealth-based projects was off-putting: "*IDRC cannot expect to drive the agenda and then have others pay".* But this opinion was atypical, and perhaps more a matter of misunderstanding the options; that SIMA, under the influence of EcoHealth, was a too-closed shop. One of the project team leaders proposed the contrary: "*Why did SIMA confine EcoHealth to malaria? If we could go further to look at other issues in animal health, the community would be happier".* And centres like ILRI "might come in". "*The project should have allowed for this kind of expansion; it was not EcoHealth limiting SIMA, but SIMA limiting EcoHealth".*

In Summary

For many, the SIMA acronym has taken on something in the nature of a conceptual framework, *a short-hand reference* to research on malaria in the contexts of agricultural practices and agriculture-based communities broadly synonymous with an ecosystem approach or, in the case of the IDRC-funded projects, the EcoHealth paradigm. At the same time, and in somewhat counterpoint to this, other references to SIMA ascribe to it the status almost of an institution, a *functioning collaboration* of agencies and projects that does not, in any practical sense, exist. For others, and probably increasingly so, SIMA is little more than the group of projects and activities that IDRC has been funding and that have been the only really concrete expression of SIMA over the past four years.

Unfortunately, in none but the last case have any criteria been proposed as to what was actually implied by SIMA; nor have there been any benchmarks for assessing progress from a baseline. Thus, although both these conceptual and structural references to what SIMA was were true to some degree, the fact is that neither is operationally accurate and those that have been responsible for managing SIMA in the broad sense have persistently failed to resolve the ambiguity by clearly defining its purposes, structures and functions. As a result, there have been few actions taken systematically to build on its strengths or manage its limitations -- thus seriously undermining its potential and constraining its impacts.

B] SIMA as a Network

i. Status of SIMA as a network

> *Networks – certainly those with a sustained development intention such as the application of EcoHealth -- are, ultimately, flexible social arrangements for social exchange. They are "dependent for their success and durability on members who commit to one another on a personal level for joint exchange, action and learning;…..They are metaphors (having) to do with communication; with intermediation between people so that things can happen; with doing things together."* [13]

SIMA "as a network" in the above sense effectively had no status. No arrangement ever developed, either spontaneously or facilitated by IDRC, which could be considered a recognizable professional community of project researchers and/or likeminded supporters coming together in common cause through a defined sense of identity, culture and self-confirmed membership. This is, in one respect, not a negative assessment: there was little in the evaluation to suggest that either IDRC or SIMA managers or the project teams were expecting such an evolution; in any event, the resources for such network activities to happen were not provided. Nor, however, was there anything to suggest such an evolution would not have been welcomed.

[13] Excerpted from Bernard. 1996. "IDRC Networks: An Ethnographic Perspective". IDRC, Ottawa: 14

The closest SIMA has come so far toward *becoming* a network is in the minimalist sense of a lightly-coordinated contact base, with occasional joint action enabling inter-project exchange initiated and managed by the Secretariat. In one sense, then, assessing the effectiveness and reach of SIMA "as a network" is a relatively straightforward matter of trying to understand what was missing, why and with what possible consequences for the goals of SIMA and IDRC.

1. Following the criteria generally associated with successful networks, there were, in summary, no signs of a SIMA-cum-EcoHealth "network culture" being built at any point in SIMA's history, including that period in which IDRC played a major role.

    - Project research teams:

        - did not express shared *sense of ownership* for SIMA, cooperate on mutual obligations, confirm a sense of the network as an effectively social-linkage organization, or recognize a common purpose with mutual benefits, rights and responsibilities;

        - did not interact directly with one another, nor therefore, did they shape what they thought and did on the basis of *mutual involvement in SIMA* – team members could not articulate the valued-added of SIMA in enabling them to do anything they would otherwise have been able to do on their own.

        - did not *purposively volunteer* to join the arrangement, but simply found themselves in by virtue of winning the competition. A couple noted, in fact, that the competitive process probably diminished the chances of collaboration or networking happening: "*even informally, talking over coffee in the hotel, we were reluctant to talk about the details of our proposal because only 2-3 of us could win".*

    - Beyond initial selection and follow-up workshops, the agendas, procedures and activities of the projects were not *negotiated and monitored internally as a group*. Inasmuch as the projects are meant to be part of a common EcoHealth theme, this must be seen as a failure of the network to emerge in any meaningful way.

    - The projects as such did not have an *external visibility as more than the sum of their parts*, something other than a common funding reference – and something which would also have increased, of course, the likelihood of making the work of the individual projects themselves more visible. Criticism among some donors that the projects were "not providing a solid evidence-base for SIMA or the ecohealth approach" were not, in this sense, fair in implying they lacked credibility or merit as fund recipients. Outsiders simply did not know what the teams were doing; nor, to a considerable degree, did the projects know much of one another.

2. In one respect, this is also not a negative assessment of SIMA insofar as the project teams were, in general, satisfied with the level of interaction they had from the Secretariat and expressed no strong sense of "missing" something more from one another. One team that experienced administrative problems "appreciated" the efficiency with which action was taken by SIMA (and IDRC) to rectify the situation. A more mixed message must be drawn from the case of another team, one which struggled for many months with the potentially more serious problem of internal breakdown in team coherence. On one hand, the team was satisfied with SIMA, uncritical of limited and ultimately ineffective intervention by the Secretariat, because "he was not actually here"; there was "not much

he could do to change the situation; he expected things to evolve on the basis of trust". On the other hand, had there been on the part of team members a more proactive sense of ownership of their work under SIMA as part of a joint network enterprise with the other projects (rather than as simply a funded project), satisfactory resolution might have been found.

ii. Outcomes of SIMA as a network

Obviously, it cannot really be said that SIMA realized outcomes as a network.

Nevertheless, through IDRC treating the several SIMA projects as a collected set of activities under the common conceptual umbrella of EcoHealth, some of the results that might have been expected from a network arrangement were realized.

- By forcing a more holistic perspective, the framework had, according to all of the teams, changed significantly their way of conceiving and interacting with the research situation – or, for some, helped them to reinforce and feel more confidence in what they were already trying to do. *"It means we don't think in terms or come in with the answers, but with a set of options – ITN[14], drugs, larvae control. EcoHealth helps you get out of an attitude of dependency"* on just one way. *"To say EcoHealth is 'too research' or 'too development' is a scapegoat. It is a necessary mix".*

- The most evident of these results, across all project teams and on the part especially of the natural scientists, were changes in attitude: in the strong expressions of belief in, and commitment to, transdisciplinary research. By working together "*almost as a family", they had "come to appreciate each other; at the end of the day, we all now have knowledge of each other, have come to understand the 'why' of each other's perspective"*. All teams distinguished a qualitative difference between this way of working and their multidisciplinary research experience of work essentially *"in parallel, coming together to make a synthesis at the end".* In building the research together, the subtle interactions between sector variables became more visible and, following from that, a greater range of options for actual intervention. For one, the project was *"a real eye-opener, (suggesting) options I would not have seen if I had not been working with an agricultural expert on the project".*

- An important factor in bringing about this level of integration of thinking, as well of practice, appeared to be the commitment of team members to working together at all points in the planning, collection and analysis of data, and creating opportunities to do this: monthly review meetings; insistence on joint fieldwork; establishing a live-in research station. Particularly important with respect to future research support sustaining the momentum and building capacities for transdisciplinarity was the emphasis put by several teams on the fact that the "main changes" had been in younger team members - research assistants and graduate students. While the senior scientists could give only some concentrated time to the research, the younger ones *"were involved together full time; they were strongly affected"*.

[14] Insecticide-treated bed nets

- Equally referenced was the impact researchers felt on their work resulting from their engaging with communities. In Kenya, one government officer member of the team considered himself "a rejuvenated person", now fully "converted to the idea of involving the community" directly and through collaboration with other social service providers, such as nutritionists partnering with the project around introduction of soy plants. While at this point, it needed "a focal point like the project" to make it happen, *"it should be a permanent collaboration among us. First, we need more solid results, more time, (but) then we need to have a national seminar to share what we have done with others at that level".* Outreach through TOT[15] had produced visible change, one group noting that they now "know more about malaria", and had "more energy for mobilizing the community". This was leading to the community taking more responsibility *"because they see how what they do affects their malaria*." Less money was being spent on medication without testing; cleaning of the compound and use of nets were up; malaria prevalence was down.

    - While only in the Mwea case did this appear to mean interactive community participation, in all cases, it was an important change insofar as it involved natural scientists in the use of more ethnographic methods and, through that, making a better link between social and biological issues; if nothing else, they believe they are "getting better data this way". More positively, according to one, interacting with the community *"made a major difference to me, to be able to put faces to blood samples; seeing how people live has helped me understand better the 'life' of malaria"*, not just its prevalence. For another, *"we are less inclined to come to the community with answers now; more with development options to discuss and decide with them, trying to move away from making them dependent on interventions from the outside"*. In a third case*, "we are moving away from a 'fire-brigade' model of addressing issues like malaria…running in, collecting samples, taking actions and running out, without engaging with the community in a sustainable way".*

A note of caution: Noted elsewhere, it is important to raise again here the point the genuinely engaging communities implies a lessening of project control over the research agenda and the introduction of perhaps different dimensions of research ethics. Community participation has enabled some projects to have perhaps a quicker influence on community behaviour than might otherwise have been the case – for example, the finding that malaria incidence was not higher among fish pond farmers causing some to rethink their decision to move out of the sector. It has also created atypical challenges to project teams – for example, determining how far to go into research on issues such as marketing options where a strategy such as soy bean inter-cropping appears to be effective in controlling malaria. And it has put some communities, perhaps, at risk in starting a programme of change with project teams**,** the future of which is not at all certain. These are features of the EcoHealth paradigm which have not yet been fully explored by any of the research teams, nor by SIMA, nor adequately faced up to by IDRC.

iii. Factors Influencing SIMA's Failure/Potential as a Network

As defined in the boxed definition above, a development network such as SIMA might have been, implies certain characteristics of systematic and purposeful action to create synergies

[15] Training of trainers

and recognition of increasing mutual ownership (symmetry in their contributions, benefits, responsibilities) among members. It implies people "doing things" together in progressively more member-initiated ways and in ways conducive to mutual learning: thinking through ideas, negotiating priorities, assessing progress on outcomes. More than simply a series of contact points, this kind of network is organic, suggesting it will *evolve* - the quality and intensity of the linkages inevitably fairly insubstantial and superficial at the beginning[16], but with the potential to mature over time through use.

Indicators of the effectiveness and reach of such a network, and the factors influencing these, are likely to be varied, interactive and nuanced. In any such network even an embryonic one, there should be *signs of basic networking conditions* being put in place e.g. people actively talking about, looking for and attempting to contribute to interaction. The following discussion of indicators and factors evident and missing with respect to SIMA are intended to give both a better sense of what happened to encourage and discourage networking in SIMA with a view to beginning to consider what could and should happen going forward.

1. Clarity of intentions and focus

Perhaps the most important factor in the failure of SIMA to evolve as a network was the failure of anyone expressly to plan for it evolving in this way, other than as something that was "nice to see". There was nothing in the data, from either interviews or documents, to suggest that anything was expected of SIMA as a network, versus more simply as a lightly-managed series of research and resource mobilizing activities within a specific task or thematic area. According to the input from a SIMA e-discussion in 2001, some commentators looked for its *"facilitating exchanges of information and ideas among relatively scattered groups of researchers and practitioners involved in the interface between health and agriculture",* but made no specific suggestions as to what would make this happen.

Logic would suggest that the failure of stakeholders to be explicit as to what they might have considered a satisfying networking outcome for SIMA *diminished significantly the possibility of any such arrangement occurring*; its managers and advisors, the researchers it supported and its prospective donors (i.e. the putative network members) left with little to guide actions that might have *worked toward* making a wider umbrella arrangement happen.

In addition to not thinking of a network as a possible outcome of/structure for SIMA, there were also indications of networking not being understood as a potential *tool for building SIMA*, a gradual *process of growing relationships* over time through regular and consistent participation on the small as well as the big things. One document, for example, explained an extended "unintended information blackout" in communication with partners and advisors as *"partly due to the fact that the portfolio did not significantly change between 2004-2006. There was therefore relatively little demand for collective frequent inputs to ongoing projects by STAP".* There was also, the "uncertain evolution" of SIMA that "*needed careful observation*

[16] Some members will invariably have more to give to the arrangement in the first instance than others; the strength of a good network is that it provides a venue through which equity and symmetry in benefits given and taken is realized. In the SIMA case, for example, while the Mwea team initially had more to offer insofar as it had already worked through two years of ecohealth research as the other projects were just beginning, there were people in all projects of equally senior and varied expertise. Any successfully sustained network is ultimately going to come down to the interactions of individuals, not "teams" (which are themselves a type of network) and "building the network" would have involved exploring, sharing and gradually building equity among all of these contributed experiences and perspectives.

without necessarily burdening all members of the management team, STAP and project co-ordinators"[17]. In fact, the embryo of a network and the survival of SIMA might likely have been better served by shared reflection on such uncertainties of its evolution, as well as exchanges on the implementation details of the research portfolio. Certainly, the advisors would have felt less excluded.

2. Relevance

Networks can put issues on the public agenda in ways which established structures often cannot; they also need to be on the public agenda if they are to generate justification for their own existence through systematic and consistent use of a range of user-tailored outreach modalities – one-on-one information exchange beyond the already converted; contributions to policy debate; awareness-raising among researchers and practitioners.

SIMA failed to evolve even as an informal loosely-linked arrangement because it failed to make clear its comparative "development relevance" advantage in terms of observably doing what other types of arrangements were not, on issues considered important by a critical mass of the user community. It did not visibly add value even to those who were nominally part of it (e.g. STAP), initially-interested donors, or the institutions and communities of practice with which the funded projects were or might have been associated.

Journal publications and contributed conference sessions were no doubt important insofar as they helped move some of the rationale and data of the research into general scientific forums; they apparently did little to *build a rationale* for the scientists and institutions in those forums for joining in, or contributing to, SIMA – and forming in this sense a community of interest network.

3. Appropriateness

While the lack of intent and proven relevance inhibited formation of network arrangements under SIMA, there were specific strategies and activities that were either more or less appropriate to constraining or facilitating their evolution. In looking forward, it will be important to consider how these and other aspects of the earlier SIMA implementation influenced either:

a. *Horizontal Connections*

As a CG system-wide initiative, SIMA appeared not to form network connections. Even the modest potentials, expressed by two SIMA advisors, of its serving "simply as a platform for information exchange among scientists", or helping raise the profile *of "the small community of malaria/agriculture scientists that meets reasonably often, and shares"* were, they felt, never effectively promoted by IWMI and did not happen.

Again during the IDRC-led period, SIMA was neither structured nor implemented in ways that connected people or projects. It was unclear whether budget provided through IWMI might have been used to promote horizontal exchanges; it was clear, however, that funds were not used to do so.

[17] "SIMA Transition Update", 21/9/06. email from SIMA to IDRC

The minimum budget provided by IDRC to enable the co-ordinator to monitor project progress resulted only in indirect linkages through the bilateral relationship of each project to the Secretariat. There were no line items in the individual research projects explicitly earmarked for communicating with, travelling to or gathering materials from one another. The five funded projects were held together conceptually under the rubric of EcoHealth and recognized this shared focus. Beyond the occasional joint training workshop, however, this "holding together" was much more defined in the minds of IDRC and the Secretariat than of either the constituent SIMA parts or outside donor observers.

The most telling point in the data from projects themselves, perhaps, was that - beyond mild disappointment -- no one expressed concern about this. There was no sense of frustration at connections being blocked. More simply, they were unable to identify anything to catalyze them to come together, including any indication from SIMA managers that they were expected to do so. They had "not really thought about contacting the others". While it is not possible to say specifically what results might have been realized by more proactive support for inter-project or other types of exchange, a fairly impressive list of "missed potentials" could be put together based on the relatively brief period of the evaluation field visits:

- All projects were struggling with the issue of whether and in what form to compensate community-level research assistants/vector monitors; there had been so far no opportunity to exchange experience.

- The Mwea project had spent several years experimenting with community participation beyond simply the use of ethnographic methods e.g. through training-of-trainers (TOT) and interventions with school teachers and students (active learning/malaria clubs) aimed at reaching out to communities to generate and disseminate information about malaria prevalence and prevention. These strategies had begun to produce notable community engagement, but also raised important questions about message quality, consistency and sustainability. This was a type of issue each of the projects will need eventually to address as they move from situation analysis to intervention; none had had any exposure to the Kenyan experience, however.

- The Uganda 1 project incorporated the "participatory impact assessment" (PIA) method adapted from DfID into its own community participation activities and found it both complementary and "very effective" in moving their own work forward. It had not thought to share it with the other projects.

- Also not shared were the ways in which various projects were realizing transdisciplinary exchange. Some examples: the "significant impact" on research quality realized by Uganda 1 in having a "critical mass" of mixed discipline researchers working together in a field research station; and the "passion to succeed" generated in Mwea 1 through the systematic insistence on joint action. Two "lessons learned" were noted in the Uganda 2 project: that by "always working together as a team, never one by one", they were able to "see the whole picture" of malaria in the community, and the community was in turn able to see different aspects of malaria through "the different discipline eyes of the team"; and that as they moved to interventions, they realized a need to include development workers on the team, because "we can't say to the community 'that's not what we do'".

- At least two projects, as well as the SIMA co-ordinator, expressed an interest in exploring how the concepts, design and methods of EcoHealth could be incorporated into university programmes with a view to extending and sustaining it for the longer term. Thinking through ideas for case studies, modules and eventual courses had gone further in some contexts than others; one, for example, was expecting to have it included in the upcoming university review of its natural sciences curriculum. None of these interests had been shared across researcher teams, however, in terms of curriculum development modalities and content; options for including one another's materials; or strategies for eliciting donor support.

- Also with respect to issues of dissemination and sustainability, several project researchers referred to their frustration with the relatively weak emphasis put by SIMA/IDRC on "planning for the application" of their studies, and on the need for more support in strengthening this in any next phase. Again independently of each other, all noted various ways in which they needed more input from IDRC for publication of their work in scientific journals; *"it would be a good compensation for the fact there is no honorarium in the project"* to improve their professional status. Even more significant from a development perspective, several emphasized an even greater interest in designing better "knowledge transfer and intervention strategies with the communities". While publishing was good, one team leader felt, it "*rarely changed things for communities. We need to move ideas from research into the system at local level -- into Comprehensive District Plans, for example".* Utilization of knowledge through community engagement is a core assumption of EcoHealth, of course; nothing to facilitate projects sharing their ideas, strategies or practices on this process had been done, however.

It was ironic that the first meeting where every project had come to share its baseline results, in November 2005, not only had the inhibition that IDRC had implied that not all the projects might be funded for phase II but also the meeting was crushed by the news that IWMI was withdrawing, there might not be a phase II and that funding was halted.

b. *Competitive Grants Mechanism*

Overall, there were no serious complaints about the fact or the procedures of the competitive grant mechanism as a means of selecting SIMA projects. Particularly, insofar as the mechanism involved a strong element of the type of tailored technical support, through the workshops and the initial proposal strengthening stage, common to traditional IDRC projects, researchers felt well enough served.

At the same time, however, they saw no advantages to the mechanism and several felt the resources spent on the RFP[18] dissemination and review *process "could have been better spent on the projects themselves, or on more exchange activities"*. There was also, from researchers of two projects, the suggestion that putting teams in competition with each other indirectly served to undermine the potential for any eventual collaboration or networking arrangement[19]. *"From the beginning, even informally in the hotel, we were reluctant to talk*

[18] Request for proposal

[19] The evaluation agrees with IDRC in its comment on this point, that "it is not always a given" that competitive arrangements "jeopardize the possibility of collaboration between participating teams". However, this is more likely to be the result where specific collaboration-building activities are not built into the design of the

about the details of our research ideas because it might have improved the others' advantage". By starting off not sharing, "it never really occurred to us later to start". This continued to be the case for several as they were thinking about a phase 2 *"in case it will also be competitive".*

The competitive arrangement may also have, to some degree, weakened the broader goal of establishing a coherent base of innovative EcoHealth research thinking and action among the teams. Changing traditional practice in the way EcoHealth implies invariably takes time, a number of false or only partially effective starts and, probably, different emphases and interpretations as to best ways forward.

Understanding this and taking the challenge seriously, it was not surprising that project teams for the most part have treated their first SIMA funding grant as a *situation analysis-cum-community participation-cum-transdisciplinary team building first phase*. More exploratory and intervention testing research is needed by all of them. To leave open the possibility of any further grant also being competitive, and thus uncertain, makes limited sense as a strategy for promoting and enabling long-term systemic change, innovation and capacity building in a research environment such as theirs.

In this respect, it is important also to note the very strongly put position of two of the projects concerning the Knowledge Translation grant within the context of a competitive process:

> "*We are not sure what is* happening *next. Are we still in a competitive process, or is the 2nd phase for us being considered on our own? If we are going to go to the community for feedback on the intervention stage, what do we say if we don't get funding? The money could cause us a problem with the community; if IDRC does not do a second phase…"*
>
> Unless IDRC could give "a reasonable assurance" that there will be a next phase of the research, then *"we would prefer to turn down the $20,000. After these last months, the community is used to our absence; we don't want to encourage them by going back to talk about what might be next steps if there is no chance there will be any".*

c. *Resources and Resource Mobilization*

Neither SIMA as a whole, nor any of the project teams, made observably significant advances in efforts to mobilize additional donor resources – this despite the several attempts made by IDRC to encourage and enable them, through both "how to" information sessions and funding, to undertake such outreach action. As a recognizable malaria-in-agriculture network SIMA might have facilitated better action in this regard. In the absence of such connectivity, however, projects remained very limited in generating funds as relatively small, slowly emerging and stand-alone studies.

The situation was not totally negative, but it was challenged. Mwea/Kenya, for example, managed to attract a small amount for a small study of ways to use the residue of soy processing, but had no obvious way to move on from there. More complicated in a way were

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programme (in this case, to overcome the fairly common expectation in the region that research funding is a zero-sum exercise). In the case of SIMA projects, the understanding among projects that any phase 2 would also be competitive, and that not all would be successful, clearly dampened enthusiasm for exchanging ideas.

the steps another project had taken in negotiating potential large-scale USAID support – a straightforward malaria control intervention without a community participation focus to be linked in parallel to, rather than integrated with, a further phase of the SIMA research. For the team, there was little choice; *"we agree it is a separate scaling up, but we can't go to USAID and say we are doing ecohealth research in malaria, because they are limited to spraying for malaria control. But we can apply to them on the basis of their landscape biodiversity approach to poverty reduction - malaria as a constraint to poverty reduction".* It will be a question for IDRC how far from an ecohealth core it would be prepared to go in co-funding a project.

Important for IDRC going forward was the fact that almost no one, at either SIMA or project level, saw fund raising as either particularly within their area of competence or part of their responsibility. *"It is unrealistic to think that a project like ours could raise money. That needs to start at the apex level, by IDRC".* While they appreciated the Resource Mobilizing (RM) training workshop in terms of "helping us to think about sustainability issues post IDRC", none considered the task of generating a plan to warrant time taken from "doing the research". Also, some felt, the timing was wrong: *"it will probably be more important after a second phase, when we have successful interventions to show. For now, we only have analysis".* Several, including somewhat surprisingly the Secretariat, interpreted the inclusion of donors in the RM workshop as simply a way to introduce them to the projects; that any follow-up with respect to generating funding "was something IDRC would do", and, in their view, should have done.

With the exception perhaps of the Secretariat, the position taken by the research projects is a not an illogical one. Skill sets and points of departure matter. While the teams might have been able to generate specifically targeted funds for their research, they were unlikely to do so in large amounts, or to do the same for SIMA as either a coordinated programme or a network. As researchers involved in experimenting with novel approaches to both research questions and design framework under EcoHealth, and to the nature of their interaction with colleagues, their references to time and capacity constraints were reasonable and fair. So, too, the point made that that making the case for the kind of major, long-term contributions needed to support a networked research programme, in such largely uncharted analytical and intervention waters, is best done "from the top". The same rationale was used by the several CG centre scientists in explaining why interest in cooperating with SIMA at their level had not translated into inter-centre agreement: it was the funding priorities and criteria of their managers that counted.

d. *Development of shared ownership*

SIMA failed to evolve as a network because it failed (perhaps did not try) to mobilize internal motivation for it; to make it member and/or user driven. Co-ordinated from the centre, it might have begun to facilitate the coalescing of pro-networking sentiments through the workshops, but ultimately it would have required members – in this case, the project teams and perhaps like-minded donors being prepared to *pull the mechanism toward their own ends*. This did not happen, nor show any signs of doing so. IDRC might have expected SIMA to enable projects to associate in the common cause of building an EcoHealth capacity in the region, but this was unlikely to happen to any observable degree as long as the projects retained the status essentially as a set of discrete research studies treated with in a series of bilateral interactions.

A sustainable network is one whose members, including donors in this case, from the outset *continue actively to work at finding a mutually acceptable shape and function*, one that both maintains individual identities and priorities, while adding the value of exchange, learning and dissemination. Any future malaria and agriculture platform, if it is going to be established as a flexible association of like-minded researchers and donors would need gradually to move toward some form of networking arrangement in this sense. Participants would need to be able and willing to agree, and regularly to renegotiate and adapt, things like shared objectives, assumptions as to costs and benefits, tasks and expected results; accessible communication channels for increasingly comprehensive information exchange and action on a mutual agenda; and mechanisms for building member capacities to network e.g. for managing, participating in, and sustaining it. SIMA did none of this.

e. *Effective use of human resources*

As noted in earlier sections, SIMA has continued from the outset to struggle in its effective use of the human resources available to it and/or that it needed. This has limited both its development as a system-wide initiative and its ability to build on its potential for linking researchers, projects and donors through even a minimal network relationship.

The functions of the co-ordinator appeared too ill-defined at the outset of SIMA, as to what should be done to reach out and create synergies, to enable much initiative in this respect. In the second, IDRC-led period, co-ordination tasks were better elaborated in terms of responsibility for the projects, but given the limited resources tied to these tasks, ambiguous lines of authority to IWMI and IDRC -- and based on limited evidence of results -- they were probably overly ambitious in requiring the co-ordinator to *"monitor (project) implementation; assist in initiating collaboration between the two research teams and other individuals and institutions working with SIMA;…provide assistance to the two teams to strengthen their capacity to effectively use the ecosystem approach…; support the teams in dissemination of research results; (and) increase the visibility of the projects, especially among the centres of the CGIAR"*[20].

At the same time, the Secretariat itself made too limited use of the human resources at its disposal through the Scientific and Technical Advisory Panel, communication in terms of outreach and feedback to the Panel described by several of the advisors themselves as "non-existent", "horrible" and "highly frustrating". Opportunities for them to contribute to "key SIMA decisions", they felt, were either ignored or not created in the first place. *"We were treated as a rubber stamp with no feedback"* to our inputs. *"We played no real role (and) so SIMA became a too narrowly focused base from which to reach out to others".* While some of this was attributed to the style of the coordinator, inadequate resources for travel, communication and their time was the more inclusive reason given for the failure on both sides to create a more integrated – and integrating --management culture.

f. *Informed action/monitoring*

Any research project is more likely to prove successful to the extent its implementation is guided and managed on the basis of informed decisions. Such decisions, in turn, are the products of consistent, transparent and evidence-based monitoring. In the case of projects

[20] Mutero, 2006: 3

implemented under the auspices of a network, the need for informed action and the monitoring on which this is based is two-fold: with respect to the projects and to the network as such -- is it a) proving an effective "value added" tool for facilitating effective project implementation by generating horizontally shared progress mapping data and, b) in so doing, is it facilitating its own maturation?

In terms of the projects as research activities, IDRC did apparently provide useful feedback. There were, however, neither resources nor well-defined procedures in place at the level of the SIMA Secretariat for this to happen with respect to the network as such e.g. if and how well the communication, exchange or a "sense of network" was happening. Monitoring of SIMA progress as a network of projects and interested contacts – or the lack thereof -- did not happen. Nor were there data to indicate regular monitoring of the *implementation processes* of the projects, as distinct from the technical progress of the research. Without such "progress mapping" of these initiatives as experiments in new ways of conceiving and doing research i.e. in the application of an EcoHealth framework to malaria, the basis of the kind of inter-personal exchange that constitutes networking was unlikely to be laid.

g. *Contributed value*

A network, to be successful and cost-effective to members, should add value to what they as individual practitioners, projects or agencies might achieve on their own. Two particularly important ways in which SIMA could have added value as a network, and which any future initiative should, are considered here.

- **Meta-analysis to advance the EcoHealth Agenda**

A development network such as SIMA can add value by *enabling identification of patterns* among its different member experiences and/or across their varying contexts; *testing the resilience of a knowledge base* through different research questions, designs or methods; *generating lessons* about the viability of interventions under varying conditions; *comparing the relative importance, potential risks and range of outcomes* of applying an innovation.

In promoting and facilitating such meta-analyses, an active network enables thinking "outside the box" of traditional practice – a necessary condition for moving forward a novel research paradigm such as those of EcoHealth and SIMA. Co-ordinated projects, like those of SIMA, are less likely to do this unless the coordinating team or advisory group actively undertakes the responsibility for generating and cross-referencing project experience and outcomes. But even here, unless the implementers themselves assume responsibility for seeking out and openly sharing their data, many of the insights are likely to be overlooked and not used to inform on-going action by either the specific project or the research programme as a whole.

This was the case for SIMA; meta-analysis was not on the agenda although several project researchers agreed when asked, however, that some form of cross-referencing might have been useful: it *"would have been better if there had been a common analysis. We have all been doing malaria and agriculture research in different agro-economic settings, and it would have been better if early on we could have charted out what each country was doing, emphasizing and finding out. It would have been easier to use (this kind of analysis) to help us make a whole without reinventing the wheel in each case".*

In this, SIMA failed to realize key – and potentially marketable - network outcomes. Based on the experience of the five research projects and interviews with interested observers, the logic of EcoHealth continues to resonate. It was often not clear, however, if or how the concept was being interpreted as something fundamentally different from ecosystem research or, within the context of SIMA, research within a general integrated vector management framework. Without any systematic or coherent analytical "drawing across" the various site experiences, its assumed merits in recognizing the complex nature of the malaria "problem" and the importance of taking a multi-sectoral, multi-dimensional perspective in framing the questions, collecting the data and interpreting implications for practice were left unexplored.

Based on the comments of donors with respect to SIMA not catalyzing support from them or from national policy communities, this was no doubt one reason: there was no basis to show it as in any way especially innovative. At the same time, as SIMA advisors and researchers themselves agreed, EcoHealth is a "hard sell" in the complexity of its methods and results, especially compared to the more "silver bullet" readily deliverable interventions of RBM[21] (ITN, IRS[22] and case management) in which donors and government agencies (even those nominally cross-sectoral ones, like the Malaria Control Programmes) are heavily invested.

- **Research Capacity Development**

Networks can be especially effective where, in bringing diverse expertise and experience together, they enable development of new capacities – new knowledge and insights, novel research or dissemination practices, ways of interacting with a wider research community[23].

Such capacities were not observably supported through SIMA. There were no initiatives underway to strengthen capacities; no procedures for regular exchange of feedback, joint analysis or interactive adaptations of the research framework. There were no examples provided of the projects being encouraged to work together in comparing applications of the EcoHealth framework in their various R&D environments; or for reviewing and possibly renewing the framework for reconfirming goals, strategies and methods. As a result, any capacities that were developed through the individual projects (and researchers did report these), were neither expressly recognized by, or contributed to, SIMA as a whole.

> For one, the Secretariat "*talked to us regularly enough, but did not encourage us to talk to other projects. It would have been good to have communicated directly with Uganda…".* Another *would "have liked more chance to exchange with Zimbabwe; by now, we would probably have produced some lessons",* but they "had no money for networking". A third perspective was similar, though with a somewhat different message: "*we are getting success stories, but we were too busy to share or to seek them out. SIMA and IDRC should have been doing that".*

While project teams knew about and had accessed the SIMA website, none reported using it regularly as an information-gathering or sharing tool; one noted its unreliability for limited local systems. One STAP member expressed frustration that the "latest" updates were, in some cases, several years old.

[21] Roll back malaria
[22] Indoor residual spraying
[23] Note that capacity development in research methodology as such is discussed in section IIBiv.

III OPTIONS FOR GOING FORWARD

Consistent with the overall structure of this evaluation, this final section is presented from the two broad perspectives of a technical analysis of the 5 SIMA projects and the organization structure of the overall arrangement. As with the previous analysis, the separation is for purposes of emphasis; in reality, the substance and structure of any research programme and/or network must necessarily be consistent.

A] Scientific Directions for Developing the Programme

When successful, the projects result in a complex but insightful picture of the functioning of a community in relation to its water sources, livelihood, environmental changes and malaria. This can provide a good basis for wise action that requires both malaria-specific and other interventions. Sometimes (more often than expected) it becomes clear that the agriculture is not greatly affecting the malaria: this does not excite malaria control agencies nor agricultural ones (although it has great importance in increasing the freedom of agriculture change from doing harm to health), but can be a really important finding for the community. Some of the most careful and helpful analyses are place-specific, or appear to be on a micro-scale and not easily transferable.

The research work carried out to date under the EcoHealth umbrella can usefully be developed in several different ways, depending upon the primary goal of the work (or funding foci). Each has both strengths and limitations, and at this stage it is useful to canvas the range of things that a follow-on from SIMA might become. We can look at aims, objectives, activities and structure.

For the existing projects, for which only baseline data have been gathered (with the exception of the prototype project in Kenya, which is at the end of a second phase), there could be the continuation of the present programme of work for the areas already under study. Indeed, continued funding is a *sine qua non* for any of the wider options, since without it IDRC will lack credibility as a responsible funding agency and able researchers will look elsewhere for support and be deterred from an Ecohealth approach.

a. Nature and Challenges of Ecohealth in Scientific Terms: an analysis of the implications of its particularities for the elements in a developing Ecohealth Programme.

Careful examination of Ecohealth policy documents shows that there are at least four key aspects of the Ecohealth projects related to SIMA, and to which the IDRC documents give emphasis. They are

1. Environmental approaches to malaria control in an agricultural context.
2. Malaria control by and for agricultural communities.
3. Consulting the community and designing studies and interventions to address their felt and expressed needs, and which they can play a major role in implementing.
4. Building research capacity in Ecohealth, and strengthening community capacity.

There are also some others, which are not analyzed separately because they follow almost inevitably from addressing the four primary aspects. For example, items 1, 3, 4 imply an interdisciplinary approach, and item 3 explicitly, and the others implicitly require attention to gender issues in both analysis of problems and devising solutions.

We feel it is useful to look at these elements separately before moving to the more specific future options. This is because, whilst good Ecohealth projects may combine several of them, there are sometimes situations in which decisions have to be made about priorities, and these are best made explicitly, so that they can be discussed with both funding agencies and National control programmes, rather than getting introduced as a mixture of things that give problems later. For example, in an agricultural malaria control programme it may be proposed to use both treated mosquito nets and some environmental measures. But that may make it extremely difficult to determine whether the environmental measures are efficacious, as the nets will have a very large relative effect. This may necessitate very large study populations, with a consequent rise in cost, if the environmental intervention is to be assessed. As there are always opportunity costs of increasing the number of interventions it is important to think through the implications of combined interventions, still more those that are polyvalent, if the phase II studies are to be well designed.

The four key aspects need attention in further developing the research projects carried out to date. They can usefully be developed in any of these four main directions, and usually in several, but the shape of the programme will sometimes depend crucially on which is considered by IDRC and/or other partners as the primary goal of the work (or the focus for seeking additional resources). This is a cause for concern to some of the team leaders in deciding what will be both best for their communities and also fungible by IDRC or another agency, and in particular in designing Phase II interventions. Each option has both strengths and limitations. The construction of a programme on the basis of the current work will need to incorporate several of the key elements, but decisions will have to be made on priority emphasis, and it is helpful to first analyze the components as follows:-

i. Ecosystem approaches to malaria control in agricultural communities

The original goal of the research was based around the concept that agricultural practices affect malaria transmission and that consequently malaria might be reduced by appropriate environmental management. This will tend to be the case where malaria transmission is relatively low.

Transmission is best measured by the basic case reproduction number, usually termed ‘BCRR’, and more simply reflected in the number of infectious bites per person per year or EIR, entomological inoculation rate. If the BCRR is below 1 then malaria will die out. If it is somewhat above 1 malaria will spread and there will tend to be a relation between the BCRR and the malaria burden on the community. Reducing transmission will cause the amount of malaria in people to fall. If the BCRR is very high, the malaria burden in people will tend to saturate, so that small or even moderate changes in the BCRR will have little effect on the malaria burden. Unfortunately, the vectors of human malaria in sub-Saharan Africa are very efficient, giving a very high BCRR in much of the region. Environmental management methods will tend to reduce mosquito vector density, which has a linear relation to BCRR and hence are relatively ineffective at high initial levels of BCRR. Where the vector is *An. arabiensis,* which is relatively inclined to feed on animals other than man, as, for example, at Mwea, changes in livestock housing and density may give rise to larger effects on transmission, proportional to the square of the change. Both of these broad categories of

intervention will have rather smaller effects than will residual insecticides on walls or on bednets. These will shorten the life expectation of adult vector mosquitoes with a very large effect upon the BCRR.

The consequences of these epidemiological processes are that, in very broad terms, changes in agricultural practice will have less effect upon the human malaria burden in much of Africa than in some other continents. On the other hand, because so much of the world's malaria is in Africa, there are parts of Africa where there will be a significant impact, especially where altitude or latitude reduce the temperature, and in some semi-urban and plantation agriculture situations where transmission is already much reduced. Nineteen million people in the 4 countries with evaluated projects live at altitudes of 1500-2500m, and a further 49 million at those altitudes in Ethiopia, Burundi and Rwanda (Table 1)

ii. Malaria Control and Mainstream Control Methods

If the primary goal of the work be that of controlling malaria for those in the study area, then it will be logically appropriate to use the methods included in the National control programme, and particularly those which are highly effective. These will include prompt treatment of symptomatic malaria, usually now by artemisinines in combination, and use of either insecticide-treated mosquito nets or of insecticide residual spraying of walls to reduce malaria transmission.

It is not clear how far these latter interventions fall within the IDRC remit for phase II. It can be argued that to withhold these highly effective interventions is unethical. From a more purely research viewpoint, however, IDRC does not have a comparative advantage in this mainstream area; moreover their very efficiency will make it difficult to evaluate the effects of environmental non-insecticidal and agricultural interventions. From the research viewpoint the involvement of communities may contribute much to mosquito net coverage. The communities under study by IDRC may have particular features that need attention if the mainstream interventions are to be effective when locally applied by or for them.

The reality of implementation of government interventions may make a stepped wedge design possible if IDRC moves rapidly, so that the environmental interventions are brought in rapidly for trial, and the mainstream interventions follow on after an interval of a year or more.

iii. Community Ecohealth

The third direction in which the projects might develop would be to give most emphasis to the stakeholder and Community Participation aspect of the Ecohealth. During what has been usually called the community diagnosis phase of the projects, a variety of community priorities emerge, several of which may not be about malaria. There is then a dilemma as to whether to pursue the community's or the research project's (as set out in the funding application) first priority. In practice this has been coped with by remaining within the project document priority and either setting aside some funds to cope with other community priority topics, or to purchase things the community rates highly, or by writing separate grant proposals to other agencies for meeting these priorities.

Once the first phase has been completed the problem may become more acute: the objective data may show that malaria is either not the dominant problem or that it may be best tackled in some other way than agriculturally. If the community and data are simply followed, the topics under study may become so diverse that there is no longer an agriculture and malaria

programme. This is where Ecohealth process strongly overrides Ecohealth objective.

In the medium term and of wider relevance, the projects will contribute to Ecohealth theory, and there is a need for IDRC to review its own concept of Ecohealth with a view to both increasing its intellectual coherence and also clarifying its similarities to and affinities with rather similar (though not identical) concepts such as sustainability science (in the USA) and transdisciplinarity (in continental European usage). Whilst Ecohealth has distinctive features as used by IDRC, if IDRC wishes to involve other funding agencies in its programmes, the current singularity of usage becomes an impediment to collaborative programmes.

iv. Ecohealth (Research) Capacity Building

Here the main aim is to create individuals and teams well placed to work in an Ecohealth manner to tackle pressing health problems. Fortunately this objective is compatible with each of the preceding three emphases and the practical question is about how far capacity building plays an important role. The projects so far show very positive approaches to capacity building.

The current array of projects makes diverse and important contributions to research capacity strengthening for Ecohealth work and to building local operational capacity within communities.

Each project has provided the basis for masters' and doctoral research, with a different balance depending on the project circumstances. The one project with an implemented phase II, Mwea, has a most impressive set of women's groups able to both influence community activities and teach other villages.

b. The Case for a continuing Malaria and Agriculture Ecohealth Programme evolving from SIMA

There are several strong arguments for a programme of work in the Ecohealth tradition on agriculture and malaria as a complementary activity to the highly focused main line intervention programmes currently being heavily and rightly supported. There are five key reasons:-

i. Two Modalities of Malaria Control

The implicit, and in some cases explicit, objectives of the projects have been to solve particular problems of the relation of agriculture to Malaria; to broaden and deepen our understanding of the malaria-agriculture relationship; to apply and to promulgate the Ecohealth Approach; and as a result to improve the lives of people in developing countries in a sustainable way whilst strengthening their research capacity.

The approach being taken by IDRC within the Ecohealth framework seeks to do three very difficult things: (i) to change the behaviour of rural communities; (ii) to alter the way in which field research in malaria is done and the behaviour of research workers; and (iii) to alter the priorities of research in another sector, agriculture, in a sustainable way, so that all these changes become self-propagating.

The evidence suggests that the first two of these things can be achieved by charismatic individuals and sustained resources while the third is particularly intractable with scarce un-ring-fenced resources because pressure will always be towards areas of comparative advantage within the sector. Given these problems, is the effort worthwhile? We consider that it is:

- For reasons derived from both the history of malaria and public health, and the epidemiology and control of malaria; and
- Because the work that has been begun under SIMA represents one of the perpetual strands of a balanced approach to disease control.

In terms of the latter, these strands may be characterized as the 'particular' and 'general' ways to tackle malaria. The 'particular' has a history exceeding a century and has taken one or two very powerful tools for malaria control and applied them forcefully and at great expense to achieve results that may be spectacular in the short run, effective in the medium term and, except under initial circumstances of low enough transmission to permit eradication, less impressive in the long term because of exhaustion of resources, decreasing motivation, competing needs, and technical problems. The use of indoor spraying of residual insecticides during the attempts at global eradication of malaria in the 1950's and 1960's was the greatest success of this approach, and the collapse of eradication in the 1970's its greatest failure.

The other 'general' strand in the battle against malaria has attempted to combine several approaches to reducing malaria including environmental modifications (often undertaken with several other aims also in mind), timely management of fever, and other measures which have, in areas of limited transmission, gradually reduced and in some cases got rid of malaria. The short-term effects have not been dramatic, those in the medium term have varied, but the long term consequences have sometimes been very successful. In this way much of the malaria of the USA and Europe was got rid of. A mixture of general public health measures, primary health care and socio-environment change have achieved this.

Much of the history of malaria control can be read as battle between protagonists of these two sorts of approach, but this has owed more to the personalities of the leaders involved than to necessity. Both approaches need to be kept in play, especially at present when some of the more recent weapons against malaria do not tidily fit into one or other category. For example, the insecticide-treated mosquito net is at present rightly promoted as a powerful specific tool to be used on a massive scale in vertical campaigns, yet its long-term use will probably depend on its becoming incorporated into cultural norms, so that it is simply a part of everyday life.

The present malaria scene is relatively dominated by the vertical approach and use of several extremely powerful control tools for malaria deployed massively at great cost. An increasing number of them are being brought into highly endemic malaria zones. There is under these conditions a special need to also foster, on a very much lower cost scale, the 'general' tradition in parallel, as a corrective to the exclusive reliance on external intervention to implement control, as a multiplicative control measure in the areas of very high endemicity and as a sustainable backstop to failures of the big campaigns. This the Ecohealth approach is able to do.

ii. Locally Appropriate Actions

The 'one size fits all' position does not apply to all populations. Even where the key material intervention is the same as elsewhere, the approach to delivery and use may have to differ in

populations with special life styles: nomadic pastoralists, forest hunter gatherers, populations inhabiting large swamps, may require a different approach if use of bednets or IRS is to be feasible. The IDRC projects in the current programme are well placed to tackle these issues.

iii. Revival of Anopheline Larval Control Research

The role of source reduction (breeding site interference) or larval control in the control of malaria is undergoing something of a renaissance at present, after a long period of neglect that was due to the success of residual insecticides from the 1950's and supported by the epidemiological models of malaria transmission that showed, among the three vector-related control modalities, the extreme relative efficacy of reduction of adult mosquito longevity, high efficacy of reducing the person-biting habit and relatively less effective reduction of vector density in reducing malaria transmission. This meant that larval control would be most effective in low malaria transmission situations and where the mosquito vectors were least competent. These characteristics markedly contrast with those in much of sub-Saharan Africa where highly efficient vectors lead to a huge excess of potential transmission.

Some of the initial revival of interest in controlling vector breeding came from those with limited familiarity with transmission dynamics or with experience in other continents with poorly competent vectors. There is general agreement that the greatest potential for larval control in Africa is in urban situations (low area, high population), plantation agriculture (high degree of control over environment and population, often at raised altitude), and in areas climatically marginal for malaria transmission, due to higher altitude or latitude. More recently there has been an increased appreciation of the patchiness of malaria transmission intensity, even outside the three lower transmission areas described above, with some indication of the degree of reduced transmission achievable from source of reduction, which may reach an order of magnitude.

There is a substantial current reawakening interest in the use of larval control in the reduction of malaria in sub-Saharan Africa. The use of microbial insecticides (*Bacillus thuringiensis* and *B. sphaericus*) with their lack of human toxicity has led to efficacy trials in areas with an endemicity of malaria that would have previously excluded them from consideration for larviciding. Efficacy trials have been promising and elementary economic calculations have given costs for a densely populated area (a rural settlement) in the order of $1 per head annually for the insecticide and its application (but excluding the supervision that follows from the research being conducted). It is the nature of science to follow trends and likely that the limits of efficacy may be further extended.

iv Supplementary Role of larval control in endemic areas?

Least attention has been paid to the potential of source reduction under conditions where highly efficacious control mechanisms such as insecticide treated mosquito nets are concurrently used. This may become a newer aspect of larval control research.

Historically, prevention and treatment have been widely separated in malariological thinking. Indoor Residual Spraying (IRS) was done by government operatives and seeking treatment was a household activity; indeed until 1992 the latter was scarcely considered an aspect of malaria control at all! The insecticide treated mosquito net now sits uncomfortably between them. It is for prevention but its use is a household activity. With 'Permanet' treatment the

governmental role is confined to distribution and subsidy at most; the best hope of prolonged use is that it will become a habit, and as much as a part of going to bed as a mattress or sheet. Health seeking behaviour is now emphasized. The views of the public health manager who seeks methods requiring minimal community participation and those who say that community involvement is essential are now complementary rather than at odds with each other, or at least they should be!

We know that, in holoendemic malaria, IRS alone, though it will greatly reduce malaria transmission, is not able to stop it, even with the addition of regular chemotherapy and in the absence of drug resistance. The relation between transmission and disease burden is complex, but only at relatively low levels does it tend towards linearity: that is to say, a rather small reduction in transmission (such as might be produced by environmental means/mosquito density reduction) will have very little effect on morbidity at high levels of transmission but much more at low levels. Recent work has suggested potential for low cost source reduction having up to a tenfold drop in transmission. The effect of superimposing low cost resource reduction by the community upon high efficacy net or IRS implementation has not been assessed. There is an impression that it might be small but this has not been investigated: it might prove to be multiplicative rather than additive or swamped. This possibility needs attention.

v Fallback Value.

Very high cost, often externally implemented, malaria control programmes depend upon external funding, currently buoyant. Experience shows that long term persistence is not always a feature of external projects, and then the brunt falls upon the community. It would be wise, to say the least, to develop community driven work as a backup against this eventuality.

vi Sustainability.

However, the next operational issue for malaria control as a whole and for larval control in particular, will be sustainable effectiveness and it may be that what can be done in a small area as a research project may prove very difficult to sustain in practice. Moreover most entomological research work will have limited interest in the complex social dynamics of community-based interventions over a long time period, so that either that research may not be done, or that some, perhaps over-enthusiastic optimism may be followed by an even less justified pessimism. This work is most likely to be done with a hope of persistent action and effects by work with an Ecohealth approach.

vii In the longer term…

The review of projects has shown that it is difficult, and sometimes inappropriate, to confine projects to malaria alone. In most projects HIV/AIDS has been an issue; however it is such a huge issue, already receiving attention from other organizations, that it is beyond the reasonable scope of even a much augmented programme, and is not in a direct sense open to environmental management. By contrast, other vector-borne diseases than malaria are an increasing problem for agro-ecosystems and farmers, need rather similar research methodology to malaria, and are often open to environmental management. The vector-borne zoonoses are also of direct relevance and need a similar research approach. Therefore, while the need to relaunch the malaria and agriculture work is the over-riding priority, once that is firmly established the review would recommend extension of the programme to other vector-

borne disease of rural dwellers and their livestock in the medium term , probably initially where a VBD is of importance in one or more of the malaria project sites.

B] Organization Structure of an Overall Arrangement

B-1: Co-ordination → Initial Considerations Going Forward

Options for a post-SIMA malaria and agriculture platform will need to take in to account a number of factors. They are interrelated and include (but are not limited to) the following:

a) The research of the current projects is unfinished, and in all cases has significant potential; a certain wasted opportunity would result if they had no further period (probably 2-3 years) of funding to complete the studies to a stage of at least some tested intervention.

b) The EcoHealth paradigm at the project implementation level does have traction, with respect especially to use of an interactive environmental "systems" focus, including governance systems; the integrated thinking catalyzed by its insistence on transdisciplinary teams; and its emphasis on community participation. Enthusiasm is based chiefly on the conclusion of the teams that these qualities "work" in improving understanding of the dynamics of malaria prevalence and in identifying and implementing control measures that are likely to be sustained. However, the paradigm is, and needs to be better recognized as, labour-intensive, with a long-term trajectory and raising important questions of research ethics vis-à-vis increased risk to communities.

c) All of these issues need to be addressed in thinking about how to draw in donors to what is still decidedly seen as an initiative that is certainly something less than a silver bullet. Donors continue to express a reasonably strong interest in the general topic of integrated ecosystem vector management, but at the same time a very lukewarm reaction to the idea of funding what is a complex, still somewhat unformed and methodologically "messy" research theme that does not yet suggest progress toward anything as well-proven as the RBM option.

d) Any effort aimed at creating medium-term funding commitments from donors will need to address the fact of varying malaria paradigms in the donor community. For example, those (apparently) in the majority that are reluctant to pursue a regional Africa-focused programme, or one confined to malaria, preferring a global programme incorporating a range of vector-based diseases; and those fewer, but probably more IDRC-compatible, agencies that recognize the necessarily context-specificity of effective malaria control and prevention research, and the importance of interventions building directly on and with communities and governance systems.

e) There is an absence in most countries of an enabling policy and institutional environment for cross-sectoral action on malaria, and thus the need here, too, for evidence-based results and buy-in. The general consensus among the projects was

that this should begin at local levels to catalyze integrated action, but also that more specific actions be taken by agencies like IDRC to help garner national attention. According to one senior malaria scientist in Tanzania, while recognizing that "the malaria in agriculture idea will always have a small niche", it will be important to give it the "kind of voice" that it still lacks.

Considered action by IDRC on determining its own priorities in following up on SIMA will need to be fairly proactive since actions by others are already being taken.

1. A recent meeting of the IWMI Board, for example, accepted the recommendation of the SIMA co-ordinator that the Secretariat be placed in IFPRI[24] and thus, indirectly, that it shift from a technical to a policy research emphasis. It is not clear what effect the Board's acceptance might have on a decision by IFPRI to host SIMA; as of the time of the evaluation, it was still considering the proposal. Opinion from those interviewed about the move of SIMA to a policy research focus was somewhat ambiguous as most agreed with the opinion of one of the projects that "SIMA needs to have a strong place at senior policy level" in order to break down the health-agriculture divide. Nevertheless, the reaction to the idea of basing the initiative at and from that perspective was generally negative.

2. WHO has written to IWMI formally endorsing ICIPE[25] as the SIMA host, with CGIAR as its operational research network in order to "maintain its system-wide character". ICIPE management itself was positive about the idea. The assumption underlying this proposal somewhat belies the reality, however, of little such character left to be maintained and the fact that ICIPE has no funding to do this. Also, while noting that ICIPE would need to strengthen "coordinating and resource mobilization functions" and upgrade "reporting and research outcome 'marketing' capacity" towards engaging the centres makes sense, the proposal critically lacks guidance on how it would do these things any more effectively than IWMI could. Nor was it clear in how ICIPE being named a Collaborating Centre of WHO might translate into its being funded; one senior WHO malaria officer was "doubtful". Important for IDRC, there were also indications from conversations with ICIPE officers that, the success of Mwea notwithstanding, institutional understanding of and commitment to EcoHealth concepts were limited and that ICIPE is primarily opportunistically driven by the scale of funding available.

3. A key issue for any SIMA follow-on will be, once again, to determine precisely what it is, might or should be in practical terms and, somewhat baldly put, whether any agencies care enough about exploring the "malaria in agriculture problem" to try again to define, promote and fund it as a viable research and intervention area. These are questions made somewhat more complicated by the fact that SIMA has become, for many, defined by the set of projects IDRC has been supporting and considered to be synonymous with its EcoHealth programme initiative. Presumably, the case would have to be made for a malaria-agriculture research platform that, while it might effectively be used to further explore EcoHealth as an especially worthy research-cum-intervention framework for comprehensive and sustained malaria management, also allowed for other perspectives.

4. Based on evaluation interviews with donors, there was nothing to suggest they would <u>not</u> be open to considering options for such a platform; in fact, the opposite was true. Critical

[24] International Food Policy Research Institute
[25] International Centre of Insect Physiology and Ecology

questions remain, of course, as to how and by whom such a process would be coordinated; and who would be prepared to make the investment necessary to seed it. There was nothing in the comments either to suggest the earlier challenges to working through mismatches in research focus, scope and reach to arrive at such a platform would be any less daunting. Most agreed, however, that any serious attempt to reactivate such an arrangement would require an identified *'champion' agency* with buy-in from its top management; *reasonable resources* committed over a *realistically long timeline* (a minimum of 5 years); an aim of generating and *consolidating results*; and a clear, open-source "*mandate to explore*" i.e. to be explicitly inclusive.

- In looking at the somewhat daunting tasks of answering the questions and starting a process of meeting these requirements, the notion of simply re-establishing the SIMA secretariat in IFPRI or another international institute such as ICIPE holds, for some, a certain allure: allowing rather simply the recasting of a platform that could build on a recognized base and, presumably, make use of the intellectual, infrastructure and network resources of an institute with a relevant track record.

  It also raises cautionary red flags for many, however -- including this evaluation, insofar as there was nothing in the data to indicate that such a move would make the actual shaping and execution of a new platform any more easily successful than was initially the case.

  a) Any such institution would need a major upfront funding commitment to take on the task;
  b) The identity and agenda of the institution would need a place, reflected in its approach to co-ordinating a revised SIMA platform and, perhaps, challenging its flexibility in attracting multi-agency interest;
  c) The pressures on the institution to compete for funds would tend to work against collaborative efforts.

5. Also, there are other organizations which, while not as immediately obvious as CG-type centres, could bring relevant in-kind institutional and professional resources to a co-ordination effort. Suggestions from the field stressed among other alternatives meriting consideration:

  - One of the universities in the region;
  - Development (as distinct from a sector-based) research centre;
  - The SADC;
  - A multi-sectoral "community of practice"-oriented agency like the Aga Khan Foundation.

➔ In fact, a key criterion in beginning to explore any of the co-ordination options will be in thinking laterally about the need for organizational learning process capacities, as well as the scientific and technical. It remains a critical task to address what was missed in the first SIMA undertaking: to recognize that, while a Malaria and Agriculture research platform may have significant potential as an innovation, it is nonetheless still a *potential* that must be systematically, consistently and energetically worked through and sold in order to be realized.

There is, of course, a stronger base on which to do this now given the research experience, emerging outcomes and lessons being learned by the five current SIMA

projects. But these strengths will need to be gathered up, packaged and presented in ways that make sense to the varying priorities and emerging agendas of prospective donors if they are to convince significant buy-in. It was not all that clear from the evaluation that many of the established CG or CG-type institutions would be ready to take on such a task.

6. IDRC would presumably play a major role in contributing ideas to, and facilitating, any such efforts to create a viable M&A platform. Meanwhile, irrespective of whether or how this wider process goes ahead, it will be important for the Centre to consider options to co-ordination of the specific projects it is/will be supporting. Two fairly broad such alternatives:

a) A minimalist option: To date, "co-ordination" of the five projects has been relatively light; in each case, ensuring simply that funds were appropriately dispersed and management of the teams reasonably smooth-running; and monitoring the technical implementation of the research.

- A second phase of funding for these projects, and the addition of any new projects, would presumably function as well through a similar level of light-handed oversight.

- Such co-ordination as administrative monitoring would not require a "secretariat" structure, but could, presumably, be handled as a set of projects under an ecohealth M&A umbrella through normal IDRC programme officer functions, and backstopped by one or more technical resource persons contracted from the region for the term of the projects on an occasional basis to review and provide advice on the research.

b) A value-added option: The aim here would be to expand the co-ordination function to include an expressly "meta" analytical and capacity development role, adding value to the projects through a constant comparative analysis of both the knowledge outcomes, and the substantive, methodological and application lessons learned they generate.

- Expected results of such a function would include:

  - Advancing the theory and practice of EcoHealth;

  - Institutionalizing regional capacities for designing, conducting and using holistic and community oriented research in general;

  - Evolving a more coherent and multi-dimensional "package" with which to attract donor partners.

- Based on the failure to apply such a function in the first SIMA, it will be important in this kind of arrangement to mobilize and contract appropriate substantive co-ordination capacity to design, conduct, facilitate and report on activities; and to ensure both sufficient and earmarked resources and explicit terms of reference for enabling them. The location of such a person or team would need to be decided. Options used in other such umbrella programmes include a base either in IDRC itself or a regional institution.

- The position could also be co-terminous with whatever agency is selected for the development and co-ordination of the wider malaria and agriculture/SIMA platform (as was the case with the SIMA-in-IWMI arrangement). While there could be benefit in terms of expanded range and synergies, coinciding the TORS and timing is likely to be difficult assuming multiple perspectives of partner institutions and donors. Any SIMA consultative process is likely to extend over a longer period. And it is not necessary that an EcoHealth project co-ordination involve a heavy secretariat structure, as presumably a wider SIMA arrangement will. Contracting someone like the present SIMA co-ordinator on a 2-3 year basis through a university, for example, could well produce very strong value-added outcomes.

B-2: Network (Initial Considerations Going Forward)

The crucial question in deciding to develop or support any network is whether, in fact, such an arrangement makes sense for the context, the goals sought and the resources available. As a loosely-coupled and essentially voluntary arrangement of people and tasks, a network is a difficult thing to get right and to sustain; it requires continually to be "worked at", and the effort to do so will only be worthwhile if the arrangement realizes a purpose that is clearly more and different from what another might do in:

- serving the needs and meets the expectations of particular members and supporters;
- providing design and management characteristics that align with the specific requirements of the members, supporters and tasks involved; and
- because it is created to mobilize or support innovative ideas and actions in a fluid development environment, enabling management and resources that are flexible and timely in adjusting to changing goals, membership and conditions.

In other words, a network is not inherently good; it does not emerge spontaneously; there is not just one way to put a network together. For those who initiate the arrangement as a labour-light way to realize novel programme goals or explore uncertain outcomes – both of which have been characteristics true of SIMA and EcoHealth – the risk of failure is high. It is the very plasticity implied by a network that, in reality, makes it labour-intensive to manage: to keep connections vibrant and relevant, while not losing focus or over-directing in ways that limit member ownership or supporter input.

As appeared to be the case of SIMA, however, a failing network is relatively easy to miss; a failed one relatively easy to hide. As with SIMA, "members" may be there as individuals on paper and they may be doing things; to some extent, donors may support these activities. The criteria defining a network, however, are a) whether members recognize themselves as such; b) whether they are doing things together beyond their individual activities; and c) whether the external environment to which the network must relate recognizes and values it as such. None of these criteria were met in the case of SIMA. Any future undertaking to create a network as a platform for furthering the conduct and application of EcoHealth research on malaria and agriculture needs to ensure that these essential network criteria can be met by planning expressly for them.

Implications

1. Strategies

While a number of strategies should be considered, two would appear to make particular sense as a follow-on to SIMA. They should not be considered as mutually exclusive:

a) Strengthening and building on the existing SIMA projects, extending gradually to others that might be doing similarly framed research (e.g. those identified in ICIPE and the urban malaria control project in Dar Es Salaam) to capitalize on the very real potential they have to extend and test the parameters and dynamics, benefits and risks of the ecohealth paradigm.

- Consistent, coherent and long-term attention to facilitating increasingly more comprehensive and interactive linkages among the projects and, especially, the individual researchers, will serve not only to advance understanding of and intellectual control over the scope of the concept (e.g. addressing some of the eco/health/capacity questions raised in the evaluation) on the part of IDRC, the researchers and communities, but also to assemble a clearer and more coherent "package" into which other donors might buy.

b) Developing a network-cum-consortium of likeminded donors with expressed interest in/commitment to elaborating and framing a broad health and environment R&D platform, in which malaria control and other vector-born diseases would be the entry point; applying and evolving an ecohealth conceptual approach would be emphasized; and initially perhaps small seed funding would gradually be expected to increase as priorities, expected outcomes and a co-ordinated work plans for research, intervention, capacity development, dissemination and monitoring activities were agreed.

As discussed briefly below, within the context of either of these two strategies, issues of structure and basic conditions for success must be considered.

2. Structure

IDRC planning in support to a network, therefore, needs to be cast in terms of thinking about options. In terms of structure, for example, there are "degrees". Based on the history of SIMA, the current state-of-play in malaria and agriculture research and IDRC's own experience, **two approaches** make sense, reflected by:

a) **A *community of practice* network** aimed at building gradually toward an increasingly holistic, ecosystem/EcoHealth understanding of, and approach to, prevention, control and case management malaria research and intervention; through exchange of information, sharing of experiences, analysis of progress and gaps. The arrangement would be loosely-coupled and non-hierarchical, made up either of like-minded researchers or donors interested in promoting such an integrated approach. Membership would be fluid, but at a minimum would include those researchers involved in the current SIMA projects. Other members would come from the wider malaria donor, policy and practice communities on the basis of interests and resources – and drop out on the same basis. Information would be considered open-source.

- Assuming a further phase of the projects, funds would need to be allocated and earmarked for communication and travel to be based on specifically defined, but flexible, workplans emphasizing a capacity development orientation.

b) **A *facilitated* network** aimed at more systematically and purposively building and/or proving a viable ecohealth framework on the basis of implemented and regularly analyzed malaria & agriculture research-cum-intervention projects; through specifically managed *team-building conditions*. In this case, while the members would still be expected to take the leading role in sustaining the linkages, this would happen gradually, with a co-ordinator taking initial responsibility for intervening with each project and other prospective members (donors, national organizations etc) to generate a shared and mobilizing "vision" of the rationale and expected results of the network; undertake real and meaningful activities together; and monitor their rights and responsibilities as part of the networking relationship per se (not just its tasks).

- None of these were done to any effective extent under SIMA.

3. Basic Conditions for Success

Networking at a global or regional is obviously complicated. While one or more networks for pushing forward and generating sustained resources for realizing the goals of SIMA/EcoHealth could well serve as very effective vehicles for spanning diverse geographic, socio-cultural and development contexts, they will do so only if they allow and encourage members to participate in and use them on the basis of being solidly anchored in their respective contexts. Any type of network needs, then, to be approached with c*aution,* to avoid moving too far or too quickly for the capacities and interests of those current or prospective members who will have to keep it going.

Drawing from the experience of SIMA in its failure to create a viable network, it will be important to:

- Ensure that expected benefits and responsibilities are clear, well justified and explicitly agreed; and backed up by a guaranteed level of commitment for long-term support from supporters and members tolerant of ambiguity and ready to be proactive in setting, facilitating and sustaining procedures for handling professional and personal interaction. Without this, the immediate demands and benefits of local priorities and institutional arrangements will gradually take precedence over the invariably more abstract values of a necessarily broader, less individually tailored cross-national arrangement.

- Take explicit steps to be inclusive, to *avoid* an overly rigid or territorial structure and approach to implementation, one that takes account of neither the multiple dimensions of the problem/issue of malaria; nor of the multiple agendas of people and agencies attempting to take action on it. A network arrangement needs to be proactive in terms of generating and sharing information, undertaking transparent and joint planning and evaluation and refraining from the tendency to plant national or agency “flags” in ways which discourage, if not preclude, collaboration.

- Design a structure in which joint action is relatively easy to undertake. The barriers to regional networking will invariably be high, and efforts to mitigate these will be essential to making engagement with the network seem reasonable, for providing opportunities for systematic and person-person networking that are fairly immediate and easy to do.

- Ensure a local face. Networks are, at the end of the day, voluntary; unless they make sense and are considered to be cost-effective to members and supporters where they are physically and professionally, a regional network cannot hope to be sustained except with significant outside resources.

Critical issues to confirm in deciding on the specifics of network options will include:

(i) That the policy, institutional and malaria prevention and control environments regionally and locally are such that a particular intensity and membership of a network makes sense given the potential demands it will make on members and resources – from a highly structured and managed arrangement through to a less labour-intense co-ordinated research programme of projects and their donors with regular mail contact and some facilitated exchange among them;

(ii) That both the minimum and ideal outcomes specifically of the network (e.g. new knowledge generated, level of reach into and changes to policy and practice communities, enhanced research capacities) are reasonably clear and agreed and are consistent with the degree of structure decided in (i);

(iii) That minimum levels, type and duration of financial and human resource support expected from prospective members (researchers, agencies, donors) for the network are clear, agreed and committed;

(iv) That the assumptions, conditions and tolerance for loss of control over the agenda of the network all members brings to the arrangement are openly articulated and negotiated;

(v) That the form and level of management needed to maintain the network, and the human resources appropriate to providing it are agreed and committed; and

(vi) **Most critically for IDRC**, that it is prepared to “go it alone” with sufficient resources and over a long enough period to justify the risks of the more vulnerable members (e.g. researchers) in engaging with the network.

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Annex 2: Contact List

(a) By Phone:

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Robert Bos/WHO (AKB)
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Matthew Lynch/JHU (AKB)
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Frank Rijsberman, IWMI (AKB)
Joachim Von Braun/IFPRI (AKB)

(b) In Person:

Dar Es Salaam

LEG Mboera/ project team leader (DB & AKB)
Malango Mlozi/ project team member (DB & AKB)
Kesheni Senkoro/ project team member (DB & AKB)
Elizabeth Shayo/ project team member (DB & AKB)

Also: Nemat Hajeebhoy/Aga Khan Foundation (AKB)
Khadija Kannady/Dar Es Salaam Urban Malaria Control Programme (AKB)
Rita Njau/WHO (AKB)
Lucas Zudson /Malarai Control Programme (AKB)

Kampala

Chris Akiiki/ project 1 team member (DB & AKB)
Joseph Okello-Onen/ project 1 team leader (DB & AKB)
Joseph Olobo / project 1 team member (DB & AKB)
Chris Byaruhanga / project 2 team member (DB & AKB)
Anne Miango / project 2 team member (DB & AKB)
Sam Mugisha / project 2 team leader (DB & AKB)
Moses Niwagaba/ project 2 team member (DB & AKB)

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Lucy Kabuage/ project team member (DB & AKB)
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Violet Kimani/ project team member (DB & AKB)
Clifford Mutero/SIMA Co-ordinator (DB & AKB)
Raphael Wanjogu/National Irrigation Board, Mwea (AKB)
James Wauna/ICIPE, Mwea (DB & AKB)
(plus project field assistants, community trainers, teachers)

Also: Christian Borgemeister/Director-General ICIPE (DB & AKB)
Delia Grace/ILRI (AKB)
Doug Merrey/FANRPAN and formerly IWMI (AKB)
Thomas Randolph/ILRI (AKB)

Annex 3: Acronyms

CGIAR	Consultative Group on International Agricultural Research
ICIPE	International Centre of Insect Physiology and Ecology
IDRC	International Development Research Centre
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
IRS	Indoor residual spraying
ITN	Insecticide-treated bed nets
IWMI	International Water Management Institute
SC	Steering/Management Committee
SIMA	System-wide Initiative on Malaria and Agriculture
STAP	Scientific and Technical Advisory Panel
TOT	Training-of-Trainers
WHO	World Health Organization

Annex 4: Evaluator Biographies

Anne Bernard has a doctorate in education and 40 years experience in international development, education, social research and project and programme design, monitoring and evaluation. She has extensive field experience in Asia, Africa, the Caribbean and Latin America; designed and conducted research/analyses in support of policy development and programme implementation; collaborated with policy-makers, researchers, practitioners and other donors; and worked with and assessed the evolution of cross-sectoral networks. She served ten years as a senior/programme officer with IDRC, in Singapore and Ottawa; and two years with CIDA.

David Bradley, DM, FRCP, FFPH, FMedSci, Hon DSc, Hon FIWEM qualified in Zoology and in Medicine from Cambridge University, worked for a decade in East Africa on parasitic disease epidemiology and taught community medicine to many current leaders of the profession in Uganda, helping to start the MPH course at Makerere 1967. He studied the epidemiology of schistosomiasis, leprosy, Buruli Ulcer and helped start research on HIV in Uganda. He carried out definitive work on tropical domestic water supply, on genetics of host resistance to leishmaniasis, on schistosomiasis models and pathogenesis and on concepts in tropical health. He was Tropical Research Fellow of the Royal Society in Oxford and then for thirty years was Professor of Tropical Hygiene and Director of the Ross Institute at the London School of Hygiene and Tropical Medicine. He pioneered multidisciplinary and interdisciplinary research there from 1974, and established the MSc in Community Health of Developing Countries which has now over 1200 graduates from many countries. He has published 220 papers and 6 books and has been an adviser to WHO, DFID and other agencies. He has been Chair of the External Review Committee of the Swiss Tropical Institute for a decade, of the ICDDRB Board, and of review boards of most tropical research institutes in Europe. As Ross Professor Emeritus since 2004 his current interests include transdisciplinary work and its philosophical basis and the development of landscape epidemiology. As a Leverhulme Emeritus Fellow he remains also committed to interdisciplinary research capacity building in Uganda.

Table 1: Population Distribution by Altitude for East Africa and Zimbabwe

A. Population Numbers by Altitude [in thousands]

Altitude m	Ethiopia	Tanzania	Kenya	Zimbabwe	Uganda	Rwanda	Burundi	7Countries	*Altitude m*
<1000	3,938	11,764	4,845	11,462	2,190	0	565	57,224	<1000
1000-1500	9,708	14,875	9,334	213	14,837	1,010	1,618	51,595	1000-1500
1500-2000	20,378	3,221	10,079	9	1,615	4,845	3,859	44,006	1500-2000
2000-2500	16,559	554	2,725	0	769	1,751	444	22,802	2000-2500
>2500	6,495	63	545	0	141	248	13	7,505	>2500
Total	57,078	30,477	27,528	11,684	19,552	7,854	6,499	183,132	Total

% of National Populations by Altitude

Altitude m	Ethiopia	Tanzania	Kenya	Zimbabwe	Uganda	Rwanda	Burundi	7Countries	*Altitude m*
<1000	7	39	18	98	11	0	9	31.2	<1000
1000-1500	17.0	48.8	33.9	1.8	75.9	13.0	24.9	28.2	1000-1500
1500-2000	35.7	10.6	36.6	0.1	8.3	61.2	59.4	24.0	1500-2000
2000-2500	29.0	1.8	9.9	0.0	3.9	22.6	6.8	12.5	2000-2500
>2500	11.4	0.2	2.0	0.0	0.7	3.2	0.2	4.1	>2500

% of Population living between 1500 and 2500 metres altitude, by Country

Kenya	46.5
Uganda	12.2
Tanzania	12.4
Zimbabwe	0.1

Ethiopia	64.7
Rwanda	83.8
Burundi	66.2
7Countries	38.5

Figure 1. Relative Parasite Prevalence Rates by Village at Mvomero, Tanzania