EXTERNAL EVALUATION OF THE BIOVISION – icipe MALARIA IVM PROJECTS IN KENYA AND ETHIOPIA

THREE PROJECT SITES: NYABONDO (SINCE 2004) AND MALINDI (SINCE 2005) BOTH IN KENYA, AND TOLAY (SINCE 2009) IN ETHIOPIA

October 2012
REPORT OF THE COMPREHENSIVE EXTERNAL EVALUATION OF THE BIOVISION–ICIPE IVM PROJECTS IN KENYA AND ETHIOPIA

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EXECUTIVE SUMMARY

BACKGROUND AND TERMS OF REFERENCE

The International Centre of Insect Physiology and Ecology (icipe—African Insect Science for Food and Health) was established in Kenya in 1970. The mission of icipe is to help alleviate poverty, ensure food security and improve the overall health status of peoples of the tropics by developing and extending management tools and strategies for harmful and useful arthropods, while preserving the natural resource base through research and capacity building. To achieve its mission, icipe has specific objectives in each of its 4-H paradigm focal areas, i.e. Human, Animal, Plant and Environmental Health (including Capacity Building and Institutional Development), with insects/arthropods as the common denominators.

The BioVision Foundation has actively been engaged in transferring icipe’s technologies to end users. The Foundation has done so by providing financial and technical support to icipe’s human health area for the last 8 years. Five projects, in three sites, have been supported hitherto. These include the Nyabondo IVM Malaria project (since October 2004) and Malindi IVM project (since May 2005) in Kenya and, more recently, Tolay IVM Malaria project in Ethiopia (since January 2009). These three projects aim at improving human health through integrated malaria vector control. Their focus is to develop and implement adaptive/integrated mosquito population management strategies necessary for guiding decision-support mechanisms that make efficient use of information on adult abundance, breeding sites and larval abundance. The projects are implemented in close collaboration with the Kenya Medical Research Institute (KEMRI) and the Ministries of Health in Kenya and Ethiopia.

A comprehensive evaluation of the projects was commissioned in May 2012 with the aim of assessing progress, achievements and challenges, and to map out future perspectives of each sub-project as well as develop a joint 5-year (2013-2017) strategic plan.

PROJECTS FUNDED

The following are five Biovision-funded projects:

1. The applicability of available technologies for adaptive integrated malaria vector management at Malindi, Kenya
2. IVM malaria model for T21—Phase III-IV: Development of a dynamic integrated disease and vector management model of malaria & its application at the community, district and national levels in Kenya
3. Integrated vector management for malaria control in Nyabondo
4. Ecologically friendly mosquito and malaria control and prevention pilot project in Ghibe valley/ Toly, Ethiopia

EVALUATION DESIGN

The evaluation design and methodology for review of Projects 1, 3 and 4 comprised of four components:

1. Documentary analysis
2. Follow-up clarification with individual investigators, managers and coordinators
3. Interviews with project staff (Project Managers & Project Assistants), Project Coordinator, BioVision Foundation managers, beneficiaries, local administration, and other relevant stakeholders, including Malindi community based organisations, school clubs and their patrons, and the District Health team (Ministry of Health, Ministry of Public Health)
4. Brainstorming retreat with icipe project teams and icipe and BioVision Foundation management to discuss the lessons learned, recommendations, and the suggested plan of action.

The brainstorming retreat was followed by the development of draft evaluation report and strategic plan, which were discussed with icipe IVM project management team. Clarification meetings and telephone consultation with the project team culminated in the development of the current final evaluation report and draft strategic plan frame.
GENERAL FINDINGS

The detailed project assessments are discussed in the main sections of this report. The most salient findings for each project are presented here including a comparative project scoreboard. The projects were assessed against five IVM components, which form the congruency of the icipe and BioVision financed objectives:

1. Integrated approach:
   - To conduct operational research in IVM
2. Evidenced-based decision making
   - To develop an IVM malaria intervention model using an adaptive management system
3. Advocacy and social mobilisation
   - To increase the visibility of the programme and increase its acceptance
4. Intra- and intersectoral collaborations
   - To strengthen coordination and partnership development for malaria prevention and control
5. Capacity building
   - To strengthen human resource and laboratory capability to support IVM strategies

Project 1: The applicability of available technologies for adaptive integrated malaria vector management at Malindi, Kenya

Starting in 2005, a project titled “The applicability of available technologies for adaptive integrated malaria vector management in Malindi, Kenya” was established in coastal Kenya in a town known as Malindi. This project has had the most successful continuity in terms of staff and outreach, built onto its own experiences and grown to obliterate gaps experienced on the way. This, in essence, is the onus of IVM, i.e. “a rational decision-making process for the optimal use of resources for vector control". An excellent collaboration between icipe and the Kenya Medical Research Institute (KEMRI) was established, with KEMRI contributing the core staff to the project (manager, sociologist, technicians and some field staff). The continued presence of a social scientist within the project ensured identification of the right entry points, engagement of existing common interest groups such as the Punguza Mbu na Malaria Malindi (PUMMA) (meaning Reduce Mosquitoes and Malaria in Malindi), community health workers (CHWs), schools’ health and environmental clubs as well as the recipient communities. The fact that a senior entomologist, who understands the entomological issues, spearheads the project is a great advantage to implementation of the IVM approaches. All the objectives of the project were achieved. This project has yielded an impressive list of deliverables with significant short-term impact. The establishment of a functional IVM strategy based on a systematic assessment study of the mosquito control needs of the Malindi community, followed by the development of the required mosquito control capabilities within the project staff, ensured an efficient delivery of IVM strategies, resulting in considerable reduction in mosquito densities and malaria prevalence. The basic model of this intervention is captured in the central role of the mosquito scouts who subsequently rolled out the IVM approaches to the local community. These mosquito scouts have effectively become a network of mosquito control training and support point persons or Community Owned Resource Persons (CORPs), who serve various community needs.

Within two years of the project, capacity was built within various community groups including 16 trainers, through a training of trainers (ToTs) programme, 150 spraymen, 62 mosquito scouts (MS) and 30 mosquito action groups (MAGs) in financial management and good governance. Further capacity for planning and management was built in 30 public health officers. In addition, the project employed a battery of communication formats to reach almost every Malindi community member, from media (radio, newsletters and TV), through to Malaria Day celebrations, club and group competitions, neighbourhood and door-to-door campaigns, exhibitions and the development of information, education and communication (IEC) materials. An advantage was that the project core staff remained with the project throughout, giving it continuity. This was made possible by additional outreach project funding (in March 2010) from the BioVision Foundation, following a request by the Malindi project team, which was dedicated to advocacy, communication and social mobilisation. A 37.5% reduction in anopheline malaria vector larval densities in breeding sites and over 65% reduction of anopheline indoor resting densities has been achieved with a corresponding 62% reduction in malaria prevalence. The collaboration with KEMRI and the sourcing of extra funding, even from BioVision, are good practices that could be upscaled to other sites.

The formation of a stakeholders’ forum was a great idea and an attempt to consolidate mosquito and malaria control in Malindi. Although the chairmanship of this forum rotates among stakeholders, complete buy-in has
not been achieved with majority of the efforts and driving of the forum being considered an icipe/KEMRI project activity. There is a need to consolidate this, and that might require the services of a communications specialist, who would develop a strategy that would engage the diverse stakeholders and bring about ownership of the activities.

Overall project management has been excellent with very few and non-critical delays in delivery. The involvement by the community has been negotiated and secured. Various partnerships—academic, health, social and business like—have been formed. The end result is a very effective, efficient and sustainable initiative. The reach of the project through the network of 62 mosquito scouts and emerging partnerships through the stakeholders’ forum is already impressive. The potential multiplier effect of the current activities signifies huge potential and future impact.

Project 2: IVM Malaria Model for T21—Phase III–IV: Development of a Dynamic Integrated Disease and Vector Management Model of Malaria & Its Application at the Community, District and National Levels in Kenya

The project started in March 2010 and is expected to create awareness on different strategies for malaria control and mobilise the community to take up the appropriate action for malaria prevention. This will ensure reduction of incidence of vector-borne diseases in Malindi. The capacity building provided to the beneficiaries through this project will enhance their capacity to respond to disease control and outbreaks and become better managers of time and utilisation of resources available. The activities of this project were assessed in the context of the applicability of available technologies for adaptive integrated malaria vector management at Malindi, Kenya.

Project 3: Integrated Vector Management for Malaria Control in Nyabondo

This project had a faltering start with many changes of coordinators and problems associated with community and stakeholder engagement and involvement. Indeed, the project started in 2004 and since then it has had 4 project managers, including the current one. In view of this, data from 2004 to 2007 was not available showing a clear weakness in data management strategies, sharing and ownership. It is, therefore, understandable why the community buy-in and stakeholder engagement has not been fully achieved. The shortcomings in data management and sharing need to be addressed for gains from the project investment to be realised.

Nevertheless, the project still managed to eliminate anopheline larvae from the abandoned brick pools by rehabilitating them and stocking them with fish, and making it an income generating activity. They dug 11,000 m² of trenches to drain pools, reducing anopheline larval mosquito densities in the ponds by at least 71% and indoor resting adult densities by 41%. By 2009, there was a 62% reduction in malaria prevalence in the region within the first half of the year and an 86% increase in use of bednets. However, the data are so inconsistently presented throughout 2007 to 2009 that it is difficult to show a trend. This could be attributed to the staff attached to the project site who were not as qualified as those in the Malindi project. As a result, their reports are not as comprehensive or as coherent as those that were written in 2010, when more qualified staff (PhD level manager and coordinator) were attached to the project. The fact that the Nyabondo project also received the reporting templates two years later than other sites might explain why the earlier reports were inconsistent and difficult to draw a trend from. It would have been great to show the continuity of the gains but having been funded one year at a time, it is understandable that the reporting was done as separate projects without much connection between years. Continued funding for at least 3 years would allow for community engagement and trust building, and consistent data collection for impact assessment which would auger well for sustainability beyond project funding period.

To record the incidence of malaria accurately, concerted efforts between the IVM team and hospitals should have been made and a template for recording the data harmonised in all participating hospitals/dispensaries. A person in each hospital should have been identified and made responsible for recording the data and facilitated to do so, e.g. by providing them some training in data entry into a specific data collection sheet/template, and also compensation for the extra work. Reporting of data after the intervention was not harmonised. This would have made it much easier to show the trends in mosquito reduction, and capacity building in communities, schools and scouts. It would also have helped the project to determine outcomes and the data could have been easier to compare.

Disruption of activities between November 2007 and April 2008 by the post-election violence broke the momentum and lost any gains in community ownership of the project. Thus the communities continued expecting to be paid for undertaking project-related activities instead of taking them over. The disruption of the activities for 6 months provided an opportunity to see what the situation would be like without this intervention. A snapshot survey
would have served as a baseline for the more consistent reporting observed from 2010. Although demographic surveys are mentioned, the findings on mosquito and larval densities, and malaria incidence at the resumption of the project were not reported.

For a community that is looking for monetary gains from this project, connecting the IVM approaches with income generation might elicit a better response in regards to project buy-in. There is, therefore, a need to dialogue with the fish pond drive project and investigate modalities for community mobilisation to convert the abandoned brick pits into fish ponds for income generation and environmental management.

Starting 2011, this project has put into place measures giving it potential for sustainability. These include connecting IVM to fish farming, the initiation of a stakeholders’ forum, engagement of a local youth group, and the formation of 14 school health clubs. However, the period since their formation is too short to give a firm assessment. There is need for a workshop to level expectations, create/secure buy-in and develop a work plan together. There is also a need to develop a clear stakeholder engagement strategy, as well as a communication strategy, to bring in new stakeholders while retaining the old ones for community mobilisation. A sociologist and a communications specialist could assist in propelling this project to sustainability.

Brick-making is the sole income-generating activity in Nyabondo that causes interdependent problems, i.e. expansion of mosquito breeding sites and environmental degradation (water wastage and deforestation). Introduction of income-generating mosquito controlling (fish farming) and environmental conserving (water management for use during the dry seasons and tree planting for fuel to stop deforestation) activities would have the desired malaria controlling impact as well as economic development of the communities involved.

The recent developments give great promise for success and sustainability of this project. In particular, combining IVM with income generation gives the rare opportunity to interlink the implementing institution’s integrated pest and vector management (IPVM) approaches. This is a very important aspect that is strategic to the business strategy and hence success of the implementing institution.

**Project 4: Ecologically friendly mosquito and malaria control and prevention pilot project in Ghibe valley/Tolay, Ethiopia**

The Tolay project started with a systematic baseline survey, clearly identifying malaria as an important problem and identifying breeding sites. People were sensitised to the danger presented by malaria-transmitting mosquitoes and the relation between mosquitoes and malaria, and were guided on environmental management and the correct use of bednets. Through community work, mosquito breeding sites were dried out and blocked water channels were cleared. Where this was not possible, stagnant water bodies were treated with* Bacillus thuringiensis israelensis* (Bti). Mosquito scouts were also trained and involved in ensuring the long-term success of the project. The project in Ethiopia targeted a population of 12,000 people.

The Tolay project was demand-driven following the success of the trypanosomosis IVM. The project capitalised on the trust the community had in the IVM staff and approaches, and build upon the lessons learned from the trypanosomosis IVM. The project has, therefore, accomplished an impressive set of deliverables within a relatively short time (3 years). The community has been successfully engaged and a stakeholders’ forum formed, which has already levelled expectations, and assigned roles to each partner. Within the 17 cells of the intervention, the project has made progress in reducing and maintaining the malaria challenge to very low levels (10%) and reduced the density of mosquito populations in the area substantially (52% reduction). These achievements have triggered a demand to scale up the project to adjacent villages, the district and region. It should be investigated whether the stakeholders’ forum can bear on the relevant ministries to start income-generating activities in the project area, such as fish farming, to make mosquito control a sustainable way of life.

There is a need to address the challenge of project work being compromised during farming peak times (harvesting and ploughing times) when scouts are torn between community and their household farm work. One way of doing this is to follow the Malindi example and remunerate/compensate the scouts when they work on the project. These scouts are the ones that monitor mosquito densities and breeding sites and also collect data, carry out surveys and manage the tree nursery establishment. They are also involved in biopesticide trials. These scouts are a bit overstretched. There is a need to recruit more scouts and to consider compensating them for loss of income when attending to the project activities. The other challenges, including *tukuls* (grass-thatched houses) being not well built, are already solving themselves as the economy improves and communities start to build better housing, thus reducing mosquito densities within the houses. The delays experienced in delivering sprays for indoor residual spraying (IRS) could easily be harmonised to arrive before the rains.
The establishment of a community tree nursery has potential to provide raw materials for biopesticides, generate income and conserve the environment, thus converting the mosquito control into a community development process. Already, the sale of tree seedlings is generating income. It should be investigated whether the extraction of pesticidal products from the mature trees can become a community income generating activity.

Overall project management, in my assessment, has been excellent with very few and non-critical delays in delivery. The involvement by the community has been negotiated and secured and various partnerships have been formed and given a forum (the stakeholders’ forum). The stakeholders’ forum is already taking charge in deciding the direction future phases of this project should take. The end result is a very effective, efficient and sustainable initiative. The fact that this project was started through a demand from the site is an indicator of its significance in the area. The reduction of mosquito densities to less than 10% and malaria prevalence by over 50% has a direct impact on the productivity of the now healthy agrarian community. The introduction of tree farming (tree nurseries) and potential for the development of a botanical product economy for IVM and IPM within the region suggest a considerable developmental impact of the project.

**Project 5: Development of a Decision-Making Support Tool for Integrated Vector and Disease Management Strategies: Application to Three Eco-Zones in Kenya**

This project was geared in two complementary directions to develop local and national models. Most activities were successfully completed and a scientific paper for the community level model (CLM) has been prepared but needs to be finalised. A national level model needs to be further developed.

Through Phase I of this project, an integrated model for disease and vector management was developed, involving a substantial analytical work that has been carried out collaboratively by the Millennium Institute (MI) modelling team in Bergen and the icipe team in Nairobi. Data and information collected in the field were integrated with a systematic literature review, and used to develop the model. The structure of the model was flexible so that different assumptions could easily be incorporated, and a user interface developed, to simplify use of the tool for non-modellers.

An impressive number of deliverables was produced within the first year (Phase I) of modelling including: (i) development of generic structure for malaria model; (ii) implementation of the model for the 3 eco-zones; (iii) validation of the model for each eco-zone; (iv) analysis of the impact of alternative intervention policies; (v) development of a user-friendly interface for end users, and (vi) a brief report on the model development. The model provided a comprehensive representation of the malaria situation in three sites and allowed the testing of alternative policies aiming at its elimination. The model showed best results in terms of historical data replication for the Mwea eco-zone, which was used for the model for policy testing. The preliminary results from policy testing illustrated that long-lasting insecticide-treated nets (LLINs) and indoor residual spraying (IRS) were particularly cost effective.

Phase II of this project sought to improve on the work carried out on the model in Phase I, and to further diffuse the preliminary research results. This included testing the assumptions that form the basis of the underlying structure of the model to ensure that they are consistent with sound scholarship and experience. Besides this, a wider appreciation of the model by beginning a sensitisation of potential end-users was investigated. A thorough assumption review and analysis of the model structure was conducted and the model was showcased to potential users. An initial publication focusing on the process of model development and its potential uses was prepared but has not been finalised even in Phase III of the project. In Phase III, the model underwent further validation and improvement of CLM through application in other eco-areas. It is understood that the training of researchers and Training of Trainers (ToT) in other eco-areas on CLM was undertaken and a paper prepared. However, the review of that research paper for submission into a high impact journal seems to be delaying further application and development of the model. Consequently, the training of personnel was restricted mainly to scientists due to a decision that sensitisation of personnel at district/provincial levels should follow a peer review of the model. It is not clear why the publication of the paper has led to stalling of other project activities and issues around this need to be sorted out.

This project generated important spin-offs: the development of the national malaria model for T21-Kenya, and the regional malaria model for sub-Saharan Africa. Based on the latter model, a relevant scientific paper was prepared and published in a leading journal in the field (*PloS One*).
COMPARATIVE PROJECT SCOREBOARD

Below is a comparative project scoreboard that summarises the “performance” of the three projects under evaluation, on five dimensions (cf. legend). The specific scores for each category in themselves should be interpreted as indicative of performance in each category and not quoted out of context in absolute terms. The individual scores are in this sense less important than the overall score. But more importantly, these scores should not be read without reference to the more detailed narrative description of each project assessment (in the other sections of this report).

Evaluation matrix for projects 1, 3 and 4

<table>
<thead>
<tr>
<th>Project short title</th>
<th>Project management</th>
<th>Activities completed</th>
<th>Impact</th>
<th>Value for money</th>
<th>Sustainability</th>
<th>Total score/30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malindi Project</td>
<td>Good</td>
<td>Excellent</td>
<td>High</td>
<td>Excellent</td>
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<td>30</td>
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<td>4</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Tolay Project</td>
<td>Good</td>
<td>Good</td>
<td>Moderate</td>
<td>Good</td>
<td>High</td>
<td>25</td>
</tr>
<tr>
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<td>3</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Nyabondo Project</td>
<td>Satisfactory</td>
<td>Good</td>
<td>High</td>
<td>Average</td>
<td>High</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Scoreboard legend:

Project management (planning, execution and monitoring and project activities): Scale: 2 = Poor; 4 = Satisfactory; 6 = Good
Activities completed (number of activities completed as proportion of total number of planned activities): Scale: 1 = Poor, 2 = Satisfactory; 3 = Good; 4 = Excellent
Impact (accumulated effect of achievements thus far): Scale: 2 = Low; 4 = Moderate; 6 = High
Value for money (actual and potential benefit generated against investment): Scale: 2 = Poor; 4 = Average; 6 = Good; 8 = Excellent
Sustainability (institutional, financial and other support available or likely to be acquired for continuation and up-scaling of the project): Scale: 2 = Low; 4 = Moderate; 6 = High

CONCLUSIONS

The projects are aimed at delivering an IVM strategy to communities in different ecological and economic environments and are connected by a need to control malaria and reduce the use of harmful insecticides for the reduction of adult and immature (larvae) mosquitoes in their feeding (using indoor residual spraying) and breeding sites (larvicide application). icipe, with financial support from BioVision Foundation and in collaboration with KEMRI, is the implementer of the projects. The projects are also connected by challenges of widespread development of resistance against currently used pesticides. In essence, icipe aims to bring in eco-friendly solutions, through research collaborations, cross-sector capacity building and the application of integrated approaches to drive sustainable malaria control. The projects were assessed against their performance in the application of integrated approaches, evidence-based decision-making, advocacy and social mobilisation, intra- and intersector collaborations and capacity building.

As far as the use of integrated approaches is concerned, all the projects understood and used integrated approaches to significantly reduce both the mosquito densities and malaria prevalence in their respective sites. The assessment further shows that there was intra- and intersector capacity building and collaborations as well as cross learning between the projects—all of them upscaled from the Malindi project. There were differences in the exact activities and some aspects of the integrated approaches used. For instance, farming edible fish as an income generating activity was pronounced in the Nyabondo site. This was not the case in Malindi, where (non-edible) fish were also used solely to eliminate mosquito larvae. The introduction in Tolay of tree nurseries from which mosquito larvicidal extracts could be made and sold to generate income through sale of seedlings and potential manufacture of larvicides was the other approach. Yet, these approaches can be learned and upscaled to each of the other sites with additional gains for impact and sustainability.

As a direct result, the assessment showed that the direct technological risks in all the projects were low. Conversely, the social risks in most projects were much more salient, including securing private partners (all projects), getting buy-in from other institutions (Municipal council, health and environment ministries, agencies and businesses)
and negotiating a new partnership with the community (Nyabondo, Tolay). It is, therefore, perhaps not surprising that project management performance was often directly related to these social risks and the ability (or inability) of teams to anticipate these in time and address them adequately. The ideal situation would have been buy-in from collaborators and communities to such an extent that they are giving project direction (as was the case in Tolay), are willing to fund project activities (as was the case with PUMMA in Malindi) or find commercial gain in getting involved (fish farming in Nyabondo, tree planting in Tolay, plastic recycling in Malindi). These aspects were also assessed against the duration (existence) of the project within the communities they were supposed to have made that impact, and how solid (established) the engagements with the stakeholders were.

The assessment concludes in saying that the projects are highly effective in reducing the threat of malaria by reducing mosquito densities using eco-friendly means. They also have the potential to replace harmful chemical pesticides using biopesticides and have the ability to demonstrate incorporation of disease control into a community and agriculture and environmental development process through the connection with income generation. The projects have had high value for money and are highly scalable and sustainable.

LESSONS LEARNED FROM THE PROJECTS

A workshop was held in which an overview of the icipe–BioVision projects was presented within the context of icipe’s Human Health programme. Also, the managers of the IVM projects at each site made an introductory presentation. Thereafter, the participants were broken into 3 discussion groups and each group presented with a set of questions, drawn from the following seven critical questions, formulated to bring out the lessons learned from the projects:

1. How was the current phase of the project managed? And how would we like to see it managed in the future?
2. What does it take to make a local consortium work?
3. How do we overcome resistance to change at all levels of model implementation?
4. What are the most effective ways of communication for communities to change practices and behaviours for mosquito and malaria control?
5. What are the best strategies for increasing BioVision and other grantee participation in malaria IVM?
6. How do we ensure effective engagement of communities with IVM for malaria control?
7. How do we develop and implement workable sustainability and scalability strategies to ensure the continued application of the IVM practices?

At the end of the workshop, the following were the lessons learned:

Lesson 1: Communication is critical to project management—90% of the project manager’s job is communication.
Lesson 2: Keeping an “issues table/desk/record” for the life of the project makes it easy to review issues at the meetings and act upon them.
Lesson 3: There is a need to document successful interventions and “work-arounds” (changes) for effective scalability.
Lesson 4: There is a need to have a budgeting and resource allocation process incorporating dialogue between the donors and the project coordinators/managers.
Lesson 5: Allow flexibility within the budget and implementation plans to cater for critical process changes (“in flight” changes) in achieving the goals.
Lesson 6: Develop a programme to consolidate the current projects and any other malaria IVM project that may develop in the future.
Lesson 7: That a local consortium is likely to stay together and perform if there are mutual and/or synergistic benefits to each individual institution.
Lesson 8: For the projects or programme to become sustainable, additional member institutions may require to be added to the existing collaborators.
Lesson 9: To draw essential partners to the partnership, the programme needs to be proactive.
Lesson 10: People need to understand the benefits the project has for them and they need to be assured that the project is here to stay with them.
Lesson 11: Develop an impact driven communications strategy that incorporates reciprocal visits and workshops for impact assessment.
Lesson 12: Develop communication system for delivering information but also for getting feedback from communities, collaborators and donors.
Lesson 13: Documentation of the successful experiences and strategies as “best practice” which can be applied to any discipline—human, environmental, plant and animal—makes the programme sellable to donors.

Lesson 14: Repeating the message in diverse formats enhances community understanding, participation and ownership of the project, thus enhancing its sustainability.

Lesson 15: Connecting malaria control strategies with income generation and empowering the communities/stakeholders to drive those activities to commercialisation is the surest way of imparting sustainability to the projects.

EVALUATION RECOMMENDATIONS

1. **Document the IVM approach as a scalable best practice:** The successful experiences, innovations and practices that enabled these projects to make impact need to be documented as a best practice, which can then become a model approach to transferring the IVM/IPM to any programme. BioVision Foundation should fund this activity, through a workshop to consolidate the value for money that these projects have achieved.

2. **Consolidate the gains within project sites:** What needs to be done within the sites to bring about sustainable mosquito/malaria control in the current sites should be supported by BioVision Foundation to consolidate their investment in the development of this model. The experience should be used to revamp/improve the documented best practice.

3. **Apply the best practice to other programmes to scale-up impact:** Once the IVM delivery best practice is consolidated, apply it to scale up impact to other areas within the countries of impact. Choose areas with similar socioeconomic and agroecological demography as those where the model has been developed and improve the model further. While BioVision Foundation can fund some of the programmes (of their strategic interest), icipe needs to solicit for funding to spread the impact of malaria IVM to other icipe programmes.

4. **Apply the IVM best practice to out-scale the impact:** Use the now tested and tried model to deliver IVM to new areas within and outside the countries of impact. Again, BioVision can fund such activities if they relate to the Foundation’s interest but icipe should look for additional funding to drive their other programmes.

5. **Consolidate the three projects into a programme:** The three projects should be consolidated into a programme for cost effectiveness, harmonisation of staffing, work plans, data collection and documentation. This would be a management cost co-shared by the programme donor and icipe.

6. **Commit funding to the programme for a long enough duration (at least 3 years) for sustainable community and stakeholders’ engagement:** This will give the programme teams certainty and enhance community/stakeholder buy-in, ownership and commitment. Eventually, this gives the programme better value for money. This should be budgeted for as an operational cost by each project.

7. **Develop annual operational plans to enable disbursement of committed funds:** Entrench annual review meetings where progress could be discussed and annual operational plans, complete with modification of activities and deliverables, developed. This could be an operational cost in every project.

8. **Establish a Monitoring and Evaluation Unit:** An M&E unit would conduct baseline, snapshot (annual) and summative surveys and develop a database to keep the programme in line with its goals and advise on the necessary adjustments. In addition, this Unit would manage the research system that would get the feedback from the recipients and stakeholders, inform the communication strategy and drive innovative research to develop new and demanded solutions. The Unit would be critical in documenting impact of the programme activities. This would be a programme cost.

9. **Complete the development of IVM model:** This would be a useful tool for making cost-effective decisions of intervention for the reduction of malaria. However, the full development through peer review, capacity building and dissemination needs to be completed.
1.0 BACKGROUND

1.1 INTERNATIONAL CENTRE OF INSECT PHYSIOLOGY AND ECOLOGY

Africa is a continent of fascinating and charming landscapes. Unfortunately, within its highlands, plains and valleys abounds one of the greatest threats to mankind—malaria. WHO estimates in the World Malaria Report that 655,000 people succumbed to the disease in 2011 (with most deaths occurring in sub-Saharan Africa). Malaria is a disease that is caused by a protozoan parasite of the genus *Plasmodium* and is transmitted by the female *Anopheles* mosquito. This menace, which kills a child every minute in Africa, poses astronomical costs to the continent, in its impact on human life and productivity, and on the healthcare system. For many years, *icipe* has been in the forefront in the fight against malaria. The Centre recognises the interrelation between poor health and the cycle of poverty. Further, *icipe* realises that although many people are aware of the need to improve and protect their health, a majority of them, especially in the rural areas, lack the necessary information. *icipe*’s work in malaria control has been guided by the steadfast belief that the menace can be alleviated through an integrated vector management (IVM) approach, tailored for specific regions and communities. In three different environments, *icipe* has established effective partnerships with communities in the fight against malaria.

The International Centre of Insect Physiology and Ecology (*icipe*—African Insect Science for Food and Health) was established in Kenya in 1970. The founders of *icipe* recognised that the mainly developing countries in the tropics had special problems that were not being adequately addressed by scientists and organisations in the North. Furthermore, there was a serious lack of indigenous expertise to resolve these problems. The mission of *icipe* is to help alleviate poverty, ensure food security and improve the overall health status of peoples of the tropics by developing and extending management tools and strategies for harmful and useful arthropods, while preserving the natural resource base through research and capacity building. To achieve its mission, *icipe* has specific objectives in each of the 4-H paradigm areas, i.e. Human, Animal, Plant and Environmental Health, including Capacity Building and Institutional Development, with insects/arthropods as the common denominators.

1.2 BIOVISION FOUNDATION

The BioVision Foundation was founded as a non-profit association in the early summer of 1998 and was transformed to Foundation status in December 2003. Building of action structures and all work for the generation of funds was achieved on an unsalaried basis by the founding members and management with support from sympathisers. With the first public action (“Good News from Africa”) in November 2000 and March 2001, developed through unsalaried work, initial financial resources could be gathered which allowed for professionalisation of the work and implementation of projects in western and coastal Kenya. The head office in Zürich has been coordinating BioVision communication and project work since February 2001. The Foundation Board as the topmost executive committee continues to provide its services free of charge.

The goal of BioVision Foundation is to make development and research findings in the field of organic pest and disease vector control accessible to people in developing countries. What has been established and tested in application by the researchers must be disseminated as quickly as possible. The problem: the ‘goods’ developed by institutions such as *icipe* are not concrete products, which can be profitably marketed and sold off. It is know-how that can be applied, and often by the easiest means. To spread this knowledge to the population at large, to instruct farmers on sustainable organic methods of control and to ensure necessary communication with researchers is the task to which the BioVision Foundation has applied itself.

1.3 *icipe*–BIOVISION MALARIA IVM PROJECTS

Malaria causes an estimated 0.7 to 2.7 million deaths per year, with most of these deaths occurring in Africa. Ninety percent (90%) of the world’s malaria cases occur in Africa (UYAPHI, 2012).

According to USAID/Kenya (2011), malaria is one of the leading causes of morbidity and mortality in Kenya and kills an estimated 34,000 children under five in the country every year. Seventy-seven percent (77%) of Kenya’s population lives in areas where the disease is transmitted. The disease is responsible for 30% of out-patient visits (requiring more than eight million out-patient treatments at health facilities each year) and 15% of all hospital admissions. About 3.5 million children are at risk of infection and developing severe malaria. Pregnant women

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are also at high risk. There are approximately 1.1 million pregnancies per year in malaria endemic areas. During pregnancy, malaria is the number one cause of miscarriages, and can cause severe anaemia. Each year, an estimated 6000 pregnant women suffer from malaria-associated anaemia, and 4000 babies are born with low birth weight as a result of maternal anaemia. Economically, it is estimated that 170 million working days in Kenya are lost each year because of malaria illness.

Malaria is also the number one health problem in Ethiopia with an average of 5 and 9.5 million cases per year between 2001–2005. It contributes up to 20% of under-five deaths and 17% of outpatient visits to health institutions. It also accounts for 15% of admissions and 29% of in patient deaths, a figure considered to be too low given that more than a third of the country’s population does not have access to health services. Tragically, in epidemic years, mortality rates of nearly 100,000 children are not uncommon. In the last major malaria epidemic in 2003, there were up to 16 million cases of malaria—6 million more than an average year. Malaria is prevalent in 75% of the country, putting over 50 million people at risk (out of a countrywide population of 77 million). Large-scale epidemics tend to occur every 5–8 years in certain areas due to climatic fluctuations and drought-related nutritional emergencies. In Gibhe Valley in Tolay, the burden of malaria is particularly great and is one of the main reasons for the high child mortality rate there.

The BioVision Foundation has actively been engaged in transferring icipe’s technologies to end-users by providing financial and technical support to icipe’s human health programme for the last 8 years. The BioVision Foundation has supported five (5) projects, namely the Nyabondo (since October 2004) and Malindi projects (since May 2005) in Kenya and; more recently, Tolay project in Ethiopia (since January 2009), Development of a Decision-making Support Tool for IVDM (2008) and IVM Malaria Model for T21 (2011). The five projects aim at improving human health through integrated malaria vector control. Their focus is to develop and implement adaptive/integrated mosquito population management strategies necessary for guiding decision-support mechanisms that make efficient use of information on adult abundance, breeding sites and larval abundance. The projects are implemented in close collaboration with the Kenya Medical Research Institute (KEMRI) and the Ministries of Health in Kenya and Ethiopia.

Community participation and involvement is a major component of these projects. The projects advocate for a “learning by doing” culture through which evidence-based IVM malaria control strategies are selected, developed, planned and implemented. Besides promoting ITN use, the projects apply biological larvicides in mosquito breeding waters, drain off mosquito larval habitats and educate communities and other stakeholders about sound vector control decision-making processes. Emphasis is placed on taking appropriate actions and local involvement through individual, household, community and/or intersectoral participation. The projects also design and execute capacity building and training programmes. Stakeholders’ meetings were held routinely to strengthen awareness and capacity in mosquito control.

A comprehensive evaluation of three BioVision malaria IVM project sites was conducted from mid May to June 2012.

2.0 AIM OF THE EVALUATION

The aim was to assess progress, achievements and challenges, plus map out future perspectives of each sub-project as well as develop a joint 5-year (2013–2017) strategic plan.

3.0 EVALUATION OBJECTIVES

The objectives of this external evaluation were to:

1. Assess the projects’ achievements (based on proposal documents and technical reports) and the impact they have had on direct beneficiaries, stakeholders (communities, CBOs, local authorities, schools, research institutes and staff) and development partners (icipe, KEMRI and BioVision Foundation).

2. Give recommendations for potential adapted malaria programme concepts (set-up, approach, strategic embedding) and respective objectives for the next phase of the icipe malaria IVM programme.

3. Help in the development of a new evidence-based strategic plan with comprehensive budget and funding gap analysis, detailed implementation plan as well as a comprehensive M&E plan, and coordination mechanism.


4.0 EVALUATION DESIGN

4.1 DOCUMENTARY ANALYSIS

The project documents consulted included the proposals and half yearly and annual reports of the project sites: Malindi and Nyabondo in Kenya and Tolay in Ethiopia. In addition, the websites of both icipe and BioVision, as well as presentations (PowerPoint) made at the brainstorming retreat at icipe were studied.

4.2 FOLLOW-UP CLARIFICATION

Once all project documentation had been consulted, project leaders were approached for clarification of issues found unclear during document study.

4.3 INTERVIEWS WITH PROJECT STAFF

Interviews were conducted with all the project managers and coordinators. The aim of these interviews was to draw out the experiences in the field, the successes, the things that were done outside what was planned, changed strategies in pursuit of meeting the project objectives, challenges that were encountered, and objectives not accomplished and reasons for not accomplishing them. In addition, interviews with project staff investigated whether the project would sustain itself should the project funding be discontinued and what needed to be done to achieve that. Thus the questions asked included:

- Were the project components completed as indicated?
- What were the strengths in implementation?
- What were the barriers or challenges in implementation?
- What were the apparent strengths and weaknesses of each step of the intervention?
- Did the recipient understand the intervention?
- Were resources available to sustain project activities?
- What were staff perceptions?
- What were community perceptions?
- What was the nature of the interaction between staff and clients?

Additional interviews were conducted with community groups, mainly as participatory evaluation discussions but also as individual interviews with group leaders and recipients of the IVM technology.

4.4 FIELD VISITS AND OBSERVATIONS

One project site, the Malindi IVM project, was visited. During the visit, interviews with the Project Manager and Coordinator, community group leaders, group members and recipients of the IVM approach were conducted. In addition, intervention sites were visited and sampling of breeding sites and mosquito counting and identification carried out. The participatory evaluation discussions were aimed at establishing how the community related with the project managers, what new knowledge they acquired, how they used and whether they were still using it, what their plans for continuing the application of acquired skills were, with or without the project support, and what other benefits accrued from the project’s intervention.

The time and resource limitations would not allow for visitation of other sites. According to icipe, Malindi site represented a site where all the IVM strategies had been put into practice, with enough time having elapsed for their effect to be apparent. It was, therefore, decided that evaluation on this site would generate insights into how the strategies could be up- and out-scaled to other sites to optimise reduction in mosquito densities and malaria incidence.

4.5 BRAINSTORMING RETREAT

A three-day brainstorming retreat was held after the project documents had been studied, fields visited and several project managers and one coordinator interviewed. The retreat was divided into two main components:
1 Day one was dedicated to presentation of the icipe's human health component and detailed project reports from Malindi, Nyabondo and Tolay sites. This day was also used to draw out the lessons learned from the projects from the time they started being funded to the date of this evaluation.

2 Days two and three were dedicated into brainstorming on the development of a malaria IVM programme, composed of the three project sites as major components, incorporating the lessons learned from the previous project phases. In addition, these days were used to lay the foundation for the development of a 5-year strategic plan for the malaria IVM programme.

The brainstorming retreat was centered on group-discussions of critical questions formulated to draw out the lessons learning on the one part and to formulate the strategic plan on the other. The questions for both of these are listed in Section 7.

5.0 **icipe AND MALARIA CONTROL**

5.1 **MALARIA VECTOR CONTROL PROJECT**

icipe's malaria vectors mega project was launched in 1996 following an international task force meeting of mosquito and malaria experts consisting of six PhD-level entomologists. The current icipe research focuses on integrated vector management, modelling and basic research on mosquito biology and ecology. The current malaria vector control strategies heavily rely upon use of synthetic pyrethroid insecticide-treated nets (ITNs) or indoor residual spraying (IRS) to control malaria. Yet more than 300 million new malaria infections and 0.88 million deaths still occur each year and nearly 90% of these in Africa, mainly among children five years and below.

Based on this grim picture and keen on reducing resistance of mosquitoes against insecticides, icipe has embarked on a holistic, evidence-based, sector wide and community prioritised control and capacity building strategy known as integrated vector management (IVM). IVM is a rational decision-making process for the optimal use of resources for vector control. The current icipe's IVM programmes target urban, rural and highland settings in Kenya and Ethiopia. However, according to icipe, implementation of IVM for malaria control is hindered by lack of accurate data on risk assessment. Thus, novel vector control tools are only considered valid when solid evidence for the efficacy of the tool (measurable reduction of disease) can be provided. Hence, the Centre is currently working with national and international partners to develop a malaria risk assessment model, which includes a vector control component.

5.2 **BASIC RESEARCH FOR MALARIA CONTROL**

Based on knowledge that host seeking mosquitoes identify their bloodmeal hosts using chemical cues, icipe invested heavily in finding the responsible chemicals, leading to identification of several compounds and blends thereof that are highly attractive to host seeking malaria mosquitoes. Tested in the field, such chemicals and blends attracted more mosquitoes than huts occupied with humans in a field study conducted in Tanzania. Like their host seeking counterparts, gravid mosquitoes identify their egg-laying sites by responding to chemical cues. Based on this understanding, icipe is currently engaged in basic research to identify chemical compounds that would modulate mosquito behaviour. Once identified lead compounds will sharpen and add to the arsenal of IVM packages.

Mosquito susceptibility to malaria parasites is the result of evolutionary processes on the parasite and the vector that modulate the balance between susceptible and refractoriness traits in natural populations. This has an effect on the ability of mosquitoes to harbour and transmit malaria parasites, an aspect that is a subject of research at icipe.

5.3 **COMMUNITY BASED MALARIA IVM STUDIES**

Community studies show that existing knowledge on malaria is a mix of scientific knowledge and traditional beliefs which, coupled to socio-economic circumstances, leads to ineffective malaria prevention. There is evidence that socioeconomic limitations, more so food security, are more important to residents than the specific problem of malaria. icipe, therefore, strives to promote IVM-based interventions by integrating them with income generating activities, e.g. by coupling with IPM-based solutions. Furthermore, icipe engages in finding eco-friendly solutions
for disease control, strengthens research collaboration within Africa and beyond, reinforces ties with national disease control programmes and builds disease control capacity at all levels, locally and beyond.

6.0 PROJECT LEVEL ASSESSMENT

6.1 PROJECT 1: THE APPLICABILITY OF AVAILABLE TECHNOLOGIES FOR ADAPTIVE INTEGRATED MALARIA VECTOR MANAGEMENT AT MALINDI, KENYA

The most important economic activity in Malindi is a highly seasonal tourism, supported by over 400 tourist villas, which operate during the tourist high season (July to September). During the low season, most tourist hotels and villas close down till the next season. During this period, majority of the tourist villas drain off their swimming pools. Unfortunately, the two rains seasons (March to May, and October to November) fall outside the tourist season, leading to rain water collecting in the drained pools and becoming mosquito breeding sites. A preliminary survey by the scientists at the start of the project showed that more than 90% of the mosquito larval habitats in Malindi were man-made, with a majority of them being from these out-of-use swimming pools.

6.1.1 OVERALL GOAL

To improve human health through integrated vector management for malaria control in Malindi, Kenya.

6.1.2 OBJECTIVES

1. Integrated approach:
   - To conduct operational research in IVM
2. Evidence-based decision making
   - To develop an IVM malaria intervention model using adaptive management system
3. Advocacy and social mobilisation
   - To increase the visibility of the programme and increase its acceptance
4. Intra- and intersectoral collaborations
   - To strengthen coordination and partnership development for malaria prevention and control
5. Capacity building
   - To strengthen human resource and laboratory capability to support IVM strategies.

6.1.3 INTEGRATED APPROACHES

The Kenya National Malaria Strategy’s main objective is “to reduce the level of malaria infection and consequently deaths by 30% of the current levels by the year 2010 and to have a “malaria free Kenya” by 2017”. The Malindi project targeted reduction of the mosquito vector densities through an evidenced-based, community empowering decision-making process for choosing and implementing an integrated vector management approach. The strategies employed included scaling up the

ACHIEVEMENTS OF THE INTEGRATED APPROACHES

- A steady decline in larval densities over time (37.2%)
- Most productive habitats, such as abandoned swimming pools and wells managed well
- Due to wide range of habitats used by culicine mosquitoes larval fluctuation has been erratic over time: larval productivity is a function of peri-domestic habitats and rainfall
- Overall there has been a 60.3% decline in Culex larval densities
- The mosquito densities were highest between June–October 2006
- Over time there has been a steady decline of Anopheles (65.3%)
- Small upsurges (peaks) are seen coinciding with rainfall season
- There has been a significant decline in Culex population (52.9%).
use of long-lasting insecticide-treated bednets (LLINs), environmental management (EM) to reduce mosquito breeding sites and application of larvicides in breeding sites that could not be eliminated. In addition, the project collaborated with local health facilities (district and sub-district) to enhance prompt diagnosis and treatment of malaria and to prevent malaria during pregnancy. The local media (TV and Radio) were involved in spreading the messages on LLINs and effective drugs against malaria.

The interventions in Malindi were derived from a baseline survey and continuous research that informed the decisions and choice of interventions that constituted the IVM strategy. Thus, research had demonstrated that larval sources were mainly man-made (<90% sources). Of significance was the existence of many swimming pools in Malindi that would be drained and go unused for prolonged durations straddling the two most important rainy seasons and allowing for collection and stagnation of freshwater for long periods. Another important man-made mosquito source were numerous water wells dug to supplement the municipal supply that did not reach many in the peri-urban and rural Malindi, which remained uncovered. In addition, the uncollected plastic waste and clogged up drainage systems of Malindi municipality all increased the breeding sites. These man-made factors were aggravated by Malindi’s warm temperatures, ranging between 22 and 30°C, average relative humidity of 65% and the town’s clay soils which are susceptible to flooding, making optimal mosquito environment. The research also found that the definitive recipients of the LLINs were unaware of the need for and did not know how to use the LLINs. It turned out that once the LLINs were donated, some of the recipients kept them instead of using them and only brought them from storage when they had an “important” guest from outside Malindi (e.g. from Nairobi). Some even used them for covering seed beds to protect seedlings from birds. Yet, information gathered from interviews with the community members, and the District hospital staff, indicate that malaria was the most important disease in Malindi.

The integrated approaches consisted of:

- Distribution of LLINs, initially to cover those at highest risk, including under 5-year olds, pregnant mothers, people living with HIV/ AIDS and the aged. Later the MOH carried out mass distribution of LLINs in accordance to MoH’s 2012 endeavour to effect universal bednet coverage.
- Larval source management (LSM) through environmental management (draining and filling) as well as testing of biolarvicides (neem, Dimilin, Larvex 100, Bti/Bs).
- Community education and participation through community level (neighbourhood) campaigns and school based (school health clubs dubbed “children as agent of change in malaria and mosquito control”). The education included correct application of the IVM approaches and bednet retreatment.

The integrated approaches were centered on mosquito scouts, who were assigned 1-km² grid cells to survey and measure adult and larval mosquito densities, educate and mobilise communities within those cells for IVM approaches, and organise and head neighbourhood campaigns and school based health and environmental clubs. Majority of mosquito scouts were drawn from pre-existing community based anti-mosquito/malaria groups/organisations, including Punguza Mbu na Malaria Malindi (PUMMA) and the community based health workers. The mosquito scouts were selected from and with full participation of the community.

Community education created awareness on the repertoire of mosquito breeding sites within their habitation, how a majority of them could easily be eliminated and how those that could not be eliminated could be kept mosquito free through larviciding, initially using Bacillus thuringiensis israelensis (Bti). They were then involved in participating and owning the elimination of the majority of breeding sites by filling up and draining stagnant pools of water, collecting and removing waste plastic containers, covering water wells, toilets and household water storage tanks. The community, through mosquito scouts, was mobilised to survey and identify mosquito breeding sites, determine adult and larval mosquito densities, apply the bio-larvicides and manage the environment to eliminate breeding sites (filling up and/or draining breeding sites) in addition to spraying with bio-larvicides, and/or stocking with fish fingerlings, the sites that could not be eliminated. The Ministries of Health and Public Health provided the data on malaria prevalence and policing of the maintenance of environmental management for malaria control, respectively, thus increasing the reach within and compliance of the urban communities with the IVM activities.
6.1.4 EVIDENCE-BASED DECISION MAKING

The finding that 90% of the mosquito breeding sites were man-made and that the community appeared not to know their role in the formation of those sites, that they did not use bednets correctly even when they were provided and did not connect their activities vis-à-vis environmental management with mosquito breeding, was evidence that they needed education. The decision to educate them was, therefore, evidence based. The outcome of that education had far-reaching effect in reducing the vector density by over 90% within the duration of the project as well as malaria prevalence within Malindi by over 60%.

Pre-existing health records indicated malaria was the most important disease in Malindi (it was holoendemic) providing evidence for the malaria IVM. There was also the potential of dealing with filariasis, another mosquito-transmitted disease endemic in Malindi, which was an added advantage. The evidence-based decision making (objective 2) was also evident through the findings that the project continuously built on successes of the past interventions: the adult mosquito density surveys grew from weekly surveys in 16 1-km² cells through 32 cells bi-weekly to district wide bimonthly surveys in 40 villages. The larval sampling and density estimation has spread to the district and is currently being undertaken every week.

During the implementation of the project, it was found that the availability of the larvicidal Bacillus thuringiensis israeensis (Bti) was not always guaranteed and that its cost was high, risking the sustainability of Bti use in the breeding sites that could not be eliminated. This led to research into locally available materials, such as neem, which could be used as alternative biolarvicides. It is not clear why the larviciding in Malindi is still mainly reliant on Bti and why detailed experimentation on its potential and application has not taken place or is not reported in this site. Studies in Ethiopia and Nyabondo indicate that neem is just as larvicidal as Bti, albeit slower in effecting the larviciding; and because it has a longer period of effect compared to Bti, it would auger well for sustainability of the project. The fact that neem grows naturally in Malindi and that extracts from coastal neem have double the concentration of active ingredient than the highland (Tolay) one (6% vs 3%), would auger well for the development of a cheaper, readily available biolarvicide. However, whether these biolarvicides had any harmful effects on soil/environmental commensals is not discussed in the reports from any of the BioVision sites. There are plans to test and identify as many such biolarvicides as possible. There are also groups within Malindi that manufacture neem products for sale. There exists an income-generating activity here for neem oil extraction and formulation of biolarvicides, which needs to be explored and transferred to these communities and/or linked to the malaria control groups such as PUMMA.

6.1.5 ADVOCACY AND SOCIAL MOBILISATION

The project has been popularised through Malaria Days, which receive media (Radio and TV) attention and broadcasting every year. During the annual Malaria Days, the project has held exhibitions and demonstrations, broadcast radio and TV documentaries, and had school clubs compete and win trophies for exemplary malaria control activities, songs, dramas, poetry and artifacts about mosquitoes, or objects using the waste plastic collected to eliminate the potential mosquito breeding sites. In addition, the project has utilised schools’ health and environmental clubs to advocate for control of mosquitoes and malaria. The Malaria Day is probably the most important annual event in Malindi and has, therefore, made the project locally and nationally visible. Local dancing troupes and school health and environmental clubs, have found expression during the Malaria Day and have, therefore, made malaria control an important part of their activities.

This has spurred them to become more involved in mosquito/malaria control activities. The media attention on Malindi, featuring a positive community activity has raised the Town’s profile and is, therefore, considered a good thing by the Municipal Council. This has in turn steered the Municipal Council to support and in some cases police the covering and elimination of breeding sites.
The mosquito scouts have been trained on the identification of mosquitoes, their breeding sites and elimination. In addition, during the training and implementation, these scouts have gained community interactive skills, trust and respect, raising their self esteem and social capital. People seek their opinion not only on matters of mosquito and malaria, but also on other matters. The training, for most scouts, is the only one they have ever received and their involvement in the IVM project the only form of gainful employment they have experienced. Because of this training, a number of scouts have found gainful employment in other projects and organisations. This entices other people to be involved in mosquito control activities.

Groups directly involved in mosquito control (such as PUMMA) have developed income-generating activities around mosquito control activities, including making baskets, poles and blocks using waste plastic paper, which they sell. While collecting the waste plastic, the groups also collect garbage and keep the town environment clean. Some of the groups have found opportunities for income generation through composting of the organic garbage and selling manure. This connection of mosquito control to income generation uplifts the socioeconomic status of the people involved and has become a central activity for a number of groups involved and is spreading to others. Should this continue, then removal of potential mosquito breeding sites will become a way of life in Malindi. The fact that the groups dedicate a proportion of the income to mosquito and malaria control would appear to suggest sustainability of the mosquito control activities as the income grows. There is, therefore, a need to boost the incomes by connecting the products to markets, through the malaria IVM and/or other projects. There is also a need to explore whether fish farming in the fresh water ponds can be developed and a niche market developed at the Coast.

The community involvement and ownership of the project in Malindi is impressive. The project is well managed, the communities clearly see the benefits and testify that they will not stop the activities even in the event of the project funding coming to an end. However, the presence of the project institutions (KEMRI/icipe) is viewed as an authority that can unclog bottlenecks when they do appear, is respected by the Municipal Council, Ministries of Public Health & Sanitation, Fisheries, Environment and Natural Resources. In the words of several mosquito scouts, these institutions are like parents, whose authoritative input is taken seriously by all stakeholders. Although the project has formed a stakeholders’ forum that could take over this authority, it is clear from interviews with the various stakeholders that the presence of the project (and the institutions) will be needed in consolidating the authority and ownership of the activities by the stakeholders and the recipients.

Several academic publications have been published, making the project known to the academia. The fact that there are peer-reviewed publications from this site means that there is a lot of data that has been collected over the years. This needs to be entered into a database from which malaria control IVM messages can be formulated. The database should, with right authorisation and non-disclosure agreements, be availed to the rest of the projects for cross learning and enhancement of implementation. Since the Malindi project has gone through and overcome many of the IVM delivery hurdles, the project should spearhead the formulation of a manual for the delivery of IVM to communities.

### 6.1.6 INTRA- AND INTERSECTORAL COLLABORATION

The activities of this project clearly demonstrate that health is an intra- and intersectoral issue, especially in Malindi. The project has further demonstrated that IVM strategies involving environmental management play a major role in controlling mosquito densities and, therefore, malaria prevalence. The integrated vector management focused on educating the communities through selected community scouts, the PUMMA network and working together with the Malindi Municipality for environmental management as well as with the District Hospitals.
Health and Public Health officials to take care of malaria and public health issues propelled this project for considerable gains. It brought in community ownership, demonstration of the health gains through the Ministry of Health (MoH) as well as environmental health policing through the Ministry of Public Health and Sanitation and the Malindi Municipal Council. The Ministry of Fisheries provided fingerlings that were used to control mosquito densities in some unused swimming pools and other breeding sites (natural water ponds) that could not be drained or filled up. In addition, the involvement of communities to cover water wells and pit latrines included the communities.

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<th>Partners involved in malaria and mosquito control in Malindi</th>
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<tr>
<td>- Kenya Medical Research Institute (KEMRI)</td>
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<td>- International Centre of Insect Physiology and Ecology (icipe)</td>
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<tr>
<td>- Ministry of Health/Ministry of Public Health and Sanitation/Ministry of Medical Services</td>
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<tr>
<td>- Malindi Municipal Council</td>
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<td>- Malindi Resident Forum</td>
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<td>- PSI Kenya</td>
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<td>- Tawfiq Hospital</td>
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<td>- AMREF</td>
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<td>- Commercial banks</td>
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<td>- International Committee for the Development of Peoples (CISP)</td>
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<td>- Hotel industry</td>
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<td>- Malindi Green Town Movement</td>
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<td>- APHIAplus (AIDS, Population and Health Integrated Assistance) Kamili Project</td>
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<td>- Kenya Red Cross Society</td>
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Having trained PUMMA and worked with them for some time, the project is shifting the mosquito scouts responsibility to PUMMA. The project now contracts PUMMA to supervise and pay the scouts. This has the effect of leaving the project time to deal with expansion into other areas of Malindi while retaining surveillance and sentinel sampling of initial sites. The National Malaria Control Programme (NMCP) is being sensitised and it is hoped that it will take over the malaria and mosquito surveillance activities.

There were challenges in keeping the communal (no man’s land) pools covered or free of breeding mosquitoes. These included municipal council septic and sewer tanks in some urban and peri-urban areas. Even when the mosquito scouts and the project provided covers, they were constantly removed or shifted by people and/or livestock. It should be investigated whether the Municipal Council or the project could fence off these tanks to keep the lids/covers on (demarcate a wayleave for the septic/sewer tanks). Violation of those wayleaves could attract penalties from the Municipal Council.

It should also be investigated whether the Ministry of Tourism and National Environmental Management Authority (NEMA) could work together to connect licensing of tourist villas to responsible management of unused swimming pools, considering the risk to which they expose the Malindi community. This would shift the expenditure on maintaining the pools free of mosquitoes from the project to the business owners and would impart sustainability beyond the project funding period.

6.1.7 CAPACITY BUILDING

**KEY MESSAGES DURING NEIGHBOURHOOD CAMPAIGNS**

- Causes of malaria.
- The importance of avoiding mosquito bites and methods of avoiding them.
- The risks involved when young children and pregnant women get malaria.
- Proper use, care and maintenance of ITNs.
- The importance of seeking appropriate medical attention for young children at the first sign of fever.
- Why pregnant women should sleep under ITNs and that they are available free when they go for antenatal clinic services.
- Mosquitoes are around all of the time; do not wait for the rainy season to be protected.
- Sleeping under a mosquito net provides security knowing that family is protected from mosquito bites.
- Money is saved when families are not spending it on transportation to/from clinics and medicine.
- Mosquito nets must be used for sleeping under, not for fishing or protecting garden plants.

The capacity building at several levels centered on the mosquito scouts, who were trained as community trainers on matters of mosquito control. The training and involvement of community-selected mosquito scouts brought ownership of the control strategy within the community and augurs well for sustainability beyond the project funding period. They were also trained to identify and distinguish different mosquitoes at different stages of development, their breeding sites, elimination of breeding sites, spraying of breeding sites, mosquito surveys as well as community interactive/mobilising skills. The trained mosquito scouts became trainers for the various community groups, school clubs and households and mobilised neighbourhood campaigns.
for destruction/elimination of mosquito breeding sites in addition to actively carrying out mosquito and breeding site surveys. It is through the mosquito scouts that the training on proper usage of long-lasting insecticide-treated bednets was carried out.

The existence of an anti-mosquito action network (PUMMA) and community health workers (CHWs), was an added advantage to the efforts in Malindi. Majority of the mosquito scouts were derived from these networks and through them, majority of the integrated mosquito control activities were carried out: LLINs mass distribution by MoH in 2012; larval source management (LSM); environmental management (draining and filling) and testing of biolarvicides (neem, Dimilin, Larvex 100, Bti/Bs); community education and participation, for example community level (neighbourhood campaigns) and school based health clubs, dubbed “children as agent of change in malaria and mosquito control”. These networks empowered the communities to negotiate for change in behaviour within the communities as well as policing of anti-mosquito activities by the District Public Health Ministry.

In addition, two PhD students have been trained and one is currently training on the project expanding the capacity and capability of dealing with issues and activities of the project.

### 6.1.8 ASSESSMENT OF THE ACHIEVEMENTS

Starting in 2005 the project titled “The applicability of available technologies for adaptive integrated malaria vector management in Malindi, Kenya” has had the most continuity in terms of staff and outreach in one area and has built onto its own experiences and grown to accommodate gaps experienced on the way. It therefore follows that sufficient human and time resources have been allocated to this project including 2 entomologists trained to PhD level, a sociologist trained at MSc level, a laboratory technologist (HND), 3 senior field workers and a data entry clerk. All the objectives of the project were achieved. The continued presence of a sociologist within the project ensured identification of the right entry points, engagement of existing common interest groups (such as the PUMMA, CHW, schools’ health and environmental clubs) as well as the recipient communities. Because the project is spearheaded by a senior entomologist who understands the issues, this was a great advantage to implementation of the IVM approaches. This project has achieved an impressive list of deliverables with significant short-term impacts. The establishment of a functional IVM strategy was based on a systematic assessment of the mosquito control needs of the Malindi community, followed by the development of the required mosquito control capabilities within the project staff. The basic model of this intervention is captured in the central role of the mosquito scouts who subsequently rolled out the IVM approaches to the community. These mosquito scouts have effectively become a network of mosquito control training and support point persons, who serve various community needs.

Within 2 years of the project, 16 training of trainers (ToTs)—individuals who are initially trained to continue helping in facilitating in more training of others—trained 62 mosquito scouts and 30 mosquito action groups (MAGs) in financial management and good governance, and 150 spraymen. Another 30 public health officers have been trained in IVM strategies, including planning and management. The project employed a battery of communication formats to reach almost every Malindi community member—from media (Radio, newsletters and TV) through to the Malaria Day celebrations, club and group competitions, neighbourhood and door-to-door campaigns, exhibitions and the development of information, education and communications (IEC) materials. An advantage is that the project core staff have remained with the project throughout, giving it continuity. This was made possible by additional outreach project funding from the BioVision Foundation, following a request by the Malindi project team, which was dedicated to advocacy, communication and social mobilisation. A 37.5% reduction in anopheline malaria vector larval densities in breeding sites and over 65% reduction of anopheline indoor resting densities, has been achieved with a corresponding 62% reduction in malaria prevalence.

The formation of a stakeholders’ forum was a great idea and an attempt to consolidate the mosquito and malaria control in Malindi. Although the chairmanship of this forum rotates amongst stakeholders, which would impart stakeholders’ ownership, the complete buy-in has not been achieved with majority of the efforts and driving of the forum being considered a project (icipe/KEMRI) activity. There is a need to consolidate this which might require the services of a communications specialist, who would develop a strategy that would engage the diverse stakeholders and bring about ownership of the activities.

### 6.1.9 SUSTAINABILITY OF THE PROJECT

Overall project management, in my assessment, has been excellent with very few and non-critical delays in delivery. The involvement by the community has been negotiated and secured. Various partnerships—academic, health, social and business—have been formed. The end result is a very effective, efficient and sustainable initiative.
6.1.10 POTENTIAL SIGNIFICANCE AND IMPACT

The reach of the project through the network of 28 mosquito scouts and emerging partnerships through the stakeholders’ forum is already impressive. The potential multiplier effect of the current activities signifies huge potential and future impact.

6.1.11 SUGGESTIONS FOR THE MALINDI PROJECT

1. There exists an income-generating opportunity for neem oil extraction and formulation of biolarvicides, which needs to be explored and transferred to those communities and/or linked to the malaria control groups such as PUMMA.

2. The connection of mosquito control to income generation uplifts the socioeconomic status of the people involved and has become a central activity for a number of groups involved and is spreading to others. This needs to be encouraged to make removal of potential mosquito breeding sites a way of life in Malindi. This would definitely give the project sustainability.

3. Although the project has formed a stakeholders’ forum that could take over the evidence based decision authority from the project, it is clear from interviews with the various stakeholders that the presence of the project (and the institutions) will be needed in consolidating the authority and ownership of the activities by the stakeholders and the recipients.

4. It should be investigated whether the Ministry of Tourism and the National Environmental Management Authority (NEMA) could work together to link licensing of tourist villas to responsible management of unused swimming pools considering the risk to which they expose the Malindi community. This would shift the expenditure on maintaining the pools free of mosquitoes from the project to the business owners and would impart sustainability beyond the project funding period.

5. Consolidation of the impact, especially in winning the icipe–KEMRI support would require a stakeholders’ forum, the full involvement of the municipal council, and the policing of the IVM environmental health approaches by the MoPHS, NEMA and MNR.

6. The finding that community groups that have found income generation through involvement in IVM contribute proportions of the income to mosquito control strategies, suggests that this could, if sufficient amounts are generated, sustain the IVM application in the area. It is recommended that income generation activities around the project be explored and supported as a way of consolidating the gains of this project.

7. The project has gained community trust and has established a good model of transferring IVM and other projects into this community. It is recommended that the networks and community engagement and trust established be utilised to deliver other technologies, e.g. the African Fruit Fly Programme’s mango IPM package, could be of great help to the community. If delivered through the value chain approach, it might generate the much needed income for communities to own and finance many of the IVM approaches for mosquito control.

8. Large amounts of data have been generated during the 8 years of this project. This data needs to be mined, analysed and documented in various formats and disseminated through the communication channels already established in the project. A book can be published in both hard and electronic media for wide distribution, as a model IVM strategy.

9. The project has generated data that the project staff might not have time to database and this might lead to loss of valuable information and value for money for the project, e.g. results of a baseline survey mentioned as a formative to this project have not been included in any project report. It is recommended that a database manager be hired to put it all in a database and a workshop to discuss and document the project outcomes and impact be held. It is further suggested that the Malindi project spearheads the formulation of a manual for the delivery of IVM to communities.

10. Once this model approach is documented, then expansion to new areas with similar agri-practices and ecology such as the South Coast of Mombasa, Tiwi, Diani, Msambweni, as well as to neighbouring countries such as Tanzania, should be considered.
6.2 PROJECT 2: INTEGRATED VECTOR MANAGEMENT FOR MALARIA CONTROL IN NYABONDO

The most important income-generating activity is brick-making, which leads to countless soil excavations. With the rains, these excavations form large water accumulations, which are ideal malaria mosquito breeding places. A comparative GIS study was conducted in 2005 to determine the surface of the water bodies during the dry and rainy seasons, among other geo-physical parameters. This investigation has shown that in 20 cells in which mainly brick-making is taking place, the water-surface increased up to 850-fold in the rainy season as compared to the dry season. The brick makers cut into the earth to dig out mud for making bricks. Once the activity is complete, these pits are abandoned, and quickly fill up with water during the rains, becoming major breeding sites for mosquitoes. Samples taken by icipe scientists showed that there were far more Anopheles mosquito larvae in the puddles created by the abandoned brick-making pits than there were in the larger ponds. With thousands of abandoned brick-making pits littering the Nyabondo plateau, malaria spreads quickly through the settlements that are located close to the breeding sites.

6.2.1 OVERALL GOAL

To reduce significantly and in a sustainable manner malaria morbidity and mortality in Nyabondo (Nyando District, Nyanza Province, Western Kenya).

6.2.2 OBJECTIVES

1. Integrated approach:
   • To conduct operational research in IVM
2. Evidenced-based decision making
   • To develop an IVM malaria intervention model using adaptive management system
3. Advocacy and social mobilisation
   • To increase the visibility of the programme and increase its acceptance
4. Intra- and intersectoral collaborations
   • To strengthen coordination and partnership development for malaria prevention and control
5. Capacity building
   • To strengthen human resource and laboratory capability to support IVM strategies

6.2.3 INTEGRATED APPROACHES

Like in Malindi, the integrated approaches in the Nyabondo site included weekly monitoring of Anopheles and Culex mosquito larval and adult densities (using CDC light traps for the adults). Infested ponds were treated with larvicides (Bti and/or neem), breeding sites were manipulated to establish and/or improve drainage (water management) or filled up to eliminate them; or fish were introduced into the ponds as mosquito larvae predators. Malaria prevalence was monitored through monthly data obtained from three participating hospitals. However, monthly malaria prevalence data were not easy to collect from the hospitals, a fact that is reflected in the reports from the different years of this project. Community involvement was hard to gain because they expected to be paid to participate in the IVM activities. The occurrence of the post-election violence, with this area being one of the sites most affected, disrupted the activities for 6 months. Even after this period, it took time to re-establish community participation in the project. The community was mobilised to participate in these activities as well as in the use of insecticide-treated bednets (ITNs) and indoor residual spraying (IRS).

The results of larviciding indicated that Bti reduced larval densities by over 90% within 3 days of application and that the ponds remained larva-free for a period of about 5 days. Neem, on the other hand, was found to be just as larvicidal as Bti but started killing larvae 5 days after application, and its effects lasted for 5 weeks. So pond treatment was carried out with Bti for quick action, followed by neem. The combined effect brought about sustained suppression of larvae. The use of Aquatain, a monomolecular surface film as an additional means of controlling mosquito larvae in Nyabondo, was proposed due to its ability to spread beyond the application areas
and is particularly useful over large water surfaces, which appear in Nyabondo during the rainy season. This would be extremely helpful because Nyabondo floods in the April–May rains season, extend the water surfaces by over 850-fold, making control efforts counterproductive during rainy seasons. This would also be useful because there is a perpetual increase in brick making activities, fuelling proliferation of mosquito habitats. It would be worthwhile investigating the use of brick making machines that utilise less soil and do not use wood during the drying process, thus reducing the number of ponds made and containing deforestation.

The problem of proliferation of breeding sites was aggravated by delayed stocking of a government fish farming drive. However, the stocking of these ponds with fingerlings provided an income-generating activity that was also mosquito controlling. Collaboration between the IVM project and the Ministry of Fisheries would appear to be a natural path to follow, especially because it would connect project activity with income generation and give the project sustainability beyond the project funding period. However, this does not seem to have happened yet.

### 6.2.4 Evidence-Based Decision Making

A baseline survey was carried out and revealed that 74% of the respondents perceived malaria as a health risk associated with brick making. It further revealed that *Anopheles* mosquito larvae were, respectively 4 and 3 times more likely to be found in artificial ponds and abandoned fish ponds, indicating that the ponds actually posed a risk of malaria being transmitted. In addition the respondents believed that an IVM consisting of planting trees (35%), draining of abandoned ponds (24%) and back filling with broken bricks (20%) would be amongst the best ways to tackle abandoned pools. These findings indicate that the decision to start the malaria IVM in Nyabondo was evidence based.

The decision to target abandoned brick ponds was based on the observation/evidence that these sites had more anopheline larvae than other sites. In addition, it was only after evidence was generated showing the complementary activities between *Bti* and neem, that the project decided to combine their use to prolong the larvicidal effect to 5 weeks thus saving the project the cost of repeated *Bti* use and spraying trips to the breeding sites, and hence reducing project costs. It is a pity that the cost–benefit ratio of using *Bti* and neem was not reported here. It would have been interesting to see how much more using neem might have saved the project. A lower cost would mean that communities would find it easier to buy. However, its being locally produced and even manufactured implies there must have been some cost saving.

The decision to use fish predators against mosquito larvae was also based on the observation that ponds that had been stocked with fish were completely larvae free. The fact that the government was actively engaged in a fish farming drive was a great opportunity to this project. The evidence that growing fish in abandoned and/or rehabilitated ponds generated income for widows and school clubs has provided evidence that this might actually provide a lasting solution to mosquito control in most ponds, if not all. Engagement and collaboration with the Fisheries Ministry should, therefore, become a priority in future phases of this project. The synergies already developed by the project encouraging fingerling production by some schools should be explored further. It would also be beneficial for BioVision to support the value chain production of such fish to consolidate the gains of this project and solidify its sustainability.

### 6.2.5 Advocacy and Social Mobilisation

The IVM would be impossible without proper community mobilisation and solid network creation. Engagement with communities usually takes time and is usually connected with persons they get to know and trust. It usually takes about three months of continuous contact with a community to develop such trust and relationship. Unfortunately for this project, several factors worked against this from the very beginning. The project started in 2004 as an independent project but had similar objectives to the one in Malindi. However, the community failed to see this as a learning/development opportunity and instead saw that a person from a different community had been imposed on them. It, therefore, took time for buy-in to happen. In addition, the community expected monetary compensation for participating in project activities. They did not see it as a thing that would benefit the community. This was mainly because the area had so many other development projects, some of which paid the community for participating. The project argued that it was not paying for attendance but compensating for travel and loss of income the participants would have incurred if they had not attended the meetings or if they had not been participating in those activities. It did not help matters that majority of the brick makers were not members of that community but had hired plots of land on which they were dependent for their livelihoods. Moreover, four coordinator changes happened within a span of six years. This meant that continuity of the community trust bestowed on a coordinator kept being broken. Matters were aggravated by the post-election violence in 2008 which saw the project activities stop for six months.
It is, therefore, commendable that despite this, the project managed to recruit and train 12 mosquito scouts; reach and involve 14 school health clubs and patrons, and teach pupils on mosquito control and malaria; connect with the Ministries and start fingerling-producing ponds with two schools and even manage to connect the project produce to markets, fetching over KShs 30,000 within the first harvest. The project put in a lot of effort to try and get buy-in: It undertook several community trainings, exchange visits and an annual educational visit (mosquito control, resource mobilisation, Kilifi visits, fish farming), developed and distributed information education and communication (IEC) materials annually to the community as well as carry out media broadcasts through Radio.

In addition, more than 10,000 m² of trenches were dug to drain abandoned pools while *Bti* and neem were used as larvicides in pools that could not be eliminated. Two annual Malaria Day celebrations attended by over 3000 people were held where 1000 brochures about the IVM project were distributed. Focus group discussions were held with one youth group and the school health clubs’ patrons. The outcome of those discussions included the youth group committing to take up fish farming and fingerling production activities on behalf of the project, coordinate project activities at all day primary schools in Nyabondo, carry out advocacy on behalf of the project and sustain the activities after project phase out.

### 6.2.6 INTRA- AND INTERSECTORAL COLLABORATIONS

The project connected with the Ministry of Fisheries for fish farming; Ministry of Education to distribute the ITNs and monitor the malaria prevalence; and Ministry of Agriculture and the National Environment Management Authority (NEMA) for land reclamation. The project also formed an umbrella community based organisation (CBO) dealing with mosquito control, from which it drew mosquito scouts and managed to integrate the activities of this CBO with the teacher committee, giving the project invaluable gains. In addition, media was drawn in to bring *Radio Nam Lolwe* working with the communities.

One gets the impression that although this has taken place, it needs a lot of consolidation since majority felt they needed to be compensated for participating in project activities—as if they are giving a service to an external entity rather than achieving their own performance indicators. The formation of a stakeholders’ forum with a view to level expectations so that they create project buy-in to enhance their participation and develop joint work plans with them, would be useful for this project.

Integrating the teachers’ committee with the umbrella community CBO has been invaluable: (i) The teachers have a general higher level of understanding and logic, so their participation helps to shape and strengthen activities of the community groups, (ii) active community participation boosts success of the mosquito/malaria control activities, and (iii) partnering with locally active government departments and the community has helped to improve community access to health care and other government services/facilities.

### 6.2.7 CAPACITY BUILDING

Several community trainings, exchange visits and 1 educational visit were carried out annually, building capacity on mosquito control, resource mobilisation and fish farming. In addition, annual visits to Kilifi for reciprocal learning with the Malindi project were undertaken. Through school health clubs and patrons, 14 schools have been trained on mosquito and malaria control IVM approaches; 3000 members of the community have been
trained to recognise and eliminate man-made mosquito breeding sites and sensitised on IVM approaches. In addition, the Malaria Day celebrations, IEC materials and radio broadcasts kept educating the community on IVM based malaria and mosquito control strategies.

This project has not trained students at university level and has not managed to develop the capacity of its staff at that level. It was understood that the project lacked the supervisory capacity to do that since it was not until 2011 that PhD level staff were deployed to this site. Now that qualified staff have been employed, including postgraduate training in the project, would avail a skilled workforce and also be the basis for developing capacity and capability within the project.

### 6.2.8 ASSESSMENT OF THE ACHIEVEMENTS

This project had a faltering start with many changes of coordinators and problems associated with community and stakeholder engagement and involvement. In fact, the community buy-in and stakeholder engagement has not been fully achieved. This is understandable considering the project has had many staff changes and discontinuation after the post-election violence. There is a need to dedicate a full-time sociologist within the project. The R&D activities in Nyabondo, though successful, were achieved under great financial strain. This strain was partly caused by activities considered to be highly labour-intensive, such as spraying the ponds and *icipe* field officers being paid daily allowances that had not been budgeted for. It is not clear whether the *icipe* staff being paid these allowances had been employed by the project or they were being called in from other projects, which would justify these daily allowances. The project staff in the three project sites not being remunerated uniformly might have contributed to the need for daily allowances in a site that had the lowest remuneration packages. However, this unequal distribution is common when dealing with different projects even if the donor is the same. The complication with this one would have been because the institution implementing activities in the three different project sites was the same. Consolidating the three project sites within one programme would have harmonised remuneration, management, activities and reporting, in addition to encouraging cross learning.

Nevertheless, the project still managed to eliminate anopheline larvae from the abandoned brick pools by rehabilitating them and stocking them with fish and making that an income-generating activity, digging 11,000 m$^2$ of trenches to drain pools, reducing anopheline larval mosquito densities in the ponds by at least 71% and indoor resting adult densities by 41%. By 2009, there was a 62% reduction in malaria prevalence in the region within the first few months and 86% use of bednets. However, the data is so inconsistently presented throughout 2007 to 2009 that it is difficult to show a trend. This could be attributed to the fact that the staff attached to the project site had not been as qualified as those in the Malindi project. As a result, the earlier reports were not as comprehensive or as coherent as those that were written in 2010 and after when more qualified staff (PhD level manager and coordinator) were attached to the project. The fact that the Nyabondo project also received the reporting templates two years later than other sites might explain why the earlier reports were inconsistent and difficult to draw a trend from. It would have been great to show the continuity of the gains; however, having been funded one year at a time, it is understandable that the reporting was done as separate projects without much connection between years.

If the effect on incidence of malaria was going to be followed, there should have been concerted efforts between the IVM and hospitals, and a template for recording the data should have been harmonised in all participating hospitals/dispensaries. It would have been good to identify a person in the hospital and made him/her responsible for recording the data and facilitated to do so, e.g. by providing training on data entry into a specific data collection sheet. This might have had them doing extra work and therefore facilitation for that extra work might have been necessary. Reporting of data after intervention could also have been harmonised. This would have made it much easier to show the trends in mosquito reduction, capacity building in communities, schools and scouts. It would also have helped the project to determine outcomes had the templates been harmonised across the sites so that when it came to assessing impact, the data could have been easier to compare.

Disruption of the activities between November 2007 and April 2008 by the post-election violence broke the momentum and lost any gains in community ownership of the project. Thus the communities continued to expect to be paid for undertaking project-related activities instead of taking them over. The disruption of the activities for 6 months provided an opportunity to see what the situation would be like without this intervention. A snapshot survey would have served as a baseline for the more consistent reporting observed from 2010. Although demographic surveys are mentioned, the findings on mosquito and larvae densities, and malaria incidence at the resumption of the project, were not reported:

For a community that is looking for monetary gains from this project, connecting the IVM approaches with income generation might elicit a better response as far as buying in is concerned. There is, therefore, a need to
dialogue with the fish pond drive project and investigate modalities for community mobilisation to convert the abandoned brick pits into fish ponds for income generation and environmental management.

6.2.9 PROJECT SUSTAINABILITY

Within the last 3 years, this project has put into place measures giving it potential for sustainability. These include connecting IVM to fish farming, initiation of a stakeholders’ forum, engagement of a local youth group, and formation of 14 school health clubs. However, the period between their formation and now is very short and there are issues regarding viewing themselves as drivers and not service givers to the project. There is a need for a workshop to level expectations, create buy-in and develop a work plan together. There is also a need to develop a clear stakeholder-engagement, as well as communications strategy, to bring in new stakeholders while retaining the old ones for community mobilisation into action. A sociologist and a communications specialist could assist in propelling this project to sustainability.

6.2.10 POTENTIAL SIGNIFICANCE AND IMPACT

Brick making is a sole income-generating activity in Nyabondo that causes interdependent problems—expansion of mosquito breeding sites and environmental degradation (water wastage and deforestation). Introduction of income-generating mosquito controlling activities (fish farming) and environmental conserving activities (water management for use during the dry seasons and tree planting for fuel to stop deforestation), would have the desired malaria controlling impact as well as economic development of the communities involved.

6.2.11 SUGGESTIONS FOR THE NYABONDO PROJECT

1. It is recommended that the use of Aquatain monomolecular surface film as an additional means of controlling mosquito larvae in Nyabondo be investigated, including its effect on soil, water and other environmental commensals. Its ability to spread beyond the application areas would be particularly useful over large water surfaces that appear in Nyabondo during the rainy seasons, extending the mosquito breeding sites by 850-fold.

2. The cost saving from using neem to complement \( Bti \) as a larvicide needs to be worked out. A lower cost would mean that communities would find it easier to buy. In addition, the neem extract’s effect on environmental commensals should also be investigated.

3. Now that the project has qualified (supervisory) lead staff, it is recommended that a postgraduate training aspect be included. This would provide the project with inexpensive skilled workforce and enhance the capacity and capability development within the project, as well as advocacy as universities get to know and publicise the results. It would also bring the universities into the network.

4. The Nyabondo project received the reporting templates two years later than other sites, and that might explain why the earlier reports were inconsistent and difficult to draw a trend from. It would have been great to show the continuity of the gains; however, having been funded one year at a time, it is understandable that the reporting was done as separate projects without much connection between years. My recommendation would be for funds to be allocated for 3 or more years at a time, even if the reporting and disbursement may have shorter durations. In my experience, the community usually requires a minimum of 3 years to fully understand, trust and buy-in for sustainable gains.

5. It is recommended that concerted efforts be made between the IVM team and hospitals and a template for recording the data harmonised in all participating hospitals/ dispensaries to determine the effect on incidence of malaria.

6. It is further recommended that the data collection be harmonised for each year of the project to enable the project draw trends in mosquito reduction, and capacity building in communities, schools and scouts. Harmonising data collection templates will also make comparison across the projects easier.

7. The disruption of the activities for 6 months during the post-election violence provided an opportunity to see what the situation would be like without this intervention. A snapshot survey would have served as a baseline for the more consistent reporting observed from 2010. It is important to start and end a project with baseline and summative surveys to make the impact deductions evidence based.
8. For a community that is looking for monetary gains from this project, connecting the IVM approaches with income generation might elicit a better response as far as buying in is concerned. There is, therefore, a need to dialogue with the fish pond drive project and investigate modalities for community mobilisation to convert the abandoned brick pits into fish ponds for income generation and environmental management.

9. Community buy-in and engagement has been problematic in Nyabondo. Hence, there is also a need to develop a clear stakeholder-engagement as well as a communications strategy to bring in new stakeholders while retaining the old ones for community mobilisation into action. A sociologist and a communications specialist could assist in propelling this project to sustainability.

10. Introduction of income-generating mosquito controlling (fish farming) and environmental conserving (water management for use during the dry seasons and tree planting for fuel to stop deforestation) measures would have the desired malaria controlling impact as well as economic development of the communities involved.

6.3 PROJECT 3: ECOLOGICALLY FRIENDLY MOSQUITO AND MALARIA CONTROL AND PREVENTION PILOT PROJECT IN GHIBE VALLEY/ TOLAY, ETHIOPIA

The Tolay project is the youngest of the three malaria IVM projects supported by the BioVision Foundation. It started in 2008 in a unique way following a successful IVM strategy on animal trypanosomosis. Tolay is a settlement scheme within the Ghibe Valley with community members from different parts of Ethiopia who migrated due to food insecurity, recurrent drought and natural resource degradation. The most important economic activity is mixed agriculture and small-scale trade at the village level. The area is sparsely populated because of high incidence of malaria and cattle trypanosomosis. Cattle are mainly used for ploughing and milk production. Limited infrastructure, lack of agricultural technologies, inadequate social services, malaria, trypanosomosis and poor natural resource management are some of the major constraints in the region. The prolonged use of pesticides to control disease vectors (mosquitoes and tsetse) has resulted in pesticide resistance and become an environmental hazard to the communities. The problem of tsetse flies has been successfully tackled through past efforts of icipe. Building on this work and incorporating lessons learned in Kenya to control malaria, a malaria control project was started. In addition, icipe has started an additional project in Tolay to promote the use of eco-friendly botanical pesticides in the control strategies in an attempt to tackle the problem of resistance to the existing pesticides and conserve the environment, as well as to generate income.

The project covers about 50 km² with land sizes of about 2.5 ha. Most houses are grass thatched (tukuls). There are two villages involved and an army camp situated between the two villages. The cells are not continuous, but are settlements separated by farmland. One village contains 500 HH under one administrative authority, with each having 2500 to 6000 people living in each field. The administrative structure is village in a district within a region. The project is within one district. The terrain lies about 1600 to 1800 meters above sea level, right into a malaria zone. In each village there are 2 community health/rural health extension workers directly employed by the government Health Bureau under the district Ministry of Health (MoH). There is one health centre serving 4 to 5 villages. The scouts are selected by the community and trained on IVM by icipe-Ethiopia country station staff. Majority of the scouts have formal education of upper primary and above. These scouts are the ones that monitor mosquito densities and breeding sites and also collect data, carry out surveys and manage the tree nursery establishment and management. They are also involved in biopesticide trials. These scouts are a bit overstretched. Being an agrarian community, the government has already organised them into agricultural development groups which make it easy to train them.
6.3.1 GOAL OF THE PROJECT

To put in place a functional and sustainable system for ecologically sound IVM malaria vector control as a showcase for the authorities in the region to reduce their reliance on synthetic pesticides for IRS and larvae contro

6.3.2 OBJECTIVES

1. Integrated approach:
   • To conduct operational research in IVM
2. Evidenced-based decision making
   • To develop an IVM malaria intervention model using adaptive management system
3. Advocacy and social mobilisation
   • To increase the visibility of the programme and increase its acceptance
4. Intra- and intersectoral collaborations
   • To strengthen coordination and partnership development for malaria prevention and control
5. Capacity building
   • To strengthen human resource and laboratory capability to support IVM strategies.

6.3.3 INTEGRATED APPROACH

Community mobilisation, involvement and education for take-up of the IVM approaches led to an increase in bednet ownership per household from 81.5% in 2008 to 96% in 2011, and bednet use by children under 5 improved from 32.8% in 2008 to 70% in 2011. There has also been replacement of DDT with deltamethrin for IRS and of temephos with Bti for larviciding the breeding sites. Like in the Nyabondo site, Bti reduced the larvae by 100% within 24 hours and remained effective for about a week. The mosquito sources were reduced by draining water bodies’ potential for mosquito breeding or filling up those breeding sites that could be filled up with soil and sand, and clearing irrigation canals. Anopheline larvae annual surveys indicated a reduction of their densities by 52% since 2008. The prevalence rate of malaria declined by 49% (total malaria cases), and by 35% in children below 5 years of age since 2008.

In addition, the Tolay site had a biopesticide development aspect and investigated plants which grow naturally in Ethiopia, including neem (Azadirachta indica), Annona spp., vetiver grass (Vetiveria zizanioides), cactus (Opuntia spp.), physic nut (Jatropha curcas) and cabbage tree (Moringa stenopetala). For selected plants, proof-of-effectiveness and safety through laboratory bioassays (larvicidal, insecticidal and repellent activities), identification of active and other constituents (GC, CC, HPLC, MS, GC-MS, NMR), evaluation of safety (toxicity levels) of the constituents and standardisation were investigated. This was followed by development of improved formulations capable of delivering compounds to target area of the pest. Neem and another plant (not named for IP purposes) were found to be effective in an inert base formulation in the laboratory. In semi field evaluations, a 0.1ppm formulation of both plant extracts was found to be larvicidal, acting faster and reducing the larvae to lower levels than Bti at 28ppm as shown in the figure below.

Semi-field trials using the eco-friendly biopesticides

![Graph showing the effectiveness of different biopesticides over time](image)

Source: Wilber Lwande, icipe 2012
6.3.4 EVIDENCE-BASED DECISION MAKING

A baseline survey had been conducted that revealed majority of the respondents knew the importance of bednets and owned at least one net which was shared among 1 to 5 persons. However, they did not have access to sources of bednets and did not know how to treat the nets with insecticides. In addition, the majority used DDT and other synthetic insecticides to spray their houses against mosquitoes. It would appear that the decision to use the integrated approaches, including LLINs, IRS, larvicide control through larviciding (using Bti, neem), habitat management and bednet use was evidence based.

6.3.5 ADVOCACY AND SOCIAL MOBILISATION

Malaria control community groups were formed in each village, a malaria control steering committee was formed to direct vector control programmes and anti malaria school clubs were formed to create awareness to school communities through media and on annual Malaria Days.

Malaria control awareness was created by icipe staff and mosquito scouts in collaboration with health extension workers. About 450 people received information on malaria control activities in Tolay and anti malaria club members and teachers visited project activities. Additional awareness creation involved distribution of project information through brochures (450), BioVision Infonet CDs (15), and DVDs on the Malindi Project (15). A Malaria Day event at Tolay attracted about 2000 people from three villages and two schools from Wayu. During the event, poems, drama and quiz competitions were used to drive home messages about malaria, the mosquito vector and their control. Practical demonstrations on the Malaria Day included making ditches (water ways) and removing rubbish in Wayu town and camp compound. About 250 brochures on malaria control written in the local language/dialect were distributed to the participants.

A constraint to advocacy is the difficulty in accessing the district office because of poor infrastructure. In addition, the use of ICTs has not quite caught up. The terrain is also quite constraining on the mosquito scouts who have to use bicycles and traverse long distances to carry out all the activities. The use of ICTs such as radio and mobile telephony should be considered for passing messages to definitive recipients. In addition, were smart phones to be used, then mosquito scouts can be agents of continuous data collection, feedback provision to the project and could also access valuable information from the project and associated databases. In addition, the malaria scouts continuously supplied malaria vector surveillance data to stakeholders and received epidemiological data from health facilities and the Ministry of Health (MoH). A scientific article on community based IVM for malaria control has been prepared from this data and submitted to the coordinator for review. Reading through the report, it is possible, from the data collected from this site, to make trends of how the project is meeting its objectives. Like the other two project sites, there is a lot of data collected from the project, which needs to be entered into a database, analysed, published and widely disseminated. In database creation, the gaps in the data collected will be identified and steps to revamp the data collection tools, techniques and timing made.

6.3.6 INTRA- AND INTERSECTORAL COLLABORATION

The intra- and intersectoral collaboration has already been consolidated into a stakeholders’ forum, which meets and makes decisions on the direction the project should take, and allocates roles of each stakeholder as shown in the table below.

Roles assigned by the stakeholders’ forum

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Groups</td>
<td>• Treating water bodies with oil, neem, Bti</td>
</tr>
<tr>
<td></td>
<td>• Draining stagnant water</td>
</tr>
<tr>
<td></td>
<td>• Organising community clean-up days and malaria control day</td>
</tr>
<tr>
<td></td>
<td>• Involvement in health education activities</td>
</tr>
<tr>
<td></td>
<td>• Participating in mosquito surveillance and disseminating information about malaria control.</td>
</tr>
</tbody>
</table>
Stakeholder | Roles
--- | ---
The Woreda Ministry of Health | • Organising environmental management activities such as draining and filling areas of stagnant water, and garbage collection
• Educating household owners on how to keep homesteads free from mosquitoes
• Management of malaria cases.
Village and Town Administration | • Forming group communication
• Facilitate training and information dissemination programme
• Disseminate materials and equipment for malaria control campaigns
• Facilitate income generation activities for community groups.
icipe-Ethiopia Malaria Control Project | • Providing information on mosquito distribution and disease prevalence
• Providing advice during malaria control campaigns
• Providing awareness, training and demonstrations on malaria vector control and prevention methods
• Organising stakeholders’ meetings and establishing inter sectoral linkage for information exchange and dissemination
• Conducting trials on vector control tools and providing IVM model that suits local conditions.

Source: Melaku Girma, *icipe* 2012

The stakeholders’ forum is already discussing and making decisions on the project. The forum has decided to: (i) step up the communication between the malaria project and the zonal health Bureau; (ii) develop a joint proposal with *icipe* to scale up the project to unreached areas; (iii) conduct joint capacity building programme; and (iv) promote the use of *Bti* for larvae control, especially in villages around a hydro electric dam within the Oromia region.

The community has been drawn into the botanical biopesticide project by planting trees that have potential for biopesticide production. Thus, a community tree nursery was set up at Biftu Beri, which now has 41,325 tree seedlings. In addition, 22,825 seedlings were distributed to various groups with 19,222 seedlings being planted by community members. However, the survival rates were low with only 8833 of the planted seedlings surviving.

![Training in tree planting techniques](image1)

![Tree nursery at Biftu Beri, Ethiopia](image2)

Photos: Wilber Lwande, *icipe* 2012

The project site is suitable for fruit growing and is near enough to Addis Ababa to exploit that market. This provides an opportunity for a fruit fly IPM project. Fruit flies have been reported as a major problem in this region. It should be investigated whether a fruit fly integrated pest management (IPM) production project targeting the fruit fly IPM could be started to boost income generation around the tree nurseries.

### 6.3.7 CAPACITY BUILDING

The project has embarked on building capacity for project implementation: 12 mosquito scouts, 27 health workers and 4 agriculture development agents (DA) were trained on malaria control; 2 postgraduate and 2 undergraduate students were attached to do research and practicals, respectively; and 340 people from the 17 cells were selected.
and trained on malaria control, including larval habitat management. The Addis Ababa University has written a letter of intent to collaborate with the project in capacity building and research. One of the students attached to the project has successfully defended her thesis research.

In addition, the community has been empowered to recognise mosquitoes, their habitat and how to protect themselves. Thus 340 community members from 17 cells were given training on mosquito breeding site habitat management, proper bednet use, and improving their houses by plastering walls and screening eaves. Moreover, 235 community members (64 women and 171 men) were trained on seedbed preparation and tree planting.

### 6.3.8 ASSESSMENT OF THE ACHIEVEMENTS

The Tolay project started with a systematic baseline survey, clearly identifying malaria as an important problem and identifying breeding sites. People were sensitised to the danger presented by malaria-transmitting mosquitoes, the relation between mosquitoes and malaria, and were guided on environmental management and the correct use of bednets. Through community work, mosquito breeding sites were dried out and blocked water channels were cleared. Where this was not possible, stagnant water bodies were treated with Bti. Mosquito scouts were also trained and involved in ensuring the long-term success of the project. The project in Ethiopia targeted a population of 12,000 people.

The Tolay project was demand-driven following the success of the trypanosomosis IVM success. The project capitalised on the trust the community had in the IVM staff and approaches, and build upon the lessons learned from the trypanosomosis IVM. The project has, therefore, accomplished an impressive set of deliverables within a relatively short time (3 years). The community has been successfully engaged and a stakeholders’ forum formed, which has already levelled expectations and assigned roles to each partner. Within the 17 cells of the intervention, the project has made progress in reducing and maintaining the malaria challenge to very low levels (10%) and reduced the density of mosquito population in the area substantially (52% reduction). These achievements have triggered a demand to scale up the project to adjacent villages, the district and region. It should be investigated whether the stakeholders’ forum can bear on the relevant ministries to start income-generating activities in the project area, such as fish farming to make mosquito control a sustainable way of life.

There is a need to address the challenge of project work being compromised during farming peak times (harvesting and ploughing times) when scouts are torn between community and their household farm work. One way of doing this is to follow the Malindi example and remunerate/compensate the scouts when they work on the project. These scouts are the ones that monitor mosquito densities and breeding sites and also collect data, carry out surveys and undertake the tree nursery establishment and management. They are also involved in biopesticide trials. These scouts are a bit overstretched. There is a need to recruit more scouts and to consider compensating them for loss of income when attending to the project activities. The other challenges, including tukuls being not well built, are already solving themselves as the economy improves and communities start to build better housing, reducing mosquito densities within the houses. The delays experienced in delivering sprays for IRS could easily be harmonised to arrive before the rains.

The establishment of a community tree nursery has potential to provide raw materials for biopesticides, generate income and conserve the environment, thus converting the mosquito control into a community development process. Already, the sale of tree seedlings is generating income. It should be investigated whether the extraction of pesticidal compounds for products from the grown trees can become a community income-generating activity.

### 6.3.9 SUSTAINABILITY OF THE PROJECT

Overall project management, in my assessment, has been excellent with very few and non-critical delays in delivery. The involvement by the community has been negotiated and secured, and various partnerships have been formed and given a forum (the stakeholders’ forum). The stakeholders’ forum is already taking charge in deciding the direction future phases of this project should take. The end result is a very effective, efficient and sustainable initiative.

### 6.3.10 POTENTIAL SIGNIFICANCE AND IMPACT

The fact that this project was started through a demand from the site is an indicator of its significance in the area. The reduction of mosquito densities to less than 10% and malaria prevalence by over 50% has a direct impact on the productivity of the now healthy agrarian community. The introduction of tree nursery establishment and
potential for the development of a botanical product economy for IVM and IPM within the region suggest a considerable developmental impact of the project.

6.3.11 SUGGESTIONS FOR TOLAY PROJECT

1. Although the project has achieved a lot, the time has been short and current activities need to be continued to consolidate the gains.

2. In addition, expansion from the first to other sites within Ghibe valley and other sites in Ethiopia should be planned within future phases of the project.

3. Wider field trials as well as the cost–benefit ratios of using plant products as larvicides need to be carried out and investigation of local larvicidal plant products be extended to the other two project sites, and should become part and parcel of the malaria IVM project as it is scaled up to other regions.

4. Thereafter, the registration and modalities for development of the formulations to commercialisation should be undertaken.

5. The possibility of introducing botanical pesticides to other icipe programmes (IVM and IPM) should be broadened.

6. Capacity should be built in communities to produce and process selected plants on a commercial basis.

7. It should be investigated whether the stakeholders’ forum can bear on the relevant ministries to start income-generating activities into the project area, such as fish farming, to make mosquito control a sustainable way of life.

8. The project needs to consider either hiring a field officer and/or compensating the mosquito scouts for loss of income during farming peak times (harvesting and ploughing times) to prevent project activities being compromised.

9. Like the other two project sites, there is a lot of data collected from the project, which needs to be entered into a database, analysed, published and widely disseminated. In database creation, the gaps in the data collected will be identified and steps to revamp the data collection tools, techniques and timing made.

10. The use of ICTs such as radio and mobile telephony should be considered for passing messages to definitive recipients, either directly by the project, or through partnership with an institution that can take over this aspect.

7.0 LESSONS LEARNED FROM THE THREE PROJECT SITES

The lesson learning started with the understanding that the three icipe–BioVision project sites had a goal to use integrated approaches to cut down the prevalence of malaria in each site. It was understood that:

- Each of the sites should present a different project brought together by IVM;
- There has been cross learning from the sites;
- It is more beneficial to consolidate the different projects into one programme;
- Each of the projects present malaria/sites in different areas—coastal, highland and plateau.

It was also understood that the projects were set in three different ecological areas, with different economic activities contributing to malaria endemicity within each site; the projects mainly utilised similar approaches but had some site-specific differences, to tackle the different socioeconomic demographics for sustainable impact on malaria control. It was, therefore, expected that each project had unique strategies for community engagement and some unique activities, and every project team might have come across some innovations, practices and products that could enhance the effectiveness of some or all projects at their respective sites. In addition, it was expected that all the three sites have accumulated a lot of data/information that could be useful in enhancing project impact.

Within the context of icipe as a research institution and with the BioVision Foundation's strategic interest in funding applied research (and by inference technology transfer), the malaria IVM projects needed to have the
following aspects as building pillars for effectiveness:

1. Laboratory and field research to provide evidence for decision making and document impact;
2. Community engagement to create awareness creation, mobilise and educate (build capacity) for sustained action;
3. Partnership with relevant stakeholders (including MOH, MPH, other research institutions, universities, pharmaceutical industries, CBOs, FBOs, schools) for effectiveness and sustainability; and
4. A communications strategy to keep all stakeholders informed and engaged for ownership, sustained action and accountability.

A workshop was held in May 2012 in which an overview of the icipe-implemented BioVision-financed projects was presented within the context of the Human Health Division by the managers of each IVM project. Thereafter, the participants were broken into 3 discussion groups and each group presented with a set of questions, drawn from seven critical questions, formulated to bring out the lessons learned from the projects:

1. How was the current phase managed and how would we like to see it managed in the future?
2. What does it take to make a local consortium work?
3. How do we overcome resistance to change at all levels of model implementation?
4. What are the most effective ways of communication for communities to change practices and behaviours for mosquito and malaria control?
5. What are the best strategies for increasing BioVision and other Grantee participation in malaria IVM?
6. How do we ensure effective engagement of communities with IVM for malaria control?
7. How do we develop and implement workable sustainability and scalability strategies to ensure the continued application of the IVM practices?

To facilitate discussion around these questions, each question was broken down into operational questions:

**Lesson 1: Communication is critical to project management — 90% of the project manager’s job is communication.**

<table>
<thead>
<tr>
<th>Communications of Project Details</th>
<th>How to improve</th>
</tr>
</thead>
<tbody>
<tr>
<td>BioVision communicates with icipe’s project Coordinator, Grants, partnerships and Projects</td>
<td>Proactively make a communication strategy</td>
</tr>
<tr>
<td>Information then trickles down through project coordinators, to managers and then to project team</td>
<td>Maintain the one office communication with icipe BUT</td>
</tr>
<tr>
<td>Intra-site meetings happen</td>
<td>Make plans for regular inter- and intra-site sharing</td>
</tr>
<tr>
<td>Communication of details is donor-driven</td>
<td>Annual project review and development of annual operational plans</td>
</tr>
<tr>
<td></td>
<td>Involve stakeholders</td>
</tr>
</tbody>
</table>

**Lesson 2: If you keep an issues table for the life of your project this will be easy to review at the meetings and act upon**

Since the projects were separate and had been operating as separate entities, there had been issues with:

- Standardisation of operations across the three sites. This was noticed and from 2011 an improvement in inter-site communication was instituted.
- The community in the Nyabondo site had a negative attitude towards the project, feeling that their involvement meant they were giving the project a service. Improved communication and actively involving the communities in implementation process helped a lot.
- A handout mentality in communities was tackled by consistent awareness creation about this being a knowledge transfer project.
- High fiscal and material demands from the collaborators were tackled by the development of stakeholders’ forums through which continuous awareness was created and the perception of the
project being a donor demystified. The stakeholders’ forums are good platforms from which partner roles can be assigned and project exit plan formulated and discussed.

- There were very tight schedules with regard to reporting which need to be addressed, so that project staff can have time to implement project activities.

Lesson 3: We need to document our successful interventions and ‘work-arounds” (changes) for effective scalability

- There is a need to space out the project reports (increase reporting interval to annual) and also to engage a monitoring unit to keep all findings in a database, and to document what went well so that the project can replicate this in new sites and/or review it to make it work even better.

Lesson 4: There is a need to have a budgeting and resource allocation process incorporating dialogue between the donors and the project coordinators/managers

- In the current projects the budget was limited to one year at a time, with additional years’ allocation being conditional to submitting new grant proposals. This creates uncertainty and challenges sustainability. Community engagement requires at least 3 years contract period. It would help the project if the funding was given for at least 3 years, but annual disbursements can be planned with demonstration of annual deliverables being achieved.

- Some of the projects experience shortage of critical human resources, including social scientists, data manager, technicians, entomologists and communications officer, which could have been corrected for in the budgeting and resource allocation process. There might be a need to create capacity within icipe for project resource allocation, since there is a claim that there is insufficient funding for materials and supplies which reflects inadequate budgeting.

Lesson 5: Allow flexibility within the budget and implementation plans to cater for critical process changes (in-flight changes) in achieving the goals

- The current project experienced fund insufficiency to support the development of information, education and communication (IEC) materials and income-generating activities. This could have been catered for by allowing sufficient contingencies and modification of a plan, through an agreed upon process with the donor to prevent substantial change in the project scope.

- Indeed, the projects evaluated would have benefited from modifications to accommodate changes implemented in the work plans to cater for hired transport and contracting temporary staff to carry out project activities.

Lesson 6: Develop a programme to house the three current projects and any other malaria IVM project that might develop in the future

- A programme would have benefited these projects by developing common documentation and sharing programme level tasks and resources such as monitoring and evaluation unit, common and harmonised databases, communications personnel etc.

2. What does it take to make a local consortium work?

Lesson 7: That a local consortium is likely to stay together and perform if there are mutual and/or synergistic benefits to each individual institution

- If IVM objectives also meet the member institutions respective institutions’ objectives and if the activities of the IVM programme would enhance their image.

- The consortium adds more value to their respective institutions by for example, attracting visibility and providing internship opportunities to students who gain valuable practical experience (non tangible benefit).

- If being in the consortium increases member institutions’ profile and opens doors of opportunities for funding (tangible benefit).

- Strength in numbers—The consortium has a holistic approach to issues as well as being multidisciplinary and multi-institutional adds value to the achievement of each institution’s key performance indicators.
Lesson 8: For the projects or programme to become sustainable, additional member institutions may require to be added to the existing collaborators

- Of critical importance to the current projects is the consideration of commercial partners to commercialise the biolarvicides that the projects might develop; and the inclusion of business developers to complete the value chains on the income-generating activities associated with malaria control, e.g. the fish industry in Nyabondo, and plastic recycling in Malindi.

Lesson 9: To draw essential partners to the partnership, the programme needs to be proactive

- Identify areas of common interest to reach a working memorandum of understanding/agreement (MOUs, MOAs).
- Pro-actively seek and interest synergistic and value adding partners to join and/or partner with the programme.
- Document and publicise achievements and best practices of the current projects/programme.
- Draw a clear code of conduct and engagement that levels expectations and spells out obligations, including penalties to keep partners accountable.
- Develop pragmatic strategic and implementation plans.
- Continuously engage with the project teams during the project.
- Periodic review of projects’ progress and feedback to enhance outputs and to keep project focus.
- Have regular partners’ sharing forums to continuously learn from mistakes and experiences for repackaging and repositioning the programme.

3. How do we overcome resistance to change at all levels of model implementation?

Lesson 10: People need to understand the benefits the project has for them and they need to be assured that the project is here to stay with them

- There is a need to develop a communications strategy about the programme, including the benefits it brings to recipient communities and collaborators.
- The communication needs to include messages in the local dialect and needs to be repeated enough to be understood by implementing recipients.
- The communications strategy must have behaviour-changing components such as demonstrations, relevance, authenticity and transparency:
  - Exchange visits;
  - ToTs and field demonstrations;
  - Participatory monitoring; and
  - Cater for different levels of the audiences (e.g. develop training courses in layman terms for the less educated).

4. What are the most effective ways of communication for communities to change practices and behaviours for mosquito and malaria control?

Lesson 11: Develop an impact driven communication strategy that incorporates reciprocal visits and workshops for impact

- Participatory approach—involvement of communities, learning by doing;
- The use of IEC—audiovisual, posters, dramas, skits, songs;
- Demonstration centre/resource centre; and
- Develop a strategy that incorporates reciprocal visits and workshops.

Lesson 12: Develop communication system not only for delivering information but also for getting feedback from communities, collaborators and donors

- Allow for sharing of strategies and findings with the community in layman’s language;
- Involvement of communities in decision making to enable them own the process;
- Use ICTs such as radio, web-based systems with mobile telephony outputs and inward voice responses; and
5. What are the best strategies for increasing biovision foundation and other grantor as well as grantee participation in malaria IVM?

Lesson 13: Documentation of the successful experiences and strategies as “best practice” which can be applied to any discipline—human, environmental, plant and animal—makes the programme sellable to donors

- Visibility of the project achievements (local to scientific levels) increases community and donor participation;
- Success of non-chemical approaches for malaria control and ecological development is a best practice which the projects have achieved; and
- The community and stakeholder reach creates a conduit through which other programmes, practices and technologies can be delivered.

6. How do we ensure effective engagement of communities with IVM for malaria control?

Lesson 14: Repeating the message in diverse formats enhances community understanding, participation and ownership of the project, thus enhancing its sustainability

- Diversify the formats to increase the learning for communities:
  - Development of IEC materials
  - Use of media (radio, TV)
  - FGDs
  - Co-learning
  - Skits, poetry, songs and dance
  - Community involvement strategies
  - Activity orientation (e.g., ball making and modelling)
  - Participation in activities (EM)

7. How do we develop and implement workable sustainability and scalability strategies to ensure the continued application of the IVM practices?

Lesson 15: Connecting malaria control strategies with income generation and empowering the communities/stakeholders to drive those activities to commercialisation is the surest way of imparting sustainability to the projects

- Develop a clear community/stakeholder engagement strategy and involve them in programme development process (including contribution to malaria control programme);
- Build capacity to drive the income-generating mosquito/malaria control strategies (may have to involve value chain partners);
- Involve the whole value-chain partnerships to ensure sustainability of income generation; and
- Apply trans- and multidisciplinary approaches to the malaria control itself.

**8.0 EVALUATION RECOMMENDATIONS**

1. **Document the IVM approach as a scalable best practice:** The successful experiences, innovations and practices that enabled these projects to make impact need to be documented as a best practice, which can then become a model approach to transferring the IVM/IPM to any programme. BioVision Foundation should fund this activity, through a workshop to consolidate the value for money that these projects have achieved.

2. **Consolidate the gains within project sites:** The things that need to be done within the sites to bring about sustainable mosquito/malaria control in the current sites be supported by BioVision Foundation to consolidate their investment in the development of this model. The experience be used to revamp/improve the documented best practice.
3. **Apply the best practice to other programmes to scale-up impact:** Once the IVM delivery best practice is consolidated, apply it to scale up impact to other areas within the countries of impact. Choose areas with similar socioeconomic and agroecological demography as those where the model has been developed and improve the model further. While BioVision Foundation can fund some of the programmes (of their strategic interest), icipe needs to solicit for funding to spread the impact of malaria IVM to other icipe programmes.

4. **Apply the IVM best practice to out-scale the impact:** Use the now tested and tried model to deliver IVM to new areas within and outside the countries of impact. Again, BioVision can fund such activities if they relate to the Foundation’s interest but icipe should look for additional funding to drive their other programmes.

5. **Consolidate the three projects into a programme:** The three projects should be consolidated into a programme for cost effectiveness, harmonisation of staffing, work plans, data collection and documentation. This would be a management cost co-shared by the programme donor and icipe.

6. **Commit funding to the programme for a long enough duration (at least 3 years) for sustainable community and stakeholders’ engagement:** This will give the programme teams certainty and enhance community/stakeholder buy-in, ownership and commitment. Eventually, this gives the programme better value for money. This should be budgeted for as an operational cost by each project.

7. **Develop annual operational plans to enable disbursement of committed funds:** Entrench annual review meetings where progress could be discussed and annual operational plans, complete with modification of activities and deliverables, could be developed. This would be an operational cost in every project.

8. **Establish a Monitoring and Evaluation unit:** An M&E unit would conduct baseline, snapshot (annual) and summative surveys and develop a database to keep the programme in line with its goals and advise on the necessary adjustments. In addition this Unit would manage the research system that would get the feedback from the recipients and stakeholders, inform the communications strategy and drive innovative research to develop new and demanded solutions. The Unit would be critical in documenting impact of the programme activities. This would be a programme cost.

9. **Complete the development of IVM model:** This would be a useful tool for making cost-effective decisions of intervention for the reduction of malaria. However, the full development through peer review, capacity building and dissemination needs to be completed.