

# Drinking-water under a “One Health” lens:

Quantifying microbial contamination pathways between  
livestock and drinking-water

Startup Stakeholder's Workshop –  
25<sup>th</sup> May 2017 at  
Bondo Pride Hotel

## WORKSHOP REPORT



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## Abbreviations

AMURT	-	Ananda Marga Universal Relief Team
CDC	-	Center for Disease Control and Prevention
CGHR	-	Center for Global Health Research
GoK	-	Government of Kenya
GPS	-	Global Positioning System
HDSS	-	Health and Demographic Surveillance System
HH	-	Household
HMS	-	Human Morbidity Study
ICAP	-	ICAP Global Health Action (Imarisha Nyanza)
JOOUST	-	Jaramogi Oginga Odinga University of Science and Technology
KEMRI	-	Kenya Medical Research Institute
KIWASH	-	Kenya Integrated Water, Sanitation and Hygiene Project
LBDA	-	Lake Basin Development Authority
NCD	-	Newcastle Disease
PBASS	-	Population Based Animal Syndromic Surveillance
PBIDS	-	Population Based Infectious Disease Surveillance
UK	-	United Kingdom
UNICEF	-	United Nation International Children's Emergency Fund
USAid	-	United States Agency for International Development
VIRED	-	Victoria Institute for Research on Environment and Development
WARMA	-	Water Resources Management Authority
WHO	-	World Health Organization
WKCDMFP	-	Western Kenya Community Driven & Flood Mitigation Project

## 1.0 Introduction

This report summarizes the results of the startup workshop for the project known as “Water Safety in Livestock-Keeping Areas; “Drinking Water Under a "One Health" Lens which was held on the 25<sup>th</sup> of May, 2017 at Pride Inn Hotel in Bondo town of Siaya County in western Kenya. The 2-year project aims at using a “One Health” approach to quantify microbial interaction pathways between livestock and drinking water. It is expected that the project will aid in the understanding of the contribution of livestock to drinking water contamination and its impact on human health in Lwak area of Siaya County in Western. It will also shed light on the proportion of diarrheal disease caused by zoonotic disease transmission and the importance of source and stored drinking water as a zoonotic transmission route in Kenya Kenya.

The workshop was organized by Victoria Institute for Research on Environment and Development (VIRED-International) in collaboration with Kenya Medical Research Institute (KEMRI), University of Southampton and University of Brighton. It was organized as an initial means of awareness creation, refinement of planned project activities, protocols and engagement with the stake holders to sensitize and involve them in project implementation as a step towards creation of ownership among the recipient communities. The concerns and visions of project were shared with the stakeholders to enlist their active and effective participation in the activities of the project right from the start of the project. Various presentations were made during the workshop and discussion sessions garnered valuable feedback from the participants thus enhancing the project design.

### 1.1 Objectives of the Workshop

The objectives of the workshop were as follows:-

- To formally introduce the *Water and One Health* project to stakeholders
- To secure stakeholder feedback about the project and use the same to improve project design
- To enlist stakeholder support and participation in the project

## 2.0 Workshop Organization and Approach

As an initial step towards organization of the workshop, discussions were held by the project team to define and clarify the objectives and nature of the workshop and the kind of participants that would most effectively meet the objectives of the workshop. A second level meeting was held between VIRED and KEMRI to identify community contacts based on KEMRI's previous engagements with the study community. The KEMRI team helped with the identification of community guides and mobilizers. The team then worked with these guides and mobilizers to select participants from the 10 villages that were targeted for the study.

A series of sensitization and community mobilization visits to the villages were then carried out to invite and make personal contacts with the participants. The invited community participants included the village mobilizers, village elders, opinion leaders including representations from various political offices and ordinary community members considering all genders. Additionally, policy level officers from both the National and County Governments of Siaya County, the local administration, Community Development Partners such as Nongovernmental organizations, Community Based Organizations, Institutions such as primary schools, Academia and local religious bodies were also represented in the invitations. The aim of this was to ensure stakeholders involved in all the sectors addressed by the project such as Natural Resources, Environment, Veterinary Services, Public Health, Water and sanitation were all represented in the invitations. Out of a total of 55 participants invited to the workshop, 52 representing about 95% of the invitees attended the workshop.

The workshop objectives were achieved through simplified expert background paper presentations on Water, Livestock and Public Health in the study area, followed by an overview of the project and its various components. This was followed by group work. Four (4) groups were formed using a systematic random number picking approach. Each group was then assigned a core thematic area in the form of questions to handle. Once the groups were convened, each of them elected their own chairperson and secretary. The project team members were distributed to each of the groups to act as facilitators taking a passive guidance role during the discussions. Results of the group discussions were presented and discussed at a plenary session. Finally a qualitative assessment of the participants' satisfaction with the workshop was carried out using open ended questionnaires. The results of the assessment were analyzed in NVivo 11 for Windows by converting the excel document into word document and singling out comments from three categories. The categories were useful aspects, issues and feedback. Responses with no comments were removed. Thematic areas covered by the responses were identified based on keywords and the comments were coded under these thematic areas. The coded comments were then analyzed.

## 3.0 Workshop Results and Discussions

### 3.1. Session 1: Preliminaries

#### 3.1.1 *Welcome and Introduction of Participants - Mr. Okotto-Okotto*

The introductory session started at 9:00 am with a session of prayer from a community Member. The moderator started by thanking the participants for their promptness and full attendance, emphasizing that their full participation in the workshop was important for the improvement of the planned project activities, their involvement, ownership and the success of the project. He set the participatory climate and the participants were then given opportunity to introduce themselves specifying their names, role in the community and any unique attributes they have which the other participants needed to know about them to improve interaction during the deliberations.

The Principal Investigator, Dr. Jim Wright, who is the project team leader, was then given time to introduce the project's team members as follows:-

- Dr. Jim Wright; The *Project Team Leader* representing the University of Southampton – UK which is the Lead Institution for the consortium.
- Prof. Hugh Taylor; Representing University and of Brighton - UK
- Dr. Diogo Gomes; Representing the University of Brighton - UK
- Prof. Thumbi Mwangi; Representing KEMRI -Kenya (Also works with Washington State University)
- Mr. Joseph Okotto-Okotto; Representing VIRED - Kenya



### 3.1.2 Official Opening by Prof. Philip Raburu

Prof. Philip Raburu, representing Prof. Okeyo (the Director General of VIRED), welcomed participants to the workshop. In his opening remarks, he thanked all the stakeholders who turned up to participate in the Workshop. He noted that the main objective of VIRED International is to do research on practical solutions to community problems. He reiterated that the organization was initiated 18 years ago and has a track record of collaborating with local and international institutions in projects that bring science home to local communities. He enumerated some of the projects in which they have partnered with some of the members of the Consortium such as the University of Southampton among others. He underscored the importance of organizations working

together when looking at issues related to water quality and health because these are cross cutting issues. Prof. Raburu noted that there is nothing people can do without water even though it is continuously polluted due lack of proper care of the environment. Many people get affected because of lack of knowledge about the things that affect the communities in the water that they use. The



*Prof. Raburu of VIRED giving the Key Note Address to Participants*

importance of building capacity as a community to ensure that the water we use does not negatively affect our socio-economic livelihoods is therefore critical.

At the national and sub-national level, he emphasized that there needs to be improved policies that ensure there is a body that monitors water quality throughout the County and Country as a whole. He stated the importance of communities being part and parcel of the solution.

He made the following observations:

- It is important to monitor water quality and ask questions as to whether or not the water consumed by local communities is of good quality
- Many people die due to consumption of poor quality water and in rural communities, such deaths end up being attributed to witchcraft.
- It is important to identify and control pollution through more research.
- County Governments should come up with policies that ensure and assure good water quality.
- There is need for a body to monitor water quality at National and County levels.
- Communities also need to develop capacity to monitor the quality of water being consumed
- KEMRI's research findings should be shared with the communities
- Human beings have a long time relationship with livestock. And problems could stealthily arise even without communities noticing
- Communities use livestock products such as cow-dung for smearing houses and baskets, milk, meat and eggs for consumption and urine for sanitizing milk, among others.
- Most livestock water drinking spots are also shared by human beings. We have livestock watering points where children bathe and women collect water. This is worse in pond waters than in the rivers

- The safety of human beings, drinking water sources and the contribution of livestock in this web of linkages require keen attention and collaborative ventures of this nature.

In conclusion, he noted that this study is to come up with findings that are scientifically proven but downgraded to the level of the local communities. It will also generate long term data that could be synthesized to develop policies that impact positively on local communities. The study therefore recognizes that the communities are the best avenue for the implementation of projects and that it is in the communities that the research findings could be directed for uptake and utilization to improve human welfare. The communities must therefore develop an attitude that a project like this belongs to them and not to the coordinating organizations. The question that the study will address is summed as follows: How can we make sure that we come up with policies from well researched solutions for the benefit of the communities?

The Meeting was declared officially open at 10:00 am

## 3.2 Session 2: Workshop Presentations

### 3.2.1 Presentation on Water, Livestock and Public Health – Dr. Peter Omemo

Dr. Peter Omemo, of the School of Health Sciences in Jaramogi Oginga Odinga University of Science and Technology (JOOUST) made the first presentation of the workshop. The main aim of his presentation was to discuss the connection between water, livestock and public health. He noted that most livestock keepers in the area depended on the lake, surface water and river water sources for water since there is no tap water within the community for domestic use. The same water sources used by livestock and wildlife, in some instances, are the same water sources used by the households in the community for various domestic purposes. He noted that there is a low level of community understanding on the relationship between livestock drinking upstream and humans drawing the same water downstream and how this could affect the state of their health. Consequently water is rarely treated before use. The presenter underscored the role that the project could play in reversing and improving this situation.



*Dr. Omemo of JOOUST giving his presentation to Workshop Participants*

It was reiterated that the linkage between rural water sources, livestock and public health requires a clear understanding of the prevailing local health risks at the local human-animal interfaces. He gave an

example of a common prevailing belief that there is “No taboo in the use of water. After all older women and men in the village would take any water and nothing bad happened to them”. This has precipitated the belief that even if you take water raw in an unprocessed state, nothing will affect your health. The presenter suggested that the solution is to find a linkage between the prevailing socio-economic systems and morbidity surveillance data for both

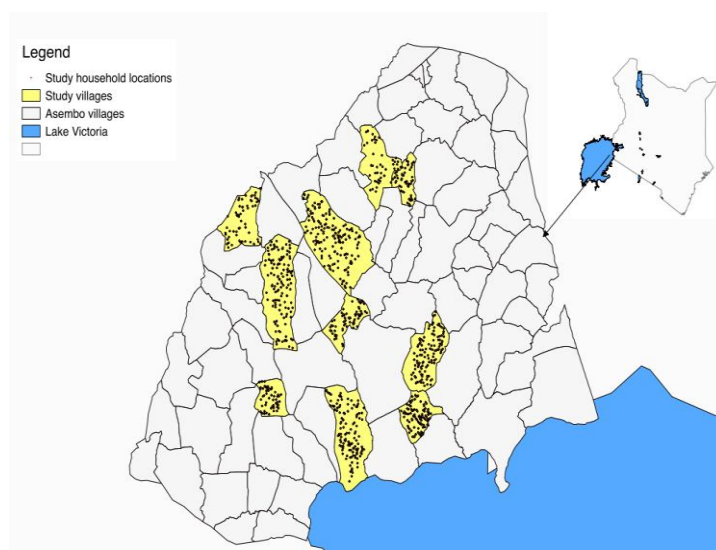
human and animals. This requires the application of participatory approaches to understand the prevailing knowledge, attitude and cultural practices of the local communities to integrate them into the various intervention activities. Thus, addressing problems of zoonotic water borne diseases in the community requires a one health approach which, promotes a concerted interdisciplinary and community participatory approaches. He concluded his presentation by emphasizing the importance of community leaders, veterinarians, social workers, environmentalists, water engineers, public health educators and school teachers working with all other stakeholders to address the problem of water quality in an integrated way.

In addition, he as noted that the project is a good attempt to bring together and hasten good health for the people of Asembo in Siaya County.

### *3.2.2 Presentation on Human and Animal Syndromic Surveillance – Dr. Elkanah Otiang’*

The presentation was given by Dr. Elkanah Otiang of KEMRI. He started his presentation by noting that 300 million persons in Sub-Saharan Africa depend on livestock for livelihood and nutrition. Not only are they a source of food and income, but also an indication of social status and wealth. Most importantly however, livestock are also a reservoirs for zoonotic diseases. He stated that 60% of infectious diseases are zoonotic. Participants were informed that KEMRI along with other partners have been carrying out a Human and Animal Syndromic Surveillance project in Siaya County of Western Kenya (Map 1), since 2001.

The aim of the project is to maximize positive attributes of livestock while minimizing their negative effects within the community. It was noted that the surveillance system looks at three pathways that link animal and human health. This includes the socio-economic aspects of households (increased income levels and educational attainment-better access to health), nutritional aspects (reduced malnutrition-decreased disease susceptibility) and zoonotic diseases (shared pathogens and microbiomes) as key interactive elements. He explained that within the surveillance system:



Map 1. Location of Study Site

- 240,000 people are being followed Within the **Population Based Infectious Disease Surveillance (PBIDS)** (KEMRI-CGHR and CDC – HDSS)
- Within PBIDS there is the **Human Morbidity Study (HMS)** which also follows more than 24,000 people in 33 villages. In this surveillance, human syndromes such as fever, jaundice, diarrhea, respiratory illness are being observed at intervals.
- Within PBIDS there is also a **Population Based Animal Syndromic Surveillance (PBASS)** being conducted in which, animals in 1,800 households in 10 villages distributed over the study area are followed at intervals. In this aspect of the surveillance, animal deaths and , respiratory, Gastro intestinal, reproductive, musculo-skeletal, skin, nervous, urogenital, and mastitis syndromes in Cattle, sheep, goats and chicken are being observed at intervals. Households are used as the primary observers and they use a toll free phone number to report any sickness in animals for a response from KEMRI field staff. Other reports of sicknesses are generated through community interviewers.



It was noted that the study is so far successful and has investigated three pathways between livestock and humans: zoonotic disease, socio-economic and health expenditure/nutrition. Results show that **for the zoonotic pathway** for every 10 cases of animal illness and death observed, the risk of human illness increases by 31%. In the **socio-economic pathway**, the more cattle a house hold owned, the higher was the income and the higher was the likelihood of a household seeking health care once a case of human illness occurs. In the **expenditure on health, and nutritional pathway**, it was found that for every 10 chicken owned, there is an 18% increase in the likelihood of a household spending on health. Furthermore, the more cows owned by a household, the greater the likelihood of the consumption of cow's milk, and the same case with consumption of eggs. All these were noted as significant findings.



*Dr. Otiang explaining a point during his presentation*

In summary, the surveillance has also revealed that;

- Gastrointestinal and respiratory illnesses are the most frequently encountered both in animals and humans.
- The likelihood of human illness in a household (HH illness index) is correlated with the likelihood of illness in animals in the same HH.
- On average, diseased cattle, sheep, and goats have significant negative effects on household consumption of products and nutrition.
- Interventions for animals diseases may help alleviate undernourishment of agricultural households in this region, and underdevelopment in other regions in general.

The last phase of the presentation focused on future work and how the study is now moving towards intervention based research. A new intervention based project on Newcastle disease (NCD) has already been nested with the wider Human and Animal Syndromic Surveillance project. The project seeks to control NCD by vaccination of chicken and their products will in turn contribute to the household's income and reduce the long term impact of malnutrition. He noted that the One Health project is also now being nested in the Human and Animal Syndromic Surveillance project.

### 3.2.3 Question/Comments from the participants and responses

The following reactions and responses emerged after this session's presentations:

Question/Comments	Responses
Are there any interventions in place on how to control infections? The feeling is that awareness has not been enough.	Yes, we do post mortem, and we work closely with the county government like restricting movement of animals and organizing for vaccinations. However the ball rolls back to the authorities to mitigate disease control measures. We try much to invite the farmers.
Has the project provided enough awareness about zoonotic diseases and can disease spread from the sick animals to human beings.  There are still cases where people prefer selling animal carcasses instead of burying	Yes the project team provides awareness and advisory services to farmers.  The project also works closely with the County veterinary department for postmortem and disease diagnosis, reporting of notifiable diseases (e.g. anthrax) and vaccination.  The project however does not enforce law. The local authority does enforcement
Have you found any zoonotic diseases? Bearing in mind that the owners can psychologically get sick whenever their animals are sick	Not yet, but we are in the process of identifying those pathogens.
Why is it that when the livestock are sick there is reduction in production	When the animals are sick it affects their feeding and hence production goes down Production also goes down if the animal dies e.g. if the calf dies, the cow will stop milk production

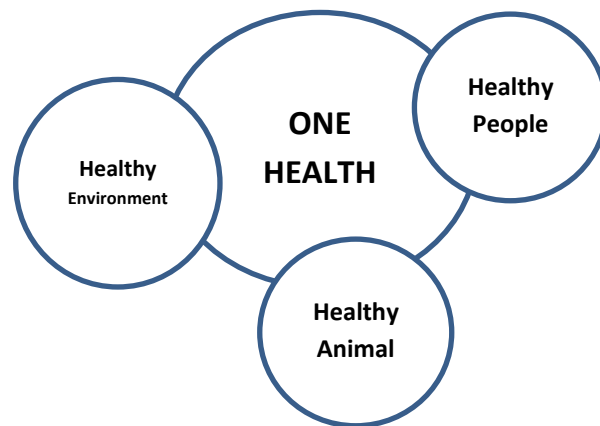
### 3.2.4 Overview of the Drinking Water Under a "One Health" Lens project – Dr. Jim Wright

The purpose of Dr. Wright's overview presentation was to introduce the project to the workshop participants. The presentation, therefore focused on the problem statement, elaboration of the project to participants, introduction of the project team members, presentation of the project work plan and finally a discussion of the significance of the project to society. He anchored the presentation on Sustainable Development Goal 6 which seeks to ensure sustainable management of water, its availability and the availability of sanitation for all by 2030. Dr. Wright reminded participants of the concept of One Health and how it relates how people, animals and the environment are integrated and interacts in space.



*Dr. Jim Wright giving his presentation to participants*

He explained that the concept of “One Health” Lens project has three components that all work together in an integrated framework to achieve better results for a healthy society. These components and how they relate to each other were graphically illustrated as in the diagram below;



Dr. Wright informed the participants that the Problem being addressed by the project is simply stated as “Disease passing from livestock to humans”. He took the opportunity to explain to participants how the project fits into the already existing surveillance system. The project is nested within the PBASS which is nested in PBIDS and the PBIDS is nested within the wider HDSS. Participants heard that the project will continue for a period of 2 year and that it is a multidisciplinary project funded through the Global Challenge Research Fund. The funding consortium is led by the Medical Research Council of UK supported by various research councils for other disciplines in the UK. He noted that the project team consists of a consortium of European and Kenyan institutions of longstanding and impressive track records in implementation of projects of this nature. The team, led by the University of Southampton-UK, consists of representatives from the University of Brighton-UK, University of Southampton-UK and VIRED International-Kenya who will work together with the local community to ensure that the project’s objectives and goals are delivered in a timely way.

Participants were informed that work has been distributed among the team members as follows;

- Looking at how people are using water and health outcomes; Household survey (Prof. Thumbi and Dr. Otiang’ - KEMRI))
- Locating hazards together in space; Participatory mapping (Mr. Okotto-Okotto - VIRED International)
- Spotting the hazards; observation checklist (Mr. Okotto-Okotto - VIRED International)
- Tracking where cattle go (Mr. Okotto – Okotto - VIRED International)
- Testing Water to assess its quality(Dr. Otiang and Mr, Okotto-Okotto - VIRED International)
- Detective work ; tracking pollution sources using microbiology (Prof. Taylor – Univ. of Brighton)

The presentation was concluded by outlining to participants some key questions that the research will seek to answer. These included observation hazards – do the checklists and participatory maps work? Detective work – can we use microbiology to track pollution sources, is it possible to reduce pathways for water borne diseases transmission? Dr. Wright intimated that collars for tracking livestock movement, microbial source tracking and participatory source mapping are techniques that could prove useful in the future to assure safe drinking water to the local communities.



### *3.2.5 Microbial Source Tracking Work – Prof. Huw David Taylor*

Prof Taylor informed participants that this project component seeks to see how pathogens move through the environment and develop tools that can be sustainably used in tracking them. He noted that this is important in providing an evidence-based approach to the protection of humans from water borne diseases. One of the ways in which microbial source tracking can be useful is in the identification of which pathway of transmission poses the greatest risk to people in a community. For example, traditional methodologies tell us how much fecal pollutants are present in water but not where it came from. Microbial source tracking can help in the distinguishing of sources of water pollution (e.g. latrines or livestock). The aim of Prof. Taylor's presentation was to discuss further about this methodology and elaborate it further to adapt it for possible use in Kenya.



*Prof. Taylor explaining a point during his presentation*

He indicated that in his methodological approach, he will use Kenyan cattle dung. Samples of these will be collected and sent to England to use the advanced facilities in the laboratories there to look for and develop host specific markers. Water pollution from human sources will be detected by growing human bacteria in test tubes and then mixing the human micro-organisms in the water samples. This will be poured on an agar plate and left to incubate overnight. The possible results of this methodology is that one may find there is no pollution from human sources or there are micro-organisms, particularly viruses, from human sources that can attack the human bacteria present in the water. The same methodology is also applicable for detecting water pollution from animal sources.

### *3.2.6 Participatory Hazard Mapping and Sanitary Risk Inspection Work - Mr. Joseph Okotto Okotto*

Mr. Okotto-Okotto's presentation focused at the outset acknowledged the fact that there is a growing effort to promote community engagement in decision making processes concerning the management of the issues that affect them in their day to day life. During the presentation, he explained that participatory hazard mapping was one of the ways which the project intends to use to involve the community members in the One Health water project activities. In order to aid quick comprehension of what participatory hazard mapping is all about,



*Mr. Okotto-Okotto engaging participants during his presentation*



key terms were simplified and explained to participants.

For instance, a hazard was simply defined as anything that could harm a person or injure a person's health, property, socio-economic status, or the environment in which one lives. It was explained that the state of hazardousness is characterized by its location, intensity, frequency and probability relative the potential victim. The process of identifying, locating and displaying the hazards in space was said to be termed as hazard mapping. Mr. Okotto-Okotto further explained that when conventional modern methods of map making are combined with the spatial knowledge of local communities in regard to hazards that they can identify in their neighborhoods and they themselves use their homegrown skills to locate them in space on pieces of paper or on the soil surface, the process is called Participatory Hazard Mapping.

Mr. Okotto-Okotto estimated that the map that will be created requires about 90% of community input in an open and inclusive environment. Session will be organized with community mobilizers and about 7-8 key informants will be identified and invited from each of the 10 villages to participate in the exercise. A high resolution satellite image (Space Photo) of the villages will be used as a base for the exercise. Participants will indicate the elements that they perceive as important in their neighborhood on the maps. He highlighted that the higher the level of participation of the community members, the more beneficial the outcome will be. It was agreed that indeed, the final map that will be created will reflect the collective experience of the group producing the map. In this regard, diversity of characteristics of the participating community members will be a critical parameter in their selection. Additionally for some households, GPS collars will be attached to their cattle to follow their movements in and around the water sources.

He noted that, this type of mapping not only helps in creating awareness of the situation of hazards in the community but also assists in the development of homegrown solutions to the mitigation of risks taking due cognizance of the local people's expert knowledge of their environment which they interact with on a day-to-day basis. The presentation emphasized that, the graphic insights that will be gleaned from the Community Hazard Maps will visually provide very significant relationships between humans, animals and the environment in the study villages. This will aid in the identification of households in the community that are at risk of disease spreading from livestock to people through water.

It was noted that the team will also use sanitary check lists (Sanitary Risk assessment Forms) to look for signs of livestock visits in or near the water sources and stored water sources in the households so as to score their sanitary risk levels. The forms have a series of observational questions (answered Yes or No) that are designed to identify sources, pathways and receptors around water points. The forms were developed by WHO for international use and the project team has modified them to fit the rural situation in the study area. Participants were further informed that as the sanity risk inspection will be going on, samples of the water sources both at source and in storages within the households will simultaneously be taken for tests to determine the microbiological contamination levels.

He concluded that the aim of a good study is to end up with an intervention and if that intervention is not collectively acceptable then it cannot succeed.

### 3.2.7 Question/Comments from the participants and responses

Participants were given a chance during a question and answer session after all the presentations were done to react or respond to the presentations in a plenary environment. The reactions and responses are presented in the table below;



*A Community Member seeking a clarification from the presenters*



*Prof. Thumbi Mwangi responding to a question from a participant*

Question/Comments	Responses
Are the markers known or are they being sought as new knowledge?	We have got some markers and they shall be tried in Kenya but it is better to isolate local markers. It will be interesting if we can get microbial source data and link it
Will we look at the quality of water before and after the study so that it can be of use in the future?	We shall have two programs but we will not do that, as that is more of an interventional study. In terms of the impact of the work – not much change will be seen in two years
Will there be a water safety plan?	It is the ultimate aim, to turn this knowledge into water safety plans. Water safety planning came into WHO and has been integrated into various countries including Kenya. In Malawi there are talks of a water safety planning initiative – government has taken it up. A suggestion is to work on a protocol for water safety planning.
The Water department in Siaya county is using water treatment approaches to avail safe drinking water to the communities. The research may help in clearing pollution. Will there still be need to subject the water to the treatment?	The project is seeking to measure the quality of the drinking water and if it is polluted, are animals playing a role in that contamination. It may also introduce methods that are cheap, and if tracking will work, within Siaya – these markers could be used to test the water as a quick cautionary measure; but, we need to ensure that the water is treated.
Most of the time researchers come into the community but never give us feedback. Will there be feedback in this research study? What mechanisms would the program have to feeding back the information to the right authorities?	It is a good point and we hope to break that trend. Towards the end of the project, there will be a feedback workshop to get all the results and findings of the project back to you in a workshop like this one. Some of the results may be able to influence policy and can be useful. The data will also be stored in an accessible location where they can be used for further research, planning and policy formulation and implementation. A requirement from the funders is that those impacts be measured several years later.

Question/Comments	Responses
If ten villages are already chosen for the study, how would the rest of the villages in the county benefit?	For this work, the idea is to be as random as we can in the selection of villages and households. The results we get can be extrapolated to benefit a large area. Various research projects have used this methodology such as KEMRI's work on Pathogens in diarrhea in children and as a result, Rota-virus vaccination has been initiated not only in the study area but also in other areas in Kenya. We hope that this One Health water project could also be used to sit down with the government in a much more constructive and comprehensive way.
Is it true that patients with ulcers can take milk directly from the cow to help with the problem?	It is a myth/misconception. It has not been proven scientifically. So process the milk before you take it to avoid any potential infections.
During drought, participants fetch water from where livestock urinate and defecate, does this pose any danger?	From knowledge, there are diseases from cattle that could be passed on from livestock to humans; but hopefully the project will tell us more about this situation.
Is the community health strategy integrated in the project? This particular framework will be useful in strengthening the decision making and participation as it already exists within the community.	Siaya has a lot of Community Health Workers. For this project, we are already working within the community health platform. It's a strategy we recognize and it is something we would like to use.
Information on hazards identified by the community participants during the participatory mapping will tend to change rapidly in the neighborhood. The map needs not to be static but it should allow for flexibility to cope with such changes.	This is a very true observation. Some types of information are really dynamic and become obsolete as soon as maps are made. This is common even in the conventional realms. The aim is to make the maps as functional as possible for community use and flexible for update is inbuilt in the mapping process. Those who participate are capacity built to be able to locate the hazards and update the maps on their own even in post project periods. However, considering this is a 2 year project, the environmental change could be very minimal.
Given the graphic presentation on how pit latrines could contaminate water, what is that should be done along the beaches? Do they leave the citizens to defecate or County Government to construct pit latrines?	It is important that when we make pit latrines, they should not be close to the water source. The further away the pit latrine is, the safer the water is. Studies done to see how far pathogens can move have indicated they can sometimes move even more than 30 meters away from the pit to the water source. However, pit latrines must be protected so that there is no seepage to the ground. Often, it is helpful to line the pits from down up the walls of the pits to seal the seepage pores and prevent pathogens from moving out into the water sources.
Are livestock affected by any diseases when they walk in water, like human beings are affected by bilharzia?	The most likely one is called Liver Fluke (Fasciola). They don't get the infection through the skin, but the hooves of the legs get soft and are more prone to infection and can cause foot rot.
Disease tracing is important for the office of veterinary services ( if you will use GPS collars)	Funders would be really keen to see information being shared and there are opportunities to do so. As a project team, we are very open to doing so and it will be critical to consider working on modalities of access the data.

Question/Comments	Responses
The team should not ignore areas of risk like livestock slaughter facilities and homesteads where they slaughter animals during funerals	The comment will be incorporated in the project design, it is very useful.
<i>Other General Participant Comments</i>	<ul style="list-style-type: none"> <li>- We really appreciate the study.</li> <li>- Other sanitation projects have enabled us to reduce/stop open defecation status in two sub-counties in the study area.</li> <li>- Mobilization needs to be done well in order to receive very good results.</li> <li>- If you really want to talk to villagers, let it be a representative of a number that is more than <math>\frac{3}{4}</math> of the village</li> <li>- Polythene bags impact livestock and should be taken into consideration</li> </ul>

## 4.0 Stakeholder Involvement and Feedback

The session was designed to capture stakeholder views about the project having been presented with the background information and an overview of all the planned activities of the One Health water project. Results from the various groups (1-4), are presented in the table below;



*Members of Group 1, 2 and 3 deeply engaged in discussions at the Workshop*



*Members of Group 3 and 4 in discussions*



## GROUP 1

ISSUES	RESPONSES
What are the relevant initiatives that have taken place in Siaya in the past, are taking place now, or are planned for in the future?	<ul style="list-style-type: none"> <li>- UNICEF and GoK</li> <li>- USaid – KIWASH –ongoing</li> <li>- WKCDFMFP - Western Kenya Community Driven &amp; Flood Mitigation Project</li> <li>- Phass- KEMRI</li> </ul>
Were past initiatives successful? Why/Why not?	<ul style="list-style-type: none"> <li>- UNICEF – reduced cases of diarrhea and cholera, poor technologies are still being used, sustainability strategy by using existing structure</li> <li>- KEMRI CDC – successful</li> <li>- WKCDFMFP - - successful</li> <li>- USAID/KIWASH – Is ongoing</li> </ul>
What might change during the course of the project?	<ul style="list-style-type: none"> <li>- Sources of water used by the communities</li> <li>- Mechanisms of using the water sources</li> </ul>
Which organizations should the project be communicating with?	<ul style="list-style-type: none"> <li>- County Government</li> <li>- Unicef</li> <li>- ICAP</li> <li>- AMURT</li> </ul>

## GROUP 2

ISSUES	- RESPONSES
What microbiological water contamination hazards are of particular concern in Siaya?	<ul style="list-style-type: none"> <li>- Human waste due to open defecation and seepage of Pit latrines</li> <li>- Livestock Waste</li> <li>- Eroded materials ( washed away into water sources)</li> <li>- Waste from slaughter houses</li> <li>- Solid waste ( markets, rubbish, no dumping sites)</li> <li>- Dead animal carcasses thrown in water bodies</li> <li>- Dead fish in water bodies due to eutrophication</li> </ul>
What about public health risks from livestock?	<ul style="list-style-type: none"> <li>- Anthrax</li> <li>- Biological waste from livestock when they are being watered</li> <li>- Dog bites</li> <li>- Cholera ( feasting in funerals)</li> <li>- Brucellosis</li> </ul>

## GROUP 3

How might project outputs be used? If microbial source tracking can be developed, how might it be useful? How could the improved observation checklist be used?
<ul style="list-style-type: none"> <li>- Identify areas with potential dangers to animals or human beings</li> <li>- Documentation of identified risk</li> <li>- Help in disease control</li> <li>- Assist in taking appropriate measures in alleviating disease</li> <li>- Help develop sensitization messages/content</li> </ul>

What suggestions are there to improve the overall project?	
ISSUES	- RESPONSES
Communication of results	<ul style="list-style-type: none"> <li>- Thorough sensitization at all levels (County, sub-County, Ward and Village levels)</li> <li>- Thorough mobilization of villages participating in study</li> <li>- Formation of committees within the study villages</li> <li>- Implementation and communication of results through the committee to all stakeholders</li> <li>- Feedback to the community/study participants</li> </ul>
Important issues for design of study	<ul style="list-style-type: none"> <li>- It would be good to create a central reporting office, in case of any problem</li> <li>- Provide reporting tools at all levels</li> <li>- Monitoring and Evaluation</li> <li>- Governance structure for the project</li> <li>- Arrange for stakeholder review meetings to give results</li> </ul>

## 5.0 Workshop Assessment

A broad analysis of the participants' responses revealed that the participants learnt a lot from the presentation. They noted that the presentations had assisted them to know that sanitation risks within their community could be identified using simple methods and be controlled to reduce harm to human health. More specifically a majority felt that the connection between their livestock and their lives in terms of water and human health was well elaborated in the presentation. The participants were delighted about the project's decision to incorporate various stakeholders prior to implementation of the project. They were expectant that the project would continue involving them during implementation. On the whole they expressed optimism that the project would change their lives by taking simple steps to provide them with tools to ensure that their water sources are free from contamination.

In view of the foregoing, some of the participants emphasized the need for community sensitization and mobilization at the household level. There was a request for the creation of a central reporting office to assist in the mapping of hazardous zones and sensitizing the community on the same. Some of the participants however, suggested that the project should as much as possible make use of the existing community's leadership structure and the Community Health Strategy as a community linkage avenue to forestall any infringement of the social and cultural fabrics of the community during interaction. A majority of the participants felt that the project team should move further and translate the findings of the project into initiatives that could be implemented to benefit the community. This included the development of sample Water Safety Plans where risks are identified as high and critical. Other initiatives that were recommended were provision of safe, secure and reliable water, inclusion of mitigation measures involving the design of water sources structures with a view of reducing pollution. In this regard, participants recommended that the project should as much as possible work with the community members who had undergone capacity building to reach other members.

Finally, a general feeling that prompt feedback on the project results, such as periodical briefs or update on progress to community members and government departments, should be given a high priority during project implementation period. Participants also noted that the time allocated by the workshop for group discussions

was not enough for exhaustive participation and reporting. This notwithstanding, it was unanimous across all participants who responded to the questionnaires that the presentations were good and time management for the entire workshop was excellent. Participants requested that the proceedings of the workshop be distributed to them through their e-mail addresses.

## 6.0 Workshop Closing Ceremony

### 6.1 Closing Remarks by Prof. Thumbi Mwangi on behalf of Director KEMRI Kisumu – Dr. Munga)

In the closing remarks, Dr Munga informed participants that KEMRI has increased its focus of on major infectious diseases. The focus has, immensely contributed to Kenya's decision making processes when addressing public health needs. He reiterated the importance of One Health Water project considering that 2 out of 3 diseases have origins in animals. Dr. Munga noted that our health and that of animals are very closely integrated. He added that in the last five years, KEMRI has collaborated with the Zoonotic Disease Unit and Washington State University and the institutions are at the forefront of projects bent on eliminating Rabies and establishing positive outcomes for poultry farmers.

Dr. Munga highlighted that the new contribution from VIREO, Universities of Brighton and Southampton are very welcome. He noted that this study adds a new component to the One Health initiative which is the environment. The ultimate goal is to develop interventions of water quality to the community. He concluded by pledging support to the team and wished success to the new project emphasizing KEMRI's never ending commitment to research and better health.

### 6.2 Vote of Thanks moderated by Prof Raburu

A community member was given the opportunity to give a vote of thanks. He thanked the organizers of the workshop and the study for thinking about improving the quality of their health through a well thought out strategy. He also thanked the participants for taking their time to participate actively in the proceedings of the day. An administrator with the national government, on his part, stated that they are now aware and are very thankful for the program. He also stated that whatever they learnt in the workshop will be taken to Rarieda so that they can use the info to achieve more and improve their health. The Director of environment of Siaya County took the opportunity to thank the organizers of the workshop and the project for the inclusivity approach of the project and all the stakeholders involved.

The workshop ended at 2:45 pm with a word of prayer



## Appendix 1: Workshop Program

TIME	ACTIVITY	RESPONSIBILITY
8.50 - 9.20 am	Registration of participants	Tom Otieno, Dan Abuto,
9.20 - 9.50 am	Welcome and Introduction of Participants	Mr. Okotto-Okotto J.
9.50 - 10.00 am	Official Opening by Prof. Okeyo-Owuor, Director VIRED	Prof. Thumbi Mwangi
10.00 - 10.20 am	Water, Livestock and Public Health; by Peter Omemo	
10.20 - 10.50 am	TEA BREAK	Tom and Dan
10.50 - 11.10 am	A glimpse into the previous work of the PBASS project by; Dr. Thumbi Mwangi	Prof. Diogo Gomes daSilva/ Prof. Phillip Raburu
11.10 - 11.40 am	Drinking Water Under a "One Health" Lens Project overview by Prof. Jim Wright	
11.40 - 12.00 pm	Microbial source tracking work by Prof. Huw David Taylor	
12.00 - 12.20 pm	Participatory Hazard mapping and sanitary risk Inspection Work by Okotto-Okotto Joseph	
12.20 - 1.00 pm	Discussions and section wrap up	
1.00 - 2.00 pm	LUNCH	Tom and Dan
2.00 - 2.30 pm	Stakeholder involvement	Prof. Philip Raburu Prof. Jim Wright
2.30 - 3.00 pm	Feedback and Plenary Discussion	Dr. Elkana Otiang'/Prof. Thumbi
3.00 - 3.20 pm	Way forward	Prof. Jim Wright
3.20 - 3.30 pm	Closing by Dr. Steven Munga Director KEMRI-Kisumu	
3.30 - 3.40 pm	Wrap up and Vote of thanks	Prof Thumbi/Prof. Philip Raburu
3.40 pm	TEA BREAK	Tom Otieno, Dan Abuto
	Participants depart at their own leisure	All

## Appendix 2: The Workshop in Pictures



Workshop Participants pose for a Group Photograph





*A moment to seek divine intervention for an excellent workshop before it began*



*Registration of Participants continuing in the background*



*Setting the climate and knowing one another before Kicking off the workshop*



*Participants keenly following the proceedings of the Workshop*



*This is how serious the group discussions were! Mapping out the issues on their Knees!!*



*The Director of Environment, Siaya, County presenting results of the deliberations of his group*



*A participant presenting results of group discussions from their group work*



*Some light moments to enhance concentration with Prof. Raburu leading the Jia.....!!!!*





*Did we pass the test? Here, a Workshop Assessment exercise in progress*



*Professor Thumbi Reads the closing remarks From Dr. Munga*



*Participants applauding the success of the Workshop*



*A religious leader from the community closes down the workshop with a word of prayer*