

## TRAINING WORKSHOP CONCEPT NOTE

Title	Introduction to Molecular Biology and Bioinformatics Training Workshop
<b>Background</b>	<p>Biosciences have greatly enhanced our ability to quickly diagnose diseases, determine the genetic diversity of pest and pathogen populations, understand host-pathogen interactions, speed the development of new varieties of crops, combine genes from a wide array of organisms in transgenic technologies and develop strategies for their management. Yet the impact of the numerous bioscience research products available is yet to be fully felt in Africa.</p> <p>Biosciences tools can be used to address many of Africa's agricultural challenges such as pests, diseases and climatic constraints that result in low crop yields and poor animal productivity. However, opportunities linking modern biosciences to agricultural improvement to solve some of Africa's major agricultural problems remain largely untapped.</p> <p>A number of NARS in the east and central Africa region have basic equipment for conducting some molecular biology techniques, and have access to the internet for bioinformatics analysis, but the skills to apply the technologies to agricultural research are largely lacking.</p> <p>This training workshop seeks to address the skills gap in basic molecular biology and bioinformatics, to increase the capacity of African scientists and institutions to conduct biosciences research and to develop and deliver new technologies for agriculture.</p> <p>The main target group for this workshop is researchers at NARS in east and central Africa who are actively engaged in biosciences research, and who need the skills to address technology gaps in their own research programs.</p>
<b>Objective(s)</b>	<p>To give agricultural biosciences researchers from east and central Africa the working knowledge of basic molecular biology and bioinformatics that can be applied to address technology gaps in their own agricultural research programmes, and that can be disseminated to other researchers at their home institutes.</p>
<b>Expected outputs and outcomes</b>	<p><b>Outputs</b></p> <p>At least 20 agricultural biosciences researchers from NARS in the ECA region equipped with practical knowledge of basic molecular biology and</p>

bioinformatics.

### **Outcomes**

Strengthened practical skills in basic molecular biology and bioinformatics for application to agricultural biosciences research in NARS in the ECA region.

### **Training Approach**

The workshop will comprise a series of lectures, extensive hands-on practical, group discussions and experience sharing by participants.

Pre- and post- workshop evaluations will be conducted by both participants and trainers.

### **Partners**

The workshop is sponsored by

- The Australia Government Department for Foreign Affairs and Trade (DFAT) through a partnership between Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO) and the BecA-ILRI Hub;
- The Bill & Melinda Gates Foundation (BMGF);
- The Swedish Ministry for Foreign Affairs through the Swedish International Development Cooperation Agency (Sida);
- The Syngenta Foundation for Sustainable Agriculture (SFSA).

### **Key Dates**

Closing date for applications: midnight **28<sup>th</sup> February 2014 (Nairobi time)**

Successful applicants will be notified by **17<sup>th</sup> March 2014**.

Dates of workshop: **5<sup>th</sup> – 16<sup>th</sup> May, 2014**

### **Workshop Venue**

The Biosciences eastern and central Africa (BecA) Hub at ILRI, Nairobi, is a Centre for excellence in modern plant, animal and microbial biology in Africa. BecA is an initiative developed within the framework of the New Partnership for Africa's Development (NEPAD)/ African Union African Biosciences initiative. It consists of the Hub, based on the ILRI campus in Nairobi, Kenya, and a network of regional nodes and other affiliated laboratories and organizations throughout the region. The BecA-ILRI Hub facilities are world class, including a range of molecular, plant transformation and genomics laboratories, and other research platforms. The Hub hosts and conducts research in crop, microbe and livestock areas where new developments in science offer promise to address previously intractable problems constraining Africa's development. Capacity building is a major goal of all activities. The scope covers agriculture and food security and their intersections with human health and nutrition, and the sustainable use of Africa's natural resources.

Further information is available at <http://hub.africabiosciences.org>

# Programme

## Introduction to Molecular Biology and Bioinformatics Workshop BecA-ILRI Hub, Nairobi, May 5-16, 2014

Time	Activity	Location	Trainers/resource persons
<b>Day 1: Monday 5<sup>th</sup> May</b>			
0745	Bus leaves Pride Inn for ILRI	Pride Inn	
0800-0830	Registration	JVC	Val Aloo, Jacqueline Mayira
0830-0900	Welcome and Workshop Opening	JVC	Dr Appolinaire Djikeng, Director, BecA-ILRI Hub
0900-1000	Introduction to the course <ul style="list-style-type: none"> <li>• Introducing the participants and trainers</li> <li>• Housekeeping issues</li> <li>• Objectives and expectations</li> <li>• Overall workshop outline</li> <li>• Outline of Day 1 activities</li> <li>• Pre-workshop evaluation</li> </ul>	JVC	Dr Rob Skilton, Team Leader Capacity Building, BecA-ILRI Hub
1000-1015	Tea/coffee	JVC	
1015-1115	Seminar <ul style="list-style-type: none"> <li>• Laboratory Health and Safety</li> </ul>	JVC	Ephy Khaemba
1115-1145	Lab <ul style="list-style-type: none"> <li>• Laboratory Health and Safety</li> </ul>	Lab 4	Ephy Khaemba
1145-1300	Lab <ul style="list-style-type: none"> <li>• Pipetting skills</li> <li>• Introduction to lab equipment</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1300-1400	Lunch	Poolside	
1400-1500	Seminar	JVC	Dr Rob Skilton

Time	Activity	Location	Trainers/resource persons
	<ul style="list-style-type: none"> <li>• Molecular biology and DNA structure</li> <li>• Introduction to PCR</li> <li>• Genomic DNA purification</li> <li>• Agarose gel electrophoresis</li> </ul>		
1500-1515	Tea/coffee	JVC	
1515-1800	Lab <ul style="list-style-type: none"> <li>• Genomic DNA (gDNA) purification (plant leaf or animal muscle tissues)</li> <li>• Prepare 1% agarose gels</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1800-1830	Review of Day 1 activities and Quiz	Lab 4	All
1830	Bus leaves ILRI for Pride Inn	ILRI Reception	
<b>Day 2: Tuesday 6<sup>th</sup> May</b>			
0745	Bus leaves Pride Inn for ILRI	Pride Inn	
0830-0900	Outline of Day 2 activities	Lab 4	All
0900-0930	Seminar <ul style="list-style-type: none"> <li>• Spectrophotometry of Nucleic acids</li> </ul>	Lab 4	Tina Kyalo
0930-1030	Lab <ul style="list-style-type: none"> <li>• gDNA purification continued</li> <li>• Nanodrop spectrophotometry of DNA</li> <li>• Gel electrophoresis of gDNA (1% gel)</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1030-1045	Tea/coffee	Outside lab 4	
1045-1230	Lab <ul style="list-style-type: none"> <li>• Gel electrophoresis of gDNA continued</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1230-1330	Lunch	Poolside	
1330-1400	Seminar <ul style="list-style-type: none"> <li>• Setting up PCR and PCR product</li> </ul>	Lab 4	Dr Rob Skilton

Time	Activity	Location	Trainers/resource persons
	purification		
1400-1530	Lab <ul style="list-style-type: none"> <li>• PCR set up using <i>Bioneer</i> master mix</li> <li>• Prepare 1.8% gels</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1530-1545	Tea/coffee	Outside lab 4	
1545-1730	Lab <ul style="list-style-type: none"> <li>• Gel electrophoresis of PCR products</li> <li>• PCR product purification</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1730-1800	Review of Day 2 activities and Quiz	Lab 4	All
1800-1930	Cocktail reception	Outside N'dama Lounge	
1930	Bus leaves ILRI for Pride Inn	ILRI Reception	
<b>Day 3: Wednesday 7<sup>th</sup> May</b>			
0745	Bus leaves Pride Inn for ILRI	Pride Inn	
0830-0900	Outline of Day 3 activities	Lab 4	All
0900-1030	Lab <ul style="list-style-type: none"> <li>• Gel electrophoresis and Nanodrop spectrophotometry of purified PCR products</li> <li>• Submit PCR products to SegoliP for DNA sequencing</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1030-1045	Tea/coffee	Outside lab 4	
1045-1145	Seminar <ul style="list-style-type: none"> <li>• PCR optimisation</li> <li>• PCR primers</li> </ul>	Lab 4	Dr Roger Pelle
1145-1300	Lab <ul style="list-style-type: none"> <li>• PCR setup using individual components</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice

Time	Activity	Location	Trainers/resource persons
			Machuka, Dr Roger Pelle, Dr Rob Skilton
1300-1400	Lunch	Poolside	
1400-1530	Lab <ul style="list-style-type: none"> <li>Gel electrophoresis of PCR products</li> <li>Purification of PCR products by ethanol precipitation</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1530-1545	Tea/coffee	Outside lab 4	
1545-1730	Lab <ul style="list-style-type: none"> <li>Purification of PCR products by ethanol precipitation continued</li> <li>Gel electrophoresis of purified PCR products</li> <li>Prepare agarose gels as required</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1730-1800	Review Day 3 activities and Quiz	Lab 4	All
1800	Bus leaves ILRI for Pride Inn	ILRI Reception	
<b>Day 4: Thursday 8<sup>th</sup> May</b>			
0745	Bus leaves Pride Inn for ILRI	Pride Inn	
0830-0900	Outline of Day 4 activities	Lab 4	All
0900-0930	Seminar <ul style="list-style-type: none"> <li>Restriction analysis of DNA</li> </ul>	Lab 4	Moses Njahira
0930-1030	Lab <ul style="list-style-type: none"> <li>Nanodrop spec. of purified PCR products</li> <li>Submit purified PCR products to SegoliP for sequencing</li> <li>Prepare 2% gels</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1030-1130	Tea/coffee Visit biotech company displays	Outside N'Dama Lounge	

Time	Activity	Location	Trainers/resource persons
	Group photo		
1130-1300	Lab <ul style="list-style-type: none"> <li>Restriction digestion of purified PCR products</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1300-1430	Lunch and visit biotech company displays	Poolside and outside N'dama Lounge	
1430-1530	Lab <ul style="list-style-type: none"> <li>Gel electrophoresis of digestion products</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1530-1545	Tea/coffee	Outside lab 4	
1545-1700	Lab <ul style="list-style-type: none"> <li>Gel electrophoresis of digestion products, continued</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1700-1730	Seminar <ul style="list-style-type: none"> <li>Other PCR methods</li> </ul>	Lab 4	Tina Kyalo
1730-1800	<ul style="list-style-type: none"> <li>Review Day 4 activities and Quiz</li> </ul>	Lab 4	All
1800	Bus leaves ILRI for Pride Inn	ILRI Reception	
<b>Day 5: Friday 9<sup>th</sup> May</b>			
0745	Bus leaves Pride Inn	Pride Inn	
0830-0900	<ul style="list-style-type: none"> <li>Outline of Day 5 activities</li> </ul>	Lab 4	All
0900-0930	Seminar <ul style="list-style-type: none"> <li>Sanger DNA sequencing</li> </ul>	Lab 4	Wilson Kimani
0930-1030	Lab <ul style="list-style-type: none"> <li>Repeat lab work as required</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr

Time	Activity	Location	Trainers/resource persons
			Rob Skilton
1030-1100	ILRI Friday Morning Coffee	Outside N'dama Lounge	
1100-1230	Lab <ul style="list-style-type: none"> <li>Repeat lab work as required</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1230-1330	Lunch	Poolside	
1330-1530	Lab <ul style="list-style-type: none"> <li>Repeat lab work as required</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1530-1545	Tea/coffee	Outside lab 4	
1545-1615	Seminar <ul style="list-style-type: none"> <li>The BecA-ILRI Hub</li> </ul>	Lab 4	Dr Rob Skilton
1615-1715	<ul style="list-style-type: none"> <li>Review Day 5 activities and Quiz</li> </ul>	Lab 4	All
1715	Bus leaves ILRI for Pride Inn	ILRI Reception	
<b>Day 6: Saturday 10<sup>th</sup> May</b>			
0745	Bus leaves Pride Inn for ILRI	Pride Inn	
0830-0900	Outline of Day 6 activities	Lab 4	All
0900-1030	Lab <ul style="list-style-type: none"> <li>Repeat lab work as required</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1030-1045	Tea/coffee	Outside lab 4	
1045-1300	Lab <ul style="list-style-type: none"> <li>Repeat lab work as required</li> </ul>	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton



Time	Activity	Location	Trainers/resource persons
1300-1400	Lunch	Poolside	
1400-1500	Review Week 1 activities and Quiz	Lab 4	Tina Kyalo, Moses Njahira, Wilson Kimani, Eunice Machuka, Dr Roger Pelle, Dr Rob Skilton
1500	Bus leaves ILRI for local Shopping Mall	ILRI Reception	
1530-1800	Shopping at a local Mall	Local Mall	
1800	Bus leaves Mall for Fogo Gaucho Restaurant	Local Mall	
1830-2030	Dinner for all participants, trainers and resource persons	Fogo Gaucho Restaurant	
2030	Bus leaves Fogo Gaucho for Pride Inn	Fogo Gaucho Restaurant	
<b>Day 7: Sunday 11<sup>th</sup> May</b>			
All day	Rest Day		
<b>Day 8: Monday 12<sup>th</sup> May</b>			
0745	Bus leaves Pride Inn for ILRI	Pride Inn	
0830-0900	Introductions and Outline of Day 8 activities	JVC	Dr Mark Wamalwa, Joyce Njuguna
0900-1000	Seminar: Introduction to Bioinformatics <ul style="list-style-type: none"> <li>• What is Bioinformatics</li> <li>• Scope of bioinformatics</li> <li>• History of Bioinformatics</li> <li>• Applications of Bioinformatics</li> </ul>	JVC	Dr Mark Wamalwa, Joyce Njuguna
1000-1030	Seminar <ul style="list-style-type: none"> <li>• Making sense of sequenced data</li> </ul>	JVC	?
1030-1045	Tea/coffee	JVC	

Time	Activity	Location	Trainers/resource persons
1045-1145	Seminar <ul style="list-style-type: none"> <li>• Introduction to CLC Main Workbench</li> <li>• Download and installation of CLC</li> <li>• Sequence trace file editing</li> <li>• Sequence assembly</li> </ul>	JVC	Joyce Njuguna
1145-1245	Practical <ul style="list-style-type: none"> <li>• Importing data into CLC</li> <li>• Quality control of data</li> </ul>	JVC	Dr Mark Wamalwa, Joyce Njuguna, Dedan Githae, Dr Anne Jores
1245-1345	Lunch	Poolside	
1345-1530	Practical <ul style="list-style-type: none"> <li>• Sequence assembly and resolving conflicts</li> </ul>	JVC	Dr Mark Wamalwa, Joyce Njuguna, Dedan Githae, Dr Anne Jores
1530-1545	Tea/coffee	JVC	
1345-1730	Practical <ul style="list-style-type: none"> <li>• Sequence assembly - continued</li> </ul>	JVC	Dr Mark Wamalwa, Joyce Njuguna, Dedan Githae, Dr Anne Jores
1730-1800	Review Day 8 activities and Quiz	JVC	All
1800	Bus leaves ILRI for Pride Inn	ILRI Reception	
<b>Day 9: Tuesday 13<sup>th</sup> May</b>			
0745	Bus leaves Pride Inn for ILRI	Pride Inn	
0830-0900	Outline of Day 9 activities	JVC	Dr Mark Wamalwa
0900-1030	Seminar <ul style="list-style-type: none"> <li>• DNA Barcoding</li> </ul>	JVC	Dr Mark Wamalwa
1030-1045	Tea/coffee	JVC	
1045-1245	Practical	JVC	Dr Mark Wamalwa, Joyce

Time	Activity	Location	Trainers/resource persons
	<ul style="list-style-type: none"> <li>DNA Barcoding</li> </ul>		Njuguna, Dedan Githae, Dr Anne Jores
1245-1345	Lunch	Poolside	
1345-1530	Seminar <ul style="list-style-type: none"> <li>Biological databases</li> <li>BLAST</li> </ul>	JVC	Dr Mark Wamalwa
1530-1545	Tea/coffee	JVC	
1545-1730	Practical <ul style="list-style-type: none"> <li>BLAST and result interpretation</li> </ul>	JVC	Dr Mark Wamalwa, Joyce Njuguna, Dedan Githae, Dr Anne Jores
1730-1800	Review Day 9 activities and Quiz	JVC	All
1800	Bus leaves ILRI for Pride Inn	ILRI Reception	
<b>Day 10: Wednesday 14<sup>th</sup> May</b>			
0745	Bus leaves Pride Inn for ILRI	Pride Inn	
0830-0900	Outline of Day 10 activities	JVC	Dr Mark Wamalwa
0900-0945	Seminar Nucleotide sequence manipulation <ul style="list-style-type: none"> <li>Sequence transcription</li> <li>Reverse complement</li> <li>Removal of primer sequences</li> <li>Open reading frames and translation</li> </ul>	JVC	Dr Anne Jores
0945-1030	Practical <ul style="list-style-type: none"> <li>Nucleotide sequence manipulation</li> </ul>	JVC	Dr Mark Wamalwa, Joyce Njuguna, Dedan Githae, Dr Anne Jores

Time	Activity	Location	Trainers/resource persons
1030-1045	Tea/coffee	JVC	
1045-1130	Seminar <ul style="list-style-type: none"> <li>Multiple sequence alignments</li> </ul>	JVC	Dr Anne Jores
1130-1245	Practical <ul style="list-style-type: none"> <li>Multiple sequence alignments</li> </ul>	JVC	Dr Mark Wamalwa, Joyce Njuguna, Dedan Githae, Dr Anne Jores
1245-1345	Lunch	Poolside	
1345-1530	Seminar <ul style="list-style-type: none"> <li>Phylogenetics</li> </ul>	JVC	Dr Anne Jores
1530-1545	Tea/coffee	JVC	
1645-1730	Practical <ul style="list-style-type: none"> <li>Phylogenetics</li> </ul>	JVC	Dr Mark Wamalwa, Joyce Njuguna, Dedan Githae, Dr Anne Jores
1730-1800	Review Day 10 activities and Quiz	JVC	All
1800	Bus leaves ILRI for Pride Inn	ILRI Reception	
<b>Day 11: Thursday 15<sup>th</sup> May</b>			
0745	Bus leaves Pride Inn for ILRI	Pride Inn	
0830-0900	Outline of Day 11 activities	JVC	Joyce Njuguna
0900-1000	Seminar <ul style="list-style-type: none"> <li>Restriction enzyme analysis</li> </ul>	JVC	Tina Kyalo
1000-1030	Practical <ul style="list-style-type: none"> <li>Restriction enzyme analysis</li> </ul>	JVC	Dr Mark Wamalwa, Joyce Njuguna, Dedan Githae, Dr Anne Jores
1030-1045	Tea/coffee	JVC	
1045-1145	Seminar	JVC	Nelson Ndegwa

Time	Activity	Location	Trainers/resource persons
	<ul style="list-style-type: none"> <li>Primer design</li> </ul>		
1145-1245	Practical <ul style="list-style-type: none"> <li>Primer design</li> </ul>	JVC	Dr Mark Wamalwa, Joyce Njuguna, Dedan Githae, Dr Anne Jores
1245-1345	Lunch	Poolside	
1345-1530	Seminar <ul style="list-style-type: none"> <li>???</li> </ul>	JVC	???
1530-1545	Tea/coffee	JVC	
1645-1730	Practical <ul style="list-style-type: none"> <li>Continued: Restriction enzymes and primer design</li> </ul>	JVC	Dr Mark Wamalwa, Joyce Njuguna, Dedan Githae, Dr Anne Jores
1730-1800	Review Day 11 activities and Quiz	JVC	All
1800	Bus leaves ILRI for Pride Inn	ILRI Reception	
<b>Day 12: Friday 16<sup>th</sup> May</b>			
0745	Bus leaves Pride Inn for ILRI	Pride Inn	
0830-0900	Outline of Day 12 activities	JVC	Joyce Njuguna
0900-1000	Seminar: Online Bioinformatics resources Further sequence Manipulation <ul style="list-style-type: none"> <li>Physiochemical properties</li> <li>Motifs and domains</li> <li>Cellular localization</li> <li>Secondary Structure</li> </ul>	JVC	Joyce Njuguna
1000-1030	Practical <ul style="list-style-type: none"> <li>Further sequence Manipulation</li> </ul>	JVC	Dr Mark Wamalwa, Joyce Njuguna, Dedan Githae, Dr Anne Jores

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1030-1100	Friday Morning Coffee	Outside N'Dama Lounge	
1100-1230	Practical <ul style="list-style-type: none"> <li>• Online Bioinformatics resources</li> </ul>	JVC	Dr Mark Wamalwa, Joyce Njuguna, Dedan Githae, Dr Anne Jores
1230-1330	Lunch	Poolside	
1330-1400	Review Day 12 activities and Quiz	JVC	All
1400-1530	Review of whole week, and general discussion	JVC	All
1530-1545	Tea/coffee	JVC	
1545-1615	Workshop feedback, and evaluation	JVC	Dr Rob Skilton
1615-1730	Closing ceremony	JVC	Dr Rob Skilton
1730-1930	BBQ dinner	ILRI Poolside	
1930	Bus leaves ILRI for Pride Inn	ILRI Reception	