

The UVIMA Project

Uchambuzi wa Viumbe kwa Maendeleo Taxonomy for Development in East Africa

UVIMA Baseline Review Consultancy
Final Report

REPORT #:

REPORTING PERIOD: 4th April- 31st May 2009

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Country:	Kenya
Countries Covered by Project:	Kenya, Tanzania, Uganda
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1. Executive Summary

This report provides findings from a consultancy geared towards documenting baseline information about pollinators and pollination studies in Kenya. The methodology adopted involved use of tables to typify information about institutions, projects, programmes, initiatives and experts in pollination studies as was described in the terms of reference (ToRs). Besides typification, key informant interviews were held with individuals from different institutions such as Kenya Agricultural Research Institute (KARI); University of Nairobi (UoN); National Museums of Kenya (NMK); Jommo Kenyatta University of Agriculture and Technology (JKUAT); Kenyatta University (KU); Sustainable Agriculture Community Development Programme (SACDEP) and Coffee Research Foundation (CRF); International Centre of Insect Physiology and Ecology (ICIPE) among others. Information was also gained from internet and print documents. From the information gathered, it is clear that most institutions only have small projects in which they are collaborating with other institutions but not long term programmes on pollination. This means that pollination is barely highlighted in many of these institutions and hence not given a specific schedule with specific professionals to handle. It was also found that only projects/programmes within the National Museums of Kenya and KARI-NARL (Nairobi) have/ are developing databases. The rest of the institutions store the little pollinator information that is available in collections, taxonomic checklists, reports, books and graduate theses.

Surprisingly, some institutions that were expected to have informative databases about pollinators and pollination, for example, KARI, and Universities, did not have any. Apart from KARI, these institutions had collections which were not complete or for some not frequently updated. It was also established that most collaborators/financial agencies are funding/doing research, training and honey production thus development of pollinator databases and collections is yet to be given priority. Besides pollinator studies have not been fully explored by many researchers hence experts are limiting.

The challenges encountered during the reporting period include: inadequate information from the internet/ institutional websites and lack of experts within the institutions.

Introduction

Pollination is an important ecosystem service that ensures reproduction in flowering plants. Although there are wide ranges of pollination agents, animal pollination and pollinators have received a lot of attention from the last decade both by scientists and policy makers at international level. This is more so in many developed countries where there is reported decline in pollinators, which threatens food supply and ecosystem health. In most developing countries, pollination is still provided by unmanaged pollinators. However, with the need to increase production, and the negative effects of agriculture and human activities threaten continued supply of feral pollination in such systems, creating a need to conserve pollinators. The presumed co-evolution of pollinators and plants contribute a lot in terms of the need to enumerate and understand pollinators for specific plants.

Among the animal pollinators, insects provide more than 80% of the plant pollination while bees are the main pollinators among the insect pollinators. There is a wide range of animal pollinators ranging from vertebrates (such as monkeys, rodents, marsupials, birds and bats) to invertebrates (mainly insects belonging to orders Coleoptera, Diptera, Lepidoptera and Hymenoptera). Birds and bats are important pollinators of some crops while the other vertebrate groups are important in the wild ecosystem.

Conservation of pollinators entails sustainable utilization and management of both agricultural and natural ecosystems to provide food, refugia and other important elements for the pollinators. This would ensure presence of enough pollinators that would contribute to pollination service of crops and non crop plants. In their absence, food security would be compromised and national economies that are reliant on cash and subsistence crops threatened.

Conservation of pollinators entails understanding their biology and population dynamics and all factors that affect these. Most importantly is to understand their interaction with crops/ plants. Most developing countries do not have this information and whatever is available may be irretrievable. Inception of UVIMA, therefore, provides opportunities for the participating countries to take stock of their pollinators. This would aid in setting of priorities and policies to ensure sustainable utilization of the pollinators for the wellbeing of their citizens. For example, certain pollinators could be conserved and/ or utilized in production systems of crops that otherwise had less consideration of pollinators such as coffee, fruit crops and many oil crops¹.

1.1 Key project achievements during the reporting period

Key Consultancy Achievements	
	That pollinator and pollination studies in Kenya are at inception and very few institutions are involved.
	Pollinator database is rudimentary and require formation.

2.1 Tools/methodologies used in the review

The review process was guided by three sets of typification. These included that of institutions, experts, projects, programs and initiatives involved in work associated with pollinators and pollination in Kenya; the actual work in Kenya concerning pollinators whether curation, management, database work, training or actual use of pollinators; and, the information held by such institutions, experts, projects, programs and initiatives whether in the form of specimen collections, database systems, taxonomic checklists, periodicals, books, research or other technical and popular publications.

An assessment of completeness/current status of databases associated with collections of pollinators in case of institutions that are involved in pollinator curation was done to identify gaps within such databases that need to be filled to make information about pollinators complete and available. Identification of financial agencies and collaborators involved/have been involved in funding projects, institutions and programs involved in pollinator curation, study, management and use in Kenya was also done.

The information above was obtained through: Internet search; literature review; library search; visits to institutions; and key-informant interviews. The reference material used is in annex 3 while the institutions visited and individuals interviewed are in annexes 1 and 2.

¹ Kasina, JM (2007), PhD Thesis, University of Bonn, Germany

2.2 Existing Resources

Institutional and personnel documented

CATEGORY /Resources	Source	Where it is developed	Where it is maintained	Where it is Disseminated (or not)	Why developed	Target audience	How - approach/method/design/platform
Collections	NMK	Zoology Department	Invertebrate Zoology, ornithology, mammology sections	To EAFRINET members, Universities and other research institutions.	To fulfil institutional mandate	Scientists/national heritage	In cabinets; pinned boxes, liquid collection, microscope slides
	KARI (NARL)	Entomology Department	Field Entomology section	Within KARI centres, other Research centres	Institutional mandate; enhance research	Scientists; farmer advisory	In Cabinets pinned boxes, liquid collection; microscope slides
	University of Nairobi	School of Biological Sciences and Department of Plant Science and Crop Protection	Zoology and Entomology sections	Same departments	For teaching	Students, visitors	In cabinets, microscope slides and liquid collection
	National Beekeeping Station	Institution	Institution	For farmers, extension staff and other end users	For training	Farmers, extension staff, researchers	Pinned collection

CATEGORY /Resources	Source	Where it is developed	Where it is maintained	Where it is Disseminated (or not)	Why developed	Target audience	How - approach/method/design/platform
	ICIPE ²	Biosystematics	Same	Same	Capacity building	Researchers and other users	Cabinets, slides and liquid collection
Databases	NMK	Zoology Department	Invertebrate Zoology section	To EAFRINET members, Universities and other research institutions.	Facilitate use and minimise use of collection	Scientists	Digital database using Specify software and housing this in NMK server
	KARI	Entomology Department	Field Entomology section	KARI Centres,	Facilitate use and minimise use of collection	Researchers, Farmers	Specify application platform and use of KARI server
	ICIPE	Biosystematics	Biosystematics	ICIPE scientists and other researchers/users	Facilitate use of taxonomy	Researchers	Web-based application; ICIPE server
Secondary e.g. keys, literature, publications and tertiary	KARI, NMK, Universities,	Zoology/entomology departments	Same departments	Same departments	For research, advisory services, as a scientific output	Researchers, students, farmers	manuals, journal articles, newsletters, magazines

² ICIPE is an international organization with Head Quarter at Nairobi

CATEGORY /Resources	Source	Where it is developed	Where it is maintained	Where it is Disseminated (or not)	Why developed	Target audience	How - approach/method/design/platform
Communication resources	Government parastatals; ministry of livestock, NGOs ³	Departments with insect perspectives	Same departments	Same departments	Dissemination to farmers, radio talk shows and policy makers	Farmers, policy makers	Audio visual, Radio and TV shows; Press release

3. Status of infrastructure for developing the resources

CATEGORY	Institutions Responsible (List all institutions you have come across in your country, including addresses, telephones and contact person(s))	STATUS Rank from 0-10 where 0 = not available and 10 = in good/excellent condition	PROGRESS Description of work undertaken to improve the resource	ISSUES Description of problems encountered; Issues that need to be addressed; Decisions / Actions that can be taken
Collections	NMK	9	Currently being updated	
	KARI	5	Only maintenance of collection	Expansion of collection (cabinets, slides) to aid in updating the collection; construction of the cabinets; supporting update and confirmation of names
	ICIPE	7	Information available on taxon identity, collection date, collection locality,	It is only accessible internally. There are efforts to make it accessible externally.

³ Parastatals include KARI, NMK, Universities (UON, JKUAT and Egerton); Ministry of livestock also includes National Beekeeping Station, NGOs (SACDEP)

CATEGORY	Institutions Responsible (List all institutions you have come across in your country, including addresses, telephones and contact person(s))	STATUS Rank from 0-10 where 0 = not available and 10 = in good/excellent condition	PROGRESS Description of work undertaken to improve the resource	ISSUES Description of problems encountered; Issues that need to be addressed; Decisions / Actions that can be taken
			collector; Majority (80%) identified to species level (butterflies/moths; beetles; flies; hoppers)	5% of it has been digitized. Institution has 200 specimens of pollinators.
	UON	3	Collection description mainly up to family or genus	Preservation methods (cabinets) etc need to be encouraged Utilization of collection for non teaching purposes need be addressed
	National Beekeeping Station	3	Small collection of mainly honey making bees	Could be modeled bee collection in the country
Databases	NMK	8	A pollinator-plant interactions database is being initiated under the Centre for Bee taxonomy and Pollinator Ecology programme	<ul style="list-style-type: none"> • Database on pollinators not yet covering details of what plants are pollinated by which species (only a recent initiative for this began for Entomology Section). Also not all pollinator specimen completely identified (there is a backlog of unidentified specimen as taxonomists are few); • Database access currently only internally accessible, no channel for external communication. The long-term objective should be the joining of the internet platform; • No resident taxonomic expertise for

CATEGORY	Institutions Responsible (List all institutions you have come across in your country, including addresses, telephones and contact person(s))	STATUS Rank from 0-10 where 0 = not available and 10 = in good/excellent condition	PROGRESS Description of work undertaken to improve the resource	ISSUES Description of problems encountered; Issues that need to be addressed; Decisions / Actions that can be taken
				bats and other small mammal pollinators, There is need for more taxonomic expertise across taxon groups; <ul style="list-style-type: none"> Species collection database is networked internally but fully internet dependent: a bad networked virus could lead to a total crash; a system that could be stable on and off-line would be best.
	KARI	4	<ul style="list-style-type: none"> Digitization at inception 	<ul style="list-style-type: none"> Lack of a computer, good camera and accessories to start digitization Need to support digitization of the departments collection as there is huge potential to impact on agriculture
	ICIPE	8	<ul style="list-style-type: none"> Majority identified to family and genus level, only a few to species level 	<ul style="list-style-type: none"> Database update infrequent and irregular; Only accessible internally Institution not strongly focused on pollination as an aspect of insect ecology; Few taxonomists particularly those working on pollinators.
	BIOTA East Africa	2	<ul style="list-style-type: none"> Database being developed at Kakamega forest BIOTA resource centre. Establishment of a resource centre at 	Slow pace of database development due to lack of expertise in pollinator study. There is an effort to begin projects like the UVIMA project to collect baseline information on pollinators.

CATEGORY	Institutions Responsible (List all institutions you have come across in your country, including addresses, telephones and contact person(s))	STATUS Rank from 0-10 where 0 = not available and 10 = in good/excellent condition	PROGRESS Description of work undertaken to improve the resource	ISSUES Description of problems encountered; Issues that need to be addressed; Decisions / Actions that can be taken
			Kakamega for BIOTA research outputs since 2001	
	Mpala Research Centre	3	<ul style="list-style-type: none"> • The informal database is in Ms Excel • Information available on taxon identity, collection date, locality and collector 	<ul style="list-style-type: none"> • Small (size not ascertained) • There's no formal database • Update of informal database irregular • Only accessible internally
Secondary e.g. keys, literature, publications and tertiary	Universities, KARI, National Beekeeping Station, NGOs	5	<ul style="list-style-type: none"> • Initiatives to publish books and journal articles about pollinators and pollination ; • Stocking libraries with pollination/pollinator books and periodicals • Student research on pollination issues on increment • Websites on pollination issues (EAFRINET) 	Institutional capacity on website development and management Encourage development of target user pollinator tools and products

4. Documentation of new opportunities where they exist

CATEGORY	Name	Institution	STATUS	Detail
	List all new opportunities you have come across that do not exist in your country)	List the all institutions that do not exist in your country and show where this new opportunity is	Rank from 0-10 where 0 = not available and 10 = in good/excellent condition	Details of the institutions including addresses, telephones and contact person(s)
Technologies	Pollinator rentals; pollinator-plant interaction	National Beekeeping Station (NBS); African Beekeepers Limited (ABL)	3	Mr. Mbae, NBS Ngong road P. O. BOX 34188, NAIROBI Mr Earnest Semioni, ABL; Tel +254 020 551 834, Cell: +254 722 700 226 Go-down, Road A, Industrial Area, P. O. Box 3752 - 00506, Nairobi –Kenya http://www.africanbeekeepers.co.ke/ bees@africanbeekeepers.co.ke
Expertise	Resident taxonomists for pollinators other than arthropods Modelling	<ul style="list-style-type: none"> • For birds: David Pearson, (UK); • For bats: Paul Webala 	2 2	<ul style="list-style-type: none"> • David Pearson is retired and contacts TBC • Webala: Tel +614 254 96171

Hardware	<ul style="list-style-type: none"> • Desktop computers • Broadening of internet bandwidth to improve speed • User friendly toolkits 		3	Any willing donor
Software	<ul style="list-style-type: none"> • Version 6 of SPECIFY collections database software • GIS software programs including ArcGIS and ArcMap for documenting and updating species distribution and ranges 	<ul style="list-style-type: none"> • University of Kansas Specify Software Project • Clark University, USA 	2 0	<p>1345 Jayhawk Blvd, Lawrence KS 66045-7561, USA. specify@ku.edu Tel +1 (785) 864-5335</p> <p>Clark Labs Clark University 950 Main Street Worcester, MA 01610-1477 USA Tel: +1-508-793-7526 Fax: +1-508-793-8842 Email: idrissi@clarku.edu</p>

5. Current status and future plans of 2, 3 and 4 above

- of existing resources
- Infrastructure
- opportunities

CATEGORY	Current status	Gaps	Future plans
Collections and Databases	Most databases and collections are not frequently updated and not shared externally	Little attention given to pollinator work	To lobby for research and associated funding for pollination work and taxonomy from the central government budgetary allocation Possibility to benefit from GBIF
Secondary e.g. keys, literature, publications and	Keys still being developed,	Literature and other	Encourage publication of second special issue

CATEGORY	Current status	Gaps	Future plans
tertiary	limited literature and publications to refer to because little has been done on pollinator work.	publications also not shared widely Most researchers not publishing in scientific journals	on pollination ⁴ . Have an open day for pollinators and display all published literature to stakeholders. Production of simplified information on pollinators in the form of brief brochures, fliers and pamphlets.
Communication resources	Few radio and talk shows; few websites have pollinator issue	TV, Radio can be used to create awareness in different languages	Press release and radio talk show facilitation
Technologies	Most institutions use Ms excel to develop their data bases and collections.	Data not networked for many institutions to access	As a developing country our priority should not be the sophisticated intricacies of pollination mechanisms but rather the applied attributes that can practically assist in boosting agricultural productivity, supplementing rural incomes and general poverty alleviation for national development grass-root level.
Expertise	Pollination ecology expertise sufficient Kenya Few pollination management and taxonomy expertise Few pollination economics and policy issues	Pollinator taxonomic capacity needed Pollination management in agriculture	To sponsor more researchers to study pollinator taxonomy (visiting scientists and exposure to international taxonomists). To incorporate pollinator studies as a specific unit in studies of crop production and protection.
Hardware	Computers lacking in most collection labs	Computers aid in development of pollinator	Key institution facilitated with computers ⁵

⁴ International Journal of Tropical Insect Science Vol. 24, No. 1 was a special issue on pollination aspects in Africa

⁵ As a first step, UVIMA should provide 2 computers to KARI NARL (field Entomology) to facilitate their digitization and products development, since there is already a framework and some work is being done on the same. This will have tangible output by the end of UVIMA project

CATEGORY	Current status	Gaps	Future plans
		tools and products	
Software	This is applied in the form of excel as a Microsoft Office programme and mostly used internally in the organization	Information not networked for sharing with other institutions hence institutions can easily duplicate work because they are not aware of what has already been done.	To have a networked database system that can be accessed by collaborating institutions.
Projects and partnerships	Most are on-going but are confined to the same institutions which are KARI, NMK, JKUAT and MoA	There seems to be a segregation of institutions such that when funding is obtained only institutions that have collaborated before tend to do the work. This limits the scope of knowledge and information sharing.	To work with new collaborators and partners so that the pollinator knowledge-base is widened.

6. Existing communication strategies and dissemination channels

CATEGORY	Name institution	Institution (List its main collaborators/partners/network members etc for pollinators)	CONTACTS (Give contact details of the Institution and focal person)
Networks	National Museums of Kenya (NMK)	KARI, ICIPE; BioNET-EafriNet (The East African wing of BioNet); African Pollinator Initiative (API);	National Museums of Kenya, P. O. Box 40648 00100 Nairobi www.museums.or.ke

UVIMA- The BioNET-EAFRINET Project, Country Consultancy Report

		Nature Kenya	Dr. Wanja Kinuthia
Partnerships	Kenya Agricultural Research Institute (KARI)	NMK, UoN	Dr. Muo Kasina P.O. Box 14733-00800 Waiyaki way, Nairobi Tel. +254-20-444 4144 ext 308; Cell. +254-723-375 984/ E-mail: jkasina@yahoo.com
	International Centre of Insect Physiology and Ecology (ICIPE)	University of Nairobi (UoN); African Regional Postgraduate Programme on Insect Science (ARPPIS)	Dr, Ian Gordon and Dr Fabian Haas ICIPE Duduville Campus, P. O. Box 30772-00100 Kasarani Nairobi Kenya E-mail: fhaas@icipe.org
	National Museums of Kenya (NMK)	Biodiversity Transect Analysis in Africa East (BIOTA-East)	Dr. Beatrice Khayota, Dr. Helida Oyieke and Dr. Muchai Muchane, P. O. Box 40658 00100 Nairobi.
	Biodiversity Transect Analysis in Africa East (BIOTA-East)	NMK, KARI, JKUAT, ICIPE	Prof. Dr. Norbert Juergens Biocentre Klein Flottbek and Botanical Garden University of Hamburg Ohnhorststrasse 18, 22609 Hamburg Germany Cell phone: +49(0)1701666500 (Germany) Cell phone: +27(0)79 0362424 (South Africa) juergens@botanik.uni-hamburg.de -
Collaborations	Jomo Kenyatta University of Agriculture and Technology (KUAT)	NMK, ICIPE, JKUAT,	Rebecca Karanja, Botany Department, JKUAT. Mobile: 0722601849 Email: rkaranja@fsc.jkuat.ac.ke

	KARI	NMK, JKUAT & Ministry of Agriculture (MoA)	Same contact as above i.e. Dr. Muo Kasina
	SACDEP	Kenya Ministry of Agriculture (MoA); Ministry of Social Services, NMK, Kenya Wildlife Service (KWS).	SACDEP-Kenya Tel: 067-30055 Shem Mecheo, Project Co-ordinator Shem.Mecheo@sacdepkenya.org Mobile: 0720930094
	National Museums of Kenya (NMK)	BioNEt-EaFriNet, UoN, KARI, ICIPE, KWS, BIOTA East, Nature Kenya	National Museums of Kenya, P. O. Box 40648 00100 Nairobi www.museums.or.ke Dr. Wanja Kinuthia
Others e.g. Linkages	Kenya Agricultural Research Institute (KARI)	Farmers, Ministry of Agriculture, Horticultural Industries and National Environment Management Authority (NEMA).	Dr. Monicah Waiganjo Deputy Centre Director KARI-Thika Mobile: 0733 595 182 Email: monicahwaiganjo@yahoo.com

7. Defining specific challenges, constraints, key gaps and opportunities for UVIMA

#	Issue/Category	Specific challenges	Constraints	Key gaps	Opportunities	Proposed Solution
1.	Expertise	<ul style="list-style-type: none"> Lack of expertise in pollinator taxonomy Only 1 key bee taxonomist in Kenya, Dr. Mary Gikungu at National Museums of Kenya; No resident taxonomic 	Huge backlog in detailed taxonomic work on collections of many pollinator specimen across taxon groups	No comprehensive knowledge of pollinators diversity in Kenya, what plants they pollinate and their relative efficiency	Donors with prior track records (GEF, UNDP, FAO etc) could be approached to fund more students or scientists to undertake their studies on	<ul style="list-style-type: none"> Funding institutions to increase funding for experts to train in pollinator work. Take advantage of internet-based taxonomic resources (IT IS, GBIF etc) to fill

#	Issue/Category	Specific challenges	Constraints	Key gaps	Opportunities	Proposed Solution
		<p>expertise for bats and other small mammal pollinators, reptile/amphibian pollinators in the key institutions</p> <ul style="list-style-type: none"> • Only one University in Kenya has a unit on Pollinator Ecology 			pollinators.	<p>up gap in limited taxonomic</p> <p>Greater enrolment of potential taxonomists in relevant University courses and pollinators be given a specific schedule in curricula.</p>
2.	Collections and databases	<p>Lack of up to-date referenced collections and databases.</p> <ul style="list-style-type: none"> • Limited accessibility to institutional databases 	<ul style="list-style-type: none"> • None of existing collections is complete in terms of taxonomy, geo-referencing or pollinator-plant relations. But NMK way ahead of the others in curation, preservation and taxonomy. • Databases exist mostly in either paper copies or MS Excel, except at NMK where a specific and efficient collections database system SPECIFY is now 	<ul style="list-style-type: none"> • No comprehensive updated pollinator species checklists obtainable from existing collections or databases 	<ul style="list-style-type: none"> • The joining of internet platform so as to raise profile of our collections • Exchange information about taxonomic developments, revisions to stay at par with developments etc • Digitization of collections specimen and data-basing these • Establishment of a national database of pollinator taxonomy, and taxonomic developments and pollinators 	<ul style="list-style-type: none"> • A system that is stable: both on and off-line would be best. • Establish inter-institutional data sharing protocols Seek institutional authority to join the internet data-basing platform • Take advantage of internet-based taxonomic resources (IT IS, GBIF etc) to fill up gap in limited taxonomic expertise • Joint projects, a national/centralized database or sufficient data sharing policy could help facilitate standardized products such as species lists,

#	Issue/Category	Specific challenges	Constraints	Key gaps	Opportunities	Proposed Solution
		<ul style="list-style-type: none"> • Most institutions do not know what collections the others are holding • Knowing which pollinators are in 	<p>in use. But this is also limited as it does not detail many pollinator attributes</p> <ul style="list-style-type: none"> • Databases have limited or no inter-departmental connectivity, even though the NMK has an internal networked platform networked internally but fully internet dependent: a bad networked virus could lead to a total crash. • Difficult to make comparisons and references on pollinators ranges and distribution • Difficulty in outlining a pollinator 	<ul style="list-style-type: none"> • Local Taxonomic collaborations rendered difficult • No comprehensive information on pollinators diversity in Kenya 	<p>projects</p> <ul style="list-style-type: none"> • Exchange of information between institutions could help avoid duplication of effort • Exploitation of existing external collaborators for taxonomic 	<p>distribution/range maps etc</p> <ul style="list-style-type: none"> • Seek donor funding for specimen digitization projects • Multi-taxon targeted studies/surveys on pollinator diversity and associated plants

#	Issue/Category	Specific challenges	Constraints	Key gaps	Opportunities	Proposed Solution
		Kenya and which plants they pollinate	conservation/management strategy		expertise resources and training	
3.	Awareness	<ul style="list-style-type: none"> • General lack of awareness among the public and many farmers in particular on pollinators and their role. • Loss or decline in pollinators 	<ul style="list-style-type: none"> • Dissemination of information between scientist and grass-root stakeholders not very explicit yet • Blanket use of insecticides and other pest control measure on (small) farms to eradicate “vermin” leading to loss of pollinators 	<ul style="list-style-type: none"> • Greater opportunities for scientist-farmer joint strategies to conserve pollinators not fully exploited yet • Lack of knowledge among small-scale farmers on unintended effect of pest control measures on pollinators 	<ul style="list-style-type: none"> • Training local stakeholders on role of pollinators in food production would be incentive to them to conserve them • Studies on pest/vermin control nature on specific pollinators 	<ul style="list-style-type: none"> • Include farmer/stakeholder training on awareness in grant proposals • Experts to educate farmers on dangers of blanket use of some pest/vermin control methods
4.	Policy	Government not sufficiently cognisant of importance of pollination and pollinators in food production and national development	No official funds from government targeting conservation and management of pollinators in Kenya	Pollinator research and conservation programs and projects seriously under-funded from domestic sources	Direct allocation of funds for research and conservation of pollinators and promote their use and management would be a big boost	Lobby politicians and policy makers to allocate funds from exchequer for research, conservation and management of pollinators

8. Checklist of resources persons in the country with knowledge in Taxonomy including (Pollinators, Pests and IAS)-

Attached separately as excel sheet

9. Related Projects

Status of projects whose objectives are more or less similar to UVIMA Project in Kenya:

Project Name	Implementing institution	Source of funding	Status (project beginning, mid-term, ending)	Focal person	Contact details
Pollinator Project	Sustainable Agriculture Community Development Programme (SAC Kenya)	GEF, CSFund based in the USA, Denmark & Finland funding through CDTF.	Midterm	Shem Mecheo	SACDEP - KENYA Box 1134-01000 Thika Email: sacdepkenya@iconnect.co.ke Tel: 067-30055, Mobile:0720930094 Email:shem.mecheo@sacdepkenya.org
Looking at pollinators of indigenous crops in Mwingi District, Kenya.	Baraka College, JKUAT and Egerton University	FAO	Ended	Prof. Grace Njoroge	Botany Department JKUAT 62000 (00200) Nairobi Kenya Mobile : 0734 916116 Email: gnjerinjoroge@hotmail.com/gnjoroge@fsc.jkuat.ac.ke
Diversity and Impacts of pollinators on coffee yields(PhD Thesis)	JKUAT	No information	Midterm	Rebecca	Botany Department JKUAT 62000 (00200) Nairobi Kenya. rkaranja@fsc.jkuat.ac.ke
Collaborative research in pollination ecology	NMK	The University of York in the UK	On-going	Mary Gikungu	mgikungu@yahoo.com

Project Name	Implementing institution	Source of funding	Status (project beginning, mid-term, ending)	Focal person	Contact details
Establishment of the Centre for Bees and Pollination at NMK	NMK	BIOTA East, BioNET and African Pollinator Initiative	On-going	Mary Gikungu and Wanja Kinuthia	mgikungu@yahoo.com and eafrinet@africaonline.co.ke
Use of bees to deter elephant crop damage in Laikipia	Mpala Research Centre	European institutional collaborators	Ended in 2007	Chris Odhiambo (for details about the project; he's not the investigator)	Mpala Research Centre P.O. Box 535, Nanyuki codhiambo@mpala.org. Tel: +254 722397762
Establishment of a honey bee farm – a demonstration project	ICIPE	From mainstream funding of ICIPE	On-going	Dr. Fabian Haas	P.O. Box 30772-00100. Nairobi fhaas@icipe.org
Meliponiculture project for local farmers towards poverty alleviation and conservation of Kakamega forest	NMK and local farmers round Kakamega forest	GEF/UNDP	On-going	Dr. Mary Gikungu	Invertebrate Zoology Department, National Museums of Kenya (NMK), P.O. Box 40658, Nairobi, Kenya. Tel/Fax (254 2) 3742 445 / 3744 833., mgikungu@yahoo.com
BIOTA E10 project	University of Bielefeld, Germany	German government	On-going	Dr Wanja Kinuthia	National Museums of Kenya Department of Invertebrate Zoology PO Box 40658 Nairobi KENYA tel: +254 (0) 20 208 8478 fax: +254 (0) 20 374 4833 eafrinet@africaonline.co.ke
Global pollination project	NMK	GEF	New	Dr Wanja Kinuthia	National Museums of Kenya Department of Invertebrate Zoology PO Box 40658 Nairobi

Project Name	Implementing institution	Source of funding	Status (project beginning, mid-term, ending)	Focal person	Contact details
					<p>KENYA tel: +254 (0) 20 208 8478 fax: +254 (0) 20 374 4833 eafrinet@africaonline.co.ke</p>
Integrated Pest Management for Biodiversity conservation	KARI	GoK, requires co-funding	New	Dr Muo Kasina	<p>Kenya Agricultural Research Institute (KARI), P.O. Box 14733-00800 Waiyaki way, Nairobi. Tel: +254-20-444 4144 ext 308; Dir. +254-20-2392710; Cell. +254-723-375 984/ +254-738-199 323 jkasina@yahoo.com</p>
Digitization of biological collection at KARI-NARL	KARI	GoK, co-funding needed	On-going	Dr Muo Kasina	<p>Kenya Agricultural Research Institute (KARI), P.O. Box 14733-00800 Waiyaki way, Nairobi. Tel: +254-20-444 4144 ext 308; Dir. +254-20-2392710; Cell. +254-723-375 984/ +254-738-199 323 jkasina@yahoo.com</p>

ANNEXES

Annex 1: List and contact details of all persons met and referred to during the consultancy meeting

NAME	INSTITUTION	POSITION	TELEPHONE
1. Prof. Grace Njoroge	JKUAT	Senior lecturer	0734916116
2. Rebecca Njoroge	JKUAT	Lecturer and PhD student	0722601849
3. Mr. Ofula	Kenyatta University	Laboratory Technologist/Entomologist	0721712362
4. Dr. Monicah Waiganjo	KARI-Thika	Deputy Centre Director	0733595182
5. Mr. Shem Mecheo	SACDEP	Project Co-ordinator	0720930694
6. Mr. H.M. Mugo	Coffee Research Foundation	Entomologist	mugohmu@yahoo.com
7. Dr Nyamasyo	University of Nairobi (School of Biological Sciences)	Senior Lecturer	0722874591
8. Prof. Nderitu	University of Nairobi (College of Agriculture and Plant Sciences)	Dean of C Faculty	0722308581
9. Dr Ian Gordon	ICIPE	Senior Scientist	+254 208632000
10. Chris Odhiambo	National Museums of Kenya and Mpala Research Centre	Research Associate	072397762
11. Dr. Mary Gikungu	National Museum Kenya	Senior Research Scientist and Director, Centre for Bee Taxonomy and Pollination Ecology	+ 254 2 3742 445 / 3744 833.
12. Dino Martin	Kenyature Kenya	Chairman, Nature Kenya Insect Committee	dinojmv@oeb.harvard.edu
13. Dr Fabian Haas	ICIPE	Head, Biosystematics unit	fhaas@icipe.org
14. Eston Mutitu	Kenya Forestry Research Institute	Head, Entomology Department	0722 386 516 kemutitu@yahoo.co.uk

Annex 2: Inventory of Outputs/Services

a) Consultancy meetings

No	Meeting Type	Title	Venue	Dates	Convened by	Organized by	# of Participants	Report issued as doc no	Language	Dated
1.	Planning	Consultants' briefing	Panorama Hotel, Naivasha	25 th April 2009	Dr. Muo Kasina	Dr. Muo Kasina	3 (Muo Kasina, Celline Achieng and Nickson Otieno)	Meeting notes-no report	English	25 th April 2009
2.	Progress	Consultants' briefing	KARI-National Agricultural Research Laboratories	20 th May 2009	Dr. Muo Kasina	Dr. Muo Kasina	3 (Muo Kasina, Celline Achieng and Nickson Otieno)	Meeting notes-no report	English	20 th May 2009
3.	Progress	Consultants' briefing	KARI-National Agricultural Research Laboratories	26 th May 2009	Dr. Muo Kasina	Dr. Muo Kasina	3 (Muo Kasina, Celline Achieng and Nickson Otieno)	Meeting notes-no report	English	26 th May 2009
4.	Key informant interview	Interview	Botany department JKUAT	28 th May 2009	Celline Achieng'	Celline Achieng	2 (Celline Achieng' and Rebecca Karanja)	Meeting notes	English	28 th May 2009
5.	Key informant interview	Interview	KARI-Thika	28 th May 2009	Celline Achieng'	Celline Achieng'	2 (Celline Achieng' and Dr. Monicah Waiganjo)	Meeting notes	English	28 th May 2009
6.	Key informant interview	Interview	Coffee Research Foundation	28 th May 2009	Celline Achieng'	Celline Achieng'	2 (Celline Achieng' and Mr. H.M.Mugo)	Meeting notes	English	28 th May 2009

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No	Meeting Type	Title	Venue	Dates	Convened by	Organized by	# of Participants	Report issued as doc no	Language	Dated
7.	Key informant interview	Interview	SACDE P	29 th May 2009	Celline Achieng'	Celline Achieng'	2 (Celline Achieng' and Shem Mecheo)	Meeting notes	English	29 th May 2009
8.	Progress	Consultants' briefing	KARI-National Agricultural Research Laboratories	2 nd June 2009	Dr. Muo Kasina	Dr. Muo Kasina	3 (Muo Kasina, Celline Achieng and Nickson Otieno)	Meeting notes-no report	English	2 nd June 2009
9.	Email Communication	N/A	N/A	29 th May and 1 st June 2009	N/A	N/A	Celline Achieng' & Prof. Len Newton	N/A	English	29 th May and 1 st June 2009
10.	Key informant interview	Interview	University of Nairobi Chiromo Campus	3 rd June 2009	Nickson Otieno	Nickson Otieno and Dr. Nyamasyo	Nickson Otieno and Dr. Nyamasyo	Interview questionnaire notes used for compiling report	English	3 rd June 2009
11.	Key informant interview	Interview	E-mail correspondence	3 rd June 2009	Nickson Otieno	Nickson Otieno	Nickson Otieno and Dino Martin	Questionnaire notes used for compiling report	English	3 rd June 2009
12.	Key informant interview	Interview		5 th June 2009	Nickson Otieno	Nickson Otieno and Dr. Mary Gikungu	Nickson Otieno and Dr. Mary Gikungu	Notes from interview and other PowerPoint presentation materials and used for compiling report	English	5 th June 2009
13.	Key informant interview	Interview	University of Nairobi	4 th June 2009	Nickson Otieno	Nickson Otieno and Mr. Aura	Nickson Otieno and Mr. Aura	Interview questionnaire notes used for	English	4 th June 2009

No	Meeting Type	Title	Venue	Dates	Convened by	Organized by	# of Participants	Report issued as doc no	Language	Dated
			Kabete Campus					compiling report		
14.	Key informant interview	Interview	ICIPE	5 th June 2009	Nickson Otieno	Nickson Otieno and Dr Ian Gordon	Nickson Otieno and Dr Ian Gordon	Interview questionnaire notes used for compiling report	English	5 th June 2009
15.	Key informant interview	Interview	ICIPE	5 th June 2009	Nickson Otieno	Nickson Otieno and Dr Ian Gordon	Dr. Fabian Haas	Interview questionnaire notes used for compiling report	English	5 th June 2009
16.		Interview	ICIPE	5 th June 2009	Nickson Otieno	Nickson Otieno and Gitau Ndung'u	Mr. Gitau Ndung'u	Interview questionnaire notes used for compiling report	English	5 th June 2009

Annex 3: Electronic & Printed Materials/references

No	Type	Title	Author(s)/Editor(s)	Publisher	Symbol	Publication Date	Where to get it and / or contact person
1.	Electronic	Status of Pollinator Studies in Kenya	Dr Mary Gikungu	Unpublished Powerpoint presentation	http://www.barcoding.si.edu/PDF/GlobalPollinatorSummitReport.pdf Cited on 21 st June 2009.	May 2009	Dr. Mary Gikungu, NMK
2.	Electronic	Current status of conservation and management of pollinators in Kenya	Dr Wanja Kinuthia	Unpublished PowerPoint presentation	http://www.ebbe.org.br/bpi/isc_meeting/kenya.pdf Cited on 21 st	Not ascertained	Dr. Wanja Kinuthia, NMK

No	Type	Title	Author(s)/Editor(s)	Publisher	Symbol	Publication Date	Where to get it and / or contact person
					June 2009.		
3.	Hard Copy/Electronic	Pollinators and pollination: a resource book for policy and practice	Eardley <i>et al.</i> , 2006 (Eds)	African Pollinator Initiative (API)	http://www.pollinator.org/Resources/Pollination%20Handbook.pdf Cited on 21 st June 2009.	2006	Downloadable from API website and the website cited under symbol column.
4	Electronic	Kenya opens Centre for Bees and Pollination	BioNet Bulletin number 97	BioNet	http://www.bionet-intl.org/opencms/opencms/bulletin/newDevelopments/list.jsp?pageIndex=4 Cited on 21 st June 2009.	October 2008	BioNet website
5.	Electronic	Fly pollination in <i>Ceropegia</i> (Apocynaceae: Asclepiadoideae): biogeographic and phylogenetic perspectives	Ollerton, J. Masinde, S, Meve, U., Picker, M. and Whittington, A.	Annals of Botany	http://aob.oxfordjournals.org/cgi/content/abstract/103/9/1501 Cited on 21 st June 2009.	2009	Dr. Siro Masinde (IUCN) Nickson Otieno, NMK
6.	Electronic	Orchid–bird interactions: a case study from <i>Angraecum</i> (Vandaeae, Angraecinae) and <i>Zosterops</i> (white-eyes, Zosteropidae) on Reunion Island	Micheneau, C., Fournel, J., Humeau, L. and Paillet, T.	Can. J. Bot. 86 (10): 1143–1151	http://www.hghbeam.com/doc/1G1-191215007.html Cited on 21 st June 2009.	2008	www.particle.web-p.cisti.nrc.ca/rparticle/AbstractTemplateServlet?
7.	Electronic	Evolution of Bat Pollination <i>in</i> <u>Bat Ecology</u>	Kuntz, T. H. and Fenton, M. B. (eds)	University of Chicago Press	http://www.press.uchicago.edu/press	2003	http://books.google.co.ke/books?id=Dc9KKEE1WWjoc

No	Type	Title	Author(s)/Editor(s)	Publisher	Symbol	Publication Date	Where to get it and / or contact person
					ite/metadata.epl?mode=toc&bookkey=29474 Cited on 21 st June 2009.		
8.	Electronic	The Pollination of East African Succulent Plants.	Newton, L.E	Succulenta East Africa, Nairobi. (ISBN 9966-761-00-4)	http://www.naturekenya.org/Publications.html Cited on 21st June 2009.	2005	Prof. Len Newton Botany Department, Kenyatta University. ellyen@yahoo.com
9.	Electronic	Sunbirds feeding on Sansevieria flowers	Newton, L.E	Nature East Africa 34(2): 8	http://www.ku.ac.ke/schools/spas/images/stories/docs/newton.pdf Cited on 21 st June 2009.	2004	Prof. Len Newton Botany Department, Kenyatta University. ellyen@yahoo.com
10.	Electronic	Some applied aspects of pollination for increased fruit and seed productivity with special reference to Citrullus lanatus (Watermelon).	Njoroge, G.N., Bussmann, R., Gemmill, B., Newton, L.E. & Ngumi, V.W.	African Crop Science Conference Proceedings 6: 108-112.	http://www.africancrops.net/meetings/acscuesday.htm Cited on 21 st June 2009.	2003	Prof. Len Newton Botany Department, Kenyatta University. ellyen@yahoo.com
11.	Electronic	Pollination	Newton, L.E	Ballya 4: 52-54.	BioOne online journals. Cited on 21 st June 2009.	1997	Prof. Len Newton Botany Department, Kenyatta University. ellyen@yahoo.com
12.	Electronic	Observations on flowering of Sansevieria robusta in	Newton, L.E	East Africa Natural History Society	http://dractax.myspecies.info/en/biblio/	1994	Prof. Len Newton Botany Department, Kenyatta University.

No	Type	Title	Author(s)/Editor(s)	Publisher	Symbol	Publication Date	Where to get it and / or contact person
		Kenya		Bulletin 24: 8-11	author/Newton?sort=year&order=asc Cited on 21 st June 2009.		ellyen@yahoo.com
13.	Electronic	Terminology of structures associated with pollinia of the Asclepiadaceae. Taxon 33: 619-621	Newton, L.E	Not indicated	http://www.jstor.org/pss/1220779 Cited on 21 st June 2009.	1984	Prof. Len Newton Botany Department, Kenyatta University. ellyen@yahoo.com
14.	Electronic	Orchid–bird interactions: a case study from <i>Angraecum</i> (Vandaeae, Angraecinae) and <i>Zosterops</i> (white-eyes, Zosteropidae) on Reunion Island	Micheneau, C., Fournel, J., Humeau, L. and Paillet, T.	Can. J. Bot. 86 (10): 1143–1151	http://rparticle.web-p.cisti.nrc.ca/rparticle/AbstractTemplateServlet?calyLang=eng&journal=cjb&volume	2008	Contact NRC Canada on the website indicated

It should be noted that Prof. Newton’s publications according to him reflects more of an amateur’s interest than scholarly work. Prof. Newton teaches a course in pollination to third-year undergraduates at the botany department of Kenyatta University (KU) but his main research subject is plant taxonomy. He has supervised PhD projects on pollination, on melons (completed 2005) and currently on coffee (though registered at JKUAT, not KU).

Annex 4: List of Pollinators in Kenya⁶

Type of pollinator	Specific	Examples of plant(s) pollinated
A. Arthropoda	• Coleopterans (Beetles)	
	• Dipterans (Flies and midges)	

⁶ See list of wide variety of crops and their pollinators in Free JB (1993) Insect pollination of crops. Second edition. Academic Press, London, and cited references

	<ul style="list-style-type: none"> Lepidopterans (Butterflies and moths) 	
	<ul style="list-style-type: none"> Hymenoptes (Honey bees and stingless honey bees, Non-honey making bees/ wild bees, wasps) 	
B. Avea (birds)	<ul style="list-style-type: none"> Sunbirds (Family Nectariniidae); 	<ul style="list-style-type: none"> The genus <i>Protea</i>, <i>Viscum</i> and <i>Aloe</i>
	<ul style="list-style-type: none"> White-eyes (Family Zosteropidae); 	<ul style="list-style-type: none"> Orchid in genus <i>Angraecum</i>
C. Mammalia	<ul style="list-style-type: none"> Bats (Fruit bats in the family Pterodidae e.g <i>Rousettus sp</i> and <i>Epomophorus sp</i>) 	<ul style="list-style-type: none"> Baobab(<i>Anasonia digitata</i>) Mangroves such as <i>Sonneratia alba</i> Neem tree (<i>Azadirachta indica</i>) Many plants in the genus <i>Musa</i> (Banana) and <i>Ficus</i> (figs)

Annex 5: Profiles of the consultant team on pollinators

Name	Qualification	Position	Institution/ Department	Address	Telephone (Office and Cell)	E-mail
Muo Kasina	PhD	Senior research officer	Kenya Agricultural Research Institute, National Research Laboratories	P.O. Box 14733-00800 Waiyaki way, Nairobi.	+254-20-444 4144 ext 308; Dir. +254-20-2392710; Cell. +254-723-375 984/ +254-738-199 323	jkasina@yahoo.com
Nickson Erick Otieno	MSc	Research Scientist and Database Manager	National Museums of Kenya, Ornithology Section	P. O. Box 406500100 Nairobi Kenya	Office: +254 20 3742161/242 Cell: +254 726 797 884	neotieno@yahoo.com
Celline Achieng' Oduor	MSc	Most recently a Project Officer in Community-Based Natural Resources Management with the African Wildlife Foundation (AWF)	Currently a consultant in both social and scientific research	P.O. Box 47296-00100 Nairobi, Kenya	+254 722 821 171	cellineoduor@yahoo.com

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