REPUBLIC OF KENYA

MINISTRY OF AGRICULTURE AND IRRIGATION

STATE DEPARTMENT OF LIVESTOCK

EASTERN AND CENTRAL AFRICA AGRICULTURAL TRANSFORMATION (ECAAT) PROJECT

ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK (ESMF)

April 2018

ACRONYMS AND ABBREVIATIONS

AAK	Agrochemical Association of Kenya
AFC	Agriculture Finance Corporation
ARAP	Abbreviated Resettlement Action Plan
CBO	Community Based Organisation
CC	Compensation Committee
CDD	Community- Driven Development
CDDC	Community- Driven Development Committees
CDP	Community Development Plan
CEC	County Environment Committee
CDE	County Director of Environment
CDP	Community Development Pan
CEOs	Chief Executive Officers
CIAT	International Centre for Tropical Agriculture
CIDP	Community Integrated Development Plan
CIG	Common Interest Group
CIP	County Integrated Plan
CPCU	County Project Coordinating Unit
CPPO	County Plant Protection Officers
CRA	Community Resource Assessment
CRF	Coffee Research Foundation
CIP	Community Integrated Action Plan
CPCU	County Project Coordinating Unit
CPSC	County Project Steering Committee
CRA	Community Resource Assessment
CRPs	Collaborative Community Projects
CSA	Climate Smart Agriculture
CSC	Community Subproject Committee
CTT	County Technical Teams
CYMMY	International Maize and Wheat Improvement Center
DLCO	Dry Land Crops Organization
EA	Environmental Audit
EAAPP	Eastern Africa Agricultural Productivity Project
ECAAT	East and Central Africa Agricultural Transformation Project
EIA	Environmental Impact Assessment
EIL	Economic Injury Level
EIS	Environmental Information System
EMCA	Environment Management Coordination Act
ESIA	Environmental and Social Impact Assessment
EMMP	Environmental Monitoring and Management Plan

ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ET	Economic Threshold
EWS	Early Warning Systems
FAO	Food Agricultural Organization
FGDs	Focused Group Discussions
FPEAK	Fresh Produce Export Association of Kenya
GIS	Geographic Information System
GOK	National Government
GPS	Geographic Positioning System
HCDA	Horticultural Crops Development Authority
IA	Implementing Agency
ICIPE	International Centre of Insect Physiology and Ecology
ICRAF	International Centre for Research in Agroforestry/World Agroforestry Centre
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDS	Institute of Development Studies
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
IPM	Integrated Pest Management
IPMF	Integrated Pest Management Framework
ISPM	International Standards for Phytosanitary Measures
ITK	Indigenous Technical Knowledge
KAGRC	Kenya Animal Genetic Resource Centre
KCSAP	Kenya Climate Smart Agriculture Project
KALRO	Kenya Agricultural Research and Livestock Organization
KEFRI	Kenya Forestry Research Institute
KEPHIS	Kenya Plant Health Inspectorate Service
KESREF	Kenya Sugar Research Foundation
KFS	Kenya Forest Service
KSC	Kenya Seed Company
KWS	Kenya Wildlife Service
MMP	Mitigation Management Plan
MoDP	Ministry of Devolution and Planning
M&E	Monitoring and Evaluation
MIS	Management Information System
MoA&I	Ministry of Agriculture and Irrigation
MoU	Memorandum of Understanding
NARIG	National Agricultural and Rural Inclusive Growth Project
NCPB	National Cereals Produce Board
NEMA	National Environment Management Authority
NGO	Non-Governmental Organization
NIB	National Irrigation Board

NPCU	National Project Coordinating Unit
NPSC	National Project Steering Committee
NPCU	National Project Coordinating Unit
NRM	Natural Resources Management
NPSC	National Project Steering Committee
ODS	Ozone Depleting Substances
OP	Operational Policy
PAD	Project Appraisal Document
PBK	Pyrethrum Board of Kenya
PDO	Project Development Objective
PIC	Public Information Centre
PICD	Participatory` Integrated Community Development
PIU	Project Implementing Unit
POs	Producer Organisations
PPPs	Policies, Plans & Programs
PRS	Poverty Reduction Strategies
RAP	Resettlement Action Plan
SDG	Sustainable Development Goals
SA	Social Assessment
SAIC	Social Audit and Integrity Committees
SLM	Sustainable Land Management
SPs	Service Providers
TBD	Tick Borne Disease
TIMPs	Technology Innovation Methods Practices
TOR	Terms of Reference
ToT	Training of Trainers
ULV	Ultra Low Volume
VC	Value Chain
VEO	Village Extension Officers
VMGs	Vulnerable and Marginalized Groups (VMGs)
WB	World Bank
WRMA	Water Resources Management Authority

EXECUTIVE SUMMARY

Introduction

1. Eastern and Central Africa Agricultural Transformation (ECAAT) project is under category B. These are projects that have minimal and site-specific impacts that are less costly to mitigate. Environmental Screening of the ECAAT Project reviewed that the project would trigger the following World Bank policies and procedures: (OP/BP 4.01) Environment Assessment, (OP/BP 4.04) Natural Habitats, (OP 4.09) Pest Management, (OP/BP 4.10) Indigenous People and (OP/BP 4.12) Involuntary Resettlement. The development of an Environmental and Social Management Framework (ESMF) is a way to comply with the World Bank safeguard policy on Environmental Assessment (EA) (OP/BP 4.01) in a case when the project activities are not defined prior to project appraisal as the case with ECAAT. For ECAAT the EA process takes into account the natural environment (air, water and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples; and physical cultural resources) and Trans-boundary and global environmental aspects.

2. EA integrates environmental and social aspects in project implementation with project and in country considerations and conditions to the extent that the World Bank will not fund any project or activity that is not in line with in country overall policy framework; national legislation, international treaties and agreements or even institutional capabilities in environment and social issues. Using the ESMF which is derived from the EA (OP/BP 4.01), therefore, the EA process intensity depends on the nature, scale, and potential environmental impact of the proposed project (WB, 2008). A range of instruments are available that satisfy the OP/BP 4.01 including: environmental impact assessment (EIA); strategic environmental and social assessment (SESA); environmental audit (EA); hazard or risk assessment; environmental and social management plan (ESMP) and the environmental and social management framework (ESMF). Environmental screening is thus undertaken to determine the extent of potential impact and the type of instrument to use.

1.1. Brief Description of Project

3. The National Government has requested for a credit facility from the International Development Agency (IDA – World Bank Group) to finance the implementation of the East and Central Africa Agriculture Transformation (ECAAT) Project which is the second phase of the Eastern Africa Agricultural Productivity Project (EAAPP). The project implementation is under the overall responsibility of Ministry of Agriculture and Irrigation, State Department of Livestock.

4. The proposed project development objective is to enhance regional collaboration to improve productivity, resilience, and competitiveness of selected agricultural commodity value chains and increase smallholder farmer access to the regional market for food commodities and products."

5. The Eastern and Central Africa Agricultural Transformation Project will focus on harmonization of selected policies across the region to create a conducive regulatory environment for regional collaboration in development, transfer, and exchange of technologies – which then enables sustainable regional collaboration and private sector investment in technology development beyond the life of the project. Access to formal markets is a major constraint for agriculture in the region, and a huge amount of regional trade in agriculture commodities is informal.

6. The project will support smallholder farmers to access regional value chains through proven approaches, such as productive alliances, and support (at least on pilot basis) the use of regional commodity exchanges to improve regional integration of markets for agricultural commodities. Overall, the regional collaboration will generate important goods of a public nature, including: (a) technologies, innovations, and management practices – for example improved varieties and breeds; (b) capacities created in the regional centers of leadership/excellence – for example laboratories, databases and information; and (c) formal networks of competent scientists to underpin sustainable collaboration; (d) harmonized regional policies and improved capacity for policy analysis; (e) gene banks for germplasm conservation; (f) reduction of greenhouse gas (GHG) emissions; (g) regional platforms for access to formal markets – e.g. productive alliances and regional commodity exchanges.

1.2. Description of Project Areas –

7. The East and Central Africa Agriculture Transformation Project will focus on out and upscaling of interventions conducted in the 23 counties that were consultatively selected using agreed criteria. These include counties previously covered under EAAPP and additional ones for up/outscaling and to accommodate additional commodities/value chains.

8. The proposed project development objective is to enhance regional collaboration to improve productivity, resilience, and competitiveness of selected agricultural commodity value chains and increase smallholder farmer access to the regional market for food commodities and products. The p-project will focus on transformation of agriculture in the region.

9. The aim of agriculture transformation is to improve the effectiveness of the sector in raising incomes, reducing poverty, improving nutrition outcomes, addressing the challenges of changing climate, fostering regional integration of markets for food commodities and products, and providing better jobs – including to skilled youth and women. This is a strategic shift from previous regional agricultural projects that had focused primarily on productivity.

10. The project's technical aspects will be guided by the following elements of agricultural transformation: (i) enhancing technology of production along the entire commodity value chains, including by providing farmers with access to technical knowledge

and improved seeds and breeds; (ii) building resilience in primary agriculture to changing climate and promoting nutrition-sensitive agriculture and food safety; (iii) developing critical skills to meet the needs of current and future food systems, including skills required by private and public sectors; (iv) forming partnerships and alliances that connect farmers with markets and enable farmers to understand market needs and produce for the market, (v) regional integration of markets for technology of production, food commodities and food products; and (vi) facilitating a policy and regulatory environment that actively enables regional collaboration in developing solutions across the value chain and which encourages private-sector participation, including in technology development.

1.3. Project Components

11. **The project has 4 components**. **Component I: Regional Commodity Programs:** This component will support regional collaboration in the development of agricultural technologies, innovations, and management practices (TIMPS) for selected commodities and to facilitate exchange and dissemination of the TIMPS across national boundaries. The focus will be on (i) efficient use of existing knowledge, technical expertise, institutional capacity and physical facilities; (iii) faster development of new technologies, innovations, and management practices; and (iv) organized transfer of genetic materials, germplasms, planting materials, breeding stock and technologies across national boundaries.

12. The project's investments in the regional centers will strengthen the human, institutional, and infrastructure capacities to enable the centers become platforms for: (i) coordinating regional priorities for development of agricultural TIMPs; (ii) advancing innovations and solutions along value chains, including post-harvest management, food safety, and development of food products; (iii) establishing linkages with global sources of knowledge, including CGIAR centers, US land grant universities, and national and regional universities; and (iv) establishing strong linkages with the private sector, especially agribusinesses involved in both input and output markets for food commodities and products.

13. The project will also finance activities to eventually transform the selected centers into certified Regional Centers of Excellence for a specific commodity or group of commodities, based on agreed criteria. The support will include: (a) establishing formal network of researchers and other collaborators in regional commodity programs; (b) capacity building on leadership and governance; (c) physical infrastructure such as scientific labs, refurbishment of the milk processing plant (incubation centers), Construction of livestock structures, finalization of the access road (linking the resource centre to the highway) at RDCoL, construction of hay barn/bull barn, completion of the Namanga Cross Border Quarantine station and construction of indigenous poultry houses among others .

14. **Component 2: Enabling Policies and Agricultural Markets:** This component will support (i) creation of an enabling policy and regulatory environment for regional collaboration in development, transfer, and exchange of technologies; and (ii) Improvement of smallholder farmer's access to regional and national markets for food commodities and

products (iii) promotion of effective models for service delivery. This will be realized through creating enabling policies and linking smallholder farmers' access to markets to regional and national markets.

15. **Component 3. Contingent Emergency Response:** This zero-cost component will finance eligible expenditures under the Immediate Response Mechanism (IRM) in case of natural or man-made crises or disasters, severe economic shocks, or other crises and emergencies in the ECAAT project countries. This contingency facility can be triggered through formal declaration of a national emergency by the government authority and upon a formal request from government of the participating country to the World Bank through the Ministry of Finance/National Treasury. In such cases, funds from other project components will be reallocated to finance emergency response expenditures to meet agricultural crises and emergency needs. The emergency response would include mitigation, recovery, and reconstruction following crises and disasters, such as severe droughts, floods, disease outbreaks, and landslides, among others.

16. **Component 4. Project Coordination and Management:** This component will focus on project coordination and management at national and regional levels. Activities financed under this component will comprise coordination, fiduciary aspects, M&E, safeguards monitoring and compliance, and day-to-day implementation of the project.

1.4. Project Beneficiaries -

17. The primary beneficiaries of the project will be smallholder farmers and pastoralists, including women ,youth and Vulnerable and Marginalized Groups (VMGs) and other stakeholders along dairy, wheat, rice, cassava, indigenous poultry, beans and oil crops value chains.

18. The project will target stakeholders organized in common interest groups (CIGs) and federated into Producer and marketing Organizations (PMOs) along the value chains (VC), and in selected county governments.

19. It is envisaged that ECAAT will be implemented in 23 counties that were consultatively selected using agreed criteria. These include counties previously covered under EAAPP and additional ones for up/outscaling and to accommodate additional commodities/value chains.

1.5. Principles and Objectives

20. Past experience in the agriculture sector has shown through previous projects that there is potential for minor and reversible negative impacts within the envisaged subprojects including refurbishment of existing infrastructure, upgrading of institutional access roads, construction of livestock holding facilities/structures , completion of Namanga Cross Border Quarantine Station, Poultry houses and installation walls among others. Eastern

and Central Africa Agriculture Transformation Project has prepared an Environmental and Social Management Framework (ESMF) to ensure that all investments are adequately screened for their potential environmental and social impacts, and that correct procedures will be followed, for all the types of investment to be undertaken through ECAAT as stated in the ESMF.

21. The ESMF is therefore, prepared to guide the selection and implementation of subprojects that will require precautionary measures related to (OP/BP 4.01) Environment Assessment. The World Bank's safeguard policy on environmental assessment (OP/BP 4.01) is to be complied with where potential risks and impacts are anticipated. In this regard, therefore, project objectives would be preventing, minimizing, mitigating or compensating for adverse environmental and social impacts and enhancing positive impacts in project selection, location, planning, design, mitigating and managing through project implementation. Preventive interventions through either mitigatory or compensatory measures should be the priority.

22. This framework targets certain activities that may negatively impact on the livelihoods of the target beneficiaries. Examples of such activities include sustainable land and water management, and infrastructural development.

23. The Bank Operational Policy on Safeguards requires that ESMF report including an integrated pest management framework (IPMF) is consulted upon and disclosed in country and accessed easily by general public, and at the Bank's Info Shop.

24. The activities envisaged under subprojects cumulatively may have negative impacts if not well mitigated (see table 1below)

Table 1: Envisaged Activities and their Potential Impacts

Activities	Negative Impacts	Social Impacts
Component: 1 Regional Commodity Programs		
Subcomponent 1.1 Infrastructure Development • **Physical Infrastructure Development (**Completion of Namanga Quarantine Station, Construction of Livestock Structures, Refurbishment of Milk Processing Plant, and Construction of	• Noise and dust pollution • Disposal of asbestos roofing materials and debris • Risk of transboundary disease transmission • Loss of access to grazing especially at Namanga Quarantine Station. • Increased generation of solid and liquid waste	• Risk of HIV and AIDS infections • Workers safety • Risk of in accessibility by the physically challenged • Risk of lead poisoning as result of use of oil-based

Activities	Negative Impacts	Social Impacts
Poultry Houses among others	• Disturbance of ecological system; contamination of ground water table • Earth Movement • Risk of water runoff due to roof catchment • Risk of lightening related damages	paints
Sub Component 1.2 Technology Development, Transfer and dissemination	• Risk of mishandling of drugs, pesticides and non-biodegradable packing materials • Inappropriate disposal of expired drugs and chemicals and the used containers/wrappings • Risk of increased generation of slurry • Risk of increased use of pesticides • Risk land degradation • Risk of afflatoxins poisoning as a result of poor handling and storage of pasture and fodder • Poor storage of liquid nitrogen containers • Risk of reduction of biodiversity as result opening up of more land and mono-cropping • Improper disposal of plastics and disposable gloves • Poor storage and handling of fertilizers and fodder • Risk of increased use of pesticides • Risk of increased use of organic and inorganic fertilizers • Biosafety issues, Food safety issues; Air, water and land	• Risk of not catering for the gender concerns and the vulnerable members of the community • Lack of PPE by inseminators

Activities	Negative Impacts	Social Impacts
	pollution through use of chemicals; • Soil fertility issues; • Adaptation to technologies/practices to climate change; • Hazardous waste (e.g. laboratory waste)	
Component 2.0 Enabling Policy and Linking Farmers to Market		
Sub Component 2.1 Improvement of smallholder farmer's access to regional and national markets for food commodities and products	(Construction of Commodity/Product bulking facilities/structures)	•

25. In line with the World Bank safeguard policy on Environmental Assessment (OP/BP 4.01), this ESMF has been prepared under ECAATP to guide in the implementation of project activities by preventing and minimizing negative environmental and social impacts through a number and structured steps which are detailed in the main text of this framework.

26. Environmental and Social Impacts - This ESMF considers that due mitigation process starting with subproject screening will be adopted and an environmental and social management plan (ESMP) for each subproject will be formulated. An Iintegrated Pest Management Plan (IPMP has been formulated and will be used in cases where agrochemical usage will be required in subprojects. Mitigation Measures – the right EA tools will be applied as and where necessary, based on the anticipated impacts and risks.

27. **Institutions/Departments Responsible** - The main institutions involved in the implementation of the ESMF are: Ministry of Agriculture and Irrigation Development (MoA&I) – State Departments of Livestock and Agriculture ; National Project Coordination Unit (NPCU) of the ECAATP; the National Environmental Management Authority (NEMA); County Governments farmers (Common Interest Groups and /Producer Organizations) .

28. The implementation of activities will be under the overall guidance of the NPCU of the ECAATP. The NPCU will undertake Training Needs Assessment with regard to the project's capacity to mainstream Environment and Social Safeguards. Following the outcome/gaps identified during the TNA, the NPCU will in collaboration with the relevant institutions conduct capacity building of the staff from ECAAT project implementing agencies both at national and county level.

29. The Farmers (Common Interest Groups/ Producer Organizations) will be trained on the mainstreaming of Environmental and social safeguards in the activity implementation,

whereas NEMA and other regulatory institutions will be involved in review of related instruments and in Monitoring and Evaluation. County level staff will be involved in capacity building of the farmers (CIG/producer organizations), Mmainstreaming of Environmental and Social Safeguards, Monitoring and Reporting.

30. Training and Awareness Creation Budget for ESMF Implementation - Positive impacts from the safeguard trainings are expected to be realized by the target communities. Key among these include: (i) increased conformity to safeguards through various capacity building levels, (ii) increased income especially from sale of quality agri-products as a result of mainstreaming safeguards in both individual smallholder farmer, pastoralists and community-based investments, (iii) inclusion of all segments of the community and gender mainstreaming in micro-project activities and community level decision-making structures; (iv) special targeting of the vulnerable and marginalized, and (v) increased participation of youth in the project's activities through funding of specific youth actions plans (YAPs) where applicable.

31. These positive impacts will contribute immensely to an enhanced ability of VMGs and the other participating CIGs members to take care of their basic needs such as payment of schools fees, health care and nutritional requirements of their families. ESMF implementation budgets will be mainstreamed in the sub- and micro-projects under all the components while the monitoring and capacity building will be under component four budget.

32. **Participatory Monitoring and Evaluation Plan** - All project results indicators will be disaggregated by gender to monitor women's participation in the project interventions. The project will also enhance capturing of this environmental and social gender data in a disaggregated manner where applicable.

33. **Stakeholder Consultation, Participation and Disclosure of ESMF**. As provided for under EMCA (1999) and WB policy OP/BP 4.01 Environmental Assessment, information and consultation on the ECAATP environmental and social management framework will be conducted as follows: Circulation of the draft ESMF for comments to all relevant institutions (e.g. MoA&I, Ministry of Water, National Environment Management Authority (NEMA), Kenya National Agricultural Federation of Farmers (KENAFF), State Department of Cooperatives and Enterprise Development.) as well as the WB.

34. The ESMF was subjected to stakeholder/public consultations on 6th March, 2018. Feedback and comments from the consultations were incorporated in the final document. The final ESMF will be submitted to both GoK departments & World Bank for review and clearance. Subsequently, the final document will be disclosed in the project/e-government sites and official media and at the World Bank external website prior to project appraisal.

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Eastern and Central Africa Agricultural Transformation (ECAAT) Project

Environmental & Social Management Framework

A. Introduction

35. The National Government through the Ministry of Agriculture and Irrigation has requested for a credit facility from the International Development Agency (IDA – World Bank Group) to finance the implementation of the East and Central Africa Agriculture Transformation Project (ECAATP). The project implementation is under the overall responsibility of Ministry of Agriculture and Irrigation (MoA&I) - State Department of Livestock.

B. Strategic Context

36. Agriculture is a major driver of the Kenyan economy and the dominant source of employment for roughly half of the Kenyan people. In 2015, the sector contributed almost 26 percent to the GDP. About 83 percent of land area is in the Arid and Semi-Arid Lands (ASALs), which are mainly pastoral areas; and only 17 percent (where also 80 percent of population lives) is classified as medium to high agricultural potential zone. Majority of Kenya's farms are small, and are getting smaller due to continuous sub-division, which is a major concern. Climate change is an agricultural risk, with implications for agriculture, the natural resource base, food security, livelihoods, and the stability of the wider economy. Kenya is highly vulnerable to the impacts of climate change.

37. ECAATP will, support strategic interventions that are considered to be key elements of agricultural transformation including: therefore,: (i) enhancing technology of production along commodity value chains, including by providing farmers with access to technical knowledge and improved seeds and breeds; (ii) building resilience in primary agriculture to changing climate and promoting nutrition-sensitive agriculture and food safety; (iii) developing critical skills to meet the needs of current and future food systems, including skills required by private and public sectors; (iv) forming partnerships and alliances that connect farmers with markets and enable farmers to understand market needs and produce for the market, (v) regional integration of markets for technology of production, food commodities and food products; and (vi) facilitating a policy and regulatory environment that actively enables regional collaboration in developing solutions across the value chain and encourages private-sector participation, including in technology development

38. The ESMF therefore, details environmental and social management policies, guidelines, technological practices and procedures to be integrated in the implementation of the ECAAT subprojects in order to effectively address the above sector constraints. It is envisaged that implementation of the ESMF document will ensure compliance with applicable legislation, policies and regulations under the Kenyan Constitution, the Environment Management and Coordination Act (Cap 387) as well as relevant World Bank Safeguards policies on Environment and Social Management issues.

39. Project Development Objective: The proposed project development objective is "to enhance regional collaboration to improve productivity, resilience, and competitiveness of selected agricultural commodity value chains and increase smallholder farmer access to the regional market for food commodities and products."

40. The PDO of ECAATP is to enhance regional collaboration to improve productivity, resilience, and competitiveness of selected agricultural commodity value chains and increase smallholder farmer access to the regional market for food commodities and products". To achieve the PDO the project will focus on structural transformation for growth and poverty reduction through competitiveness, resilience to shocks, and macro stability through: (a) boosting agriculture productivity to improve the sectors competitiveness; (b) skills development, including technical skills and higher education, to generate competent skills that meet the needs of the private and public sectors; (c) building competitiveness of smallholder farmers to access formal regional markets for food; (d) nutrition sensitive agriculture to address malnutrition and contribute to long-term human capital development; and (e) climate smart agriculture practices to build resilience in the food system.

41. In this context, the project will seek regional solutions to: (i) generate highly productive technologies and improve farmers access to the technologies, innovations, and management practices; (ii) adapting to the threat of climate change, through a regional approach to development of resilient technologies (seeds and breeds) and management practices that improve water use efficiency; (iii) improve smallholder farmers access to regional value chains and removing barriers to movement of agricultural inputs and produce; (iv) leverage human capital and skills that may not be available in each country to support regional agenda for transformation of agriculture; (v) develop skills for the food system to meet the needs of public and private sectors; and (vi) promote innovative approaches in the business of agriculture and create sustainable regional collaboration for agriculture transformation.

42. In the project area, ECAAT Project will promote sustainable landscape management with coordinated interventions at spatial scales (communities) that attempt to optimize the interactions among a range of land cover types, institutions, and agro-pastoral and pastoral activities. This sustainable landscape management will help: (i) optimize the management of different CSA interventions depending on natural resource (agriculture, livestock, forestry); (ii) take into account the external environment (devolved governance structure, policies, strategic plans, regulations, markets, among others) that might alter the relationship between the stakeholders; and (iii) encourage inclusive stakeholder consultations (common interest groups, vulnerable and marginalized groups, producer organizations, savings and credit societies, service providers, input suppliers, civil society, NGOs, CBOs, and government agencies, among others) to strengthen institutional capacity (at national, county and community levels) and enhance service delivery.

Project Beneficiaries

43. The direct beneficiaries of the project are estimated at about 115,000 smallholder farmers in selected counties. Producer organizations (POs), Vulnerable and Marginalized Groups (VMGs), micro-small-and-medium enterprises will also directly benefit from the project interventions.

44. The indirect beneficiaries will be staff of the national and county governments (including ward level) departments, Middle Level Training institutions (Dairy Training Institute, Kenya School of Agriculture, AHITI, Livestock Training Institute and AHITIs) and semi-autonomous government agencies (KARLO, KAGRC and KEPHIS, among others). These institutions will benefit from the technical and institutional capacity building interventions under the project.

45. ECAAT project will cover the 23 counties that were consultatively selected using the criteria indicated below . These include counties previously covered under EAAPP and additional ones for up/outscaling and to accommodate additional commodities/value chains. These include the following:

- Dairy (14) - Murang'a, Nyeri, Nyandarua, Meru, Elgeyo Marakwet, Uasin Gishu, Kakamega, Vihiga, Bungoma, Nakuru, Migori, Nyamira, Garissa and Taita Taveta
- Wheat (4) - Narok , Nyeri, Nakuru and Meru
- Rice (4) - Kisumu (Ahero Irrigation Scheme in Nyando Sub county& Muhoroni), Homabay, Meru and Busia (Bunyala Irrigation Scheme)
- Beans (5) - Kitui, Busia, Laikipia, Narok, Nyeri and Machakos
- Indigenous Poultry (7) - Busia, Kakamega, Laikipia, Kitui, Taita Taveta, West Pokot and Kilifi
- Cassava (3) – Busia, Migori & Kilifi

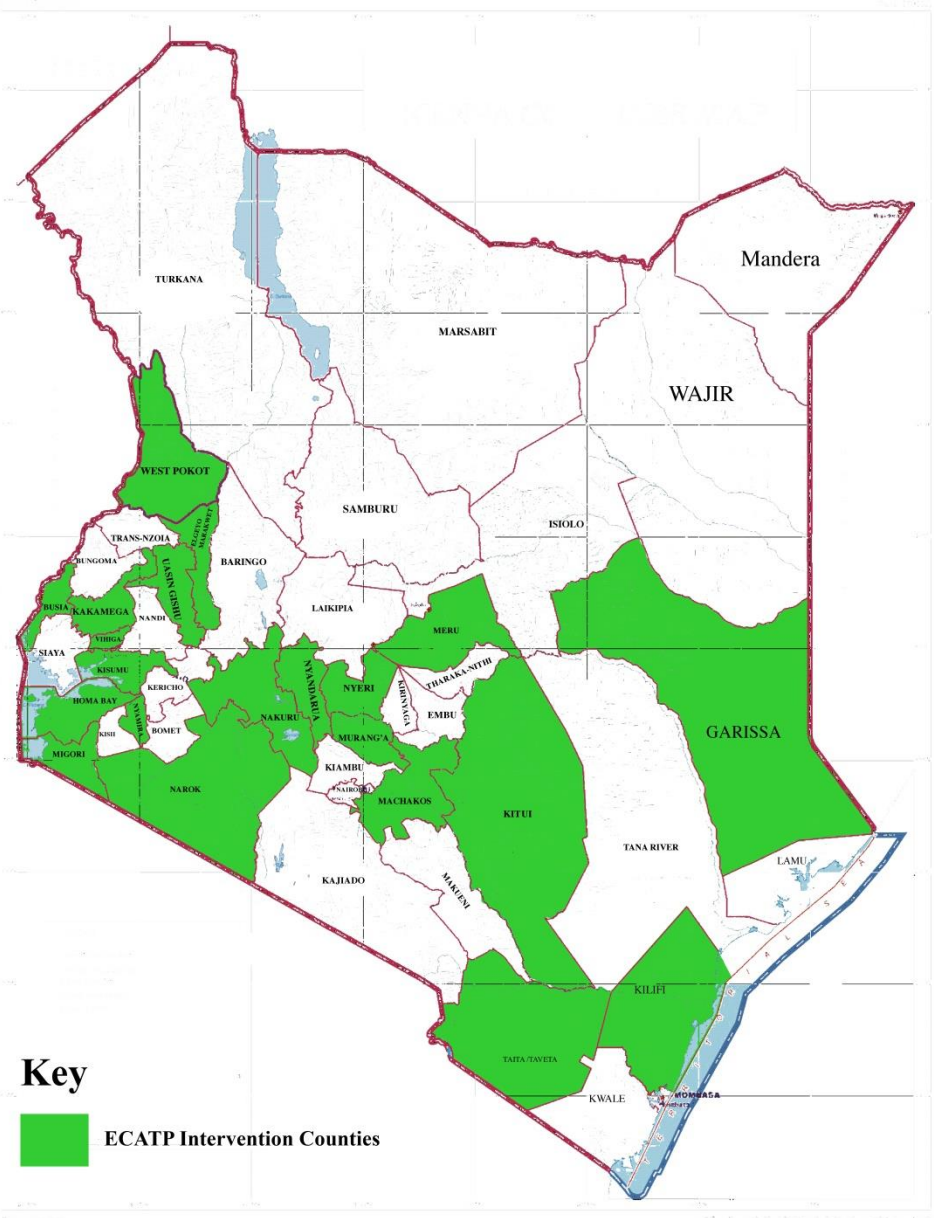


Figure 1: Eastern and Central Africa agriculture transformation project intervention counties

46. The above counties/intervention areas were identified consultatively using the criteria below:
    - Up/out-scaling of TIMPs developed under EAAPP in former project areas.
    - Complementarity with identified priority value chains in CIDPs and willingness of counties to partner with project and co finance project costs.
    - Agro-ecological zones in relationship to targeted commodities.
    - Number of existing sector projects and programmes.
    - Clustering of project areas (sub counties) to reduce operational and maintenance costs in project implementation and leverage on existing project implementation structures.

C. Project Description

The Context

47. Kenya has three main agricultural production systems. The smallholder mixed crop-livestock system found in areas that receive more than 1,000 mm of rainfall annually (high potential zones), spreading from central Kenya, through the central Rift Valley to western Kenya and the coastal strip. This system takes the form of a maize-based, dairy production system with or without cash crops, such as coffee, tea and horticulture. The crop-livestock-tree production (Agro-silvo-pastoral) system found in areas that receive between 750 and 1,000 mm of rainfall annually (medium potential zones). This system focuses on integration of livestock and crops, soil and water conservation, and growing drought tolerant and early maturing crops. In some areas, irrigation schemes have also been set up to enhance crop production. The pastoral/extensive livestock production system found in areas receiving 200–750 mm of rainfall annually (low potential zones), stretching from north and north-eastern Kenya to the southern parts bordering Tanzania. Livestock production, mainly beef animals and small ruminants, are the major enterprises under small-scale, but also some large scale ranches.

48. ECAATP will focus on agriculture transformation that aims at improving the effectiveness of the sector in raising incomes, reducing poverty, improving nutrition outcomes, addressing the challenges of changing climate, fostering regional integration of markets for food commodities and products, and providing better jobs – including to skilled youth and women. This is a strategic shift from previous regional agricultural projects that had focused primarily on productivity.

49. The project's technical aspects will be guided by the following elements of agricultural transformation: (i) enhancing technology of production along the entire commodity value chains, including by providing farmers with access to technical knowledge and improved seeds and breeds; (ii) building resilience in primary agriculture to changing climate and promoting nutrition-sensitive agriculture and food safety; (iii) developing critical skills to meet the needs of current and future food systems, including skills required by private and public sectors; (iv) forming partnerships and alliances that

connect farmers with markets and enable farmers to understand market needs and produce for the market, (v) regional integration of markets for technology of production, food commodities and food products; and (vi) facilitating a policy and regulatory environment that actively enables regional collaboration in developing solutions across the value chain and which encourages private-sector participation, including in technology development. ECAAT Project interventions will be concentrated in counties with comparative advantage for selected commodity value chains including dairy, Wheat, Rice, Cassava, Indigenous Poultry and Beans

50. **Project Components –**The project has 4 components. **Component I: Regional Commodity Programs:** This component will support regional collaboration in the development of agricultural technologies, innovations, and management practices (TIMPS) for selected commodities and to facilitate exchange and dissemination of the TIMPS across national boundaries.

51. The focus will be on (i) efficient use of existing knowledge, technical expertise, institutional capacity and physical facilities; (iii) faster development of new technologies, innovations, and management practices; and (iv) organized transfer of genetic materials, germplasms, planting materials, breeding stock and technologies across national boundaries. The project's investments in the regional centers will strengthen the human, institutional, and infrastructure capacities to enable the centers become platforms for: (i) coordinating regional priorities for development of agricultural TIMPs; (ii) advancing innovations and solutions along value chains, including post-harvest management, food safety, and development of food products; (iii) establishing linkages with global sources of knowledge, including CGIAR centers, US land grant universities, and national and regional universities; and (iv) establishing strong linkages with the private sector, especially agribusinesses involved in both input and output markets for food commodities and products.

52. The project will also finance activities to eventually transform the selected centers into certified Regional Centers of Excellence for a specific commodity or group of commodities, based on agreed criteria. The support will include: (a) establishing formal network of researchers and other collaborators in regional commodity programs; (b) capacity building on leadership and governance; (c) physical infrastructure such as scientific labs refurbishment of the milk processing plant (incubation centers), Construction of livestock structures, finalization of the access road (linking the resource centre to the highway) at RDCoL, construction of hay barn/bull barn, completion of the Namanga Cross Border Quarantine station and construction of indigenous poultry houses among others .

53. **Component 2: Enabling Policies and Agricultural Markets:** This component will support (i) creation of an enabling policy and regulatory environment for regional collaboration in development, transfer, and exchange of technologies; and (ii) Improvement of smallholder farmer's access to regional and national markets for food

commodities and products. (iii) promoting effective models for service delivery. This will be realized through creating enabling policies and linking smallholder farmers' access to markets to regional and national markets.

54. **Component 3. Contingent Emergency Response:** This zero-cost component will finance eligible expenditures under the Immediate Response Mechanism (IRM) in case of natural or man-made crises or disasters, severe economic shocks, or other crises and emergencies in the ECAAT project countries.

55. This contingency facility can be triggered through formal declaration of a national emergency by the government authority and upon a formal request from government of the participating country to the World Bank through the Ministry of Finance/National Treasury. In such cases, funds from other project components will be reallocated to finance emergency response expenditures to meet agricultural crises and emergency needs. The emergency response would include mitigation, recovery, and reconstruction following crises and disasters, such as severe droughts, floods, disease outbreaks, and landslides, among others.

56. **Component 4. Project Coordination and Management:** This component will focus on project coordination and management at national and regional levels. Activities financed under this component will comprise coordination, fiduciary aspects, M&E, safeguards monitoring and compliance, and day-to-day implementation of the project.

H. Environmental and Social Issues Relevant to the Project

57. The Eastern and Central Africa Agriculture Transformation (ECAAT) project has prepared this Environmental and Social Management Framework/Integrated Pest Management Plan (ESMF/Plan) to ensure that all investments are adequately screened for their potential environmental and social impacts, and that correct procedures will be followed, for all the types of the investment to be made by ECAATP as stated in the ESMF objectives.

58. The objectives of the ESMF are to:

(i) Comply with the legal framework, and establish procedures, and methods for environmental and social screening, planning, and review, approval and implementation of the investments to be financed;

(ii) Identify roles and responsibilities, including reporting procedures, monitoring and evaluation;

(iii) Identify capacity/or training needs for different stakeholders to ensure better implementation of the provisions in the ESMF and also in the sub-project Environment and Social Management Plans (ESMPs) and;

(iv) Identify funding requirements and resources to ensure effective mainstreaming and implementation of the framework.

E. Project Environmental and Social Risks

59. **Project Environmental Risks:** ECAATP has been classified as Environmental Assessment Category B in accordance with World Bank safeguard policies. The overall environmental impacts of the project are expected to be positive. Significant positive impacts to the natural and socioeconomic environments will be achieved by reduced greenhouse gases emissions, increased agricultural productivity and profitability leading to improved livelihoods, promotion of sustainable agricultural practices and reduced vulnerabilities of targeted rural communities.

60. The activities envisaged under each component (Table 1) and subprojects cumulatively may have negative impacts if not well mitigated and therefore the use of this framework, with subsequent preparation of the subproject safeguards instruments will be very important at all implementation levels.

61. (**Sustainable Land Management (SLM)** technologies and practices for sustainability – natural resources should not be used beyond their capacity to be naturally replenished, both in quality and quantity, for the well-being of future generations. Failure to invest in SLM leads to farming and agro-pastoral populations producing less and less thus facing food and nutritional insecurity. The populations become more vulnerable to future economic and climatic shocks as 70 percent live and exclusively depend on the smallholding setups of the agriculturally productive regions.

62. The aggravated situation may further lead to resource use conflicts, starvation and destitution. Remedial measures planned for in the design of the project and detailed in the ESMF for targeted communities include: Sustainable productive land management technologies, development and adoption of early maturing crops; breeding and adoption of livestock that are more adapted to various climatic conditions and production of appropriate fodder and forage including preservation and conservation technologies and practices.

Project Social Risks

63. The overall risk rating for the social safeguards as explained in the identified risks is moderate. There are several social risks envisioned in the implementation process of ECAATP including**:** (i) ECAATP and the line ministries have limited capacity to implement, monitor and supervise this ESMF; it is thus critical and prudent for ECAATP to enhance the current staff experience, knowledge and skills to effectively guide the implementation of this Environmental and Social management framework.

64. The project design includes elements to ensure transparency, accountability and good governance of the project implementation process. A strong emphasis is laid on social accountability through social audits and an independent verification mechanism is also included. (ii) Socio-cultural issues in some target communities hinder resource allocation/share, resource access and use, and equity issues in project implementation. These challenges affect project implementation and ownership.

65. Therefore, in the project design, gender, and inclusion of youth and VMGs will be mainstreamed at all levels of implementation. This will be done through capacity building of stakeholders, inclusion of VMGs in decision making process and support of VMGs targeted interventions. (iii) During the implementation of ECAATP component 1, 2 and 3, specific investments in infrastructure for storm water drainage/run off harvesting at RDCoL for pasture and fodder production and climate change adaptation technologies

66. These investments will likely affect negatively the livelihoods though the envisaged impacts are mainly positive. For the negative impacts the magnitude will vary in degree depending on the nature of investment under the ECAATP. At this point, the exact impact of the future investments under the ECAATP is not yet known and it will only be known when investments under ECAATP are identified.

67. The ECAATP safeguards instruments will be finalized, consulted upon and publicly disclosed.

Table 2: Examples of ECAAT Project Impacts

Project Components & Sub Components	Impacts	
	Negative Environmental Impacts	**Social Impacts**
Component 1: Regional Commodity Programs		
Subcomponent 1.1: Establishment and strengthening of regional centers of leadership and national centers of specialization (Completion of Namanga Quarantine Station, Construction of Livestock Structures, Refurbishment of Milk Processing Plant, and Construction of Poultry Houses among others	• Noise and dust pollution • Disposal of asbestos roofing materials and debris • Risk of transboundary disease transmission • Loss of access to grazing especially at Namanga Quarantine Station. • Increased generation of solid and liquid waste • Disturbance of ecological system; contamination of ground water table • Earth Movement • Risk of water runoff due to roof catchment	• Risk of HIV and AIDS infections • Workers safety • Risk of in accessibility by the physically challenged • Risk of lead poisoning as result of use of oil-based paints • Risk of lightening related damages
Sub Component 1.2: Collaborative development, transfer, and dissemination of agricultural technologies.	• Risk of mishandling of drugs, pesticides and non-biodegradable packing materials • Inappropriate disposal of expired drugs and chemicals and the used containers/wrappings • Risk of increased generation of slurry • Risk of increased use of pesticides • Risk land degradation • Risk of afflatoxins poisoning as a result of poor handling and storage of pasture and fodder • Poor storage of liquid nitrogen containers • Risk of reduction of biodiversity as result opening up of more land and mono-cropping	• Risk of not catering for the gender concerns and the vulnerable members of the community • Lack of PPE by inseminators

Project Components & Sub Components	Impacts	
	• Improper disposal of plastics and disposable gloves • Poor storage and handling of fertilizers, fodder and crops and livestock products • Risk of increased use of organic and inorganic fertilizers • Biosafety issues, Food safety issues; Air, water and land pollution through use of chemicals; • Soil fertility issues; • Adaptation to technologies/practices to climate change; • Hazardous waste (e.g. laboratory waste)	
Component 2.0: Enabling Policies and Agricultural Markets		
Sub Component 2.1: Enabling policies	N/A	N/A
Sub Component 2.2: Linking smallholder farmers access to markets to regional and national markets. (Construction of Commodity/Product bulking facilities/structures)	• Risk of increase in environmental contamination as a result of poor disposal of cassava, wheat rice and milk processing wastes (Water, peelings and husks) • Risk of use of non-biodegradable packaging and wrapping materials • Workers safety • Noise and dust pollution • Risk of poor handling of processed product • Risk of promoting gender insensitive value addition and processing technologies	
Sub Component 2.3: Promoting effective	E- waste	Issues of accessibility and affordability of ICT

Project Components & Sub Components	Impacts	
models for service delivery		gadgets or networks by VMGs
Component 3: Contingency Emergency Response		
Component 4: Project Coordination and Implementation		
Subcomponent 4.1: National Project Coordination and Management, Monitoring and Evaluation	N/A	• Conflicts, e.g. friction during mapping of roles of county and national representation; • Project coordination office and implementing agencies; • Inter-intra community conflicts

National Environmental and Social Polices, Regulations and Guidelines

68. This section reviews the relevant institutional, legal and policy framework in the country which has a direct bearing on the ECAATP. The section also outlines the World Bank Safeguard Operational Policies applicable to the project including a comparative analysis and gaps existing between the Bank's policies and host country regulations and suggestions on bridging the gaps. Finally, sections on international laws and conventions that bear relevance to the implementation of this project have also been highlighted.

69. Implementation of the ECAATP will require that appropriate and effective institutional structures and management mechanisms are put in place at national and county level . The project will build on various existing structures and mechanisms such as those used for recently closed and ongoing projects (Eastern Africa Agricultural Productivity Project, Kenya Agricultural Productivity & Sustainable Land Management Project, Kenya Adaptation to Climate Change Project, Western Kenya Community Driven Development Project, Kenya Devolution Program, etc.)

70. Overall project coordination and monitoring will be conducted at the national level at the MoA&I - State Department of Livestock. However, project implementation will be handled at national and county levels consistent with the ECAAT project focus.. At the national level, there is sufficient experience and expertise to handle safeguard. For example, the climate change unit under MoA&I - State Department of Livestock and NEMA are some of the existing national structures that will aid in implementation. However, local levels are not likely to have such capacity.

71. The county level implementation agencies will be strengthened to provide quality services to the community institutions. The NPCU will build capacity at county level for effective mainstreaming and implementation of safeguard concerns in the community subprojects. Currently, there is still a considerable variation in capacity and resources among the counties (including capacity to manage safeguards).

72. The project will make provision for capacity building and training in safeguards for county and project implementation staff (refer to Section on Environmental and Social Safeguards Capacity Building and Training). Some communities have existing conflicts management committees and, market committees that can be useful resources.

73. The Kenya Government environmental and social management requirements for ECAATP funded subprojects are discussed below:

The Kenya Constitution, 2010 (Constitution of Kenya 2010)

74. The Constitution which was promulgated on the 27th of August 2010 takes supremacy over all aspects of life and activity in the Republic. With regard to environment, Section 42 of the Constitution states as follows: -

> Every person has the right to a clean and healthy environment which includes the right:
>
> a) To have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69; and
>
> b) To have obligations relating to the environment fulfilled under Article 70'

75. In Sections 69 and 70, the Constitution has inter alia identified National Obligations in respect to the environment and Enforcement of Environmental Rights respectively as follows: -

1. Section 69 (1): The State shall—

   a) Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;

   b) Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya;

   c) Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;

   d) Encourage public participation in the management, protection and conservation of the environment;

   e) Protect genetic resources and biological diversity;

   f) Establish systems of environmental impact assessment, environmental audit and monitoring of the environment;

   g) Eliminate processes and activities that are likely to endanger the environment; and

   h) Utilize the environment and natural resources for the benefit of the people of Kenya.

76. Section 69 (2) States that; every person has a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

77. Section 70 provides for enforcement of environmental rights thus:

> (1) If a person alleges that a right to a clean and healthy environment recognized and protected under Article 42 has been, is being or is likely to be, denied,

violated, infringed or threatened, the person may apply to a court for redress in addition to any other legal remedies that are available in respect to the same matter.

(2) On application under clause (1), the court may make any order, or give any directions, it considers appropriate:

a) To prevent, stop or discontinue any act or omission that is harmful to the environment;
b) To compel any public officer to take measures to prevent or discontinue any act or omission that is harmful to the environment; or
c) To provide compensation for any victim of a violation of the right to a clean and healthy environment.

(3) For the purposes of this Article, an applicant does not have to demonstrate that any person has incurred loss or suffered injury.

Kenya Vision 2030

78. The economic, social and political pillars of Kenya Vision 2030 are anchored on macroeconomic stability; continuity in governance reforms; enhanced equity and wealth creation opportunities for the poor; infrastructure; energy; science, technology and innovation (STI); land reform; human resources development; security as well as public sector reforms. The 2030 Vision aspires for a country firmly interconnected through a network of roads, railways, sea ports, airports, water and sanitation facilities, and telecommunications.

Environment Management and Coordination Act (Cap 387), EMCA

79. This is an Act of Parliament that was reviewed in 2015 and provides for the establishment of an appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto. This Act is divided into 13 Parts, covering main areas of environmental concern as follows: Preliminary (I); General principles (II); Administration (III); Environmental planning (IV); Protection and Conservation of the Environment (V), Environmental impact assessments (EIA), audits and monitoring (VI); Environmental audit and monitoring (VII); Environmental quality standards (VIII); Environmental Restoration orders, Environmental Easements (IX); Inspection, analysis and records (X); International Treaties, Conventions and Agreements (XI) National Environment Tribunal (XII); Environmental Offences (XIII).

80. The Act has provided for Environmental safeguards within the statutes of Kenya by regulating for Environmental Impact Assessment (EIA), environmental Audits (EA) and Strategic Environmental Assessments. EIA/EA regulations gazette notice 101 in schedule II provides for activities that require EIA projects and those that required EIA full studies, this categorization depends on the level of risks anticipated from an activity. Through this process an impact rating is anticipated and therefore informs the decision on whether the project goes to full categorization or not.

81. The Act provides for the setting up of the various ESIA Regulations and Guidelines which are examined in the sections that follow below:

Environmental (Impact Assessment and Audit) Regulations 2003

82. The Environmental (Impact Assessment and Audit) Regulations 2003 state in Regulation 3 that "the Regulations should apply to all policies, plans, programmes, projects and activities specified in Part III and V of the Regulations''; basically provides for the guidelines of undertaking, submission and approval of the ESIA Reports, a key requirement outlined in this ESMF.

83. In the recent past the Strategic Environmental Assessment (SEA) guidelines which has been released requires that policies, plans and programs be subjected to SEA. Schedule II provides for a list of projects that should undertake an EIA and therefore provide a screening level within the laws of the Kenya.

Environmental Management and Co-ordination (Waste Management) Regulations 2006

84. These are described in Legal Notice No. 121 of the Kenya Gazette Supplement No. 69 of September 2006. These Regulations apply to all categories of waste as provided in the Regulations. These include among others industrial wastes, hazardous and toxic wastes, pesticides and toxic substances.

85. The proposed Project will have to abide by these regulations in dealing with waste management especially the provisions of wastes which may be generated during construction and operation phases of the subproject investments. Pesticides are expected to be used in the agricultural activities envisaged in the KCSAP and as such the regulations on the disposal of pesticide wastes must be adhered to. Agricultural value chain activities have a potential for generation of solid waste with the potential of environmental impact.

Environmental Management and Coordination (Water Quality) Regulations 2006

86. These are described in Legal Notice No. 120 of the Kenya Gazette Supplement No. 68 of September 2006. These Regulations apply to water used for: domestic, agricultural and recreational purposes, fisheries, wildlife, and any other purposes.

87. The regulation applies to the protection of sources of water for domestic use; water for industrial use and effluent discharge; and water for agricultural use: Agricultural value chain activities have a potential for generation of Agro-chemical effluent with the potential of environmental impact and pollution of water sources.

88. These Regulations outline:

- Quality standards for sources of domestic water;
- Quality monitoring for sources of domestic water;
- Standards for effluent discharge into the environment;

- Monitoring guide for discharge into the environment;
- Standards for effluent discharge into public sewers;
- Monitoring for discharge of treated effluent into the environment.

89. In fulfilling the requirements of the regulations the ECAAT project proponent will have to undertake monitoring of both domestic water and waste water to ensure compliance with the acceptable discharge standards.

Environmental Management and Coordination, Conservation of Biological Diversity (BD) Regulations 2006

90. These regulations are described in Legal Notice No. 160 of the Kenya Gazette Supplement No. 84 of December 2006. These Regulations apply to conservation of biodiversity which includes Conservation of threatened species, Inventory and monitoring of BD and protection of environmentally significant areas, access to genetic resources, benefit sharing, offences and penalties.

91. This regulation is important in undertaking the envisaged ECAATP activities such as management of rangelands, Agriculture value chain and seed systems development for increased productivity.

Environmental Management and Coordination (Fossil Fuel Emission Control) Regulations 2006

92. These regulations are described in Legal Notice No. 131 of the Kenya Gazette Supplement no. 74, of October 2006 and will apply to all internal combustion engine emission standards, emission inspections, the power of emission inspectors, fuel catalysts, licensing to treat fuel, cost of clearing pollution and partnerships to control fossil fuel emissions used by the Contractor. The fossil fuels considered are petrol, diesel, fuel oils and kerosene.

Environmental Management and Coordination (Wetlands, Riverbanks, Lake Shores and Sea Shore Management) Regulations 2009

93. These regulations provide for the protection and management of wetlands, riverbanks, lakeshores and sea shore management and detail guidelines on the same. Agricultural activities in depressed climatic conditions is attracted to major water sources like rivers and lakes and therefore creates the risk of encroachment of riparian lands and possible pollution of such water sources therefore project documentation such as ESMPs/ESIAs will need to demonstrate compliance with this regulation.

Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009

94. These regulations prohibit making or causing any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. It also prohibits the Contractor from excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of

others and the environment or excessive vibrations which exceed 0.5 centimeters per second beyond any source property boundary or 30 metres from any moving source. Under the regulation the Contractor will be required to undertake daily monitoring of the noise levels within the Project area during construction period to maintain compliance with national occupational health and safety guidelines or the World Bank General EHS guideline limits, whichever is more stringent.

Environment Management Coordination Act Cap 387 (Air Quality Regulation) April 2014

95. The National Environment Management Authority (NEMA) has regulated ,the Air quality within the Environment Management Coordination Act Cap 387.The regulation provides for air quality control through; (i) regulation of air pollution; (ii) development of Air Quality Standards in order to regulate emission from diverse sources with area of priority such as air pollutants from certain known sources i.e. automobiles; (iii) control of odour emissions; (iv) regulation and standards on ambient air quality; (v) and particulate matter.

96. The regulation provides for requirement for control of air emission from stationary sources and listed facilities; the development of an air quality control plan is also provided for, development of standards for, mobile sources including fugitive emissions and control of emission from automobiles.

97. This regulation is enforceable and has compliance provision attracting penalties on violation. This regulation will be enforced by NEMA. Agricultural activities contribute emission that may attract compliance with this regulation therefore the need to mainstream this regulation in ECAAT project safeguards. Emission from Agriculture forms part of the GHG inventory for land and land use and Forest inventory. There is need for ECAAT project to provide for GHG abatement.

Occupational Health and Safety Act, 2007

98. This is an Act of Parliament that provides for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The Act has the following functions, among others:

i. Secures safety and health for people legally in all workplaces by minimization of exposure of workers to hazards (gases, fumes & vapors, energies, dangerous machinery/equipment, temperatures, and biological agents) at their workplaces.
ii. Prevents employment of children in workplaces where their safety and health is at risk.
iii. Encourages entrepreneurs to set achievable safety targets for their enterprises.
iv. Promotes reporting of work-place accidents, dangerous occurrences and ill health with a view to finding out their causes and preventing of similar occurrences in future.

v. Promotes creation of a safety culture at workplaces through education and training in occupational safety and health. This will be achieved with reference to national occupational health and safety guidelines or the World Bank Genera EHS guideline limits, whichever is more stringent

The Water Act 2002 as amended The Water Act No 43 (2016)

99. The Water Act 2016 provides for the regulation, management and development of water resources, water and sewerage services, and for other connected purposes. Water resources in Kenya are owned by the Government, subject to any right of the user, legally acquired. The control and right to use water is exercised by the Minister administering the Act, and such use can only be acquired under the provisions of the Act.

100. The Minister is also vested with the duty to promote investigations, conserve and properly use water throughout the country. Water permits may be acquired for a range of purposes, including the provision and employment of water for the development of power, agricultural and other uses. The following are the regulations developed under Water Act 2002 relevant to and which are still valid for the ECAATP. These regulations will relate to abstraction and use of water from rivers.

The Water Resources Management Rules (2007)

101. These Rules are described in Legal Notice Number 171 of the Kenya Gazette Supplementary Number 52 of 2007. They apply to all water resources and water bodies in Kenya, including all lakes, water courses, streams and rivers, whether perennial or seasonal, aquifers, and shall include coastal channels leading to territorial waters. The Water Resources Management Rules empower Water Resources Management Authority (WRMA) to impose management controls on land use falling under riparian land.

The Wildlife Conservation and Management Act, Cap 376

102. The Wildlife (Conservation and Management) Act, Cap 376 of 1976, as amended in 1989, covers matters relating to wildlife in Kenya including protected areas, activities within protected areas, control of hunting, import and export of wildlife, enforcement and administrative functions of wildlife authorities. The 1989 amendment specifically established the Kenya Wildlife Service (KWS) as the parastatal charged with implementation of the provisions of the Act.

103. The Act specifically provides for the protection and regulation of protected animals, game animals and game birds as defined in three schedules. The first schedule includes game animals mostly mammals, although the list also includes crocodile and ostrich. The second schedule lists game birds, and the third schedule lists protected animals, which comprise primarily mammals, although it also includes two species of marine turtles, while in 1981 it was amended to include several species of reptiles, amphibians and butterflies. Apart from the protection provided to plants within National Parks and National Reserves, plants receive no further protection under this Act outside the protected areas.

104. Specific provisions of the Act allow for the establishment of National Parks (Section 6), National Reserves (Section 18), and local sanctuaries (Section 19). The National Parks are managed by KWS. Strict regulations prohibit various activities within National Parks, unless they are subject to the written consent of the Minister or, in other cases, the Director of KWS. No such prohibitions are specified for National Reserves or for local sanctuaries. Areas that were formerly game reserves but are declared as National Reserves continue to be administered by the local authorities, unless otherwise directed by the Minister by a Kenya Gazette Notice.

Public Health Act Cap 242

105. The Public Health Act provides for the protection of human health through prevention and guarding against introduction of infectious diseases into Kenya from outside, to promote public health and the prevention, limitation or suppression of infectious, communicable or preventable diseases within Kenya, to advice and direct local authorities in regard to matters affecting the public health to promote or carry out research and investigations in connection with the prevention or treatment of human diseases. This Act provides the impetus for a healthy environment and gives regulations to waste management, pollution and human health.

106. The Public Health Act regulates activities detrimental to human health. The owner(s) of the premises responsible for environmental nuisances such as noise and emissions, at levels that can affect human health, are liable to prosecution under the act. An environmental nuisance is defined in the act as one that causes danger, discomfort or annoyance to the local inhabitants or which is hazardous to human health. This Act controls the activities of the project with regard to human health and ensures that the health of the surrounding community is not jeopardized by the activities of the project such as water development.

Physical Planning Act, (Cap 286)

107. This Act provides for the preparation and implementation of physical development plans for connected purposes. It establishes the responsibility for the physical planning at various levels of Government in order to remove uncertainty regarding the responsibility for regional planning. A key provision of the Act is the requirement for Environmental Impact Assessment (EIA). This legislation is relevant to the implementation and citing of Agriculture/livestock based infrastructure in urban areas.

108. It provides for a hierarchy of plans in which guidelines are laid down for the future physical development of areas referred to in a specific plan. The intention is that the three-tier order plans; the national development plan; regional development plan; and the local physical development plan should concentrate on broad policy issues.

109. The Act calls for public participation in the preparation of plans and requires that in preparation of plans proper consideration be given to the potential socio-economic development needs of the population, the existing planning and future transport needs, the

physical factors which may influence orderly development in general and urbanization in particular, and the possible influence of future development upon natural environment.

The Forest Act No. 7 (2005) as amended The Forest Conservation and Management Act, No. 34 (2016)

110. An Act of Parliament to give effect to Article 69 of the Constitution with regard to forest resources; to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socioeconomic development of the country and for connected purposes.

The Land Act, 2012

111. It is explicit in the Land Act, 2012, Section 107, that whenever the national or county government is satisfied that it may be necessary to acquire some particular land under section 110 of Land Act 2012, the possession of the land must be necessary for public purpose or public interest, such as; in the interests of public defense, public safety, public order, public morality, public health, urban and planning, or the development or utilization of any property in such manner as to promote the public benefit; and the necessity therefore is such as to afford reasonable justification for the causing of any hardship that may result to any person having right over the property, and so certifies in writing, possession of such land may be taken.

Community Land Act No. 34 (2016)

112. ACT of Parliament to give effect to Article 63 (5) of the Constitution; to provide for the recognition, protection and registration of community land rights; management and administration of community land; to provide for the role of county governments in relation to unregistered community land and for connected purposes.

The Lakes and Rivers Act (Cap 409)

113. This Act provides for protection of river, lakes and associated flora and fauna. The provisions of this Act may be applied in the management of the project especially river banks protection, abstraction of irrigation water, agrochemical uses and soil erosion control.

Climate Change Act 2016

114. The Country developed a Climate Change Act 2016, gazetted in June 2016 and resident with the Ministry of Environment and Natural Resources. The Act aims at creating a regulatory framework for enhanced Climate Action responses measures and to provide a mechanism and measure for low carbon climate resilient development.

115. The Climate Change Act has five sections namely i) Climate change policy coordination and oversight, which establishes the National Climate Change Council to oversight all Climate change matters in Kenya ii) responses measures and actions, articulating specific Climate actions to be undertaken , such as ensuring mainstreaming

Climate change matters into policies, plans and programmes iii) Climate Change duties and responsibilities , that assign specific duties to institutions to follow with respect to Climate Change, for example NEMA is given specific roles of monitoring Compliance with the Act in the area of greenhouse gas emission; (iv) and Public participation, and financial provisions and miscellaneous.

116. Emission from Agriculture forms part of the GHG inventory for land and land use and Forest LULUCF inventory. Compliance with reporting on GHG emission from Agriculture sectors forms part compliance revision of Climate Change Act 2016.

F. Relevant Sector Policies

National Policy on Environment and Development

117. Currently, a far-reaching initiative towards an elaborate national environmental policy is contained in the Session Paper No. 6 of 1999 on Environment and Development. This policy advocates for the integration of environmental concerns into the national planning and management processes and provides guidelines for environmental sustainable development. The challenge of the document and guidelines is to critically link the implementation framework with statutory bodies such as the National Environmental Management Authority (NEMA), Kenya Wildlife Service (KWS), and Kenya Forestry Service (KFS).

The National Environmental Sanitation and Hygiene Policy, 2007

118. The National Environmental Sanitation and Hygiene Policy is devoted to environmental sanitation and hygiene in Kenya as a major contribution to the dignity, health, welfare, social well-being and prosperity of all Kenyan residents. The policy recognizes that healthy and hygienic behavior and practices begin with the individual. The implementation of the policy will greatly increase the demand for sanitation, hygiene, food safety, improved housing, use of safe drinking water, waste management, and vector control at the household level, and encourage communities to take responsibility for improving the sanitary conditions of their immediate environment.

National Forest Policy 2015

119. The goal of this Policy is to: enhance the contribution of the forest sector in the provision of economic, social and environmental goods and services. The specific objectives of this policy are to:

- Contribute to poverty reduction, employment creation and improvement of livelihoods through sustainable use, conservation and management of forests and trees.
- Contribute to sustainable land use through soil, water and biodiversity conservation, and tree planting through the sustainable management of forests and trees.

- Promote the participation of the private sector, communities and other stakeholders in forest management to conserve water catchment areas, create employment, reduce poverty and ensure the sustainability of the forest sector.
- Promote farm forestry to produce timber, wood fuel and other forest products.
- Promote dry land forestry to produce wood fuel and to supply wood and non-wood forest products.
- Promote forest extension to enable farmers and other forest stakeholders to benefit from forest management approaches and technologies.
- Promote forest research, training and education to ensure a vibrant forest sector.

National Oceans and Fisheries Policy, 2008

120. The overall objective of this policy is to: "Create an enabling environment for a vibrant fishing industry based on sustainable resource exploitation providing optimal and sustainable benefits, alleviating poverty, and creating wealth, taking into consideration gender equity." The specific objectives of this policy are to:

- Promote responsible and sustainable utilization of fishery resources taking into account environmental concerns;
- Promote development of responsible and sustainable aquaculture, recreational and ornamental fisheries;
- Ensure that Kenya has a fair access to, and benefit from, the country's shared fishery resources;
- Promote responsible fish handling and preservation measures and technologies to minimize post-harvest losses;
- Encourage value addition, marketing and fair trade in Kenya's fishery products worldwide;
- Encourage efficient and sustainable investment in the Kenya fishery sector;
- Promote active involvement of fisher communities in fisheries management;
- Integrate gender issues in fisheries development; Promote fish consumption in the country

Wildlife Policy 2007

121. The goal of this Policy is to provide a framework for conserving, in perpetuity, Kenya's rich diversity of species, habitats and ecosystems for the wellbeing of its people and the global community. The objectives and priorities are to:

- Conserve Kenya's wildlife resources as a national heritage.
- Provide legal and institutional framework for wildlife conservation and management throughout the country.
- Conserve and maintain viable and representative wildlife populations in Kenya.
- Develop protocols methodologies and tools for effective assessment and monitoring of wildlife conservation and management throughout the country.
- Promote partnerships, incentives and benefit sharing to enhance wildlife conservation and management.
- Promote positive attitudes towards wildlife and wildlife conservation and management.

National Wetland and Conservation Management Policy (2013)

122. The development of this Policy is in cognizance of the importance of wetlands nationally and Kenya's obligation under the Ramsar Convention. The policy takes into consideration the broader national environmental frameworks, particularly the Environment Management and Coordination Cap 387, the country's premier framework environmental law, the Water Act 2002 and the Forest Policy 2007.

Multilateral Environmental Agreements

123. Kenya has ratified various international conventions that deal with the protection of the environment that may be directly or indirectly applicable to activities under the proposed subprojects operations and processes in the selected countries. These are as follows: -

The United Nations Framework Convention on Climate Change (UNFCCC or FCCC)

124. This is an international environmental treaty produced at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992, informally known as the Earth Summit. The objective of the treaty is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The treaty itself sets no mandatory limits on greenhouse gas emissions for individual countries and contains no enforcement mechanisms. In that sense, the treaty is considered legally non-binding. Instead, the treaty provides for updates (called "protocols") that would set mandatory emission limits. The principal update is the Kyoto Protocol, Kyoto protocol was a protocol under the UNFCCC and has now ceased, the latest convention under UNFCCC being the Paris agreement concluded during COP 21 in Paris, France where Countries made a commitment through there Nationally Determined Conditions (NDC) to reduce their emissions.

The United Nations Convention to Combat Desertification (UNCCD)

125. Kenya is a signatory to this treaty which aims to combat desertification and mitigate the effects of drought through national action programs that incorporate long -term strategies supported by international cooperation and partnership arrangements. The Convention, the only convention stemming from a direct recommendation of the Rio Conference's Agenda 21, was adopted in Paris on 17 June 1994 and entered into force in December 1996. It is the first and only internationally legally binding framework set up to address the problem of desertification.

International Convention on Biological Diversity (CBD) of 1992

126. This treaty promotes the protection of ecosystems and natural habitats, respects the traditional lifestyles of indigenous communities, and promotes the sustainable use of resources.

National Biodiversity Strategy and Action Plan (NBSAP) 2000

127. The country is already reviewing this action plan so as to meet the Aichi Target which aims to halt loss by biodiversity by year 2020.

World Heritage Convention (1972)

128. Kenya is a party to this convention which is concerned with cultural and natural heritage. The convention deals with monuments and areas that are deemed to be of 'outstanding universal value' in terms of beauty, science and/or conservation. Kenya has several sites that have been declared World Heritage Sites, such as Mt. Kenya's natural forests. Any deterioration or disappearance of such heritage is a loss to all the nations of the world. The importance of wetlands and water birds are also covered under the Ramsar Convention of 1971, which governs wetlands of international importance. The convention entered into force in Kenya in 1990 and Kenya is therefore committed to avoid degradation of wetlands under its jurisdiction.

Agreement of the Conservation of Eurasian Migratory Water Birds (2001) and the African Convention on the Conservation of Nature and Natural Resources (1968)

129. Kenya ratified this convention which seeks to protect migratory water birds and also conservation of nature and natural resources. It is therefore important to ensure that the Project, value chain development recognizes and safeguards nature and natural resources

.

The Convention on International Trade in Endangered Species of Wildlife Fauna and Flora (CITES) 1973

130. This international treaty prohibits trade in endangered and their trophies. Such species include elephant ivory, rhino horns and Dugongs among others.

East African Community Natural Resource Protocol

131. Kenya is a member of the East African Community (EAC) which was signed in the year----------.Among the related Protocol is the Natural Resource Protocols ,which Kenya

is a signatory and bounds the state on management of Natural Resources including those are trans-boundary in nature including shared waters such as Lake Victoria.

G. World Bank Safeguard Policies

Safeguards (including Social and Environmental Safeguards)

132. The project has primarily triggered four Bank's Environmental and Social Safeguard Policies: Environmental Assessment (OP/BP 4.01); Pest Management (OP 4.09); Indigenous Peoples (OP/BP 4.10); and Involuntary Resettlement (OP/BP 4.12). The policy on Physical Cultural Resources (OP/BP 4.11) is triggered as a precaution for now subject to identification of sub project implementation sites .

Table 3: Operational Safeguards Policies Triggered by the Project

Environmental and Social Safeguards Triggered	YES	NO
OP/BP 4.01: Environmental Assessment	X	
OP/BP 4.04 Natural Habitats		X
OP/BP 4.36 Forests		X
OP 4.09 Pest Management	X	
OP/BP 4.11 Physical Cultural Resources		
OP/BP 4.10 Indigenous Peoples	X	
OP/BP 4.12 Involuntary Resettlement	X	
OP/BP 4.37 Safety of Dams		X
OP 7.50 Projects in International Waters		X
OP 7.60 Projects in Disputed Areas		X

Environmental Assessment (OP 4.01)

133. Proposed project investments in infrastructure (e.g. Civil works and agriculture value chains (e.g. produce chilling or storage facilities, local level value addition, limited use of agro-chemicals,) are likely to have negative environmental and social impacts, which however are expected to be small-scale, site specific and largely reversible. The area of project investments and the design of subprojects are not yet known, since the project activities will be identified and decided upon by implementing institutions. The project has adopted a framework approach to managing safeguards with subproject specific documents developed prior to implementation once they are identified.

134. The project has prepared this Environmental and Social Management Framework (ESMF) for handling environmental assessment, pest management, natural habitats impacts and physical cultural resources ("chance find procedures");: (i) identifying and assessing potential adverse environmental and social impacts, based on the types of activities envisioned; and (ii) proposing screening methods and processes of assessing and designing appropriate mitigation measures for the identified investments.

135. . The localized impacts of the various micro-projects will be determined by the screening process for environmental and social impacts. The screening will utilize: (a) Environmental and Social Screening form (Annex 1), which will help identify potential adverse environmental and social impacts; and Environmental and Social Checklist, which will outline simple environmental mitigation measures (a simplified ESMP) for sub-projects not requiring a full ESIA study. Where a significant adverse social impact will be identified, the project will prepare a Resettlement Action Plan or a Vulnerable and Marginalized Group Plan in accordance with the Resettlement Policy Framework and Vulnerable and Marginal Groups Framework, which are prepared, consulted upon and disclosed separately.

Natural Habitat (OP/BP 4.04)

136. All sub-projects will be screened for impacts on natural habitats. The project will not fund any sub-projects deemed to adversely affect natural habitats. Using the screening checklist prepared for this project and annexed to the ESMF, the client will identify and not pursue any subprojects that are believed to result in significant conversion or degradation of natural or critical habitats from the list of fungible subprojects. Therefore, Natural Habitat OP 4.04 has been triggered under this project.

Pest Management (OP 4.09)

137. ECAAT project will support interventions geared towards increasing crops and livestock production and productivity, which ideally would promote the application of pesticides. Thus, ECAAT project will sensitize and/or train its beneficiaries on safe handling and application of pesticides. As such, the project developed an Integrated Pest Management Framework (IPMF)

Physical Cultural Resources (OP/BP 4.11)

138. This is triggered as a precaution. There could be “chance finds”, although micro-projects are not expected to traverse areas of cultural or historical importance. Chance find procedures will be prepared for inclusion in the technical specifications and will be included in all infrastructure contracts and in the environmental and social safeguard framework documents.

Indigenous Peoples (OP/BP 4.10)

139. This Policy is triggered as the proposed project Counties have communities who meet the requirements of OP 4.10. This is a national scale project whose subprojects will be determined through the PICD system and therefore their locations are not yet known hence the need to use the vulnerable and marginalized group framework (VMGF) approach. During project implementation, once the specific locations and activities are identified, the project will prepare and disclose the VMGPs, which will be prepared in a participatory and consultative manner.

Involuntary Resettlement (OP/BP 4.12*)*

140. The World Bank's safeguard policy on involuntary resettlement, OP/BP 4.12 is to be complied with where involuntary resettlement, impacts on livelihoods, acquisition of land or restrictions to access to natural resources are likely to occur. The Bank OP/BP 4.12 requires that RPF report must be consulted upon and disclosed as a separate and stand-alone report. Given the possible array of subprojects likely to be proposed by communities, this policy is triggered.

141. The purpose of the RPF will be to establish the resettlement and compensation principles, organizational arrangement, and design criteria to be applied to meet the needs of the project affected people (PAPs). The RPF therefore is prepared specifically to guide and govern ECAAT project as sub-projects are selected for financing.). The disclosure of the RPF & RAP documents subsequently prepared should be in locations where they can be easily accessed by general public and at the external website of the World Bank.

142. Whenever applicable, the Environmental and Social Impact Assessments/Environmental and Social Management Plans (ESIAs/ESMPs), Resettlement Action Plan (RAPs), Integrated Pest Management Plans (IPMPs) and Vulnerable and Marginalized Group Plans (VMGPs) would be developed for individual sub-projects before commencement of project implementation. The relevant World Bank Group Environmental Health and Safety Guidelines and Industry Sector Guidelines for Agriculture and Agribusiness are applicable to subprojects.

http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/our+approach/risk+management/ehsguidelines

143. Environmental and Social Management Framework (ESMF): *The Objectives of the ESMF include the following:*

- To guide identification of potential environmental and social impacts for each sub-project to be financed under ECAAT project
- To help describe the potential negative and positive environmental and social impacts resulting from such investments.
- To propose broad streamlined procedures for the environmental and social assessment process and subsequent supervision of sub-projects.
- To define a typology of projects which might require an environmental assessment (ESIA, ESMP) by location, size of project and other site-specific criteria.
- To develop guidelines for preparation of the operation and maintenance plans by communities and local government for new investments taking into account environmental and social considerations and mitigation measures identified during micro-project evaluation.

- To identify potential policy and institutional issues regarding the environment and discuss means of resolution that could be undertaken during project implementation.
- To help develop a monitoring and evaluation system for environmental and social impacts and significant environmental values to be included in the overall project monitoring and evaluation system.
- To suggest improvements to the program for sensitization and capacity building of community leaders, county and national officials involved in the implementation of ECAAT project.

144. The ESMF stakeholder consultation was conducted on 6th March, 2018. The observations and comments from the workshop were included in the final ESMF. Key stakeholders in the application and implementation of the ESMF for the ECAAT Project will be consulted including National Environmental Management Authority (NEMA) officials at the national and county levels.

145. During the implementation of ECAAT project activities, potential environmental and social impacts will be considered and managed. The impacts must be mitigated, minimized or preferably avoided particularly to meet the national environmental regulations and requirements as set out in the Environment Management Coordination Act Cap 387 (as amended in 2015) and its related regulations and the World Bank safeguards policies requirements .

146. The preliminary screening of the areas to be financed through Project Preparation Grant (PPG) indicated that there may be no land acquisition or resettlement, as all project physical activities including civil works under Components 1 and 2 are envisaged to be carried out within the existing institutions. O.P 4.12 has been triggered as a precautionary measure awaiting identification of the actual sub project sites. Consequently this ESMF/IPMP along with a RPF and VMGF are prepared to guide preparation of site-specific Environmental and Social safeguard instruments

147. Sub-projects supported that require involuntary land acquisition or the acquisition of land requiring the resettlement or compensation of more than 200 people shall require a RAP prepared and implemented by ECAATP under guidance of MoA&I – State department of Livestock.,.

148. ECAAT project will cover the 23 counties that were consultatively selected using agreed criteria. The included counties previously covered under EAAPP and additional ones for up/outscaling and to accommodate additional commodities/value chains. These include the following:

- Dairy (12) - Murang'a, Nyeri, Nyandarua, Meru, Elgeyo Marakwet, Uasin Gishu, Kakamega, Vihiga, Migori, Bungoma, Nakuru, Nyamira, Garissa and Taita Taveta

- Wheat (3) - Narok, Nyeri and Nakuru
- Rice (4) - Kisumu (Ahero Irrigation Scheme in Nyando Sub county), Homabay, Meru and Busia (Bunyala Irrigation Scheme)
- Beans (5) - Kitui, Busia, Narok, Laikipia, Nyeri and Machakos
- Indigenous Poultry (6) - Busia, West Pokot, Laikipia, Kitui, Kakamega and Taita Taveta

149. The project investments are institutional based and thus may not lead to relocation and resettlement of communities within the project investment areas

150. For each subproject, relevant safeguards instruments will be prepared & disclosed as a funding requirement by the National Project Coordinating Unit (NPCU). The ESMF includes Annexes to be used as tools for screening, assessing and monitoring subprojects during selection and implementation phases

151. The ESMF outlines the institutional arrangements relating to: (i) identification of environmental and social impacts arising from activities under the ECAAT sub- projects, (ii) the implementation of proposed mitigation measures, (iii) Capacity Building and (iv) Monitoring and Evaluation

152. The ESMF will be mainstreamed in ECAAT Project Implementation Manual (PIM) and the Operations Manual (POM) to enhance mechanisms for: (i) Screening of proposed sub-projects, identifying potential environmental and social impacts and management of safeguard policies implications; (ii) Institutional arrangements for implementation and capacity building; (iii) Monitoring implementation of safeguard instruments such as ESMPs, IPMPs, VGMPs and RAPs; (iv) Public consultation and Grievance Redresses including communication channels; and (v) The estimated costs related to the various safeguard instruments that may be applied.

ESMF Implementation Arrangements

Institutional Arrangement

153. Implementation of ECAATP ESMF will involve a 2 tier institutional arrangement (national and county). The two tier institutional arrangement aims at achieving efficient decision-making process and implementation as well as using the constitutionally mandated governance procedures at all levels for a sustained application and adoption. The 1st tier which is at national level will represent the MoA&I, (the main implementing agency) and other national GoK stakeholders (NEMA, ministries for environment, water, irrigation, industrialization, etc.) need to be sensitized on the environmental and social safeguards. In the MoA&I, the project will be anchored in the State Department of Livestock. The overall implementation oversight is to be done by the National Project Steering Committee (NPSC) chaired by the Principal Secretary, State Department of Livestock, MoA&I through the National Project Coordinating Unit.

154. The 2nd tier is the county level. The county governments are the executing agencies of the project The NPCU will liaise with the relevant institutions to build the capacity of its staff and that of the CPIU on safeguards and implementation of the frameworks in order to ensure the relevant safeguard policies are integrated in a sustainable manner into all project activities.

155. For any sub/micro projects that involves physical infrastructure the sub/micro project committee will hire the expertise to implement in consultation with the NPCU for adherence to the laid down guidelines. The oversight for civil works will be undertaken at county level by the relevant county government departments.

156. The ECAAT - NPCU will include a specialist charged with handling issues of environmental and social safeguards. The specialist will be hired once the project is declared effective. The Safeguards specialist duties will include backstopping the sub-projects implementing teams to comply with the relevant National Environmental and Social requirements and the World Bank's environmental and social safeguard policy requirements, including reviewing, screening, approving, monitoring and reporting of the subprojects implementation progress.

157. The ECAAT Project Environment and Social Safeguards Specialist will be responsible for guiding the formulation and development of ESIAs/ESMPs/RAPs/VMGPs in the project and periodically reviewing and improving capacity for managing safeguards compliance county level. The ESMPs guidelines are provided annex 6

Subprojects screening

158. The screening procedure strengthens accountability to the communities targeted for support, stakeholders in the development processes, and the broader development portfolio. Environmental and social screening and assessment processes for projects have become standard practice in development cooperation and are usually required by national regulatory frameworks and multilateral and bilateral donors. Therefore, application of the environmental and social screening and review processes demonstrates the appropriateness of safeguard measures. Additionally, safeguard approaches have proven to be ideal vehicles for consultation and disclosure of information. In the presence of well-designed grievance mechanisms, they provide an effective process for conflict resolution and mediation as spelt out in the ECAAT project frameworks

.

159. **Screening thus constitutes an environmental and social safeguard approach which is a key component of overall quality assurance process (Annex 1)**. The screening of sub projects and development of safeguard instruments at the county level will be undertaken by the CPIU with support of the NPCU – safeguard specialist. The outcome of the environmental and social screening process is to determine if and what environmental and social review and management is required. The screening process aims to quickly identify those projects where no potential environmental and social issues exist, so that only

those with potential environmental and social implications will undergo a more detailed screening process **(Annex 9).** The sub projects with potential environmental and social impacts will be subjected to detailed environmental and social impact assessment (ESIA). The outcome of this exercise will be an environmental and social management plan (ESMP) with adequate mitigation measures to address all the environmental and social issues identified, roles and responsibilities on monitoring and evaluation of the issues for compliance and reporting. The ESIA will be carried out by a team of experts under the leadership of the Environment and Social Safeguards Specialist (s). The ESIA report will be submitted to the world bank for review and clearance. The cleared document will then be submitted to NEMA for review and approval. The implementation of the ESMP will be done by the respective agencies/counties through the supervision of the Environment and Social Safeguards Specialist. Where development of ARAP will be required though not anticipated, as most of the envisaged investments are institutional based, the same process will be undertaken with adequate stakeholder participation/involvement.

160. Therefore, the two main objectives of environmental and social screening are to: firstly, enhance the environmental and social sustainability of a proposed project. This aspect of screening focuses on the environmental and social benefits of a project. Secondly, it is to identify and manage environmental and social risks and impacts that could be associated with a proposed project. This aspect of screening focuses on the possible environmental and social costs of an intervention and may point to the need for environmental and social review and management. The screening process can also focus the project activity to the National regulatory requirements.

1. ENVIRONMENTAL AND SOCIAL SAFEGUARDS TRAINING AND CAPACITY BUILDING

Capacity Strengthening for ESMF Implementation

161. In order to effectively carry out the environmental and social management responsibilities for subproject implementation, institutional strengthening will be required. Capacity building will encompass all ECAAT Project staff and sub-project executing institutions – Implementing Agencies (IA) and service providers.

162. ECAAT Project will undertake a Training Needs Assessment and prepare a training plan that includes training modules for the project staff, VMGs, Implementing Agencies (IAs) and CIGs etc.; as part of the ESMF. Below are some of the capacity building training needs: -

- Use of Screening Form and Checklist
- Design of appropriate sub-project mitigation measures.
- Public consultations in the ESMF process.
- Design of appropriate monitoring indicators for the sub-project's mitigation measures
- Integration of sub-project ESMPs into the ECAATP's cycles during their project implementation stages.
- Grievance Redress Mechanism
- Community mobilization/participation and social inclusion
- Training sessions on mitigation of environmental and social impacts and ESMP
- Training on how to generate baseline data
- Training Impact analysis and impact rating

163. Effective implementation of the VMGF, ESMF, and the RPF will require adequate capacity enhancement within institutions and other stakeholders, especially in regard to monitoring and evaluation. There is need for capacity building of implementers at the Project Coordinating Unit and the project implementing structures including at the National, County and Community levels.

Table 4: Type of training and target groups

Level	Key target groups	Type of Training /Activity
National level	PIU National Steering Committee National Technical Advisory Committee	Sensitization on the PICD and Environmental and Social Safeguard framework
County level	County Project Steering Committee, County Project Technical Team with line department and ministries at the county level	Environmental and Social safeguard framework Application of the screening checklists, manuals and tools Conflict resolution and the grievance mechanism Social Audits Report Writing Citizen and Stakeholder Engagement Decision making on screening results
Community level	Community level structures (value chain producer organizations, community interest groups, vulnerable and marginalized groups, and the community development committees).	Skills on screening and use of the Environment & Social Check List Checklist for the RPF and RAP implementation VMGF and Plan training Conflict Resolution and Participatory M& E and reporting Gender Screening Training on the CIDP Lobby and Advocacy Building Farmer organizations Training on ESMPs

164. **Environmental and Social Management Plan (ESMP)**: The ESMP is a key output of the ESIA and will be the backbone for the implementation of safeguards during project implementation, operation and decommissioning and its implementation costs have to be well defined and included in the bidding and contractual documents. While there are no standard formats for ESMPs, it is recognized that the format needs to fit the circumstances in which the ESMP is being developed and the requirements, which it is designed to meet.

165. ECAAT Project is preparing a standard ESMP in a format suitable for inclusion as technical specifications in the contract documents. ESMPs should be prepared after taking into account comments and clearance conditions from both the relevant agency providing environmental clearance and WB.

166. The detailed guidelines on ECAAT Project ESMPs preparations are provided. ESMP in general include the following components: (i) mitigation plans, (ii) monitoring plans, (iii) institutional arrangements, (iv) capacity building, and (v) associated costs. The ESMP will also cover a set of social issues, as applicable: (i) Listing the potential social and gender impacts; (ii) Identifying adequate mitigation or enhancement measures for each impact (direct or indirect; permanent or temporary; physical or economic, residual and cumulative); (iii) Assigning responsibility for the implementation of mitigation and enhancement measures; (iv) Assigning time and cost estimates for implementation of mitigation and enhancement measures (v) Defining indicators with gender disaggregated data for Monitoring and Evaluation of implementation of mitigation and enhancement measures.

167. **Resettlement Action Plans and Abbreviated Resettlement Action Plan (ARAP):** It is anticipated that ECAAT Project will not result into large scale land take and therefore physical or economic displacement may be minimal or on a lower side. The Resettlement Policy Framework has been prepared for this Project setting out the requirements to develop a Resettlement Action Plan, should economic or physical displacement occur as a result of a sub-project. The RFP also includes a protocol for community land donation.

168. The A RAP is designed to ensure impacts arising from land acquisition, displacement and relocation are avoided, minimized or mitigated at least to restore the standards of living of affected people at pre-project level. A RAP focuses on people affected by land acquisition, relocation and restriction of access, and defines a strategy for formalizing arrangements and responsibilities for mitigating negative impacts caused by land acquisition.

169. The RPF will be consulted and applied to all sub-projects as appropriate. In the event that there are very few PAPs affected by a sub-project an Abbreviated RAP (ARAP) may be prepared or the ESIAs may incorporate a section on land acquisition and the corresponding compensation and other mitigation measures. The required components of RAPs and ARAPs are set out in OP4.12

170. **Vulnerable and Marginalized Group Framework (VMGF): V**ulnerable groups are understood in the context of the Constitution of Kenya to mean the marginalized and minority communities but even within this group there are those individuals and communities who meet the requirements of OP 4.10.

171. The VMGF will be prepared based on the presence of VMGs within the project counties. During project implementation VGMPs in accordance to the VMGF will be prepared where necessary by the project team.

K. Stakeholder capacity building

172. **The implementing stakeholders will require trainings on the environmental and social safeguards but at various intensities, stipulated in the matrix (Annex 7).** This is because each level of stakeholders and type will have a different role in as far as environmental and social safeguards implementation and monitoring are concerned. Some levels such as the project coordinating unit and county technical teams will require detailed trainings and some of them will be ToTs while the national level may require just the sensitization/awareness approach; the benefitting farmers will have capacity building which is not detailed but enough to allow them perform and deliver the expected outcomes.

L. COMMUNICATION, CONFLICTS AND GRIEVANCES HANDLING MECHANISMS

Introduction

173. **All communities are faced somewhat with various conflicts including displacement through political influence, cattle rustling, internal civil strives, and community strives instigated through some external forces**. In each of these challenges there exist local solutions/remedies that can be enhanced to contain the identified conflicts. Project interventions will attract social accountability and hence facilitate sustainable impacts. The project will endeavor to receive feedback from the community on the project implementation

174. **A Conflicts and Grievances Handling Strategy will be formulated in a participatory way and explained in the ECAATP ESMF.** In addition, a communication strategy will be developed to guide the formal communication for the project together with all stakeholders as explained by the ESMF. In a nutshell, the ECAAT Project Frameworks recommends: institutional strengthening; role of private-public partnerships; targeting of the vulnerable and marginalized groups; need for ideal project environment to boost implementation; project implementation structures and need to capacity build them; and need to delineate roles and responsibilities for peace and efficiency.

ESMF MONITORING AND EVALUATION

175. **All project results indicators will be disaggregated by gender to monitor women's participation in the project interventions**. The project will also enhance capturing this environmental and social in a disaggregated manner data gender where applicable.

176. **The compliance with ESMF will be monitored. The NPCU at the** MoA&I, **– State Department for Agriculture will establish a monitoring system involving the PCU staff at national and county** level, to ensure effective preparation and implementation of the subprojects safeguards instruments. A set of monitoring indicators will be determined during ESMP implementation and will be guided by the indicators contained in the ESMF/PAD document. The NPCU and CPIU through designated safeguards focal persons will carry out monitoring of ESMP implementation.. . Appropriate monitoring formats will be prepared for monitoring and reporting requirements.

177. **The Environmental Management and Coordination Act (EMCA) require that all projects be subjected to a review and screening process in order to determine whether a full scale ESIA is necessary or not.** This is done through preparation of a project report which will be prepared by the ECAATP. Each investment will need to be reviewed independently for potential environmental and social impacts. In cases where a full scale ESIA is required, it will be mandatory that the feasibility study is undertaken concurrent with the ESIA study in order to ensure that the findings of the ESIA are incorporated in the feasibility study at the design stage. This will ensure that environmentally sound design including proposed mitigation measures as well as alternatives are incorporated in the feasibility reports at the design stage hence avoiding design change at an advanced stage.

178. **As already discussed, the ECAATP** has been rated as category B. As such , appropriate instruments will be prepared once the NPCU/CPIU identifies a subproject to be implemented..,. ECAATP support will also depend on: (i) the applicant has presented the certified copy of the positive conclusion of the relevant national authority **i**.e. NEMA or - as the case may be - the Review Committee determines that no further environmental review is required, and (ii) the World Bank has reviewed and cleared the environmental documentation and issued its formal no objection.

H. PUBLIC COMPLAINTS AND GRIEVANCE REDRESS

179. **ECAAT Project Team has developed a grievance handling mechanism, which is to be applied by all subprojects.** ECAAT Project will conduct separate sessions at each subproject to inform the affected communities about the mechanism. During the implementation of ECAAT Project all subprojects will maintain a complaint record database to enable complaint tracking and review and establish a complaint handling committee and involve county grievance handling committees in grievance handling processes. The grievance handling procedures are included in the ESMF (Annex 8).

I. PUBLIC CONSULTATION AND DISCLOSURE

180. National stakeholder/public consultative workshop was held on 6th March, 2018 at KARLO Headquarters for the Vulnerable and Marginalized Frameworks, (VMGF), Environment and Social Management Framework (ESMF) and Resettlement Policy Framework (RPF) with 73 representatives from the 23 project Counties and national implementing institutions. There were three representatives of the VMGs drawn from Garissa, Elgeyo Marakwet and Kilifi counties. The identification of the VGs representatives was done through the county agriculture and livestock offices as guided by the existence of the VMGs in their respective counties. Gender was also considered in the identification of stakeholders. The stakeholders were taken through the proposed ECAAT project focusing on the technical components and the proposed activities/interventions and the frameworks (VGMF, ESMF/IPM and RPF). This was followed by guided discussions and issues/clarifications/questions arising were adequately addressed. The comments and observations from the consultative workshop were incorporated into the VGMF to generate the final version.

181. **Disclosure: After the stakeholders' consultation workshops all comments by the participants will be incorporated in the final documents** and ESMF will be disclosed on the Ministry website and the link shared with the WB. A summary of the framework will also be advertised in the main local dailies and shared with the World Bank. Subsequently, the framework will be disclosed in the WB external website and all project documents updated accordingly.

ANNEXES

Annex 1: Environmental and Social Screening Checklist

ESM Sub-projects Screening Checklist (Prototype)

***(*Sub-projects screening process by benefitting communities/Agencies)**

Section A: Background information

Name of County……	
Name of CSU/Monitoring Officer/Researcher ……	
Sub-project location…….. Name of CBO/Institution…….. Postal Address:……. Contact Person……Cell phone:…….. Sub-project name…….	
Estimated cost (KShs.)……	
Approximate size of land area available for the sub-project…… Objectives of the subproject…… …… …… ……..	
Activities/enterprises undertaken……	
How was the sub-project chosen?..... Expected subproject duration……	

Section B: Environmental Issues

Will the sub-project:	Yes	No
Create a risk of increased soil erosion?	☐	☐
Create a risk of increased deforestation?	☐	☐
Create a risk of increasing any other soil degradation	☐	☐

Affect soil salinity and alkalinity?	☐	☐
Divert the water resource from its natural course/location?	☐	☐
Cause pollution of aquatic ecosystems by sedimentation and agro-chemicals, oil spillage, effluents, etc.?	☐	☐
Introduce exotic plants or animals?	☐	☐
Involve drainage of wetlands or other permanently flooded areas?	☐	☐
Cause poor water drainage and increase the risk of water-related diseases such as malaria?	☐	☐
Reduce the quantity of water for the downstream users?	☐	☐
Result in the lowering of groundwater level or depletion of groundwater?	☐	☐
Create waste that could adversely affect local soils, vegetation, rivers and streams or groundwater?	☐	☐
Reduce various types of livestock production?	☐	☐
Affect any watershed?	☐	☐
Focus on biomass/bio-fuel energy generation?	☐	☐

If the answers to any of the above is 'yes', please include an ESMP with sub-project application.

Section C: Socio-economic Issues

Will the sub-project:	Yes	No
Displace people from their current settlement?	☐	☐
Interfere with the normal health and safety of the worker/employee?	☐	☐
Reduce the employment opportunities for the surrounding communities?	☐	☐
Reduce settlement (no further area allocated to settlements)?	☐	☐
Reduce income for the local communities?	☐	☐
Increase insecurity due to introduction of the project?	☐	☐

Increase exposure of the community to communicable diseases such as HIV/AIDS?	☐	☐
Induce conflict?	☐	☐
Have machinery and/or equipment installed for value addition?	☐	☐
Introduce new practices and habits?	☐	☐
Lead to child delinquency (school drop-outs, child abuse, child labour, etc.?	☐	☐
Lead to gender disparity?	☐	☐
Lead to poor diets?	☐	☐
Lead to social evils (drug abuse, excessive alcohol consumption, crime, etc.)?	☐	☐

Section D: Natural Habitats

Will the sub-project:		
Be located within or near environmentally sensitive areas (e.g. intact natural forests, mangroves, wetlands) or threatened species? *NB: If the answer is yes, the sub-project should not proceed.*	☐	☐
Adversely affect environmentally sensitive areas or critical habitats – wetlands, woodlots, natural forests, rivers, protected areas including national parks, reserves or local sanctuaries, etc.)? *NB: If the answer is yes, the sub-project should not proceed.*	☐	☐
Affect the indigenous biodiversity (flora and fauna)? *NB: If the answer is yes, the sub-project should not proceed.*	☐	☐
Cause any loss or degradation of any natural habitats, either directly (through project works) or indirectly? *NB: If the answer is yes, the sub-project should not proceed.*	☐	☐
Affect the aesthetic quality of the landscape?	☐	☐
Reduce people's access to the pasture, water, public services or other resources that they depend on?	☐	☐
Increase human-wildlife conflicts?	☐	☐
Will the sub-project: Involve the use of pesticides or other agricultural chemicals, or	☐	☐

increase existing use?				
Cause contamination of watercourses by chemicals and pesticides?	☐	☐		
Cause contamination of soil by agrochemicals and pesticides?	☐	☐		
Experience effluent and/or emissions discharge?	☐	☐		
Export produce? Involve annual inspections of the producers and unannounced inspections?	☐	☐		
Require scheduled chemical applications?	☐	☐		
Require chemical application even to areas distant away from the focus?	☐	☐		
Require chemical application to be done by vulnerable group (pregnant mothers, chemically allergic persons, elderly, etc.)?	☐	☐		

Use irrigation system in its implementation?

NB:

If the answers to any of the above is 'yes', please include an ESMP with sub-project application.

SECTION E: Pesticides and Agriculture Chemicals

If the answer to the above is 'yes', please consult the IPMP that has been prepared for the project.

Section F: Vulnerable and Marginalized Groups meeting requirements for OP 4.10

Are there:		
People who meet requirements for OP 4.10 living within the boundaries of, or near the project?	☐	☐
Members of these VMGs in the area who could benefit from the project?	☐	☐
VMGs livelihoods to be affected by the subproject?	☐	☐

If the answer to any of the above is 'yes', please consult the VMGF that has been prepared for the project.

Section G: Land Acquisition and Access to Resources

Will the sub-project:	Yes	No
Require that land (public or private) be acquired (temporarily or permanently) for its development?	☐	☐
Use land that is currently occupied or regularly used for productive purposes (e.g. gardening, farming, pasture, fishing locations, forests)	☐	☐
Displace individuals, families or businesses?	☐	☐
Result in temporary or permanent loss of crops, fruit trees and pasture land?	☐	☐
Adversely affect small communal cultural property such as funeral and burial sites, or sacred groves?	☐	☐
Result in involuntary restriction of access by people to legally designated parks and protected areas?	☐	☐
Be on monoculture cropping?	☐	☐

If the answer to any of the above is 'yes', please consult the mitigation measures in the ESMF, and if needed prepare a (Resettlement Action Plan) RAP.

Section H: Proposed action

(i) Summarize the above:	**(ii) Guidance**
☐ All the above answers are 'No' ☐ There is at least one 'Yes'	• If all the above answers are 'No', there is no need for further action; • If there is at least one 'Yes', please describe your recommended course of action (see below).

(iii) Recommended Course of Action

If there is at least one 'Yes', which course of action do you recommend?

☐ CPIU[1]s and CDE will provide detailed guidance on mitigation measures as outlined in the ESMF; and
☐ Specific advice is required from CDE[2], Lead Officer and CIPUs regarding sub-project specific EIA(s) and also in the following area (s)

[type here]

☐ All sub-project applications/proposals MUST include a completed ESMF checklist. The ECAAT NPCU will review the sub-project applications/proposals
☐ The proposals will then be submitted to ECAAT NPCU for clearance and thereafter implementation by institution in the proposed subprojects.

Expert Advice

☐ The National Government through the Department of Monuments and Sites of the National Museums of Kenya can assist in identifying and, mapping of monuments and archaeological sites; and

☐ Sub-project specific ESIAs, if recommended, must be carried out by experts registered with NEMA and be followed by monitoring and review. During the process of conducting an ESIA the proponent shall seek views of persons who may be affected by the sub-project. The WB policy set out in OP 4.01 requires consultation of sub-project affected groups and disclosure of EIA's conclusions. In seeking views of the public after the approval of the sub-project, the proponent shall avail the draft EIA report at a public place accessible to project-affected groups and local CSOs.

Completed by: [type here]

Name: [type here]

Position / Community/Institution: [type here]

Date: [type here]

Field Appraisal Officer (CDE): [type here]

Signature: [ ]

Date: [type here]

[1] County Project Implementation Unit
[2] County Director of Environment and the County Technical Team

Note:

Project category	**Characteristics**
A	Full and extensive ESIA needed- irreversible environmental impacts; impacts not easy to pick or isolate and mitigation cost expensive; ESMP design not easily done; Must have a detailed ESIA done and future annual ESAs instituted
B	Site specific environmental impacts envisaged; mitigation measures easy to pick, not costly and ESIA / ESMP is required; and subsequent ESAs
C	Have minimal or occasionally NO adverse environmental impacts; exempted from further environmental processes save environmental audits

Annex 2: Draft Terms of Reference for Sub-Project Requiring an ESIA

Based on the screening and scoping results. ESIA terms of reference will be prepared. A Consultant Firm (or individual) will conduct the ESIA and the report should have the following format:

Introduction and Context

This part will be completed at a time and will include necessary information related to the context and methodology to carry out the study.

Objectives of the Study

This section will indicate (i) the objectives and the project activities; (ii) the activities that may cause environmental and social negative impacts and needing adequate mitigation measures.

Mission/Tasks

The Consultant should realize the following:

- Describe the biophysical characteristics of the environment where the project activities will be realized; and underline the main constraints that need to be taken into account at the field preparation, during the implementation of the project.
-
- Assess the potential environmental and social impacts related to project activities and recommend adequate mitigation measures, including costs estimates;
- Assess the need of solid and liquid waste management and suggest recommendation for their safe disposal;
- Review political, legal and institutional framework, at national and international level, related to environmental and social, identity constraints and suggest recommendations for reinforcement;
- Identify responsibilities and actors for the implementation of proposed mitigation measures;
- Access the capacity available to implement the proposed mitigation measures, and suggest recommendation in terms of training and capacity building, and estimate their costs;
- Develop an Environmental and Social Management Plan (ESMP) for the project.

The ESMP should underline (i) the potential environmental and social impacts resulting from project activities; (ii) The proposed mitigation measures; (iii) the institutional responsibilities for implementation; (iv) the monitoring indicators; (v) the institutional responsibilities for monitoring and implementation of mitigation measures; (vi) the costs of activities; and (vii) the schedule of implementation.

Public consultations

The ESIA results and the proposed mitigation measures will be discussed with local communities, NGOs, local administration and other organizations mainly involved by the project activities. Recommendations from this public consultation will be included in the final ESIA report.

Plan of the ESIA Report

- Cover page
- Table of Contents
- List of Acronyms
- Executive Summary
- Introduction
- Description of project activities
- Description of Environment in the project area
- Description of policy, legal and Institutional Framework
- Description of the methodology and techniques used in assessment and analysis of the project impacts
- Description of environmental and social impacts for project activities
- Environmental and Social Management Plan (ESMP) for the project including the proposed mitigation measures;
- Institutional responsibilities for monitoring and implementation; Summarized table for ESMP.
- Recommendations
- References
- List of Persons/Institutions met

Annex 3: Complaints Registration Form

Complaints Registration Form: _____

ECAATP Complaints Registration Form

LOCATION: County: _ Sub County: CIG/PAP/VMG Name: NAME OF COMPLAINANT: PHONE number: ADDRESS: Community position: resident □ member □ Official □ Other □
Classification of the grievance (Check box) □ CIG/formation □ Inter-community dispute □ Procurement □ Technical/operational coordination □ Financial □ Process delays □ Other (specify)
Does he/she inform the CRC of his/her neighborhood regarding to this grievance? Yes □ No □ If No, ask him/her to inform the NSC, for solving this grievance.
Brief description of the grievance:
What is the perceived cause?
Suggested action (by complainant) to address grievance: _____
_____ Signature of complainant: Date: / /
Received on behalf of ECAATP by: Registration no: Name: Designation: Signature: Date: / /

Annex 4: Training Matrix Budget for the Environmental and Social Safeguards

Activity	**Year**					**Total Budget (US$)**	Remarks
	1	2	3	4	5		
Deployment of an– Environment and Social Safeguards Focal Persons	X						
Awareness creation at national level	X					70,000	2-day workshop
Awareness creation at county level (23 counties)	X					200,000	2-day workshop for all relevant county implementing agencies
Awareness creation at CIG, CWG and individual farmer level	X	X	X	X		60,000	One day sensitization meeting
ToT training for county technical teams	X					150,000	Three-day training workshop
ECAATP Frameworks training to county technical teams	X		X			140,000	Two-day training
ECAATP Frameworks training/reviews to communities	X	X	X	X	X	70,000	One day capacity building
Undertake ECAATP Project Environmental and Social Impact Assessment/ESA (start and end period)		X			X	250,000	Consultancies
Undertake sub projects ESIAs/ESAs		X	X	X	X	400,000	Consultancies
Environmental and Social Safeguards						80,000	Twice per year

Activity	**Year**					**Total Budget (US$)**	Remarks
monitoring by the technical teams							
Train on Environmental Assessment OP 4.01/ECAATP ESMF	X	X	X	X	X	100,000	All target groups
Train on Pest Management Policy OP 4.09/ECAATPIPMF (Annex to ESMF)	X	X	X	X	X	100,000	All target groups
Total						1,620,000	

Annex: 5 Grievance Handling Mechanism (GRM)

- **A. Grievances Redress Mechanisms**

Grievances may arise from members of communities who are dissatisfied with: (a) the eligibility criteria, (b) community planning measures, (c) approval of CAPs and allocation of funds or (d) actual implementation.

This section sets out the measures to be used to manage grievances. The overall process of grievance handling is as follows3:

- ❖ Compensation committees including representatives of PAPs will establish the compensation rates.
- ❖ During the initial stages of the valuation process, the affected persons are given copies of grievance procedures as a guide on how to handle the grievances/sensitization of PAPs.
- ❖ The process of grievance redress will start with registration of the grievances to be addressed for reference, and to enable progress updates of the cases.
- ❖ The project will use a local mechanism, which includes peers and local leaders of the affected people. These will ensure equity across cases; they eliminate nuisance claims and satisfy legitimate claimants at low cost.
- ❖ The response time will depend on the issue to be addressed. Compensation will be paid to individual PAPs only after a written consent of the PAPs is received. Should a PAP decline the compensation suggested, he/she could appeal to the County GRM Committee and NPCU including the National Land Commission
- ❖ A Compensation Committee (CC) whose membership includes National Land Commission representative at the local level will first revise PAP case.
- ❖ Then the CC will draft its inclusions and submit them to the next level of GRM for redress and when these have failed the individual PAP has the right to take his case to the civil courts for litigation.

In order to deal with the grievance that may rise during the implementation of the RAP, there is need to incorporate a grievance redress process with IAs and with PAPs representatives committee to hear the complaints and provide solutions and reduce unnecessary litigation by resolving disputes through mediations.

- **B. Grievance Redress Process**

At the time the individual resettlement plans are approved and individual compensation contracts are signed, affected individuals and homesteads would have been informed of the process for expressing dissatisfaction and to seek redress. The grievance procedure will be

[3] Details of the GRM are to be put in the project operational manual

simple, administered as far as possible at the local levels to facilitate access, flexibility and open to various scrutiny.

The Resettlement Committee4 being a party to the contract would not be the best office to receive, handle and rule on disputes. Therefore, taking these concerns into account, all grievances concerning non-fulfillment of contracts, levels of compensation, or seizure of assets without compensation should be addressed to the County Lands Officer, assisted by the local National Land Commission

If the verdict rendered by the chief is not acceptable to either the individual affected or the management committee, then the parties in their compensation contract would have agreed that the matter would be appealed to a Court of Law as provided for by law. Notwithstanding that the grievance redress mechanism accepts that the compensation and resettlement plans will be (contracts) binding under the laws of Kenya.

The grievance redress mechanisms is designed with the objective of solving disputes at the earliest possible time which will be in the interest of all parties concerned and therefore implicitly discourages referring such matters to the Courts which would otherwise take a considerably longer time.

Grievance procedures may be invoked at any time, depending on the complaint. No person or community from whom land or other productive assets are to be taken will be required to surrender those assets until any complaints s/he has about the method or value of the assets or proposed measures are satisfactorily resolved.

All attempts would be made to settle grievances. Those seeking redress and wishing to state grievances would do so by notifying their area chief. The chief will inform and consult with the Resettlement Committee, the IA, the National Land Commission and PAP and other records to determine a claim's validity. If valid, the chief will notify the complainant and s/he will be settled. If the complainants claim is rejected, then the matter will be brought before the County Land Registrar and National Land Commission. If the PAP is dissatisfied with their decision, then s/he will be free to seek the determination by a Court of Law as provided in the Constitution. The decision of the High Court would be final and all such decisions must be reached within a full growing season after the complaint is lodged.

If a complaint pattern emerges, the IAs, the local National Land Commission and the local Chief will discuss possible remediation. The local leaders will be required to give advice concerning the need for revisions to procedures. Once they agree on necessary and appropriate changes, then a written description of the changed process will be made. The IA

[4] The role of this committee, establishment and composition will be detailed in the project operational manual

and the local National Land Commission will be responsible for communicating any changes to future potential PAPs when the consultation process with them begins.

Annex 6 : Guidelines for Preparation of Sub project ESMPs

1. The EA process involves the identification and development of measures aimed at eliminating, offsetting and/or reducing environmental and social impacts to levels that are acceptable during implementation and operation of the projects. As an integral part of EA, ESMP provides an essential link between the impacts predicted and mitigation measures specified within the EA and implementation and operation activities. While there are no standard formats for ESMPs, it is recognized that the format needs to fit the circumstances in which the ESMP is being developed and the requirements, which it is designed to meet. ECAATP is preparing a standard ESMP in a format suitable for inclusion as technical specifications in the contract documents. ESMPs should be prepared after taking into account comments and clearance conditions from both the relevant agency providing environmental clearance and WB. Given below are the important elements that constitute an ESMP.

a) Description of Mitigation Measure

2. Feasible and cost-effective measures to minimize adverse impacts to acceptable levels should be specified with reference to each impact identified. Further, the ESMP should provide details on the conditions under which the mitigation measure should be implemented. The ESMP should also distinguish between the type of solution proposed (structural and non-structural) and the phase in which it should become operable (design, construction and/or operation). Efforts should also be made to mainstream environmental and social aspects wherever possible.

b) Monitoring program

3. In order to ensure that the proposed mitigation measures have the intended results and comply with national standards and World Bank requirements, an environmental performance monitoring program should be included in the ESMP. The monitoring program should give details of the following:
    - Monitoring indicators to be measured for evaluating the performance of each mitigation measure (for example: national standards, engineering structures, extent of area replanted, etc).
    - Monitoring mechanisms and methodologies
    - Monitoring frequency
    - Monitory locations

c) Institutional arrangements

4. Institutions/parties responsible for implementing mitigation measures and for monitoring their performance should be clearly identified. Where necessary, mechanisms for

institutional coordination should be identified, as often, monitoring tends to involve more than one institution.

d) Implementing schedules

5. Timing, frequency and duration of mitigation measures with links to the overall implementation schedule of the project should be specified.

e) Reporting procedures

6. Feedback mechanisms to inform the relevant parties on the progress and effectiveness of the mitigation measures and monitoring itself should be specified. Guidelines on the type of information wanted and the presentation of feedback information should also be highlighted.

f) Cost estimates and sources of funds

Implementation of mitigation measures mentioned in the ESMP will involve an initial investment cost as well as recurrent costs. The ESMP should include cost estimates f into the sub-project design, bidding and contract documents to ensure that the contractors will comply with the mitigation measures. The costs for implementing the ESMP will be included in the sub-project design and bidding documents.

Annex 7: Safeguards Procedures for Inclusion in the Technical Specifications of Contracts

I. General

1. The Contractor and his employees shall adhere to the mitigation measures set down and take all other measures to prevent harm, and to minimize the impact of his operations on the environment.
2. The Contractor shall undertake all activities in accordance with legal requirements and the WB EHS Guidelines.
3. The Contractor shall prepare an Environmental, Health and Safety Plan detailing how they will comply with the requirements of this ESMF and other applicable environmental and social documentation (e.g. ESIA) and submit it to the Engineer for approval by the Project proponent.
4. The Contractor shall not be permitted to unnecessarily strip clear the right of way. The Contractor shall only clear the minimum width for construction and diversion roads should not be constructed alongside the existing road.
5. Remedial actions which cannot be effectively carried out during construction should be carried out on completion of each Section of the road (earthworks, pavement and drainage) and before issuance of the Taking over certificate:
    i. These sections should be landscaped and any necessary remedial works should be undertaken without delay, including grassing and reforestation;
    ii. Water courses should be cleared of debris and drains and culverts checked for clear flow paths; and
    iii. Borrow pits should be dressed as fish ponds, or drained and made safe, as agreed with the land owner.
6. The Contractor shall limit construction works to between 6 am and 7 pm if it is to be carried out in or near residential areas.
7. The Contractor shall avoid the use of heavy or noisy equipment in specified areas at night, or in sensitive areas such as near a hospital. The contractor will have to monitor noise for compliance with noise regulations and WB EHS requirements.
8. To prevent dust pollution during dry periods, the Contractor shall carry out regular watering of earth and gravel haul roads and shall cover material haulage trucks with tarpaulins to prevent spillage.

II. Transport

9. The Contractor shall use selected routes to the project site, as agreed with the Engineer, and appropriately sized vehicles suitable to the class of road and shall restrict loads to prevent damage to roads and bridges used for transportation purposes. The Contractor shall be held responsible for any damage caused to the roads and bridges due to the transportation of excessive loads and shall be required to repair such damage to the approval of the Engineer.

The Contractor shall not use any vehicles, either on or off road with grossly excessive, exhaust or noise emissions. In any built-up areas, noise mufflers shall be installed and maintained in good condition on all motorized equipment under the control of the Contractor.

10. Adequate traffic control measures shall be maintained by the Contractor throughout the duration of the Contract and such measures shall be subject to prior approval of the Engineer.

III. Workforce and Labour Management

11. The envisaged ECAAT project investments will be implemented in public institutions in specified counties and sub counties and as such does not anticipate importation of labour outside the project area(s). In this regard, the contractors shall whenever possible be encouraged to locally recruit the majority of the workforce and provide appropriate training as necessary. However, where applicable, the contractor shall be guided to develop Labour Influx Management Action Plan and code of conduct. The Contractor will install and maintain a temporary septic tank system for any residential labour camp and without causing pollution of nearby watercourses. The Environment and Social Safeguards Specialist will supervise the implementation of the Labour Influx Management Action Plan.
12. The Contractor shall establish a method and system for storing and disposing of all solid wastes generated by the labour camp and/or base camp.
13. The Contractor shall not allow the use of fuel wood for cooking or heating in any labour camp or base camp and provide alternate facilities using other fuels.
14. The Contractor shall ensure that site offices, depots, asphalt plants and workshops are located in appropriate areas as approved by the Engineer and not within 500 meters of existing residential settlements and not within 1,000 meters for asphalt plants.
15. The Contractor shall ensure that site offices, depots and particularly storage areas for diesel fuel and bitumen and asphalt plants are not located within 500 meters of watercourses, and are operated so that no pollutants enter watercourses, either overland or through groundwater seepage, especially during periods of rain. This will require lubricants to be recycled and a ditch to be constructed around the area with an approved settling pond/oil trap at the outlet.
16. The contractor shall not use fuel wood as a means of heating during the processing or preparation of any materials forming part of the Works.

IV. Quarries and Borrow Pits

17. Operation of a new borrows area, on land, in a river, or in an existing area, shall be subject to prior approval of the Engineer, and the operation shall cease if so instructed by

the Engineer. Borrow pits shall be prohibited where they might interfere with the natural or designed drainage patterns. River locations shall be prohibited if they might undermine or damage the river banks or carry too much fine material downstream.

18. The Contractor shall ensure that all borrow pits used are left in a trim and tidy condition with stable side slopes and are drained ensuring that no stagnant water bodies are created which could breed mosquitoes.
19. Rock or gravel taken from a river shall be far enough removed to limit the depth of material removed to one-tenth of the width of the river at any one location, and not to disrupt the river flow, or damage or undermine the river banks.
20. The location of crushing plants shall be subject to the approval of the Engineer, and not be close to environmentally sensitive areas or to existing residential settlements and shall be operated with approved fitted dust control devices.

V. Earthworks

21. Earthworks shall be properly controlled, especially during the rainy season.
22. The Contractor shall maintain stable cut and fill slopes at all times and cause the least possible disturbance to areas outside the prescribed limits of the work.
23. The Contractor shall complete cut and fill operations to final cross-sections at any one location as soon as possible and preferably in one continuous operation to avoid partially completed earthworks, especially during the rainy season.
24. In order to protect any cut or fill slopes from erosion, in accordance with the drawings, cut off drains and toe-drains shall be provided at the top and bottom of slopes and be planted with grass or other plant cover. Cut off drains should be provided above high cuts to minimize water runoff and slope erosion
25. Any excavated cut or unsuitable material shall be disposed of in designated tipping areas as agreed to by the Engineer.
26. Tips should not be located where they can cause future slides, interfere with agricultural land or any other properties, or cause soil from the dump to be washed into any watercourse. Drains may need to be dug within and around the tips, as directed by the Engineer.

VI. Historical and Archaeological Sites

27. If the Contractor discovers archaeological sites, historical sites, remains and objects, including graveyards and/or individual graves during excavation or construction, the Contractor shall:
    i. Stop the construction activities in the area of the chance find.
    ii. Delineate the discovered site or area.

iii. Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be present until the responsible local authorities and the Ministry of Sports, Culture and the Arts take over.

iv. Notify the supervisory Engineer who in turn will notify the responsible local authorities and the Ministry of Sports, Culture and the Arts immediately (less than 24 hours).

v. Contact the responsible local authorities and the Ministry of Sports, Culture and the Arts who would be in charge of protecting and preserving the site before deciding on the proper procedures to be carried out. This would require a preliminary evaluation of the findings to be performed by the archaeologists of the relevant Ministry of Sports, Culture and the Arts (within 72 hours). The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage, including the aesthetic, historic, scientific or research, social and economic values.

vi. Ensure that decisions on how to handle the finding be taken by the responsible authorities and the Ministry of Sports, Culture and the Arts. This could include changes in the layout (such as when the finding is an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage.

vii. Implementation for the authority decision concerning the management of the finding shall be communicated in writing by the Ministry of Sports, Culture and the Arts; and

viii. Construction work will resume only after authorization is given by the responsible local authorities and the Ministry of Sports, Culture and the Arts concerning the safeguard of the heritage.

VII. Disposal of Construction and Vehicle Waste

28. Debris generated due to the dismantling of the existing structures shall be suitably reused, to the extent feasible, in the proposed construction (e.g. as fill materials for embankments). The disposal of remaining debris shall be carried out only at sites identified and approved by the project engineer. The contractor should ensure that these sites: (i) are not located within designated forest areas; (ii) do not impact natural drainage courses; and (iii) do not impact endangered/rare flora. Under no circumstances shall the contractor dispose of any material in environmentally sensitive areas.
29. In the event any debris or silt from the sites is deposited on adjacent land, the Contractor shall immediately remove such, debris or silt and restore the affected area to its original state to the satisfaction of the Supervisor/Engineer.

30. Bentonite slurry or similar debris generated from pile driving or other construction activities shall be disposed of to avoid overflow into the surface water bodies or form mud puddles in the area.
31. All arrangements for transportation during construction including provision, maintenance, dismantling and clearing debris, where necessary, will be considered incidental to the work and should be planned and implemented by the contractor as approved and directed by the Engineer.
32. Vehicle/machinery and equipment operations, maintenance and refuelling shall be carried out to avoid spillage of fuels and lubricants and ground contamination. An oil interceptor will be provided for wash down and refuelling areas. Fuel storage shall be located in proper bounded areas.
33. All spills and collected petroleum products shall be disposed of in accordance with standard environmental procedures/guidelines. Fuel storage and refilling areas shall be located at least 300m from all cross-drainage structures and important water bodies or as directed by the Engineer.

Annex 7: General Environmental and Social Mitigation Plan

Impacts	Mitigation Measures	Responsibility	Time Frame		
			ST	MT	LT
Physical Environment					
Waste Disposal	• Provision of waste receptacles and facilities • Separation of waste at source • Training and awareness on Safe Waste Disposal in construction camps for all workers • NEMA approvals on final waste disposal • Collection and temporary storage of Waste oil /fuel from vehicles and equipment. • Contract NEMA approved waste collector & transport • Waste oil disposal by NEMA approved oil marketing companies or agents.	Beneficiary Groups (CIG/Producer Groups County Governments, NEMA, Ministry of Environment and Natural Resources, Research Institutions, ECAATP	✓		
Air pollution	• Operation of well-maintained machineries by the contractors. • Routine maintenance program for all equipment and machineries on site. • Use of good quality fuel and lubricants only. • Wetting of operational sites to reduce dust raising	Beneficiary Groups (CIG/Producer Groups County Governments, NEMA, Ministry of Environment and Natural Resources, Research Institutions, ECAATP Members ECAATP		✓	

Impacts	Mitigation Measures	Responsibility	Time Frame		
			ST	MT	LT
Physical Environment					
Noise and Vibration	• Maintaining daytime working hours (8am to 7pm). • Use well-conditioned and maintained equipment and vehicles with some noise suppression equipment (e.g. mufflers, noise baffles) intact and in working order. • Ear covers for noise level control • Ensure contractual agreements with the construction contractors on noise and vibration mitigation. • Implementation of best driving practices when approaching and leaving the site (speed limit of ≤30 km/hr) to minimize noise generation and avoid unnecessary hooting and revving. • Switching off Engines of vehicles/trucks and earth-moving equipment and other machineries when not in use.	Beneficiary Groups (CIG/Producer Groups County Governments, NEMA, Ministry of Environment and Natural Resources, Research Institutions, ECAATP County Government	✓		
Interference with the visual landscape	• Landscape installation after construction and restoration of disturbed areas e.g. borrow pits for visual aesthetics • Rehabilitation of degraded sites	Beneficiary Groups (CIG/Producer Groups County Governments, NEMA, Ministry of Environment and Natural			✓

Impacts	Mitigation Measures	Responsibility	Time Frame		
			ST	MT	LT
Physical Environment					
		Resources, Research Institutions, ECAATP			
Uncontrolled Water use	• Issuance of water abstraction permits from the relevant authorities. • Judicious use of water	Beneficiary Groups (CIGs & Producer Organizations Water Resources Management Authority (WRMA), Ministry of Water and Irrigation, NEMA, Ministry of Environment & Natural Resources			✓
Water pollution	• Banning of garbage/refuse, oily wastes, fuels/waste oils into drains or onto site grounds • Proper securing of fuel storage tanks/sites to contain any spillage • Complying with water quality regulation • Maintenance and cleaning of vehicles, trucks and equipment far from project sites or close to water bodies. • Adequate provision of Toilet facilities at the construction sites avoids indiscriminate defecation. • Application of Integrated Pest	Beneficiary Groups (CIGs and Producer Organizations County Government, Ministry of Environment & Natural Resources, WRMA, Research Institutions, Ministry of Roads & Transport, NEMA, Ministry of Public Health & Medical Services, ECAATP.		✓	

Impacts	Mitigation Measures	Responsibility	Time Frame		
			ST	MT	LT
Physical Environment					
	Management Plan (IPMP) where necessary.				
Soil and Land Degradation	• Minimal land clearing • Rehabilitation of degraded areas • Minimal construction work during rainy season	Beneficiary Groups (CiGs & producer Organizations) County Government, MoALF, KFS, Ministry of Public Works, NEMA, Ministry of Environment and Natural Resources, ECAATP. County Government			✓
Interference and destruction of Faunal habitats	• Avoidance or minimal disturbance on sensitive habitat areas. • Regular inspection and monitoring on identified or suspected sensitive habitats (swamps/ wetlands), prior to start and during work. • Species assessment	National Government, KWS, KFS, NEMA, Ministry of Environment and Natural Resources, WARMA, relevant NGO'S & CBO's, ECAATP.			
	•				✓
Loss of employment and	• Assisting the affected through livelihood assistance and provision of new jobs to	Beneficiary Groups (CIGs & Producer	✓		

Impacts	Mitigation Measures	Responsibility	Time Frame		
			ST	MT	LT
Physical Environment					
livelihoods	avoid interrupted income flow. • Use of local labor as much as possible and where available. • Compliance with labor & employment law	Organizations), Ministry of Agriculture livestock & fisheries, County Government, National Government, Ministry of Lands, Physical Planning Department, ECAATP.			
Land and property loss	• Due process should be followed to establish the true owner of any land, be it family or communal land. • Proper valuation of properties to be lost. • Community land donation or asset contribution in accordance with an established protocol (e.g. Annex 3) • Appropriate compensation of acquired land in accordance with the resettlement policy framework (RPF) and RAP, ARAP	Beneficiary Groups (CIGs & Producer Organizations), GoK, Ministry of Agriculture livestock & fisheries, County Government, Ministry of Public works, Department of Physical Planning, Ministry of Lands, ECAATP.	✓		
Impacts on human health/ traffic safety and sanitation	• Proper covering of trucks carrying construction materials with polythene material from or to project site. • Use of road worthy vehicles/trucks should be used on sites with qualified	Beneficiary Groups (CIGs & Producer Organizations), Ministry of Health, Ministry of Roads and Transport,	✓		

Impacts	Mitigation Measures	Responsibility	Time Frame		
			ST	MT	LT
Physical Environment					
	and experienced drivers. • Marking of active construction areas with high-visibility tape or fence to reduce the risks and accidents involving pedestrians and vehicles. • Immediate backfilling of open trenches and excavated areas as soon as possible after a construction. • Securing of open trenches and excavated areas to prevent pedestrians or vehicles from falling in. • Availing adequate sanitary facilities for workers and open range defecation will not be countenanced. • Provision of protective equipment to the construction workers and necessary education on suitable Personal Protective Equipment. • Enforce use of PPEs for all workers to minimize accidents • Strict adherence to basic rules with regard to protection of public health such as proper hygiene and disease (HIV/AIDS) prevention. • Occupational safety	County Government, Contractors, Physical Planning Department, NEMA, Ministry of Public Health, OHS department ECAATP.			

Impacts	Mitigation Measures	Responsibility	Time Frame		
			ST	MT	LT
Physical Environment					
Erosion and interference of cultural heritage / archaeological interest / existing ecologically sensitive areas	• Carrying out re-construction surveys to identify and document cultural heritage resources and existing ecologically sensitive. • Implementation of a chance find procedure and reporting system by contractors upon encountering a cultural heritage feature or ecologically sensitive item/issue. • Delineation and gazettement of ESA & heritage sites • Awareness creation • Archeological assessment and documentation • Comply with Heritage Act •	Beneficiary Groups (CIGs & Producer Organizations) Ministry of Gender and Social Service, Ministry of Environment & Natural Services, NEMA, NMK, Ministry of Agriculture livestock & fisheries, Ministry of Public works and ECAATP.			✓
Impacts on human health and public safety	• Implementation of an Environmental, Health and Safety (EHS) plan being that of contractual agreement by the contractors in order to outline procedures	Beneficiary Groups (CIGs & Producer Organizations), Ministry of Public health and		✓	

Impacts	Mitigation Measures	Responsibility	Time Frame		
			ST	MT	LT
Physical Environment					
	for avoiding health and safety incidents and for emergency medical treatment. • The EHS Plan will be prepared by the Contractor and submitted to the Supervising Engineer for approval by the main implementing agency prior to start of works. • Wearing of suitable Personal Protective Equipment (PPE) by contractors in accordance with the EHS plan. • • Enforcement of use of PPEs by all to minimize accidents. • Sufficient training to all contractors and workers on safe methods pertaining to their area of work to avoid injuries. • Sensitization sessions for the communities to enhance their understanding of the risks related to construction.	medical services, Ministry of public works, Department of Physical planning, Ministry of Agriculture livestock & fisheries, County Government and ECAATP			
Labour related issues	• Preparation of redundancy plans and packages for the affected workers which will include re- training and re- tooling of the affected and avoidance of labor strife.	GoK, Ministry of Gender and Social Services, Ministry of Agriculture livestock & fisheries,	✓		

Impacts	Mitigation Measures	Responsibility	Time Frame		
			ST	MT	LT
Physical Environment					
	• Avoid child labour • Compliance to labor • Information on rights • Safe and healthy working condition • Equity • Right to association • GRM for employees • Worker protection	Ministry of Labour, ECAATP. Contractor, County government			
Waste pollution from construction camps	• Preparation of site specific Waste Disposal Plan. • Strategic installation of waste disposal receptacles and signs within the construction camps. • Provision of training and awareness on clean environment. • Provision of adequate toilets and efficient sewer system within construction camps • 3 Rs (reduce, reuse, recycle)	County Governments, Ministry of Agriculture livestock & fisheries, Ministry of Environment and Natural Resources, WARMA, NEMA, Ministry of Public health and Medical services, ECAATP.		✓	
Impact on gender access to water for household use and household plots	• Consideration of diverse needs for water and accessibility modes to be effected for each group. • Recommendation of appropriate mitigation measures for the affected.	Beneficiary Groups (CIGs & Producer Organizations) Ministry of Gender and Social Services, Ministry of			✓

Impacts	Mitigation Measures	Responsibility	Time Frame		
			ST	MT	LT
Physical Environment					
	• Recommendation of group specific appropriate measures to specific impacts as per the project's specific social assessment. • Improve access to safe and clean drinking • Improve quality of Water resources / • Making water affordable	Labour, Ministry of Water & Irrigation, WRMA and Ministry of Agriculture and Irrigation.			
Impact of gender access fisheries and Pastoralists	• Improve access to water for domestic use in pastoralist • Segregate water for watering livestock & domestic • Improve access to benefits from livestock • Access to fishing • Improve access to benefit from fishing	MoA&I, NDMA, County Government, WRMA, National Government, NGOs and CBOs, Cooperatives, organizations. Service Providers and Private Sector			
Impacts on vulnerable and marginalized groups	• Identification and profiling of vulnerable and marginalised groups through Vulnerable and Marginalised Groups Framework (VMGF). • Designing of investment specific plans.	Beneficiary Groups (CIGs & Producer Organizations) Ministry of Agriculture livestock & fisheries, County Government, Ministry of Labour, Relevant NGOs		✓	

Impacts	Mitigation Measures	Responsibility	Time Frame		
			ST	MT	LT
Physical Environment					
		& CBOs, Private financial institutions, ECAATP.			
HIV/AIDS prevalence Spread and other related public health diseases –Water borne diseases etc.	• Designing and conducting of HIV/AIDS awareness, sensitization and prevention program for each project with the entire community coverage. • Designing of programs targeting reduction of the spread of water borne diseases in collaboration with Ministry of Health	Beneficiary Groups (CIGs & Producer Organizations) Ministry of Agriculture and Irrigation, Ministry of Devolution and Planning, County Government, Ministry of Public Health and Medical Services, NEMA, Ministry of Water and Irrigation, WARMA, Ministry of Public Works, Relevant CBO's & NGO's, Research Institutions, ECAATP.			✓
Downstream Impacts of dams, dykes and weirs and other water infrastructure e.g. irrigation investments, bulk	• Maintenance of environmental flow reserves for the river to retain water in reservoir during drought, ensure that water retention in dam is controlled to ensure that adequate reserve is left to flow downstream for users Proper designing of dams by qualified	Ministry of Environment & Natural Resources, Ministry of Water and Irrigation, WARMA, Ministry of Agriculture & Irrigation, Ministry of			✓

Impacts	Mitigation Measures	Responsibility	Time Frame		
			ST	MT	LT
Physical Environment					
water supply,	personnel; • Instituting dam safety panel and development of a dam safety plan. • Catchment conservation activities • Proper Standard Operation Procedures for operation and maintenance for infrastructure	Devolution and Planning, County Government, Ministry of Public Works, Research Institutions, Financial institutions, NGO's, CBO's, ECAATP.NEMA			
Impacts on community employment, skills and knowledge	• Prioritization of local communities in matters of employment and training (skilled) to for sustainable work force in the project e.g. operation and maintenance	Beneficiary Groups (CIGs & Producer Organizations), Ministry of Labour, Ministry of Agriculture & Irrigation, Ministry of Devolution & Planning, County Government, CBO's, NGO's, ECAATP.			✓

Annex 8 – Integrated Pest Management Framework

REPUBLIC OF KENYA

INTEGRATED PEST MANAGEMENT PLAN (IPMP)

FOR

EASTERN AND CENTRAL AFRICA TRANSFORMATION PROJECT

EXECUTIVE SUMMARY

The purpose of this document on Integrated Pest Management (IPM) is to provide a strategic framework for the integration of climate change mitigation measures, smart agriculture, SLM practices and technologies, environmental and pest management considerations in the planning and implementation of the East and Central Africa Agricultural Transformation Project (ECAATP). This IPMP has been prepared and revised as a guide for initial screening of the sub-projects for negative impacts which would require attention and mitigation prior to their implementation.

The framework incorporates:

i. Guidelines on assessment of the potential impacts of pesticide use within ECAATP taking into account the World Bank's Operational Policy OP 4.09, as well as Kenya's environmental policies, laws and regulations.
ii. Development of screening procedures (including checklists) that will be used as a mechanism in the IPMP for screening potential environmental and social impacts due to sub-project interventions. This will help exclude pesticides that fall under WHO class 1A and 1B.
iii. Guideline for development of appropriate methods to promote an Integrated Pest Management (IPM) approach that will minimize the need for chemical pesticides during each project intervention.
iv. Review of national environmental policies, legislation, regulatory and administrative frameworks and formulation of recommendations in the context of each of the projects as appropriate
v. Review of the relevant conventions and protocols to which Kenya is a signatory
vi. Management and implementation capacity for mitigation measures, and formulation of appropriate recommendations, including the institutional structure and the responsible agencies for implementing the framework, a grievance mechanism
vii. Monitoring and evaluation (M&E) of potential impacts;
viii. Evaluation of capacity building and training needs and their costs;
ix. Presentation of an outline on institutional arrangements for IPM
x. IPM assessment procedures, monitoring indicators and mitigation strategies, as appropriate under each of the projects.

It will also improve beneficiaries' attention towards smart agriculture, SLM practices and technologies and climate change mitigation measures.

INTRODUCTION

The objectives of IPMF are:

a) Establish clear procedures and methodologies for IPM planning, design and implementation of ECAATP funded sub-projects.
b) Develop monitoring and evaluation systems for the various pest management practices for subprojects.
c) To assess the potential economic, environmental and social impacts of the pest management activities within the sub-projects.
d) To mitigate against negative impacts of crop protection measures
e) To identify capacity needs and technical assistance for successful implementation of the IPMP
f) To identify IPM research areas in the Project
g) To propose a budget required to implement the IPMP

Pest	Economic importance	Management
Crops (rice, wheat, beans, sunflower and cassava)		
Stalkborers (Busseola fusca)	Larvae feed on leaves in the whorl then tunnel into the stalk. This results into deformed stunted plants or death of plant if damage is severe.	Stalks are buried or burned to eliminate diapausing larvae, early sowing reduces infestation, intercropping with pulses (except rice), Neem (muarobaini) powder (4-5gm i.e. pinch of 3 fingers) per funnel, Neem seed cake (4gm/hole) during planting, use the extract of Neurataneniamitis, a botanical pesticide, use of insecticides.
African armyworm (Spodoptera exempta)	Due to its rapid development, high reproductive capacity and mobility by migration, there is little time to react as infestations often go unnoticed. Degree of damage varies with stage of development of crop, prevailing weather conditions and density of caterpillars and area affected. In areas of erratic rainfall they can wipe out the crop totally.	Scout the crop immediately the forecast warns of expected outbreak in the area Apply recommended insecticide or botanical extract timely
Leafrusts (Puccinia spps)	Can lead to complete destruction of a crop like in case of stem rust	Timely planting, Crop rotation, Clean seeds, reduce density, Allow adequate aeration
Leafblights (Helminthos pariumturcic umandmayd is)	Significant yield losses have been reported in susceptible varieties Susceptible varieties	Crop rotation, Deep plough of crop residues
Common smut (Ustilago maydis) - Maize,		Clean seeds, Crop rotation, Removal of plant debris by deep Ploughing

African rice gall midge (Orseolia oryzivora) - Rice	The pest may be very damaging causing crop losses of 30-50% and occasionally losses of 100% reported	Plant recommended early maturing varieties
Stalk-eyed fly (Diopsis spp)–Rice, sorghum	The fly significantly decreases the number of panicles produced, the percentage of tillers with panicles, the grain weight of the total yield. Significant grain yields	Destruction of eggs in the seed beds, Early planting, Proper fertilization, User recommended plant spacing, observes simultaneous planting, Destruction of stubble after harvest, Clean weeding, Plough after harvest to expose the eggs to natural enemies Resistance varieties, Stalk management in dry season
Rice yellow mottle virus	The virus is an important constraint to rice production in sub-Saharan Africa. Yield losses vary widely from 10-100%depending on variety and	No known control measures. Control the vector
Rice blast (Pyricularia oryzae	Yield losses due to this disease may be as high as 75% or more in disease conducive condition	Rice blast management requires implementing a variety of cultural practices which include destruction of infested residue, use of clean seed, water seeding and continuous flooding to limit blast development and formation of nitrate and may cause drought stress. Planting of resistant cultivars and use of fungicides when needed.
Shoot fly (Atherigoma soccata - Bean		Observe recommended time of planting to avoid the pest, Plant recommended varieties, destroy infected crop residues by burying, Apply recommended insecticides if necessary

Wireworms (Agriotes spp.). Affected plants Potatoes, Field beans, cereals	Wireworms are the soil-inhabiting larvae of click beetles (Elateridae). They are typically found in grassland but can attack a wide range of crops. Wireworm feeding on potatoes can cause significant reductions in tuber marketability, even at low populations. In cereals, wireworms can affect heavy	Consolidating seedbeds helps restrict movement of the pest and controlling grass weeds can reduce availability of food sources. In arable rotations, plough-based cultivation may help to reduce populations. For potatoes, avoid wireworm-infested fields entirely and consider lifting the crop early if damage is expected. The main natural enemies are fungi and parasitic wasps. Larval stages are attacked by ground beetles and adults are eaten by birds.
Larger grain borer (LGB) Weevils , dried cassava roots	Adults bore into cassava or maize grains, tunneling extensively and producing large quantities of dust. They cause considerable losses in stored grain weight losses as high as 35%. Average losses for cassava dried roots of 19% rising to as high as 30% has been observed.	Selection of tolerant varieties, Timely harvest, De-husking and shelling, Proper drying ,Sorting and cleaning of the produce, Cleaning & repair of the storage facilities, Use rodent guards in areas with rat problems, Use improved granaries, Use appropriate natural grain protectants e.g. where applicable or, Use recommended insecticides at recommended dosage and/or, Keep the grain in airtight containers and store these in a shady place, preferably in-doors, Carry out regular inspection of the store and produce. Timely detection of any damage to the grain and/or storage structure is essential to minimize potential loss or damage, promote biological control of LGB using Teretriosoma nigrescens (Tn) to minimize infestation from wild sources. This is the task of the national plant protection services because the agents have to be reared and released in strategic sites.
Beans and other pulses		

Black bean aphid (Aphis fabae) Affects field beans,	The black bean aphid can cause significant damage to bean crops. Damage mainly occurs through the direct feeding of the pest, which can result in yield reductions if aphid populations grow large enough. These aphids also transmit viruses, such as bean leaf roll virus (BLRV), pea enation mosaic virus (PEMV), bean yellow mosaic virus (BYMV)	Lady beetles and their larvae are great beneficial insects to welcome into your garden. Ants tend to be attracted to the honeydew left by aphids, so ant activity can often lead you to aphid colonies spray from the garden hose can help remove aphids from plants. Follow up with two applications of insecticidal soap, one week apart. Be sure to apply the soap spray to leaf undersides and crevices.
Pea aphid (Acyrthosiph on Affects Beanspisum	Pea aphid is a major pest of peas and beans. Attacks by the pest can result in reduced yields by spoiling flowers, causing pod filling to fail and by generally reducing plant efficiency. Bean leaf roll virus (BLRV). PSbMV affects quality in vining peas and the maintenance of disease-free seed stocks. PEMV can cause large yield reductions in severe cases. Honeydew produced by the pest can provide an ideal medium for the growth of saprophytic fungi.	Avoid growing peas or beans in fields with nearby concentrations of clover or Lucerne. Predators, such as ladybirds and hoverfly larvae, may help control pest populations. Other natural enemies include spiders, fungal pathogens and parasitoids. Virus transmission risk can be minimized by ensuring that seed stock is free of PSbMV.
Bean seed flies (Delia platura and Delia florilega)	Importance Damage can be localised and sporadic, even though the adult flies are common. Usually, the first sign of damage is the patchy emergence of seedlings.	Properly burying any organic debris from previous crops should reduce risk. Natural controls are likely to include generalist predators, such as certain species of beetle, spiders, insect-pathogenic fungi and parasitoids (beetles and wasps).

Bruchid beetle (Bruchus rufimanus)	In field beans, seeds damaged by the bruchid beetle reduce the value of the crop for human consumption, export trade or for seed. In broad beans, the presence of the damage or the larvae makes them unacceptable for processing and may lead to rejection of the crop.	The parasitic wasp, Triaspisluteipes, attacks the beetle larvae. Small emergence holes in the seeds may be due to this natural enemy. control chemical is available
Bean weevil (Sitonalineatus) Affects, Beans	The bean weevil can cause yield reductions in field. Adult feeding does not normally cause significant damage but larval feeding within the root nodules can affect yield. The larvae are difficult to target and pressure from this pest has increased in recent years. Adults can transmit the broad bean stain virus (BBSV) and the broad bean true mosaic virus (BBTMV), which can affect product quality and result in large yield losses reductions if the infection occurs early	Avoid cropping in areas that have previously had large pea and bean weevil populations. Natural enemies include spiders, ground beetles, rove beetles, predatory flies and parasitoids.
Thrips - beans,	Field thrips (Thripsangusticeps) attack pea and bean crops at early emergence, feeding inside the tightly rolled leaves of the growing point, and continue to feed throughout the growing season.	Frequent examinations of the emerging crop should be made. In peas, this should be from the first appearance of pods until the pods are full. Treatment in peas and beans is justified as soon as damage is seen. For field thrips in high-risk areas, sow late-emerging crops.

Cutworms (Noctuid moths, eg Agrotis segetum – affects Oilseeds, Potatoes, Lettuce	Cutworms are the larvae of certain Noctuid moths, in particular the turnip moth. Older larvae feed underground, damaging plant roots and stems, sometimes so badly that the plant stem is severed. Although cutworms are sporadic pests, damage can be severe, leading to the loss of plants and reductions in quality. Roots and onion bulbs can be rendered unmarketable by cutworm feeding	Young larvae are very susceptible to irrigation while feeding above ground on plant foliage and well-timed irrigation can be a very effective method of control. Biological control with predators or parasitoids Pesticides based on microbial control agents (e.g. Bt) may be effective.
Beananthracnose	Causes stems breakage of affected stems, pod drying and shrinking resulting to crop loss and yields	Practice good crop rotation, Sanitation and crop hygiene, use certified seed, Observe recommended time of planting, Plant tolerant/resistant varieties
Rust (Uromyces appendiculatus)	Yield reduction results from the fungal growth on the leaves	Avoid planting beans in high altitude areas, Practice good crop rotation, Sanitation and crop hygiene, plan tolerant/resistant varieties, Observe recommended time of planting, Spray with recommended fungicides when necessary
Haloblight (Pseudomona ssp)	Leaf spots cause distorted leaves and pods leading to reduced yield and quality	Plant tolerant/resistant varieties, Spray with recommended fungicide when necessary, Use certified seed
Bean common Mosaic virus	Lead to reduced growth and production	Plant tolerant/resistant varieties; Effect good control of aphids
Bean aphids (Aphis fabae)	Causes yellowing and or distorted necrotic spots on leaves and stunted shoots. They secret sticky sugary substance that encourages sooty mould growth	Practice early planting, Apply recommended insecticides or botanical extracts if necessary

Bean bruchids (Acanthoscelides obtectus)	The pest causes quantitative, in the number of seeds or parts of seeds eaten and qualitative, in the grains contaminated by excrement or insect bodies. These losses may be increased by subsequent attacks from fungi or bacteria because larval stage completion elevates temperature and relative humidity, inviting secondary rotting by micro-organism attack.	Early harvesting and good drying of the beans, Ensure the beans are dry and well cleaned before storage, Apply recommended storage insecticide/botanical extracts, Storage in airtight containers, Vegetable oil seed coating
Angular leafs pot (Phaeisariopsisgriseloa)	Reduced production is as a result of affected leaves and pods. The disease is seed born	Use of clean seed, Burial of infected debris, Crop rotation. Use of cultivar mixtures, Intercropping with cereals Plant tolerant cultivars
Common and Fuscous bacterial blight(Xanthomonaphaseli)	Water soaked spots brown spots on leaves and pods result to crop and yield loss	Plant resistance or tolerant varieties Use pathogen free, high quality seed, Field sanitation including burning of crop residues, Rotation sequence with cereals
Cassava		
Cassava mealy bugs (Phenococcusmanihot)	It causes stunting, leaf distortion; defoliation reduced root formation and hence yields losses.	Improve the soil fertility by manuring mulching and intercropping Practice crop rotation Use clean planting material Resistant varieties, Plant health stem cuttings Plant as the beginning of the wet season
Cassava green mites (Mononychellustanajaa)	Reduces cassava yields by damaging the photo-synthetically active leaf surface area of the plant. Yield reductions can go as high as 80%	Improve the soil fertility by manuring, mulching and intercropping, Practice crop rotation; Use clean planting material Resistant varieties, Plant health stem cuttings; Plant as the beginning of the wet season

Cassava root scale (Stictococus vayssierra)	Scales affect stems, roots and tubers. Early infection kills plants and prevents production	Plant health stem cuttings Plant at the beginning of the wet season
Cassava white scale (Aonidomyt ilusalbus)	Leaves wilt and drop from plant, stunted growth lead to poor tuber yields; Cuttings from infected plants do not sprout	Plant health stem cuttings; Plant as the beginning of the wet season
Variegated grasshopper (Zonocerusv ariegates)	The pest defoliates the plants and removes barks leading to plant death and reduced yields	Destroy the breeding sites, Dig egg-laying sites of variegates grasshopper in the wet season to expose and destroy egg pod of the pest, Biological control: use fungal pathogens, e.g. Metarlizium spp.
Cassava mosaic disease (CMD)	Affected plants grow stunted, leaves are distorted resulting to poor root yields and low-quality stem cuttings, The disease is spread by cuttings	Improve the soil by manuring, mulching and intercrops, Plant health stem cuttings; after harvesting destroy infected cassava stems, use resistance varieties that tolerate CMD, manipulate sowing date and planting spacing to reduce incidence of the disease, Plan resistance varieties
Cassava Anthracnose (Colletotrich umgraminio cola)	Causes drooping of petioles and leaves, wilting and death of plant parts resulting to loss of yields	Plant cuttings from health plants without leaf chlorosis; After harvesting destroy discarded infected cassava stems; cleansing of farm tools; crop rotation; check field regularly and rogue and destroy affected plants
Cassava brown streak disease	Defoliation, dieback of shoots results to reduced yields. The stems, leaves and petioles may have brown gum	Plant cuttings from health plants without leaf chlorosis; After harvesting destroy discarded infected cassava stems; Cleansing of farm tools, Crop rotation Harvest early, Grow resistance varieties
Cassava root rot disease (Phytophtor a, Pithiumand Fusariumsp	Leaves wilt, roots dieback and swelling of tubers and plant death Rotting of roots cause foul odour. Quality and yield of the cassava roots is seriously affected	Harvest early, Plant cuttings from health plants without leaf chlorosis After harvesting destroy discarded infected cassava stems, Cleansing of farm tools

Impact on Production

Estimates of potential crop damage from pests in the absence of control have been made by measuring damage as a proportion of total feasible output. Generally, estimates of damage during outbreaks and plagues range from insignificant losses of the planted crop to 100 percent, depending on the year, region and pest species.

Weeds are reported to generally cause up to 70% of yield losses on susceptible crops. However, in some areas such as the Lake Victoria Basin, *Striga* is the number one ranked weed causing severe damage to crops like maize, sugarcane and sorghum. Documented literature indicates that it causes between 42-100% yield losses. Other notorious weeds are grasses and broad-leaved weeds that cause 30-70% yield loss.

A major weed that may require noting although it does not affect crops is the water hyacinth which causes fish catch reduction ranging from 30-100% depending on the levels of infestation. Spread of introduced weed species such as the water hyacinth, poses a serious production impediment in many developing countries resulting in severe disruption of the socioeconomic activities of the local communities.

Some studies may over-estimate the potential crop losses caused by pests. They rarely account for farmers' response to mitigate the effects of pests and are often based on calculations of optimal production conditions. In both ways, they may overstate the losses caused by the pests. Studies of pests have been carried out by focusing on estimated damage in the absence of control and comparing them with direct costs of control operations. Thus, these studies have the same drawbacks and, in all likelihood, they give an incomplete picture of the true net benefits of pest control.

There are numerous diseases of crops reported in Kenya that are causing havoc to crop production. Among the leading diseases are those caused by viruses and bacteria.

The major diseases identified include:

Cassava mosaic virus seriously affected the crop causing significant losses in production. Experiments carried estimated losses of crop at 36%, although the impact seems to be declining in view of the control measures that have been undertaken by KALRO through introduction of resistant cassava varieties.

Impacts on food security

The effect of pest damage on the food security has not been analyzed in the past. However, where there are major damages there is significant losses in production and hence the food supply such as in maize. A case in point is that of the cassava mosaic virus which razed the whole of the lake basin in Kenya extending to the Uganda side, thereby causing serious reduction in the crop supply.

During severe attacks of these diseases the supply of the affected crops is inhibited hence causing shortages in the availability and hence high prices in the market Thus the consumers are exposed to high prices making the crop unaffordable.

Livestock Pests

Impacts on production

All animal diseases have the potential to kill affected animals, but the severity of the disease will vary depending on factors such as the species and breed of animal, its age and nutrition and the disease agent. Many animal diseases have mortality rates of between 50% and 90% in susceptible animals. Rift Valley Fever normally produces only a mild infection in local African breeds of cattle, sheep and goats, while exotic breeds of the same species may experience severe spates of abortion. Under experimental conditions, some "mild" strains of classical swine fever virus kill less than half of the infected pigs while other "virulent" strains may kill up to 100%. Productivity losses can persist even in animals that survive disease. Abortions caused by Rift Valley fever do not only entail the loss of offspring but also the loss of one lactation and thus reduced milk supply for human consumption in the year following an outbreak. Foot-and-mouth disease leads to considerable loss in milk production in dairy cattle. In Kenya, losses caused by foot-and-mouth disease in the early 1980s amounted to KShs. 230 million (1980 value) annually, approximately 30 % of which were due to reduced milk production.

The first outbreak of rinderpest in Eastern Africa in 1887 was estimated to have killed about 90% of Ethiopia's cattle and more than 10 million cattle on the continent as a whole resulting in a widespread famine. Rinderpest losses in production has been estimated with and without the control campaign and found benefits exceeded costs. The benefit/cost ratio ranged from 1.35:1 to 2.55:1. As mentioned earlier in cost-benefit studies, there are many variables that are not considered in a simple evaluation of costs and losses that might lead to an underestimation of the costs and/or an overestimation of the benefits of a control campaign.

Reductions in mortality and improvements in animal productivity are the traditional goals of disease eradication programmes. Access to export markets is now becoming an equally important reason. Improved response to outbreaks and increased access to vaccine have reduced the likelihood of many disease epidemics, but this experience is countered by increased trade, smuggling and susceptibility of small poultry and ruminant populations raised in intensive conditions.

Most analyses of animal disease do not include the cost of treatment, perhaps because it is regarded as minor. The effects of disease on animal productivity depend on the actual disease incidence, which may be reduced by a control campaign. Animal diseases directly affect the size and composition of animal populations and thus indirectly have repercussions on the environment. In conjunction with other environmental factors, major livestock

diseases determine which production system, species and breeds of animals are adopted by livestock owners.

Impacts on human health and the environment

The majority of animal diseases do not cause epidemics in humans, although occasionally humans can become infected. The viruses causing rinderpest, *peste des petits* ruminants, classical swine fever and Asian swine flu, as well as the causative agent of CBPP, are not infective for humans but foot-and-mouth disease virus has been isolated from around 40 people worldwide following a mild cause of disease.

Some animal pests and diseases can affect humans directly and may use animals as vectors that aid in their transmission. Areas with conflict or poor health controls pose a greater risk of human infection from animal disease. Larger production units and increased contact among animals also increases the impact of outbreaks.

Rift Valley fever virus can infect humans, where it causes a febrile illness, which is sometimes complicated by hemorrhage, encephalitis and blindness. The virus is transmitted among animals and from animals to humans by certain mosquito species, which gives rise to the distinct association of Rift Valley fever epidemics with periods of high rainfall. Humans also appear to contract the infection through direct contact with infected tissues and fluids of animals at slaughter.

INTEGRATED PEST MANAGEMENT

In the early years of the last century, different crop protection practices were integral parts of any cropping system. However, with increased world human population, the demand for more food was eminent. This also coincided with increased pest problem and advent of pesticides. From the 1940's to the 1970's, a spectacular increase in yield was obtained with the aid of an intensive development of technology, including the development of a variety of agro-pesticides. In many countries this advancement was coupled with the development of education of farmers and efficient extension services. However, in many developing countries, pesticides were used without adequate support systems. Agro-pesticides were often used injudiciously. Misuse and over-use was stimulated by heavy subsidies on agro-chemicals. Crop protection measures were often reduced to easy-to-use pesticide application recipes, aimed at immediate elimination of the causal organisms. In places where the uses of improved varieties were propagated, packages of high-yielding varieties with high inputs of agro-pesticides and fertilizers made farmers dependent on high external inputs. Since then, it has been realized that this conventional approach has the following drawbacks:

a) Toxicity; poisoning and residue problems
b) Destruction of natural enemies and other non-target organisms
c) Development of resistance in target organisms
d) Environmental pollution and degradation
e) High costs of pesticides;
f) Inadequate skills and knowledge to manage and use pesticides.

These drawbacks necessitate a crop protection approach that is centered on local farmer needs, sustainable, appropriate, environmentally safe and economical to use. That is the Integrated Pest Management (IPM) approach.

There are many different definitions of Integrated Pest Management that have been developed over years. In 1967, FAO defined IPM as "a pest management system that in the context of the associated environment and the population dynamics of the pest species, utilizes all suitable techniques and methods in as compatible manner as possible, and maintains the pest population at levels below those causing economic injury". The requirement for adoption of IPM in farming systems is also emphasized in the World Bank OP 4.09 on Pest Management, which supports safe, effective, and environmentally sound pest management aspects, such as the use of biological and environmental friendly control methods.

The preconditions for an IPM approach are:

- Understanding of the ecological relationships within a farming system (crop, plant, pests organisms and factors influencing their development)
- Understanding of economic factors within a production system (infestation: loss ratio, market potential and product prices)

- Understanding of socio-cultural decision-making behaviour of farmers (Traditional preferences, risk behaviour)
- Involvement of the farmers in the analysis of the pest problems and their management
- Successive creation of a legislative and agricultural policy framework conducive to a sustainable IPM strategy (plant quarantine legislation, pesticides legislation, pesticide registration, price policy)

The main elements of an IPM program are:

- Use of available, suitable, and compatible methods which includes resistant varieties, cultural methods (planting time, intercropping and crop rotation), biological control, safe pesticides, etc. to maintain pests below levels that cause economic damage and loss
- Conservation of the ecosystem to enhance and support natural enemies and pollinators
- Integrating the pest management strategies in the farming system
- Pests and crop loss assessments

This Integrated Pest Management Framework (IPMF) addresses the need for the ECAATP project to promote ecosystem approach in pest management. This approach has benefits in terms of enhancing good human and environmental health and improving economic wellbeing of the farmer and pastoral communities.

The IPMF enable stakeholder groups to establish functional mechanisms enabling farming and pastoral communities to identify, understand and manage pest and vector problems; Reduce of personal and environmental health risks associated with pesticide use; Protection of beneficial organisms such as pest natural enemies and pollinators to enhance agricultural productivity.

Other benefits of applying the framework is the envisaged collaborative linkages between the project and international IPM groups would help bring relevant expertise e to strengthen national and local capacity in addressing pest problems. For example, quarantine pests, alien invasive species and stringent minimum pesticide residue levels limit the potential for farmers to benefit from international trade opportunities. The experience is an eye opener in setting mechanism to develop a national IPM policy to encourage national and local compliance with international conventions and guidelines on pesticides, and to further develop IPM.

POLICY, INSTITUTIONAL AND LEGAL FRAMEWORKS FOR IMPLEMENTING IPM

I*ntroductio**n***

The Government of Kenya has been emphasizing on increased productivity and commercialization of agriculture. To achieve this Farming and pastoral communities are expected to increase utilization of external inputs, including pesticides. This IPMP intends to ensure that there is safe and judicious use of pesticides in the country. Worldwide, there is also a common agreement that although agriculture is a main contributor to food security, the sector has contributed to environmental degradation and climate change. Therefore, both the government and international stakeholders have had impact on the implementation and utilization of IPM strategies in Kenya. This has resulted to formulation of policies, institutions and legal frameworks that in one way or another influences agricultural production and agro-enterprises.

IPM International Policies

Convention on Biological Diversity (1992)

The Convention on Biological Diversity adopts a broad approach to conservation. It requires Parties to the Convention to adopt national strategies, plans and programs for the conservation of biological diversity, and to integrate the conservation and sustainable use of biological diversity into relevant sectoral and cross-sectoral plans, programs and policies. The proposed programme is expected to conserve biodiversity, especially the rare and endangered species in the project area and its environs.

World Bank Operational Policy on Pest Management, OP 4.09

The Bank uses various means to assess pest management in the country and support integrated pest management (IPM) and the safe use of agricultural pesticides, economic and sector work, sectoral or project-specific environmental assessments, participatory IPM assessments, and adjustment or investment projects and components aimed specifically at supporting the adoption and use of IPM. In the Bank-financed agriculture operations, it advocates pest populations reduction through IPM approaches such as biological control, cultural practices, and the development and use of crop varieties that are resistant or tolerant to the pest. The World Bank does not finance any pesticides programs, which fall under WHO class 1A and 1B of pesticides.

International Plant Protection Convention of FAO (1952)

The IPPC is an international treaty to secure action to prevent the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control. It is governed by the Commission on Phytosanitary Measures (CPM) which adopts International Standards for Phytosanitary Measures (ISPMs).

United Nations Framework Convention on Climate Change (1992)

The convention seeks to regulate levels of greenhouse gases (GHGs) concentration in the atmosphere, to avoid the occurrence of climate change at levels that would harm economic development, or that would impede food production activities.

World Food Security and the Plan of Action of November 1996

This declaration seeks to secure effective prevention and progressive control of plant and animal pests and diseases, including especially those which are of trans-boundary nature, such as rinderpest, cattle tick, foot-and-mouth disease and desert locust, where outbreaks can cause major food shortages, destabilize markets and trigger trade measures. It promotes regional collaboration in plant pests and animal disease control and the widespread development and use of integrated pest management practices.

National Policies

There are several policies that have been developed in the country that have impact on crop production and IPM implementation. Some of these policies are:

(i) Vision 2030
(ii) National Agricultural Research Systems
(iii) Agricultural Sector Development Strategy
(iv) National Agricultural Sector Extension Policy
(v) Environment Policy
(vi) National Food and Nutrition Policy
(vii) National Seed Industry Policy

Institutional framework

Different institutions and stakeholders are involved in pest management and influence adoption of IPM programs. These include:

Agricultural sector ministries

The functions of various agricultural ministries are hinged on various policy documents, guidelines and institutional structures. Some of the services provided by the sector ministries include the provision of National direction on agriculture and livestock development, husbandry and management through Agricultural Policy and Services. The lead ministries are also instrumental in guaranteeing national food security through the National Food Policy. Many of the food security policies in Kenya are closely linked to Poverty Reduction Strategies (PRS) and Sustainable Development Goals (SDGs).

The county departments of Agriculture, Livestock and Fisheries provide Extension Services to the ward levels, though they are constrained by various economic, human resource and geographical factors. Extension services are not limited to husbandry practices but encompass high level of pest management. However, there are institutions exclusively charged with

express mandate of crop and animal pesticides products regulation in Kenya. Various research institutions are involved in applied research in both crop and animal production. The main focus has been on high yielding varieties of crops and animals as well as development of early maturing and disease resistant varieties.

Institutions of particular interest include: Kenya Agriculture and Livestock Research Organisation (KALRO), and Kenya Seed Company (KSC). There are also government financial institutions that support farmers such as Agricultural Development Corporation (ADC) and Agricultural Finance Corporation (AFC). The key public institutions that support production and marketing are: National Cereals and Produce Board (NCPB) and New Kenya Cooperative Creameries.

There are several public and private institutions that play a major role in pest management in Kenya these include: Kenya Plant Health Inspectorate Service (KEPHIS), Pest Control Products Board (PCPB) and National Environment Management Authority (NEMA), Agro Chemical Association of Kenya (AAK).

Several commercially oriented institutions, parastatal and companies address specific enterprises. These include sugar companies, agro-chemical industries, NGOs and farmer organizations (e.g., FPEAK, KENFAP, and Kenya Flower Council).

There are international and regional institutions that are involved in pest management of crops and animals which includes, ILRI, ICIPE, IITA, CYMMIT, CIP, ICRAF (WAC), CIAT, ICRISAT and DLCO

Legal Framework

There are many statutes that deal with pests and diseases directly and others that are indirectly connected with pest control and management. These include:

Chapter 324 – Plant Protection Act
This Act makes a provision for the prevention of the introduction and spread of diseases destructive to plants. The most applicable parts of this Act to Integrated Pest Management are specified in Sec. 3, 4, 5, 6, 7 and 8.

The act creates specific rules to support plant protection in various crops. These includes: sugarcane (L.N.294/1962. Rule 3, Sch. 2), Maize and Sorghum (L.N.216/1956. Schedule (7 and 8), Sisal (L.N.522/1957, L.N.365/1964, L.N.153/1958, L.N.177/1959, L.N.558/1960) and Banana (Cap.178 (1948), Sub. Leg. L.N.365/1964).

Chapter 326 – Seeds and Plants Variety Act
This Act regulates transactions in seeds, including provision for the testing and certification of seeds; for the establishment of an index of names of plant varieties; to empower the

imposition of restriction on the introduction of new varieties; to control the importation of seeds; to authorize measures to prevent injurious cross-pollination; to provide for the grant of proprietary rights to persons breeding or discovering new varieties. The act includes subsidiary legislation on seeds and plant varieties (seeds) regulations, registration of seed growers, seed certification and seed importation and exportation.

Chapter 347 on Irrigation

The Act makes regulations for the administration and day-to-day control of national irrigation schemes and standards of good husbandry and the control of pests and diseases in national irrigation schemes

Chapter 346: Pest Control Products

This Act covers the use, application, importation and trade in pest products. It includes regulation on:

- Prescribing for the purposes of this Act the nomenclature of pests, classes and kinds of pests and pest control products;
- Prescribing the form in which applications for registration shall be made and the information to be furnished therewith;
- Respecting the registration of pest control products and establishments in which any pest control products are and led by manufacturers or dealers and prescribing the fees therefore, and respecting the procedures to be followed for the review of cases involving the refusal, suspension or cancellation of the registration of any such product or establishment;
- Prescribing the form, composition, and all other standards relating to the safe use of pest control products, including toxic residue effects;
- Respecting the manufacture or treatment of any pest control product to facilitate its recognition by change in colouration or other means;
- Respecting the standards for efficacy and safety of any pest control product;
- Respecting the manufacture, storage, distribution, display and use of any pest control product;
- Respecting the packaging, labelling and advertising of pest control products;
- Respecting the taking of samples and the making of analyses for the purposes and provisions of this Act;
- Prescribing the information to be supplied and the form of such information in respect of any pest control product that is to be imported into Kenya;
- Prescribing the circumstances and conditions under which pest control products that have met the requirements of the Cattle Cleansing Act may be deemed to be registered as prescribed under this Act;

Chapter 338 - National Cereals and Produce Board

This Act regulates and controls the marketing and processing of mainly maize, wheat and scheduled agricultural produce.

Chapter 364 - Animal Diseases

This Act provides regulation on matters related to the diseases of animals. The Legislation regulates importation of animals and provisions affecting infected areas such as prohibition of the importation or the exportation of all animals or any specified kinds of animals, or of carcasses, meat, hides, steins, hair, wool, litter, dung, semen, live viruses capable of setting up infections in animals, sera, vaccines and other biological or chemical products intended to be used for the control of animal disease or fodder, from any specified country, port or territory.

Chapter 128 – Chiefs' Authority

The Act has two items on pests and diseases:

Section 11 giving the Chiefs powers to issue orders for suppressing or controlling animal or insect pests or plant pests, noxious weeds or diseases and Section 12 giving Chiefs power to require work or services in emergency in connection with an emergency consequent on fire, flood, earthquake, violent epidemic or epizootic disease, invasion by animal or insect pests or plant diseases or pests, or arising from circumstances which would endanger the existence of the whole or any part of the population, to be done or rendered, he may, in writing, authorize any chief to issue orders under this section to persons within the jurisdiction of such chief, and any chief so authorized may by any such order require any able-bodied adult person to perform any such work or render any such service as aforesaid specified in such order.

Chapter 325 - Suppression of Noxious Weeds

The act regulates declaration of plants as noxious weed (G.N.1721/1955, L.N.173/1960) and to eradicate it. The Local Authorities have powers under Cap. 265 (L.N.256/1963) **to** eradicate any noxious weed from land within its area and for compelling owners or occupiers of land to cause any such weed to be eradicated from their land, and for such purposes by-laws may appoint or provide for the appointment of inspectors.

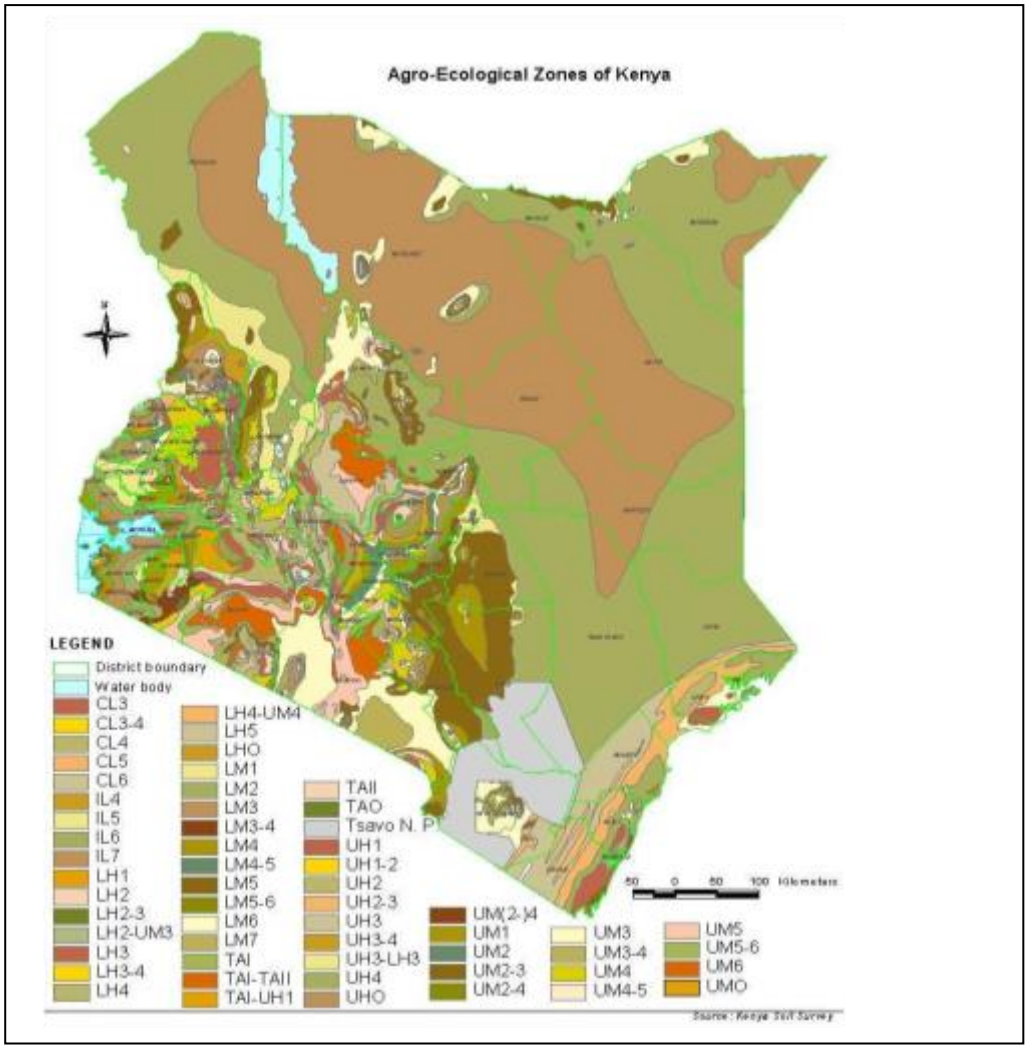


Figure 1: Agro-ecological zones of Kenya

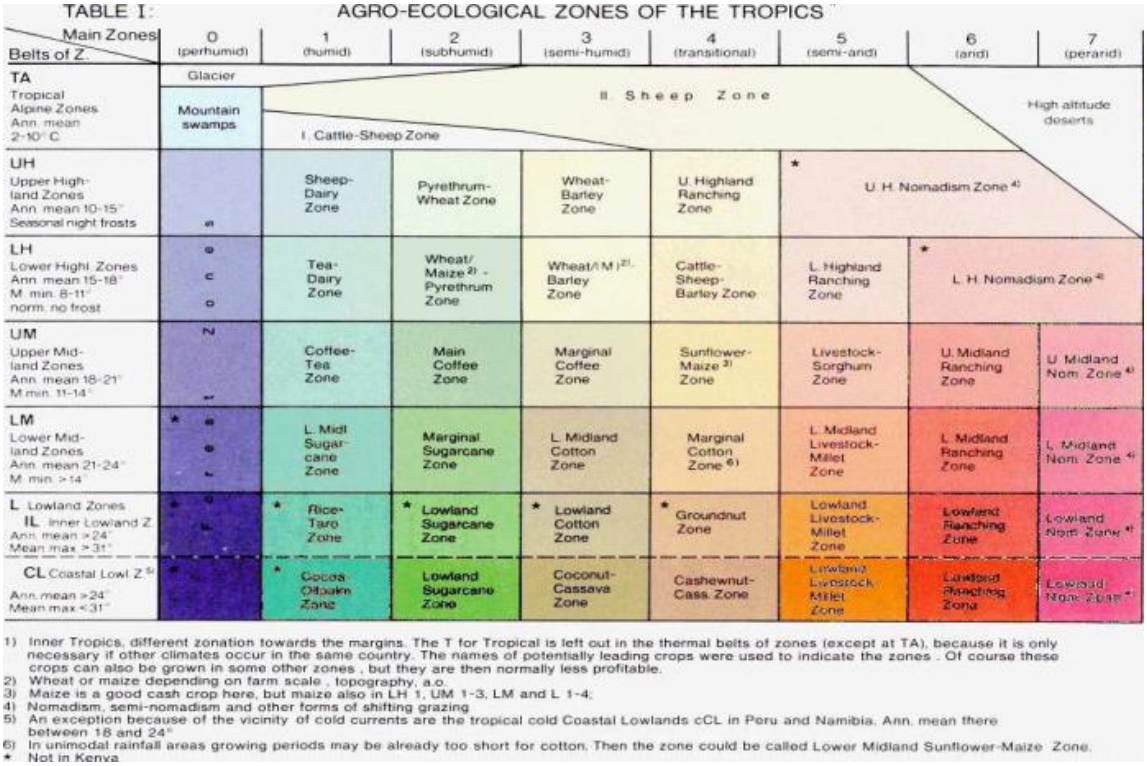


TABLE I: AGRO-ECOLOGICAL ZONES OF THE TROPICS

Belts of Z \ Main Zones	0 (perhumid)	1 (humid)	2 (subhumid)	3 (semi-humid)	4 (transitional)	5 (semi-arid)	6 (arid)	7 (perarid)
TA Tropical Alpine Zones Ann. mean 2-10° C	Glacier / Mountain swamps	I. Cattle-Sheep Zone	II. Sheep Zone					High altitude deserts
UH Upper Highland Zones Ann. mean 10-15° Seasonal night frosts		Sheep-Dairy Zone	Pyrethrum-Wheat Zone	Wheat-Barley Zone	U. Highland Ranching Zone	* U. H. Nomadism Zone 4)		
LH Lower Highl. Zones Ann. mean 15-18° M. min. 8-11° norm. no frost		Tea-Dairy Zone	Wheat/Maize 2) - Pyrethrum Zone	Wheat/(M) 2) - Barley Zone	Cattle-Sheep-Barley Zone	L. Highland Ranching Zone	* L. H. Nomadism Zone 4)	
UM Upper Midland Zones Ann. mean 18-21° M. min. 11-14°		Coffee-Tea Zone	Main Coffee Zone	Marginal Coffee Zone	Sunflower-Maize 3) Zone	Livestock-Sorghum Zone	U. Midland Ranching Zone	U. Midland Nom. Zone 4)
LM Lower Midland Zones Ann. mean 21-24° M. min. >14°	*	L. Midl Sugarcane Zone	Marginal Sugarcane Zone	L. Midland Cotton Zone	Marginal Cotton Zone 6)	L. Midland Livestock-Millet Zone	L. Midland Ranching Zone	L. Midland Nom. Zone 4)
L Lowland Zones IL Inner Lowland Z Ann. mean >24° Mean max >31°	*	* Rice-Taro Zone	* Lowland Sugarcane Zone	* Lowland Cotton Zone	* Groundnut Zone	Lowland Livestock-Millet Zone	Lowland Ranching Zone	Lowland Nom. Zone 4)
CL Coastal Lowl. Z 5) Ann. mean >24° Mean max <31°	*	* Cocoa-Oil palm Zone	Lowland Sugarcane Zone	Coconut-Cassava Zone	Cashewnut-Cass. Zone	Lowland Livestock-Millet Zone	Lowland Ranching Zone	Lowland Nom. Zone 4)

1) Inner Tropics, different zonation towards the margins. The T for Tropical is left out in the thermal belts of zones (except at TA), because it is only necessary if other climates occur in the same country. The names of potentially leading crops were used to indicate the zones. Of course these crops can also be grown in some other zones, but they are then normally less profitable.
2) Wheat or maize depending on farm scale, topography, a.o.
3) Maize is a good cash crop here, but maize also in LH 1, UM 1-3, LM and L 1-4;
4) Nomadism, semi-nomadism and other forms of shifting grazing
5) An exception because of the vicinity of cold currents are the tropical cold Coastal Lowlands cCL in Peru and Namibia. Ann. mean there between 18 and 24°
6) In unimodal rainfall areas growing periods may be already too short for cotton. Then the zone could be called Lower Midland Sunflower-Maize Zone.
* Not in Kenya

Figure 2: below provides the description of these agro-ecologies in Kenya.
In addition, it also provides the agro-enterprises suitable in each zone (see appendix 1 on crop production and area in Kenya).

Planning for subprojects

To effectively plan, design and implement an IPM program, there is need to understand the agro-ecological zones where the project will be based. This is important since IPM relies on the ecosystem approach in its implementation. The ECAAT project will be implemented in different agro-ecological zones; hence the IPM elements will also depend on the location of the projects.

In addition to the agro-ecologies and enterprises, IPM planning involves consideration of the inputs required in the production processes of the target enterprise. For example, what support does the project provide to the target farmers in terms of acquiring key farm inputs? Are the inputs used by farmers complementary and do they empower the farmer economically? Are there simple and cheap methods that farmers can adopt in their production systems? Some of the key inputs applied include seeds, fertilizers and pesticides.

Set up of an IPM Program

Planning is at the core of an IPM program and needs to be tailored for every crop that is to be considered. Early planning, prior to a growing season, is crucial for the program as it will help to minimize reliance on pesticides.

A good Integrated Pest Management program has four parts:
a) Identifying problems;
b) Selecting tactics;
c) Considering economic and environmental factors; and
d) Evaluating the program.

Identifying Problems

You have to know what's happening in your fields before you can make good management decisions. You should scout your crops often and on a regular basis to identify problems. Scouting is, in fact, the key feature of any IPM program. By scouting, you will be able to detect potential problems early. The earlier you discover a problem, the better your chances are of avoiding economic losses.

To scout effectively, you have to:

Know the crop's growth characteristics to recognize abnormal or damaged plants.

Identify the cause of the problem to know what kind of pest you are dealing with. If you encounter something you cannot identify, consult an expert.

Determine the stage of growth of the pest and the crop. This is essential for proper timing of control methods.

Decide whether the infestation is increasing or decreasing.
Assess the condition of the crop.

Map out problem areas. It may be possible to limit the area that needs treatment.

Use the right scouting method for the specific pest.

Select Tactics

Once you've identified the problem, you should consider how to control it. Your goal in selecting control tactics is to use methods that are effective, practical, economical, and environmentally sound. To select the best control tactics, you have to:

Understand the life cycle and habits of the pest. Some control methods will work only if they are used at the right time.

Decide whether the infestation is serious in terms of economic loss.

Compare the costs and benefits of various control methods.

Make plans for the future. Not every part of an IPM program can be put into effect immediately. Some tactics, such as planting resistant varieties or rotating crops, require long-range planning.

Consider Economic Factors: Know When It Pays to Use a Pesticide

Despite efforts to avoid using chemicals, there are times when only pesticides can control the damage. Even so, it may not pay to use them. Pesticides should be used in an IPM program only when the benefits (yield, quality, aesthetic value) exceed the costs of control. Otherwise time and money are wasted. It is not easy to figure out when it pays to use pesticides. There are many variables: the pest population, variety, crop growth stage, value of the crop, weather and cost of the control. The following economic concepts are helpful in determining the point at which it pays to use pesticides:

Economic damage (ED) occurs when the cost of preventable crop damage exceeds the cost of control. For example, if Maize is worth Kshs 1,800 a bag and an insecticide costs Kshs 10,500 an acre, then economic damage occurs when insect damage causes a yield loss of seven or more bags an acre.

Economic injury level (EIL) is the lowest pest population that will cause economic damage. For many pests it is important to use control measures before this level is reached.

Economic threshold (ET) is the pest population level at which a control tactic should be started to keep the pest population from reaching the EIL. (The ET is also called the action threshold.) Economic thresholds have been established for a number of crop/pest systems, in particular those involving insects. This information is available from the Agricultural Extension Service. It has been harder to develop economic thresholds for weeds and diseases, but research is being done to develop ETs for these systems.

Evaluating IPM Program

Evaluation means deciding how effective a program is and whether any changes are needed.

To evaluate an IPM program, the following steps are to be followed:

Monitor your fields and keep records. Each time you visit your fields, make a note of crop and pest conditions—record crop yields and quality and record any counts on pest populations.

Record control measures. Records should include dates, weather conditions, pest levels, application rates and timing, and costs. Good records are a guide if the same problem occurs. They are also a good legal safeguard.

Compare effectiveness. Whatever control tactics are chosen, use a different method on some strips. That way you can compare them; which worked better, taking into account costs and environmental impacts

Pesticide reduction and judicious use

There are no quick and easy answers to concerns about pesticide use. When pesticides are properly used according to the label, risks are minimized.

Pesticides vary greatly in their level of toxicity, so during training in integrated pest management an ecological approach to pest control we stress the importance of using a product that is effective, but as nontoxic as possible to non-target organisms.

A reduction in pesticide use can only be achieved with a greater understanding of plant selection, placement and care. Farmers can do a great deal to reduce and, in many cases, eliminate their use of pesticides.

There may be a cultural, mechanical, physical, biological and/or chemical approach that effectively controls the problem with minimal impact on humans and the environment, and integrated pest management considers all those approaches. Whatever the situation, it is always important to first identify the problem, monitor the severity and spread, and know at what time or stage control is necessary.

Investigate the cause

Once you begin to understand the underlying causes for pests, disease and weed problems, you can develop long-term solutions to keep your plants healthy with fewer pesticides. Pesticides often are used as a quick and temporary solution to address a more serious underlying problem that must be corrected. As an example, some farmers see weeds in the farm and rush to apply a herbicide. There are many herbicides available to help control weeds temporarily, and they may be beneficial if they are properly applied and used at the correct time. However, weeds are usually indicators of soil compaction problems that must be alleviated for long-term control.

Use tillage practices that aerate and loosen the soils, allowing crops to thrive in place of weeds. Add fertilizers, lime and gypsum, based on soil tests, to provide critical nutrients and adjust pH for proper plant growth. The best time to irrigate a crop field is very early in the morning or after 16:00 to prevent extended leaf wetness, which increases the potential for disease. Deep and infrequent irrigation is best. For flowers and vegetables, water plants at the base and avoid wetting leaves.

Insect problems also can be reduced with proper plant selection and care. For instance, select crops that are pest tolerant or resistant. Selection of the latest varieties of crops tested and released by the Kenya Plant Health Inspectorate Service and suitable for the agro ecological zone will minimize the need for pesticides.

There are many new biological alternatives (beneficial insects, fungi, bacterium, etc.) for insect pests that can be used in an IPM program such as nematodes (Steinernema species), ladybird beetles, bacteria (bacillus species) and fungus (Beauvaria bassiana).

Choosing controls

There is no such thing as a completely safe and natural pesticide. Pesticides can vary greatly in their level of toxicity to non-target organisms such as people, pets or

beneficial insects. Even organically approved pesticides can pose a danger to people and the environment if they are not used properly.

Take care with all pest-control products and use them as directed. Products will list the specific pest or pests they control and the plants onto which they can be applied. They must be used at the proper concentration in order to be effective without posing additional risks to the applicator or the environment. It is illegal to misuse them.

Pesticides are grouped into various types or categories. For example, there are fungicides, insecticides, herbicides (for weeds), nematicides (for nematodes) and miticides (for mites). While many pesticides control specific problems, there are still some broad-spectrum controls. In addition, there are many products that are only effective if they are used at a specific growth stage of the pest, so timing is critical.

It is never wise to use blanket applications of pesticides on large areas or to use them based on a calendar alone. The improper use of pesticides can pose a risk to the applicator, family, plants, beneficial organisms and the environment.

There are times when pesticides are needed to prevent major losses of plant material. The judicious and proper use of pesticides can occur with a sound IPM program.

Application of non-chemical means of pest control:
Some of the main features of IPM involve the non-chemical methods of pest control:

Biological controls: the use of natural enemies of crop pests, often called beneficials, which include parasites, predators and insect pathogens. Environmental friendly chemical interventions sometimes are included in the biological controls, such as the use of semio-chemicals, including pheromones and feeding attractants, and bio-pesticides, for example specific and beneficial friendly insecticides.

Cultural and crop or livestock management controls: tissue culture, disease-free seed, trap crops, cross protection, cultivation, refuge management, mulching, field sanitation, crop rotations, grazing rotations, steam cleaning, trapping, freezing and intercropping.
Strategic controls: planting location, timing of planting and harvesting.
Genetically based controls: insect and disease resistant varieties/breeds and rootstock.

Implementation
This will utilize such tools as the general micro-projects screening checklist as per ESMF which is followed by a more detailed investigation undertaken as guided by specific IPM questions using Appendix 1: Questionnaire on Pest Management

Step One: Understand IPM and its advantages over other pest control methodologies

To understand IPM and its advantages, you have to recognize some of the fundamental ways it differs from more traditional pest control programs:

IPM addresses more than just the symptoms of a pest problem

Non-integrated pest control programs tend to focus on killing pests while ignoring the reasons why pests are there in the first place, which doesn't do much to prevent recurring problems. By removing or altering the conditions that attract or are conducive to pest infestations, IPM practitioners can better cure existing infestations and prevent future ones.

Scheduled chemical treatments are not IPM

Many pest control plans call for routine pesticide applications whether pests are present or not. These applications are seen as "protective barriers" that will prevent infestations. They are not. In fact, unnecessary applications may even lead to the development of pesticide resistance in target pest populations and increase problem infestations instead of reducing them. And an application of a pesticide on a regular schedule is not IPM. IPM instead relies on routine inspection and monitoring for pest presence. Pesticides are considered only when there is clear evidence of pest presence (e.g., pest sightings, droppings or pest catches in monitoring traps, and when non-chemical approaches such as vacuuming, trapping and exclusion (i.e., physically blocking pests' entrance) have been unsuccessful or are inappropriate.

IPM techniques are less toxic, more targeted

Some pest controllers will apply pesticide to exposed areas far from where it is really needed and use more of it than necessary. IPM practitioners apply pesticides with precision and choose the least-toxic formulation to get the job done.

IPM is not a one-person job

Long-term pest management solutions typically depend on daily pest monitoring and a variety of sanitation, breeding, tillage, management and appropriate agronomic practices. No one person can do it alone. Without cooperation from land owners, land occupiers management and staff, the IPM model falls apart and chemical treatments will be difficult to avoid.

IPM requires greater expertise than traditional programs

Managing pests with less pesticide requires a strong working knowledge of pest biology and behaviour, current pest control technologies and practices, climate and its effects on pest proliferation, greenhouse and storage structural characteristics and staff behaviour. Without this knowledge, it will be difficult, if not impossible, to prevent infestations without routine chemical applications.

IPM is effective simply put, IPM is more effective in controlling pests over long periods than unitary use of the conventional chemicals which do imbalance the ecosystems. This is not surprising, since IPM combines many control techniques instead

of relying on any one technique. IPM's efficacy advantage has been confirmed by research and in practice. IPM approach is recommended by pesticide management stakeholders.

IPM costs less long-term

It is a common misconception that IPM programs are more expensive than traditional programs, partly because it can cost more up front to implement an IPM strategy. But IPM is analogous to preventive health maintenance. In the long term, it's almost certainly more cost-effective in terms of time, personnel and materials to prevent problems than to remediate the same symptoms again and again.

IPM poses less risk

Farm workers may have compromised immune, neurological, and digestive and respiratory systems that put them at increased risk of suffering harmful effects from exposure to pesticides. Chemically sensitive individuals, pregnant women, infants, children and the elderly may be especially vulnerable to the effects of pesticides. By reducing pesticide use, IPM helps reduce the potential for negative impacts on human health and the environment.

Step Two: Identify the implementation team

As with any successful initiative, the transition to an IPM program requires a diverse, action-oriented team. The leader of this team should be familiar with pests, pesticides, pesticide regulations

Pest management principles and environmental issues have a direct link to supporting leadership and have the time and authority to supervise IPM implementation. Other team members could include environmentalists, agronomists, crop protection experts (entomologists, pathologists) animal production experts, animal health experts, veterinarians, maintenance staff, public health experts, food services, industrial hygiene, environmental services, safety and infection control.

If you do not have IPM expertise in-house and plan to contract out IPM services, you may wish to identify your prospective vendor and make use of their information and support as you develop implementation plans.

Step Three: Decide on scale of implementation

To determine the scale and strategic approach you need to take, first discuss what IPM is—and what it isn't—with key staff and committees. If you are outsourcing and have identified a prospective IPM vendor, ask a representative to accompany you to committee meetings to help explain the IPM approach and give examples of documented success in facilities like yours. Through these discussions you can build understanding and address potential objections with solid information. Having well-positioned members of your designated IPM committee present before department heads, board of directors and other committees may create sufficient buy-in to allow you to make changes in your pest control methods across the board.

Feeling resistance? Try a pilot/ demonstration plot to accommodate concerns, work out the kinks and build support. Problems can more easily be seen as a learning process when you start small. When determining where to carry out your pilot, remember that IPM involves altering the environment to reduce pest entry points, and food and water sources, so it works best when it encompasses an isolated area. For example, choose a single building if possible, rather than one floor of a building, where pests can easily travel from another floor to continue to invest your pilot areas. Remember, IPM takes time to achieve positive results, and even successful programs may go through a period of static as you discover problem areas and adjust accordingly.

Step Four: Set goals and measurable objectives for your IPM program

Measurable goals to track could include pest management costs, monitoring of pest activity before and after implementation of an IPM program, number of calls related to pest problems and toxic chemical use reduction. When will your IPM program be up and running? Know how much will it cost? What is to be accomplishing by choosing IPM? Knowing when one has succeeded? One need to know answer these questions before tackling IPM implementation.

When will the shift to IPM occur?

The first step is to develop an implementation timeline that includes time to execute all of the steps outlined in the implementation plan. Make sure to include time to obtain administration and staff buy-in, conduct any staff training and manage an RFP process if you expect to outsource to a pest management professional.

How much will it cost?

The budget for the program will be critical to administration. Be sure to design a budget that differentiates the costs of initial implementation from the costs of maintaining the program, which should be less than the implementation cost. Talk to industry colleagues whose facilities have implemented IPM programs. How long did it take them? Do they outsource, and if so, to whom? Are they satisfied with their service? What is their budget? What does it include? Be sure to analyze the marginal cost of your IPM program when compared to the costs of your current pest control effort. It may be less than you think.

How will you know if IPM is succeeding?

The advantages of IPM—efficacy, cost and safety—are laudable but probably won't do you much good when it comes to asking for budget if you don't have a system in place to measure the program's achievements. Build measurable objectives for each of those goals into your program plan from the beginning.

Efficacy: Since IPM is better at controlling pests, you should see a measurable reduction in pest sightings, client complaints and monitoring station counts over time. But if you're planning to measure against these or similar metrics later, you'll need benchmark data on them now. Consider how you will obtain and compile that data before the switch to IPM. Once you've implemented your IPM program, you'll want to allow the

program sufficient time—at least six months—to make a real difference before you measure. Remember, IPM's not an overnight event but a process.

Cost: Do you expect to see cost reductions over time as IPM gains momentum? When? Set specific dollar-figure parameters for your IPM costs so you can measure against them later.

Safety: IPM's ability to create a safer environment is predicated in large part on reducing pesticide use. If you're already outsourcing to a professional, ask them if records are available as to the volume of pesticides applied in the facility for the previous year (or more if available). If you're just starting a contract with a professional for the IPM program, be sure the company can provide detailed information on how any decision to apply pesticides will be made, their advance notification procedures for pesticide application, and how they will supply you with pesticide usage records when pesticides are applied (see Step 10). In either case, the information will help you prepare for, benchmark and track pesticide usage. The goal should be a downward trend over time or ideally, a specific reduction amount, with the end result a reduction to only very occasional usage of highly toxic pest control chemicals.

Step Five: Analyse current housekeeping, maintenance and pest control practices

As you prepare to make the switch to IPM, it helps tremendously to have a clear idea of your facility's current policies and practices when it comes to structural maintenance, sanitation and pest control. In some cases, current practice may be in line with IPM principles. In others, you may have a long way to go. The more you know about what your facility is doing now, the better you can prepare for the necessary changes. Here are a few considerations to keep in mind as you lay the groundwork.

Structural Maintenance

One of the best (and maybe most obvious) ways to keep pests out of a facility is to physically stop them from entering wherever possible. As part of your regular IPM inspections, you'll need to inspect cracks, crevices or other unnecessary openings in the building exterior that can be used by pests as harborage areas or entry points—no matter how small—and seal them as appropriate. Is your maintenance staff or pest management provider already doing this? If not, who will be responsible for this activity under the IPM program? Will training be required? What are the cost implications?

Sanitation

If pests can't find the food and water they need in your facility, they have much less reason to be there. That's why sanitation will always be one of the most powerful tools in the IPM arsenal. The cleaner the facility, the less need there will be for chemical pest control treatments. Does your facility already follow a written sanitation plan indicating cleaning schedules, procedures and responsible parties? If so, make sure the routine sanitation inspections focus on areas of high pest pressure (e.g., receiving docks, food service areas, admissions areas, break rooms or bio-hazard rooms). You may need to work with the appropriate parties to implement a sanitation plan that pays

special attention to these sensitive areas. Also consider how daily staff sanitation practices play into the overall cleanliness of the facility.

When it comes to pest control, a sanitation plan is only as strong as its dirtiest station. Be prepared for staff pushback and the chance that staff may need some special training (see Step 9)

Step Six: Establish a system of regular IPM inspections

Whereas many pest control programs still revolve around regularly scheduled pesticide applications, IPM revolves around regular facility inspections. These inspections are the "engine" for an ongoing cycle of IPM activities that may or may not include chemical treatments. These activities include:

Inspections
Pest Identification
Selection of Control Methods
Monitoring
Evaluation

IPM inspections must focus on the five "zones" or "triggers" of pest activity: entry points, water sources, food sources and harborage areas. During inspections, all existing pest issues and potential problem areas, inside and out, must be noted for follow-up (see Step 7). If your facility chooses to outsource IPM services, it will be the provider's job to perform a thorough inspection during each scheduled visit and determine appropriate treatment methods. For in-house IPM programs, the greatest inspection challenge will be establishing routine, proactive surveillance by trained specialists (see Step 9).

Step Seven: Define policy treatment selection

Even in the cleanest facility, pests will appear from time to time, so you need a clear, written policy on how your facility will respond when they do:

The policy should define non-chemical and chemical treatment options and the order in which they should be considered. It should be very clear on when and where chemical treatments are appropriate. Finally, it should include an "approved materials" list to ensure smart choices when chemical treatments are applied.

Keep in mind as you develop your policy that the first step in any IPM response is to correctly identify the pest that has invaded. Because pest behavior varies so much from one species to the next, the appropriate response will vary just as widely.

Once the pest is identified and the source of activity is pinpointed, the treatment policy should call for habitat modifications such as exclusion, repair or better sanitation. These countermeasures can greatly reduce pest presence before chemical responses are considered.

Additional treatment options—chemical and nonchemical—can then be tailored to the biology and behaviour of the target pest.

The final step in the response cycle is Monitoring. The information you gain through continuous monitoring of the problem will help determine additional treatment options if they are needed.

If you outsource to a pest management professional, work with the provider to agree on a policy and a written approved materials list. But don't forget that the policy applies to facility staff as well as the provider.

Step Eight: Establish communication protocols for environmental services, facility maintenance, facility management and service provider

Because IPM is a cooperative effort, effective communication between various parties is a prerequisite for success. Clients and employees must document pest sightings, the pest management professional must make recommendations and notify appropriate parties of chemical treatments, environmental services must communicate with maintenance to make necessary repairs, and so forth. Consider the "bird's eye view" of an effective IPM communication flow above.

Step Nine: Develop worker training plans and policies

As mentioned in Step 6, the greatest challenge for in-house IPM programs will be establishing routine, proactive surveillance by trained specialists. Whether you outsource or not, remember that your employees can serve as a vast pool of "inspectors" charged with reporting pest sightings, which will quicken response times and help limit the scope of new infestations. Host training sessions to acquaint employees with IPM principles and the role they will play in a successful IPM program. Some pest management providers will offer IPM training for your staff. Take advantage of it. A little on-the-ground help from employees will go a long way toward achieving your IPM goals.

Step Ten: Track progress and reward success

Remember the measurable objectives you set and data you gathered in Step 4? Your goals will not mean much if you do not measure the IPM program's performance against them at least once a year. Detailed service records will be critical to these evaluations, so make sure your pest management professional or in-house program provides the following documentation:

Detailed description of the parameters and service protocols of the IPM program (i.e., what are the ground rules?) Specific locations where pest management work was performed; Dates of service. Activity descriptions, e.g., baiting, crack-and crevice treatment, trapping, structural repair. Log of any pesticide applications, including:
Target pest(s)
The brand names and active ingredients of any pesticides applied
Registration numbers of pesticides applied
Percentages of mix used in dilution

Volume of pesticides used expressed in pounds of active ingredient
Applicator's name(s) and certification identity (copy of original certification and recertification should be maintained.)

Facility floor plan on which all pest control devices are mapped and numbered
Pest tracking logs (sightings and trap counts)

Action plans, including structural and sanitation plans, to correct any pest problems
Pest sighting memos for staff to use in reporting pest presence to the pest management provider
Using these records, and assuming the goals of your IPM program are increased efficacy, lower costs and reduced pesticide use (see Step 4), you should see:

Fewer pest sightings and client complaints. Lower monitoring-station counts over time.
Lower costs after the first 12-18 months, once IPM's efficacy advantage has had time to take effect.

Downward trend in volume or frequency of pesticide usage.
Report the program's successes following each evaluation and encourage good practices by recognizing individuals who played a role. Remember, IPM is a team effort. Communicating the success of your program in reducing toxic chemical use and exposure, reducing pest complaints and lowering costs will help facility staff understand the purpose of the program and appreciate its success. The more they understand, the more likely they will participate willingly in helping you expand and institutionalize IPM in your facility.

When your program has been in place for long enough to show significant results, you may also wish to work with your community affairs department to publicize your successes more broadly to demonstrate your environmentally responsible approach to effective pest control. And last but not least, led by example by sharing your success with other stakeholders.

MONITORING AND EVALUATION SYSTEMS FOR THE VARIOUS PEST MANAGEMENT PRACTICES OF THE PMP

Successful implementation of the ECAATP in the Counties will require regular monitoring and evaluation of activities undertaken by the CIGs. The focus of monitoring and evaluation will be to assess the build-up of IPM capacity in the Farmer Groups and the extent to which IPM techniques are being adopted in agricultural production, and the economic benefits that farmers derive by adopting IPM. It is also crucial to evaluate the prevailing trends in the benefits of reducing pesticide distribution, application and misuse.

Indicators that require regular monitoring and evaluation during the programme implementation include the following:

The IPM capacity building in membership of Farmer Groups: Number of farmers who have successfully received IPM training in IPM methods; evaluation the training content, methodology and trainee response to training through feedback Numbers of Farmer Organizations that nominated members for IPM training; emphasize the number of women trained; assess Farmer Groups understanding of the importance of IPM for sustainable crop production

Numbers of farmers who have adopted IPM practices as crop protection strategy in their crop production efforts; evaluate the rate of IPM adoption

In how many crop production systems is applied IPM? Are the numbers increased and at what rate.

How has the adoption of IPM improved the production derive by adopting IPM Economic benefits: increased in crop productivity due to adoption of IPM practices; increase in farm revenue resulting from adoption of IPM practices, compared with farmer conventional practices;

Social benefits: improvement in the health status of farmers

Numbers of IPM networks operational and types of activities undertaken

Extent to which pesticides are used for crop production

Efficiency of pesticide use and handling and reduction in pesticide poisoning and environmental contamination

Levels of reduction of pesticide use and handling and reduction in pesticide poisoning and environmental contamination

Number of IPM participatory research project completed

Influence of the results of IPM participatory research on implementation of IPM and crop production

Overall assessment of: activities that are going according to plans; activities that need improvements; and remedial actions required

The following indicators will be incorporated into a participatory monitoring and evaluation plan:
Types and number of participatory learning methods (PLM) delivered; category and number of extension agents and farmers trained and reached with each PLM; practical skills/techniques most frequently demanded by counties and farmers, and food, cash and horticultural crops and livestock management practices preferred by farmers.

Category and number of farmers who correctly apply the skills they had learnt; new management practices adopted by most farmers; types of farmer-innovations implemented; level of pest damage and losses; rate of adoption of IPM practices; impact of the adoption of IPM on production performance of farmers

Increase in food, cash and horticultural production systems/livestock production; increase in farm revenue; social benefits: e.g. improvement in the health status of farmers, reduction in pesticide package and use; and number of community families using preventive mechanisms against diseases.

Proposed Pests Monitoring and Evaluation Regime
The participatory M&E system for IPM should also be enterprise-based so as to deal with a group of diseases and pests affecting any single crop. The approaches being proposed here therefore does not handle single pest to otherwise the issue of different agronomic practices for different crops would have to be taken into consideration.

Similarly, the animal, forestry and aquaculture pests are treated in a similar way. This approach seems to be the most cost effective in terms of mobilizing stakeholders with common interest (e.g. sugar cane farmers, tea farmers, banana farmers, aquaculture farmers, livestock farmers, etc.) as well as area of coverage and intensity of the pest problems.

Since pest problem is an existing problem and a major constraint to several enterprises in Kenya, it is obvious that there are already existing pest management programmes within the country. In view of these efforts, it will be advisable to use the Participatory Impact Monitoring (PIM) approach.

The steps involved in participatory M&E should include:

Stakeholder Analysis and identification of M&E team
Setting up objectives and expectations for monitoring
Selection of Impacts to be monitored (Variables/Indicators)
Develop Indicator sheets
Develop and test the tools to be used in data collection (Usually Participatory Rural Appraisal tools are used)
Collect the data from as many sources of stakeholders as possible

Assessment of the data and discussion for a arranged on regular basis

Participatory Impact Monitoring (PIM)

Participatory Impact Monitoring (PIM) should be employed for continuous observation, systematic documentation and critical reflection of impacts of IPM, followed by corrective action (plan adjustments, strategy changes). It should be done by project staff and target groups, using self-generated survey results. The stakeholder analysis and selection of participatory M&E team is therefore very important in implementing an effective impact monitoring (See guide on 4-Step Stakeholder Analysis templates).

Once an agreement on the objectives of PIM is reached among the stakeholders (development partners, implementing agency, target groups etc), their expectations and fears regarding project impact are identified, e.g. in brainstorming sessions. The more participatory the activities have been planned the more these views will overlap each other.

Having examined already existing M&E data regarding the selected impacts, the task is to develop indicator sheets (Shown below) which contain all important information for impact measurement: definitions of terms, indicators and their rationale, survey units and respondents, instructions for data collection, statements on limitations of the methods used.

Users and the key questions for which the indicator is intended (if appropriate comment on area affected, villages affected, seriousness scale, impacts on humans, environment etc., recognizing that one indicator may fill several roles in this respect).

Indicator Fact Sheets Sample

Suggested Contents/Format

Indicator Name:

Use and interpretation:

Meaning and potential causes of upward or downward trends

Implications for of the indicator to IPM

Units in which it is expressed (e.g. km^2, number of individuals, % change)

Description of **source data:** (origins, dates, units, sample size and extent)

Calculation procedure (including appropriate methods and constraints for aggregation)**:**

Most effective **forms of presentation** (graph types, maps, narratives, etc. – give examples where possible):

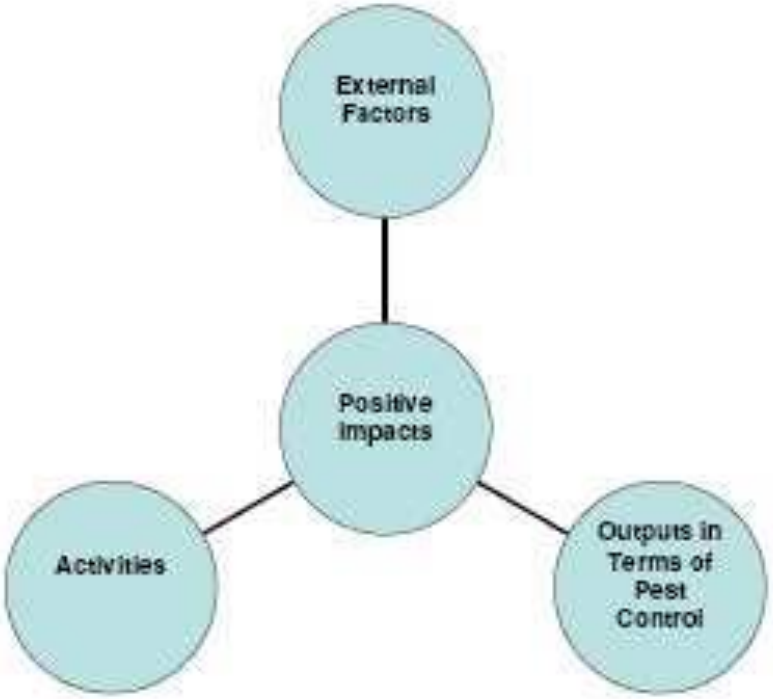
Limits to usefulness **and accuracy**: (e.g. rates of change – increase/decrease, poor quality data, limited scope for updating etc.)

Data sources and process for updating:
Sources could include key informants, opinion leaders, NGOs, GoK Departments, Development Agencies etc. There could be several sources of similar datasets or information

Closely related indicators:
Other existing or monitored indicators that give similar information for monitoring the same change or impact
Source: (i.e. who calculated the indicator (author etc.), with contact information or references.

The factsheet assumes that political, legal, agro-ecological and other framework conditions are almost the same for a single enterprise; any observed differences regarding selected impacts will be largely due to the (additional) input towards IPM.
After the selection of impacts to be monitored, impact hypotheses are established in order to obtain a clearer picture of the IPM and the environment in which it acts. In impact diagrams, project activities / outputs that are supposed to lead to a certain impact can be arranged below, external factors above the impact in the centre of the diagram (Fig. 2).

Figure 2: Participatory Impact Monitoring (PIM) approach to IPM



Once questionnaires and other tools (e.g. PRA instruments) have been pre-tested, and a decision on sample size and composition has been taken, impact-related information and data is collected and processed. Interviews are held with randomly selected

individuals (e.g. female farmers), key persons (e.g. village elders, teachers) or groups (e.g. saving and Credit Groups, Development agencies, Institutions etc).
Joint reflection workshops with project staff, target group representatives and other stakeholders are conducted in order to (a) consolidate impact monitoring results by combining the views of various actors and (b) ensure that necessary plan adjustments and strategy changes are in line with the target groups' demands and capacities.

Integrated Pest Management Monitoring Framework

The Participatory M&E Framework for IPM should follow a feedback principle in which results or impact of any interventions can be traced to the activities/inputs. Either by using conventional pest management method or IPM, the feedback should allow for evaluation of the methods used and adjustment or incorporation of additional control methods (Fig. 3). The results of the activities form the basis of the factsheets to be used in monitoring.

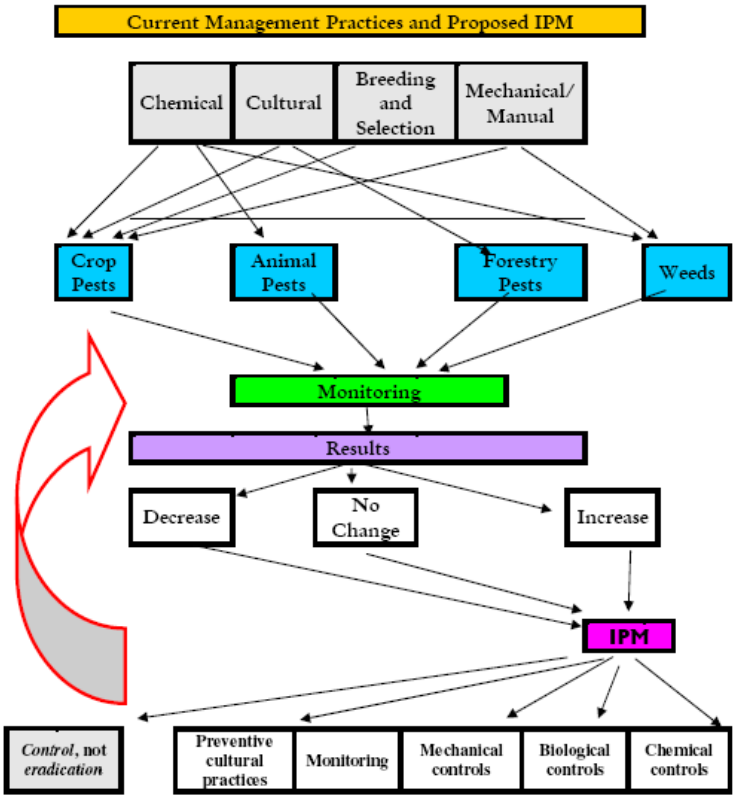


Figure 3: Monitoring framework for Integrated Pest Management based on previous practices and proposed approaches

MANAGEMENT ACTIVITIES WITHIN THE SUB-PROJECTS

Management of Crop Pests

Rodents

Rodents, particularly the multi-mammate shamba rat, (*Mastomys natalensis*), are major pests of food crops. The most affected crops are maize, millets, paddy and cassava. Maize is the most susceptible of all the crops. At the pre-harvest -stage, maize is attacked at planting (the rodents retrieve sown seeds from the soil causing spatial germination). In some cases, as much as 100% of the seeds are destroyed, this forcing farmer to replant.

Farmers in outbreak areas are strongly advised to do the following to reduce potential damage to crops and the environment.

Regular surveillance. The earlier the presence of rodents is observed, the cheaper and simpler any subsequent action will be and losses will remain negligible

Sanitation. It is much easier to notice the presence of rodents if the store is clean and tidy

Proofing i.e. making the store rat-proof in order to discourage rodents from entering
Trapping. Place the traps in strategic positions

Use recommended rodenticide. However, bait poisons should be used only if rats are present. In stores or buildings, use single-dose anticoagulant poisons, preferably as ready-made baits.

Encourage team approach for effectiveness. The larger the area managed or controlled with poison, the more effective the impact

Birds (Quelea quelea spp)

Birds are serious migratory pests of cereal crops, namely wheat, rice, sorghum and millet across the country. The quelea birds, which in Kenya occur are swarms ranging from thousands to a few millions, have been responsible for famines of varying proportions in some areas.

Bird pest problems in agriculture have proved difficult to resolve due in large part to the behavioural versatility associated with flocking. The array of food choices available to birds is also complex, hence forth; necessary information is needed for successful control strategies. The total damaged per bird per day, if the bird is exclusively feeding on cereal crops, has been estimated at 8 g and 10 g.

Several techniques have been tried to reduce bird populations to levels where crop damage is minimal. Traditional methods, slings, bird scares, and scarecrows, are still being used

in many parts. Modern techniques of frightening devices, chemical repellents, less preferred crop varieties and alternative cultural practices have been evaluated.

All the methods have minimal value in situations where bird pressure is high and where habitation is likely to develop through repetitive repellent use and other methods, which may alleviate damage in small plots or in large fields for a short time.

The aerial spraying of chemical (parathion and later fenthion) on nesting and roosting sites, the most widely used technique to date. Currently, only fenthion 60%ULV aerial formulation is being used. The pesticide is recommended to be used at the rate of 2.0l/ha.

The concerns over possible human health problems and environmental damage resulting from the large-scale application of chemical pesticide for quelea control have led to a proposal for alternative non-lethal control strategy. Chemical pesticide applied for quelea control represent a risk for human, terrestrial, non-target fauna and aquatic ecosystems. The chemical pose risk by directly poisoning or by food contamination/depletion. Among the terrestrial non-target invertebrates, there are beneficial species. Some are responsible for organic matter cycling; others are predators, and parasitoids of crop pests. Some assure pollination of crops and wild plants, while others again produce honey and silk. The fact that non-target birds and, occasionally, other vertebrates may be killed by quelea control operations is well-established.

The risk of human health problems and environmental damage can be mitigated considerably by development of integrated environmentally sound control strategies including Net-Catching. These methods will educate farmers become custodians of the environment. A new emphasis is the possibility of harvesting quelea for food. Since quelea is a good source of protein and preferred by many people. This method offers more rapid prospects for implementation which enable farmers to continue making their own decisions important for the control of quelea in their area. While present indications are that harvesting is probably not an option as a crop protection technique, it offers the possibility of providing income to rural populations in compensation for crop losses.

In respect of quelea birds, FAO is currently encouraging the use of IPM approaches to the problem of bird attacks on cereal crops. This means working with farmers in examining all aspects of farming practice in relation to quelea damage, and seeking to minimize external inputs, especially pesticides. In includes modifying crop husbandry, planting time, week reduction, crop substitution, bird scaring, exclusion nesting, etc. and only using lethal control for birds directly threatening crops when the other methods have failed. It is also important for farmers to be aware of the costs of control using pesticides, and in the case of commercial farmers, for them to bear some or all of the costs. A major likely benefit of IPM is reduced environmental side-effects resulting from decreased pesticide use. Although some elements of IPM have been tried in bird pest management, a major effort has yet to be made, for quelea, to focus on farmers in all aspects of the problem.

Locust

Locusts live and breed in numerous grassland plains, the best ecologically favourable ones are known as outbreak areas. During periods with favourable weather, locusts multiply rapidly and form large swarms which escape and may result into a plague. There are eight known locusts outbreak in East and Central Africa. The strategy for red locust control combines regular monitoring of breeding sites followed by aerial application of fenitrothion 96.8% ULV to eliminate potential threatening hopper populations.

Armyworm

The African armyworm (Spodoptera exempta) is a major threat to basic food production in a number of east and southern African Countries Armyworm is a major pest of cereal crops (maize, rice, sorghum and millets) as well as pasture (grass family) and therefore a threat to food security and livestock. Overall losses of 30% for crops have been estimated though in major outbreak years' losses in maize of up to 92% are recorded. Armyworm outbreaks vary from year to year but serious outbreaks occur frequently.

Due to its economic significance, management and control is centrally co-ordinated by Crop Protection Department of the Ministry of Agriculture. Its control combines monitoring in identified breeding areas, forecasting and early warning of potential outbreaks. The national armyworm control programme runs a network of several traps distributed throughout the country. The traps are placed at county offices, research stations and in large-scale farms. Weekly returns from these traps are used in forecasting potential outbreaks for the following week. The information about potential outbreaks is passed to the regions and counties from where it is further passed to farming communities through the extension system. Farmers are advised to inspect their fields for signs of infestation. If the crop is attacked, farmers should spray with diazinon, fenitrothion or chlorpyrifos, whichever is available at the nearest pesticide store. Both ULV and knapsack sprayers can be used depending on available formulation in the outbreak areas. This service could be improved through a better monitoring and reporting system that empowers farmers to be partners in a co-ordinated network. This will require the following activities:

Development of community-based monitoring and early warning approaches
Formulating and implementing appropriate training for county plant protection officers (CPPOs), village extension officers (VEOs) and farmers to impart simple reliable monitoring skills

Formulating and implementing a reliable community based early warning network

This approach is likely to have a number of benefits. One, less pesticides will be used because farmers will be able to identify and apply control measures on the most vulnerable stage of the pest, which is not possible in the current set-up. Secondly, farmers can use less toxic and environmentally friendly proven alternatives to pesticides e.g. botanical extracts and/or bio-pesticides at relatively low cost with minimum environmental hazards.

Thirdly, if well-co-ordinated, the information generated by farming communities can be integrated in the nation monitoring and early warning system to improve the quality of the information at national and international level.

A new natural control for armyworm is being developed by using a natural disease of the armyworm as biological control in place of toxic chemical insecticides. This disease of armyworm is caused by specific agent, the Spodoptera exempta nucleo polyhedron virus (or NPV). It has been observed since the early 1960s the late in the season many armyworm outbreaks collapse due to the occurrence of a disease that killed up to 98% of caterpillars. NPV can be sprayed like chemicals onto pest outbreaks causing epidemics of NPV disease that kill off the pests, effectively acting as a natural insecticide. What is more, the killed insects produce more NPV spreading the disease further. The NPV produced by dying insects can infect later generations of armyworms so that the effect is longer lasting than chemical insecticides (Mushobozi, et.al. undated)

Key livestock pests and diseases

Livestock disease is one of the major constraints to animal production in Africa (Table below). This is in addition to inadequate nutrition, poor management practices and socio-economic constraints. Vector-borne diseases, particularly trypanosomiasis transmitted by the tsetse flies and tick-borne diseases (TBDs) seriously limit livestock production and improvement in much of African countries south of the Sahara. In addition, the tsetse flies also transmit the fatal human sleeping sickness.

Table 5. Major livestock pests and diseases in Kenya

Disease	Aetiology	Epidemiology	Hosts	Transmission	Sources of Vulnerability
Foot and Mouth Disease	Caused by a virus of the family Picornaviridae, genus Aphthovirus with seven immunologically distinct serotypes: A, O, C, SAT1, SAT2, SAT3, Asia1. The virus is resistance to physical and chemical action. It survives in lymph nodes and bone marrow at neutral pH.	Epidemiologically, foot and mouth disease is one of the most contagious animal diseases, with important economic losses. Though it exhibits low mortality rate in adult animals, but often high mortality in young due to myocarditis	Cattle Zebus Sheep Goats Swine All wild ruminants	Direct or indirect contact (droplets), animate vectors (humans, etc.), inanimate vectors (vehicles, implements), and airborne, especially temperate zones (up to 60 km overland and 300 km by sea).	Resistance to physical and chemical action. (virus persists in the oropharynx for up to 30 months in cattle or and 9 months in sheep FMD is endemic in parts of Asia, Africa, the Middle East and South America Sporadic outbreaks in free areas Survives in lymph nodes and bone marrow at neutral pH.
Rinderpest	Caused by virus family Paramyxoviridae, genus *Morbillivirus*	High morbidity rate, mortality rate is high with virulent strains but variable with mild strains	Cattle, zebus. Sheep Goats	By direct or close indirect contacts	Resistance to physical and chemical action Remains viable for long periods in chilled or frozen tissues In Africa it has been eradicated from several countries and sub-regions, and is normally absent from the northern and southern

Disease	Aetiology	Epidemiology	Hosts	Transmission	Sources of Vulnerability
					parts of the continent
Lumpy Skin Disease	Virus family Poxviridae, genus *Capripoxvirus*	Morbidity rate 5-85% Mortality rate very variable	Cattle Bos taurus Zebus, domestic buffaloes)	Transmission may occur via infected saliva in the absence of an insect vector. Though no specific vector has been identified to date, mosquitoes (e.g. Culex mirificens and Aedes natrionus) and flies (e.g. *Stomoxys calcitrans* and *Biomyia fasciata*) could play a major role	Endemism: LSD was confined to sub- Saharan Africa strict quarantine to avoid introduction of infected animals in to safe herds in cases of outbreaks, isolation and prohibition of animal movements slaughtering of all sick and infected animals (as far as possible) correct disposal of dead animals (e.g. incineration) disinfection of premises and implements vector control in premises and on animals
Rift Valley Fever	Virus family Bunyaviridae, genus *Phlebovirus*	High mortality rate in young animals High abortion rate in ruminants	Cattle Sheep Goats Dromedaries Several rodents	Haematophagous mosquitoes of many genera *(Aedes, Anopheles, Culex, Eretmapodites, Mansonia*, etc.) can transmit fever as biological, competent vectors. Mosquitoes	Resistance to physical and chemical action Survives in dried discharges and multiplies in some arthropod vectors. Can survive contact with 0.5% phenol at 4°C for 6

Disease	Aetiology	Epidemiology	Hosts	Transmission	Sources of Vulnerability
				(Aedes) are the reservoir host Direct contamination: occurs in humans when handling infected animals and meat	months For animals: wild fauna and vectors for humans: nasal discharge, blood, vaginal secretions after abortion in animals, mosquitoes, and infected meat. Possibly also by aerosols and consumption of raw milk RVF has been recognized exclusively in African countries, with an underlying association with high rainfall and dense populations of vector mosquitoes
Sheep Pox and Goat Pox	Virus family Poxviridae, genus *Capripoxvirus*	Morbidity rate: Endemic areas 70-90% Mortality rate: Endemic areas 5-10%, although can approach 100% in imported animals	Sheep and goats (breed-linked predisposition and dependent on strain of capripoxvirus)	Direct contact and Indirect transmission by contaminated implements vehicles or products (litter, fodder) Indirect transmission by insects (mechanical vectors) has been	Resistance to physical and chemical action Survive for many years in dried scabs at ambient temperatures. Virus remains viable in wool for 2 months and in premises for as long as 6

Disease	Aetiology	Epidemiology	Hosts	Transmission	Sources of Vulnerability
				established (minor role) Contamination by inhalation, intradermal or subcutaneous inoculation, or by respiratory, transcutaneous and transmucosal routes	months
Highly Pathogenic Avian Influenza	Virus family Orthomyxoviridae, genus *Influenzavirus* A, B. To date, all highly pathogenic isolates have been influenza A viruses of subtypes H5 and H7	Highly contagious	to assume all avian species are susceptible to infection	Direct contact with secretions from infected birds, especially faeces Contaminated feed, water, equipment and clothing Clinically normal waterfowl and sea birds may introduce the virus into flocks Broken Contaminated eggs may infect chicks in the incubator	Resistance to physical and chemical action Remains viable for long periods in tissues, faeces and also in water Highly pathogenic viruses may remain viable for long periods of time in infected faeces, but also in tissues and water

Disease	Aetiology	Epidemiology	Hosts	Transmission	Sources of Vulnerability
Newcastle Disease	Virus family Paramyxoviridae, genus *Rubulavirus*	Many species of birds, both domestic and wild The mortality and morbidity rates vary among species, and with the strain of virus	Chickens are the most susceptible poultry, ducks and geese are the least susceptible poultry A carrier state may exist in psittacine and some other wild birds	Direct contact with secretions, especially faeces, from infected birds Contaminated feed, water, implements, premises, human clothing, etc. Sources of virus Respiratory discharges, faeces All parts of the carcass Virus is shed during the incubation period and for a limited period during convalescence Some psittacine birds have been demonstrated to shed ND virus intermittently for over 1 year	Survives for long periods at ambient temperature, especially in faeces Strict isolation of outbreaks Destruction of all infected and exposed birds Thorough cleaning and disinfection of premises Proper carcass disposal Pest control in flocks Depopulation followed by 21 days before restocking Avoidance of contact with birds of unknown health status Control of human traffic. One age group per farm ('all in-all out') breeding is recommended Medical prophylaxis Vaccination with live and/or oil emulsion vaccines can markedly reduce the losses in poultry

Disease	Aetiology	Epidemiology	Hosts	Transmission	Sources of Vulnerability
					flocks Live B1 and La Sota strains are administrated in drinking water or as a coarse spray. Sometimes administered intra-nasally or intra-ocularly. Healthy chickens may be vaccinated as early as day 1-4 of life, but delaying vaccination until the second or third week increases its efficiency Some other infections (e.g. Mycoplasma) may aggravate the vaccine reaction. Killed virus vaccine should then be used

For livestock animals, the most common disease is the East Coast Fever which is a tick-borne disease. The problem as worsened in the last 10 years as most of the communal dips have collapsed and the private dips are not accessible to most of the farmers. Another reason is that the ticks have now gained resistance to the organophosphates originally used for their control and the farmers now have to use pyrethroids which are relatively more costly and therefore unaffordable to most farmers. The situation has led to an increase in other tick- borne diseases such as Babeiosis, heartwater and anaplasmosis.

Foot-and-mouth disease is highly contagious and can spread extremely rapidly in cloven-hoofed livestock populations through movement of infected animals and animal products, contaminated objects (for example livestock trucks) and even wind currents. Vaccination is complicated by a multiplicity of antigenic types and subtypes. Substantial progress has been made towards the control and eradication of foot-and-mouth disease in several regions, notably Europe and parts of South America and Asia. Foot and mouth disease is relatively easily contained through the use of vaccines. However, the many variances of the disease slow down the control process.

Contagious bovine pleuropneumonia (CBPP) is often regarded as an insidious, low-mortality disease of cattle, but this assessment is based on experiences in endemic areas. In susceptible cattle populations, the disease can spread surprisingly rapidly and cause high mortality rates. The disease is spread with the movement of infected animals, including acute cases and chronic carriers. Major CBPP epidemics have been experienced in eastern, southern and western Africa over the last few years. It currently affects 27 countries in Africa at an estimated annual cost of US $2 billion(Thomson, n.d.).

Another disease of importance is mastitis. The disease is related to hygiene and is common where hygiene in the livestock pens is not maintained. Similarly, nagana which is transmitted by tsetse fly is an equally troublesome disease in Livestock.

Tsetse fly control methods include the following:
Deployment of insecticide (e.g. deltamethrin) impregnated targets/traps
Application of pour-ons on livestock with Flumethrin
Cattle crush-pen spraying with Decatix, which also controls ticks and biting flies
Disease surveillance
Use of zero grazing unit protective nets

Since the trypanosome parasite also causes sleeping sickness in people, successful control of the disease in cattle should result in added benefits for human health. Another potential benefit is that increased use of targeted treatment of cattle with insecticide may lead to reduced incidence of malaria in some localities where mosquitoes feed on the same animals.

The most important disease occurring in goats is Helminthiasis. The disease is caused by helminthes (worms) and the farmers spend a considerable amount of money on buying dewormers.

The major disease of poultry is Newcastle. This is a virus spread primarily through bird- to-bird contact among chickens, but it can also spread through contaminated feed, water or clothing. Outbreaks occur in most parts of the world, and there have been two major pandemics over the last century. It is a major constraint to the development of village chicken industries, particularly in Asia and Africa. A large number of wild bird species can harbour Newcastle disease virus and, occasionally, the disease affects large-scale commercial poultry units in developed countries, despite tight biosecurity measures. Others diseases within the country include Gumboro, Coccidiosis and fowlpox.

POTENTIAL ECONOMIC, ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PEST MANAGEMENT

Introduction

The effective control of diseases and pests is pertinent for improved crop and livestock production. No single crop or plant is free from diseases and pests. There are pests and disease of economic importance that require cost effective control for improved productivity. Effective management can only be achieved when social, economic and environmental factors are taken in account', particularly when you are making a choice of the appropriate control measure. This is important for increased adoption and effective use of the selected method. Some of the major social and economic activities to be considered are presented in the Table below. In addition, an understanding of the institutional and legal frame work is also important in assessing the impacts of the current pests and disease control measures.

Table 6 Social and economic activities associated with the presence of pests and vectors

Pest and vectors	Economic Activities	Social Activities
Crop Pests	Cash crop Production, subsistence crop production, storage of crops, marketing of crops, production movements	Population movement, siting of homes
Insect borne vectors (mosquitoes, tsetse flies, black flies)	Farming, forestry, game hunting, fishing, livestock management, market attendance, population movements	Recreation (water and land), housing, waste disposal;, fetching water, population movements, settlement patterns leisure (siting outside the houses)
Animal-borne vectors (tick and mites)	Livestock management, Game hunting	Recreation sanitation conditions
Water-borne vectors (snails)	Fishing irrigation, livestock management, market attendance, population movements.	Siting of homes, bathing, washing, fetching water recreation (water), waste disposal, population movements, settlement patterns

Adopted from: Pest and vector management in the tropics, Youdeowei, A., 1983

An environmental impact of pest management is a change in the environment caused by applying or using a certain method of pest or disease control. This will involve a change in the properties of a natural or man-made resource in a way considered important. In this case, specific environmental areas of concern will include: the quality of ground and surface water, wetlands and terrestrial communities (flora and fauna), and aquatic communities including fishery and other animals and soil properties. While the social economic impacts include: the health and personal safety of the people using the various control methods. The primary goals of any control programme against pests or diseases are, first, to establish the "optimal" level of disease or pest presence to meet a country's goals and, next, to choose the most cost-effective way of achieving that level of control.

Implication of control measures

Control of plant pests and diseases

The control of pests and diseases raises the most obvious concern of the resulting losses when there is no control, as pests populations can expand quickly from a localized outbreak to critical levels with serious infestations occurring simultaneously in several areas and neighbouring regions. The fast-initial multiplication may occur unnoticed in remote and unpopulated areas and follow a natural (biologically induced) pathway. Once cropping areas are invaded, there is rarely sufficient time to prevent damage through control operations.

The widespread loss associated with an outbreak of pests and diseases makes it imperative for control measures to be undertaken. In view of major pests and diseases losses occurring in the lake basin, there is added need to prevent impacts on scarce food resources. Normally a control is carried out as a response to the appearance of pests and disease, with the main effort aimed at eradicating them once they appear in significant or levels. The primary response is widespread pesticide spraying to target pests, manual removal, biological control such as use of predators and parasitoids, use of resistant varieties, etc. All these methods have different effects on the environment, health and safety and general social setting. The rapid identification of early stages of attacks in the lake basin is critically important to minimize the damage to neighbouring regions

Control of Livestock pests and diseases

Animal diseases are spread either through natural pathways or human intervention. The transmission of certain diseases requires an insect to serve as a vector, dictated by external environmental conditions and possibly appropriate plant hosts to carry out its life cycle. Based on biological reasons, these disease pathways have limited geographical scope, which simplifies the task of identifying pathways for disease transmission compared with plant pest introduction. In the lake- basin movement of livestock and derived products is regulated and controlled to prevent the entry and subsequent spread of exotic disease agents. Furthermore, disease surveillance systems with laboratory diagnostic support are maintained to ensure the early detection of disease outbreaks and contingency plans are in place to respond rapidly to an epidemic. In addition to these there is immense use

of pesticides through spraying to control the spread of the disease and the use of acaricides to treat the disease.

Associated Risks

The control measures may be associated with risky outcomes in terms of expected profitability and is often measured by the variance. The risks may include and not limited to the following:

- Incorrect choice of herbicide, such that non-target species are damaged,
- Mistakes in calibration
- Effectiveness of pesticides which depends on the weather or other factors.

Impacts of empirical plant and animal pests and disease control methods

Use of Pesticides

Pesticides are commonly used in the control of diseases, pests and weeds on various crops. Other than crops (food, horticultural and cash), areas where pesticides are used is livestock industry (cattle and poultry) in the control of ticks and for treatment. Pesticides/acaricides are used to control ticks and tick-borne diseases as well as viral, helminth and mycoplasmal diseases of economic importance. Drugs and vaccines are popularly used to control livestock diseases.

Impact on Environment

All campaigns against invasive species of pests and disease tend to occur over large areas, thereby affecting a significant amount of territory and people. The use of pesticides in an effort to control pests, both introduced and indigenous, can lead to serious health effects in developed and developing countries. Control of animal diseases is far less risky to people and the environment.

It is understood that pesticide use can be dangerous to farmers, nearby exposed populations and the affected environment. It is estimated that there are almost 5 million cases of pesticide poisoning in developing countries each year. World Health Organization (WHO) has estimated that there are 3 million severe human pesticide poisonings in the world each year, with approximately 220,000 deaths. While developed countries use about 80 percent of the world's pesticides, they have less than half of this number of deaths. It is not known how many of these poisonings should be attributed to control measures against plant pests.

The high concentrations of the organo-chlorine compounds in the soils where they are directly applied signal a potential problem. Other chemical compounds present include pyrethroids, triazines, etc. These compounds are also detected in water and sediments from rivers which drain through the farming areas, and that their concentration in water is influenced by their concentration in soil and sediments. Rain plays a major role in the transportation process through surface run-offs. The presence of compounds in the soil for up to five years since last application shows that the pesticides also persist in tropical soil conditions. High levels of these chemicals become harmful to man and aquatic community as the chemicals are eventually washed as run offs to the water

bodies. The use of pesticides becomes injurious particularly for example as evidenced by the spray drift if the spraying is not well done it affects non-target plants or animals.

The table below shows the list of agrochemicals that are banned in the country. The danger is that some of these chemicals which are banned are still being used in the lake basin including DDT and dieldrin, amongst others. However, pest eradication or the prevention of spreading requires pesticides for a shorter term and in a smaller area than would be employed if the pest were to spread. Therefore, it is important to balance the risk of pesticide use for control at different stages of pest outbreaks against the potential negative impacts.

Table 7. List of banned or restricted pesticides in Kenya.

BANNED PESTICIDES IN KENYA			
	Common name	Use	Date Banned
1.	2,4,5 T (2,4,5 – Trichloro-phenoxybutyric acid)	Herbicide	1986
2.	Chlordane	Insecticide	1986
3.	Chlordimeform	Insecticide	1986
4.	DDT (Dichlorodiphenyl Trichloroethane)	Agriculture	1986
5.	Dibromochloropropane	Soil Fumigant	1986
6.	Endrin	Insecticide	1986
7.	Ethylene dibromide	Soil Fumigant	1986
8.	Heptachlor	Insecticide	1986
9.	Toxaphene (Camphechlor)	Insecticide	1986
10.	5 Isomers of Hexachlorocyclo-hexane (HCH)	Fungicide	1986
11.	Ethyl Parathion	Insecticide All formulations banned except for capsule suspensions	1988
12.	Methyl Parathion	Insecticide All formulations banned except for capsule suspensions	1988
13.	Captafol	Fungicide	1989
14.	Aldrin	Insecticide	2004
15.	Benomyl, Carbofuran, Thiram combinations	Dustable powder formulations containing a combination of Benomyl above 7%, Carbofuran above 10% and Thiram above 15%	2004
16.	Binapacryl	Miticide/Fumigant	2004
17.	Chlorobenzilate	Miticide	2004

BANNED PESTICIDES IN KENYA			
	Common name	Use	Date Banned
18.	Dieldrin	Insecticide	2004
19.	Dinoseb and Dinoseb salts	Herbicide	2004
20.	DNOC and its salts (such as Ammonium Salt, Potassium salt & Sodium Salt)	Insecticide, Fungicide, Herbicide	2004
21.	Ethylene Dichloride	Fumigant	2004
22.	Ethylene Oxide	Fumigant	2004
23.	Fluoroacetamide	Rodenticide	2004
24.	Hexachlorobenzene (HCB)	Fungicide	2004
25.	Mercury Compounds	Fungicides, seed treatment	2004
26.	Pentachlorophenol	Herbicide	2004
	Phosphamidon	Insecticide, Soluble liquid formulations of the substance that exceed 1000g active ingredient/L	2004
27.	Monocrotophos	Insecticide/Acaricide	2009
28.	All Tributylin Compounds	All compounds including tributyltin oxide, tributyltin benzoate, trybutyltin fluoride, trybutyltin lineoleate, tributyltin methacrylate, tributyltin naphthenate, tributylin chloride	2009
29.	Alachlor	Herbicide.	2011
30.	Aldicarb	Nematicide/Insecticide/Acaricide.	2011
	Endosulfan	Insecticide.	2011
31.	Lindane	Insecticide.	2011

Source: Pest Control Products Board (2012)

Impact on Health and Safety

Concerns remain about worker exposure, residues on food and harm to domestic and non- target wild animals. Fish and invertebrates are frequently vulnerable, especially aquatic arthropods. Stocks of obsolete pesticides have also become a serious health and environmental problem in many countries of Africa and the Near East. Since pest outbreaks are erratic and difficult to predict, there is a danger that more pesticides than needed will be ordered or that pests will migrate out of the country before the pesticides arrive. As a consequence of the need to be prepared for initiating a control campaign at short notice, stockpiles of pesticides can be found in many of the countries affected by migratory pests. Often, they are not stored correctly, which has resulted in corroded containers, lost labels and release of the chemicals into the environment.

The pesticide stockpiles pose a very important problem that requires urgent attention, especially for stocks near urban areas where there is a risk of the pesticides contaminating drinking-water, food or the air. However, in general they lack the resources and technology to mount appropriate disposal campaigns. The use of pesticides, fungicides and herbicides may lead to water pollution, given that water is used for drinking and other domestic purposes

Safe Use of Agrochemicals

The project will facilitate trainings on safe use and disposal of agrochemicals at county and community level following the industrial guidelines on safe use. Recommended Agrochemicals will be sourced from registered dealer/suppliers. Transportation of the chemicals will be done in a safe manner to avoid any spillage and using recommended packaging. Farmers and stakeholders will be sensitized/trained on safe handling of chemicals including application rates, post-harvest intervals and disposal of the empty containers and expired chemicals. This will also involve the recommended time of chemical application and protective gear. Where accidental spillage takes place, the right cleaning materials will be used to minimize exposure to humans and the environment. Communities will be sensitized on safe disposal of empty containers so as not to be used for household purposes such as water storage and salt/sugar dishes among others. The project will in addition promote integrated pest management as a means of minimizing excessive use of agrochemicals. This will guard against environmental pollution. **(Annex 10).**

Use of Biological method

The biological control of pests and diseases entail the use of insects, bacteria or fungi on the host to eliminate the pest or disease. For example, in the control of water hyacinth, specific weevils' spp. are used to destroy the weed.

Impact on Environment

This is one of the known environmentally friendly control methods as compared to other control methods. Unlike other methods biological control is applied carefully and selectively and since no chemicals are used it has no adverse effect on the environment. In comparison to other methods it is cost effective since its application may entail community participation and can be integrated in other control methods. The natural enemies once established may spread to other remote areas as in the case of water hyacinth.

The only criticisms is that the control agents are slow in action and take a longer period to generate results and therefore cannot be used in emergency situations. The danger comes in when the host is eliminated if the pest is not host specific then they may attack other plants (crops) or insects and therefore create an imbalance in the ecosystem.

In the case of the control of water hyacinth the use of weevils damages the water hyacinth which then rots and sinks providing a substrate on which other plants thrive on; e.g. cyperus, papyrus, hippo grass. This phenomenon was observed in Lakes Kyoga

and Victoria when the beetles were successfully used in the control of water hyacinth in the late 1990's. The new plants (ecological succession) which emerge possess a problem on communication, water supply and fishing in the lake.

The use of resistant clones in the control of diseases and adoption of a fast method of propagating plantings has numerous environmental benefits. For example, providing a reliable supply of improved tree seedlings will have important benefits for the environment. By increasing and sustaining the supply of timber, pressure on forests will be reduced on natural forests, helping to preserve valuable natural biodiversity and rare habitats. The Tissue culture technology also has the potential to increase biodiversity by replacing the stocks of rare and endangered tree species. The wider environmental benefits of increasing tree cover include improving soil stability, reducing erosion, preventing desertification and stabilizing global climate.

Impact on Health and safety

Since no chemicals are used there are no dangers and thus the method is generally/fairly safe. Refer to the ECAATP Environmental and Social Management Framework (disclosed in Kenya and in World Bank InfoShop) for guidance for usage of Personal Protective Equipment by workers, including farmers.

Use of Mechanical method

This method involves the use of automated machines and may also be expensive depending what machines are used. For example, inter-cultivation is done using a tractor mounted inter-cultivator to control weeds in crops such as sugarcane and use of boom sprays.

Impact on Environment

This may be friendly or unfriendly to the environment depending on the operation carried out and the disposal technique of the weeds or the wastes. For example, when the water hyacinth is chopped mechanically and left to rot and sink at the bottom of the lake, they result into accumulation of water hyacinth debris. These materials impact on biotic communities, the environment and socioeconomic activities. These calls for choosing a method where by the chopped materials are completely removed from the site.

Impact on health and safety

The wise operation of the machines and the supporting labour becomes important in the safety and handling.

Use of manual method

The manual control basically consists of the use of labour with simple implements/tools. The major concern is often the high cost involved. For example, weeding is particularly expensive before the tea matures and covers the ground completely

Impact on Environment

It is friendly to the environment as there is no pollution of land, water or air when the method is applied. An example would be the control of mole rats using traps. In the coffee sector, it is safe to ensure that the uprooted weeds are not placed on the tree stumps as this may introduce soil borne diseases into the tree, while in the sugar sector, when smutted stools of sugarcane are uprooted and not buried in the ground they cause more infection on the cane.

Impact on Health and safety

The danger involved in the manual control includes the risk of bilharzias, snake bites, hippo or crocodile attacks, depending on which plant and where the operation is carried out.

Use of Quarantine

Quarantine refers to a period when an animal or person that has or may have a disease is kept away from others in order to prevent the disease from spreading. For plants it is a situation which ensures safe movement, treatment, introduction and destruction of diseased/infected plants materials to reduce the risk of exposure of the country's plant resources (environment) to foreign pests, diseases and noxious weeds.

Impact on Environment

This method is fairly safe to the environment as it allows for the control and management of pests and diseases through isolation.

Impact on Health and safety

Quarantines ensure safe passage of animals and plants by reducing contamination or spread of diseases.

CAPACITY NEEDS AND TECHNICAL ASSISTANCE FOR SUCCESSFUL IMPLEMENTATION OF THE IPMF

IPM is a knowledge intensive and interactive methodology. The need to accurately identify and diagnose pests and pest problems and understand ecosystem interactions could enable farmers with biological and ecological control opportunities and in making pragmatic pest control decisions. Thus, the success of IPM depends largely on developing and sustaining institutional and human capacity to facilitate experiential learning for making informed decisions in integrating scientific and indigenous knowledge to solve county, ward and village specific problems.

Poor communication between farmers, extension agents and researchers from research institutes and universities has often led to poorly-targeted research or to poor adoption of promising options generated by research. The full benefits of investment in agricultural research thereby remain untapped under these circumstances. Closer farmer-research investigator interaction and adaptive research and participatory learning approaches in capacity building efforts can help to bridge this gap and make research results more applicable by farmers. The farmers will learn biological and ecological processes underpinning IPM options, and use the newly acquired knowledge to choose compatible methods to reduce production and post-harvest losses through frequent field visits, meetings, demonstrations, adaptive research trails, etc.

Capacity building will be achieved through farmer-based collaborative management mechanisms where all key stakeholders shall be regarded as equal partners. Beneficiary farmers shall be the principal actors facilitated by other actor such as from research institutes, academic institutions, sector ministries, NGOs, etc. as partners whose role will be to facilitate the process and provide technical direction and any other support necessary for the implementation of PMP. The pilot PMP should be designed to build on, and to some extent strengthen existing national capacities for the promotion and implementation of IPM.

The major actors and partners will include the following:

The programme beneficiary farmers: as the principal beneficiaries they will be organized into Farmer Groups for training and adoption of IPM practices. The farmers will be facilitated to set up Community IPM Action Committees to coordinate IPM activities in their areas.

Agricultural sector ministries have the national mandates in implementation of crop protection and pest management research. The two projects will provide logistical and technical support to the Implementing Agencies and other stakeholders to be trained as IPM trainers and to exploit their experiences in the implementation of IPM and management of outbreak and migratory pest. ECAAT Project will thus provide capacity and policy guidance and/or oversight for implementation of the two projects at regional/county level. The IPM commodity team will serve as resource persons at FFS, counties or any other mechanism deemed suitable for conducting IPM Trainers and Farmer Group training sessions. The team will also be a major partner to farmer groups in the planning and execution of farmer participatory research activities related to IPM.

The sector ministries within the ECAAT project counties should provide staff for training at FFSs and should play major role with NGOs/CBOs in the public awareness campaign, production of extension materials, radio and television programmes in the respective counties. They should also monitor the prevalence of inputs supply by the dealers.

Ministry of Health (MoH)*:* the county hospitals or clinics in the ECAATP operational areas should set up databases on incidence of data on poisoning, effect of pesticides on human health and environmental contamination. This data will then be used to measure and validate the ameliorating effects of IPM adoption and KCSAP implementation that is expected to reduce risks to pesticides exposure.

National Environmental Management Authority (NEMA)*:* will collaborate with the counties hospitals and natural resources management offices of the counties on training beneficiary farmers in environmental management.

Partners will include the following:

Research and training institutions: to formulate proposals for research and training programmes for the development of IPM protocols, and training modules for participating ECAATP - commodity IPM team and programme staff.

World Bank, FAO and Global IPM facility: to be a valuable source of technical information and to provide technical support for training, planning and field implementation of IPM in Farmer Groups. The ECAATP programmes will also build on the knowledge, structures, facilities, and lessons learnt in other related projects in Africa and elsewhere.

Agriculture Service Providers and NGOs that are working on providing services to farmers and improving agricultural productivity, environmental management and rural health matters will be identified to provide services and technical support to the field implementation of IPM and another pilot PMP.

IPMP IMPLEMENTATION AND BUDGET

The ECAATP programme management team will be responsible in the implementation of this IPMF and estimated costs for the various activities under these projects will be built in the budget. The core activities will be: - Coordination; Development of IPM packages for the ECAATP counties; IPM orientation workshops; Training of trainers and Farmer groups training; Public awareness and promoting the adoption of IPM practices; Field guides/training materials for production, purchase and distribution; Farmer's field days; Field visits and study tours; Annual workshops on progress and lesson learnt; Monitoring and evaluation

Implementation

The extension staff, cooperatives/POs extension staff sponsored and none sponsored by ECAATP PCU and representative of farmers responsible for IPM execution will give periodic reports and planned activities for the following quarter and should reflect the approved work program for each in PO or cooperative. This would include: Name of crop and area under demonstration, Activities performed during this period (1 to 3 months), Number of farmers involved, Dates of various activities, Inputs used, Pest and diseases observed and control methods Person hours or days spent on each activity, Field days and number of people attended, Farmer to farmer visits done and number of participants, Leaders invited and attended any of IPM events, Lessons learnt and problems during the month, Other activities done by the group, Future plans, Observation and suggestions

Budget

A tentative cost estimates of budgetary requirements (Table 8)

Table 8: Budget element for implementation of IPMP- ECAATP **(in USD)**

Line item	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Total**
Capacity building						
IPM orientation	500	300	300			1100
TOT	1500	1500	1000			4000
FG training	1000	1000	1000	1000	1000	5000
Surveillance	500	500	500		1000	12500
Workshop	400	500	600	800		2300
Field guides/IPM materials	500	300	400			1200
Public awareness	600	600	400	200	200	2000
M&E/Reporting	1000	5000	500	400	400	7300
Coordination	200	200	200	200	200	1000
Grand total						**36,400**

Appendix 1: Questionnaire on Pest Management

This questionnaire will be used with the farmers' groups for purpose of implementing the IPMP

1) Pest Control Practices
a) Do you use any pesticides to control pests (Insects, diseases, weeds) of crops each season?

Yes___ No__If yes, name them:	Name of pesticide	Name of pest, disease, weed controlled	Number of times applied/season	When did you apply (growth stage or month) Quantity purchased

If No, WHY?
_____

b) If you use any of the above pesticide types, do you keep records of the:

Application location Yes……. No …….

Date of application Yes……. No …….

Pesticide product trade name
Yes……. No …….

Operator name Yes……. No …….

If No, WHY?

c) How do you decide when to use the pesticides (tick all that apply)?
We use pesticides at regular intervals throughout the season (calendar) We use pesticides when we see pests in the field (control)
We use pesticides after field sampling and finding a certain number of pests or a certain level of damage (scouting
Told by someone to apply (specify who) _____
Other (specify)_____

d) Do you use a knapsack sprayer? Yes_No _____ If yes, do you own it Yes_No _____
Do you rent it Yes_____No _____
Do you borrow it Yes_____No _____
e) From your experience, are there any negative/harmful effects of using pesticides?
Yes……. No …….
f) If yes, list the negative effects:
1. ……
2.....
3. ……
4. ……
5. ……

g) Do you use any kind of protective clothing while applying or handling pesticides? Yes _No
Why? _
h) If YES, what kind? _____
2. Knowledge of pesticide handling and storage (tick one in each row)
a) Do you read labels on the pesticide container before using?
Sometimes___ Always_____ Never_____
b) How often do you wear protective clothing and other accessories like nasal mask, eye goggles, and boots when applying the pesticides?
Sometimes___ Always_____ Never _____
c) Do you mix pesticides with your hands?
Sometimes___ Always_____ Never _____

d) Do you observe the pre-harvest waiting periods after applying the pesticides?
Sometimes___ Always_____ Never _____

e) After spraying, do you wait 12 hours before entering the field?
Sometimes___ Always_____ Never _____
f) Do you store pesticides in a secure, sound and well-ventilated location?
Sometimes___ Always_____ Never _____

g) Do you make a cocktail before applying the pesticides? (i.e., mix more than one chemical and apply them at once?)
Sometimes___ Always_____ Never _____
h) Where do you store your pesticides? ___

Why do you store them there?

_____

i) What do you do with your pesticide containers after they are empty?___

_____

j) Do you know of any beneficial insects (insects that eat harmful insects)?
Yes……. No …….
k) If yes, name them:
i) ____ ii) _____ iii)_____

3. Pesticides and Health

a) Do you find that pesticide application is affecting the health of: Persons regularly applying pesticides
Sometimes___ Always_____ Never _____

Persons working in fields sprayed with pesticides
Sometimes___ Always_____ Never _____

Persons harvesting the produce
Sometimes___ Always_____ Never _____
4. Options to Pesticides

a) From your experience, are you aware of other methods for controlling insects' diseases and/or weeds besides pesticides?

Yes……. No ……

b) If yes, describe these practices:

i) _____ii) ___ iii) ___iv)

5. Information

a) What information do you think you need for improving your crop production and marketing?

6. Training

a) Have you ever received any training on any of the following topics related to crop production?

Integrated Pest Management

Yes……. No …….

No. of times/past yr. …….

Pesticide Usage Yes……. No …….

No. of times/past yr. …….

Pesticide Safety Yes……. No …….

No. of times/past yr. …….

Insect Identification Yes……. No …….

No. of times/past yr. …….

Disease Identification Yes……. No …….

No. of times/past yr. …….

Quality aspects of production

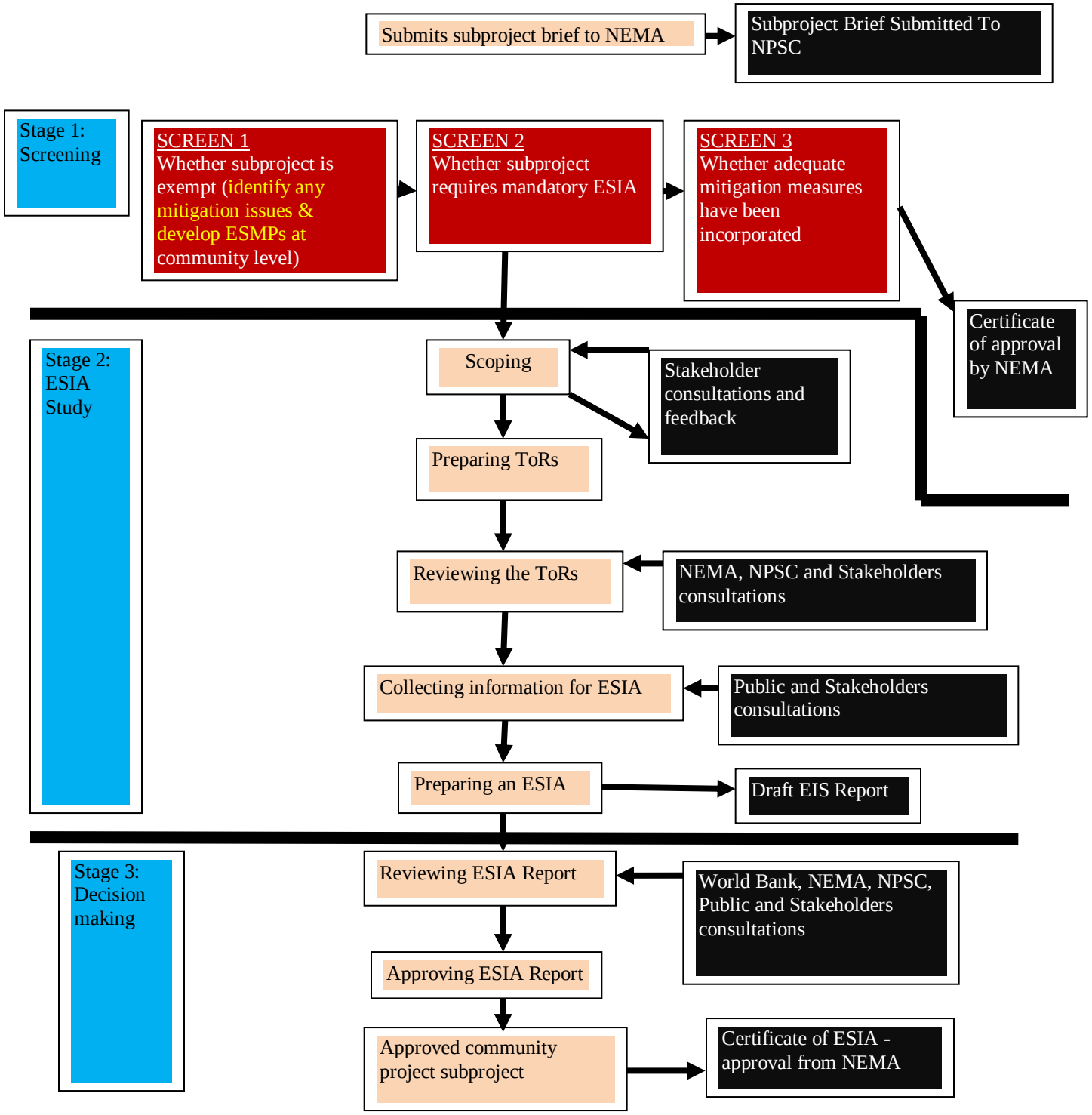
Yes……. No …….

No. of times/past yr.…….

7) Is there anything else that you want us to know about your crop production?

Thank you for your time

Annex 9: Schematic Presentation of ESIA Process



Annex 10: Schematic Presentation of Cold Chain Management