From Crisis to Control

Case studies in emergency locust interventions

Ministry of Agriculture and Livestock Development

EMERGENCY LOCUST RESPONSE PROGRAM

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Disclaimer and Credits

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Abbreviations and Acronyms

ASAL	Arid and Semi-Arid Land
ATC	Agricultural Training College
BMU	Beach Management Unit
CCPP	Contagious Caprine Pleuropneumonia
CDDC	Community-Driven Development Committee
CIGs	Common Interest Groups
CIRAD	The French Agricultural Research Centre for International Cooperation Organisation
CLIDP	Community Level Infrastructure Development Programme
CPSS	County Project Steering Committee
CSA	Climate Smart Agriculture
CTAC	County Technical Advisory Committee
EABL	East African Breweries Limited
ECF	East Coast Fever
ELRP	Emergency Locust Response Program
EU	European Union
FAO	Food and Agriculture Organisation
FCDC	Frontiers Counties Development Council
FFS	Farmer Field Schools
FMD	Foot and Mouth Disease
FPO	Farmer Producer Organisation
GAPs	Good Agricultural Practices
ICT	Information Communication and Technology
ILRI	International Livestock Research Institute
IPM	Integrated Pest Management
IPs	Indigenous Persons
KALRO	Kenya Agricultural and Livestock Research Organization
KCSAP	The Kenya Climate Smart Agriculture Project
KFS	Kenya Fisheries Services

KFSSG	Kenya Food Security Steering Group
KTBH	Kenya Top Bar Hive
LCC	Locust Command Centre
LPOs	Livestock Production Officers
MIS	Management Information System
NGOs	Non-Governmental Organisations
NPK	Nitrogen, Phosphorus, and Potassium
NWWDA	Nothern Water Works Development Agency
NTAC	National Technical Agricultural Committee
OFSP	Orange-Fleshed Sweet potato
PDO	Project Development Objective
PICD	Participatory Integrated Community Development
PLWDs	People Living with Disabilities
PLWHIV	People Living with HIV
PMC	Project Management Committee
PPR	Peste des Petits Ruminants
SACCOs	Savings and Credit Cooperative Organisation
SCITTs	Sub-County Implementation Technical Teams
SEAG	Small East African Goats
SHG	Self-Help Group
SILC	Savings and Internal Lending Community
SLM	Sustainable Land Management
TIMPs	Technologies, Innovations, and Management Practices
TNA	Training Needs Assessment
ToT	Trainers of Trainers
VMGs	Vulnerable and Marginalised Groups
VSL	Village Savings and Loan
VSLA	Village Savings and Loan Association
WFP	World Food Programme
WUA	Water Users Association

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Foreword

The agriculture sector is a cornerstone of Kenya's Vision 2030, driving the nation toward its goal of becoming a middle-income country with a robust annual economic growth rate of at least 10 percent by 2030. This sector is pivotal not only for achieving the Sustainable Development Goals (SDGs) but also for ensuring food security, supplying raw materials for agro-industries, creating jobs, and generating income and foreign exchange.

Moreover, as outlined in the Agricultural Sector Transformation and Growth Strategy (ASTGS), the sector aims to enhance productivity, improve market access, and promote sustainable practices. The Bottom-Up Economic Transformation Agenda (BETA) further emphasizes the importance of agriculture in empowering local communities and fostering inclusive economic growth.

However, the agriculture sector faces significant challenges, particularly from climate change and disasters like drought, invasive pests, and diseases. A prime example of this vulnerability was the catastrophic locust invasion in December 2019, which affected 28 counties, primarily in arid and semi-arid regions. The subsequent drought exacerbated the situation, leading to devastating losses of crops, pasture, and livelihoods for pastoralist and agro-pastoralist communities.

In response to this crisis, the Government of Kenya, with the invaluable support of the World Bank, launched the Emergency Locust Response Program (ELRP). This initiative aims to restore lost livelihoods and bolster resilience among affected communities. Implemented across 15 counties over five years (June 2020 to June 2025), the ELRP employs a multifaceted approach that includes building community resilience, mobilizing local institutions, enhancing access to water for agriculture, managing invasive pests, and strengthening early warning systems.

The six themed case studies documented in this book showcase the remarkable achievements and lessons learned from these interventions. This publication serves as an invitation to stakeholders to engage with these insights, drawing upon the successes and challenges encountered to inform future agricultural development efforts. By sharing our experiences, we aim to foster replication and learning, particularly in the context of restoring livelihoods and enhancing community resilience in the face of disasters.

I extend my heartfelt gratitude to the World Bank for its financial and technical support, and to the Government of Kenya, including the Ministry of Agriculture and Livestock Development, the State Department of Agriculture, and the county governments of the 15 implementing counties. A special thanks to the communities who have shown remarkable resilience throughout the project's journey. The call to action is to continue re-(building) a more resilient agricultural future for Kenya.

Priscilla Muiruri

National Project Coordinator, Emergency Locust Response Program

Introduction

In early 2020, East Africa experienced one of the most devastating Desert Locust (DL) plagues in decades, significantly threatening food security and the livelihoods of millions in the region. In Kenya, this outbreak marked the worst locust invasion in over 70 years, impacting 28 counties and putting approximately 3 million people at risk of food insecurity. Contributing to this crisis were weather extremes and drought exacerbated by climate change.

In response, the Government of Kenya (GoK), in collaboration with county governments and various development partners, promptly initiated control measures. The Ministry of Agriculture and Livestock Development (MoALD) worked closely with the Desert Locust Control Organization for Eastern Africa (DLCO-EA) and the Food and Agriculture Organization (FAO) to conduct surveillance and control operations in the affected areas.

The Kenyan Government secured funding from the World Bank, through the Contingency Emergency Response Component of the Kenya Climate Smart Agriculture Project (KCSAP), enabling immediate financing for DL control operations. However, as locust invasion persisted, there arose an urgent need for enhanced resources to support ongoing surveillance and control efforts, as well as to restore the livelihoods of affected households.

As the principal technical agency for Desert Locust monitoring and management, the FAO launched an appeal for financial support to address these pressing needs. In response, the World Bank initiated a rapid regional response to combat the locust threat, further supporting the GoK in implementing the Emergency Locust Response Project (ELRP), from 2020 to 2023. This initiative was subsequently extended to June 2025, following additional support from the World Bank aimed at mitigating the severe drought effects impacting many counties involved in the project.

About the Project

The Emergency Locust Response Program (ELRP) was implemented in line with the Government of Kenya's (GoK) Third Medium Term Plan (MTPIII), which emphasizes the "Big Four" agenda. Effective management and control of Desert Locusts (DL) played a crucial role in achieving the vision of 100% food and nutrition security outlined in this agenda.

The project was executed by the GoK through the Ministry of Agriculture and Livestock Development (MoALD) and the State Department for Agriculture, with funding support from the World Bank.

The ELRP, implemented in Kenya for a period of five years (June 2020 to June 2025), intended to prevent and respond to the threat to livelihoods posed by the Desert Locust (DL) outbreak and drought, and to strengthen Kenya's systems for preparedness. It involved national, county and community-level efforts. At the community level smallholder farmers, agro-pastoralists and pastoralists implemented community-led interventions, considering factors like environmental and social safeguards, gender inclusion and social equity. The project was implemented in 15 counties spread within the Arid and Semi-Arid agri-ecological zones of Kenya. The 15 counties are: Elgeyo Marakwet, Embu, Meru, Isiolo, Wajir, Garissa, Mandera, Marsabit, Turkana, Baringo, West Pokot, Kitui, Machakos, Samburu, and Tharaka Nithi.

The implementation of the program followed a three-tiered institutional framework: National, County, and Community levels. At the National level, the MoALD served as the primary implementing agency for components 1, 3 and 4. At the County level, local governments acted as executing agencies for component 2. Community-level interventions were carried out by targeted beneficiaries, ensuring a grassroots approach. Additionally, the project was implemented in collaboration with various organizations engaged in Desert Locust surveillance and control.

The Program supported various interventions, including:

1. Building community resilience and livelihoods restoration;
2. Forming and supporting community institutions, including Community-Driven Development Committees (CDDCs), Common Interest Groups (CIGs), Farmer Producer Organisations (FPOs), and Savings and Credit Cooperative Societies (SACCOs);
3. Promoting access to water for crops and livestock production, and sustainable land management;
4. Control and management of invasive and migratory pests, including locust control; and
5. Strengthening early warning systems and predictive analytics.

Project components

The project undertook interventions through four components as follows:

Component 1: DL surveillance and control measures

The objective of activities under this component was to limit the growth of existing climate-change-induced Desert Locust populations and curb their spread by undertaking DL surveillance and control operations. The necessary equipment and pesticides were acquired for the surveillance and control operations. During control operations, Pest Management Plan (was embraced to mitigate against the risks associated with pesticides use and likelihood of negative impacts on human health, animal health and the environment.

Component 2: Livelihood protection and rehabilitation

The objective of this component was to support affected farmers and livestock holding households to restore their productive assets for enhanced adaptation and resilience. Towards this, the project supported initiatives to enhance access to food and rehabilitation of food production systems and livelihoods damaged by DL and drought that affected most of the counties implementing the project. The main interventions supported included: Crops and livestock technologies, innovations and management practices (TIMPs)/packets to restore livelihoods; Community based projects geared towards rehabilitation of degraded pasture and crop lands, enhancing storage capacity for feed and produce; strengthening of producer organizations to upscale their operations such as input bulk purchasing, storage, value addition, marketing; emergency response for immediate restoration of pastures, food security; Livelihood diversification focusing on alternative livelihood activities that are less dependent on changes in weather and climate variability.

Component 3: Coordination and early warning preparedness

Interventions under this component focused on building and strengthening Kenya's systems for DL early warning preparedness at National and County levels of government. The main activities included: i) setting up surveillance systems and units; ii) capacity building of staff; iii) installation of surveillance units and equipping, and; iv) linking with international and regional organizations to strengthen early awareness and preparedness systems, and limiting the spread of swarms within Kenya and across the region

Component 4: Project management

This component supported oversight, coordination and management of project functions including financial management, procurement, monitoring and evaluation and learning, environmental and social management, knowledge management and communications and day-to-day operations.

Project Scope

Components 1, 3, and 4 were implemented at the national level by the Ministry of Agriculture and Livestock Development (MoALD) across all counties affected by locust invasions. Component 2 interventions were carried out at the county level, focusing on 144 wards in 15 counties that were significantly impacted by the Desert Locust invasion. The interventions specifically targeted food-insecure, vulnerable and marginalized households, with particular emphasis on female-headed households during the selection process.

About the Book

The six case studies contained in this book highlight the collaborative efforts, strategies and lessons learned from the Emergency Locust Response Program, showcasing rebuilding of livelihoods, and resilience and adaptability of communities in the face of environmental challenges.

Beyond the Desert Locust Invasion: Restoring, Rehabilitating and Enhancing Resilience among Pastoral and Agro-Pastoral Communities in Kenya

Authors: David Yongo, Dr. Douglas Indetie, Fredrick Aloo

Introduction

The once vast grazing lands in Northern Kenya have shrunk over the decades due to increased settlements, recurrent drought and other natural calamities, such as Desert Locust (DL) infestation. Predominantly livestock-keepers, these communities in pastoral and agro-pastoral areas continue to experience increased vulnerability and shortages of livestock feed. Most Arid and Semi-Arid Lands (ASAL) are either bare or heavily infested with invasive plant species, contributing to the reduction of the desirable forage. Other contributing factors to inadequate feeds include overgrazing and continuous overstocking.

Livestock production in Kenya is inhibited by inadequate feeds due to a combination of biotic and abiotic factors. Biotic factors like forage quality, quantity, and competition from other species influence feed availability and quality, while abiotic factors like temperature, rainfall, and soil fertility affect plant growth and overall feed production. Invasion of DL and the subsequent drought in Kenya during the years 2019 to 2022 led to destruction of vegetation covering an area of approximately 607,029 ha.

During dry spells, predominant livestock keepers suffer from food and nutrition insecurity, as well as shrinking incomes occasioned by livestock losses and reduced livestock production. Climate change adds an extra layer of vulnerability to this already fragile ecosystem, exacerbating the underlying causes of poverty and food insecurity. It is estimated that more than 2 million livestock were lost during the drought in the years 2020-2022. The losses consisted of 645,446 cattle, 869,876 sheep, 719,876 goats and 14,419 camels. An estimated 34,281 households lost all their livestock resulting in complete loss of livelihoods (State Department for Livestock, 2022). In 2019-2021, Kenya experienced a severe DL invasion, primarily affecting the northern, eastern and parts of rift valley regions.

With this massive loss of livelihoods there was need to intervene by providing supplementary feeds and initiating rehabilitation and restoration of the denuded farmlands through re-seeding and introduction of favourable pasture and fodder species. Further, households that lost a significant number of livestock were assisted to re-stock. The remaining animals were also supported by animal health interventions to enable them to survive. To enhance resilience for the affected households, communities were also assisted to diversify their livelihoods and to build their resilience.

The problem

The impact of DL invasion compounded with drought significantly reduced the availability of productive grazing land, threatening the livelihoods of livestock farmers. This resulted in overgrazing, land degradation, loss of weight and, in severe cases stock mortality leading to reduction in livestock productivity.

Loss of livestock, due to mortality and reduced productivity, and loss of crops led to household food insecurity and loss of livelihoods. According to the 2020 short rains season assessment report (GoK, 2021), the number of people facing acute food insecurity was estimated at 1.4 million in the arid and semi-arid lands. In addition to the DL invasion, the 2022 drought negatively impacted the region, exacerbating the situation for the communities.

Addressing the consequences of drought and DL invasion, therefore, required emergency interventions that would respond to the core livelihood needs of the communities. These included the establishment of pastures and fodders, feed supplementation, rangeland rehabilitation, livestock re-stocking with fast growing breeds and re-seeding. Additionally, there was need to restore the lost livelihoods and build resilience of the affected communities using alternative livelihood options such as apiculture, poultry farming and fisheries. Further, the communities were supported through input packets which included, seeds, fertilizer and equipment.

Tackling the problems

Identifying community priorities: The ELRP project conducted a Participatory Integrated Community Development (PICD) process to identify priority areas of intervention that would enhance rehabilitation and restoration of livelihoods. The PICD process was also used to identify Common Interest Groups (CIGs) and the Vulnerable and Marginalised Groups (VMGs).

The PICD process identified interventions areas that were broadly categorised into: Micro-projects (targeting community level interest groups) and Sub-projects (targeting multiple sub-county interventions). The Micro-project interventions were supported through project proposals developed by the CIG's and VMG's, while Sub-projects proposals were developed by the County technical teams in consultation with the communities. The proposals were vetted and approved for funding and implementation. The

PICD process created a pathway for community engagement and linkage to identify, prioritise and document their felt needs through the proposals. This led to targeted interventions for building resilience and livelihood restoration.

Capacity building: The project undertook a capacity building process that involved the rolling out of 60% of the 151 TIMPs on good livestock husbandry, animal health practices, rangeland restoration, pasture and fodder establishment, feeding, re-stocking, breeding management and other good agricultural practices. A total of 59,209 households benefitted from livestock inputs packets, while 44,313 households benefitted from re-stocking. The project also facilitated the preparation of a training manual and user's guide for trainers; *Sustainable agricultural livelihoods restoration, rehabilitation and resilience in Kenya (2022),* to guide and sensitise the communities on the process of structured restocking, and re-seeding.

Pasture and fodder establishment:

There was deliberate effort to address pasture and fodder conservation. The CIGs were trained and supported to engage in hay making and conservation, silage making, conservation of crop residues and Climate Smart Agriculture (CSA) -TIMPs across the 15 project counties. Three hay barns were constructed in Marsabit, Mandera and Garissa counties.

Further, the project supported 2,432 CIGs/VMGs with livestock inputs packets comprising drugs, feeds, pasture and fodder seeds that were productive and more drought tolerant. The CIGs/VMGs undertook site selection for pasture establishment, land/seed-bed preparation, planting/sowing, weed control and general management. Site selection was done based on the rainfall amount in the areas, soil types and topography.

Among the grass species promoted were *Cenchrus ciliaris (fox tail), Eragrostis superba (Masai love grass), Chloris gayana (Rhodes grass) Sorghum sudanensis (Sudan grass),* amongst other range grass species. Out of the 2,432 CIGs/VMGs, 113 received approximately 41,260kgs of grass seed, which was planted on 121,498 hectares across 7 counties.

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Rangeland rehabilitation: The communities, through the PICD process, identified sites for rehabilitation. The CIGs/VMGs undertook restoration of pasture lands through re-seeding of degraded rangelands. Pasture establishment

Technologies, Innovations and Management Practices (TIMPs) were initiated for pasture production and natural pasture improvement through re-seeding with suitable adaptable drought-tolerant seeds notably *Eragrostis superba* (Maasai love grass), and *Cenchrus ciliaris* (African fox-tail). Re-seeding was done on micro-catchments such as furrows made by plough or pits to hold water. Restoration of degraded areas entailed Sustainable Land Management (SLM) practices such as planting the right trees in the right places, increasing above and below ground biodiversity, and conservation of natural vegetation through enclosures. To help diversify community livelihoods, the project distributed 4,779 Langstroth hives to 240 CIGs/VMGs, with 4,824 members.

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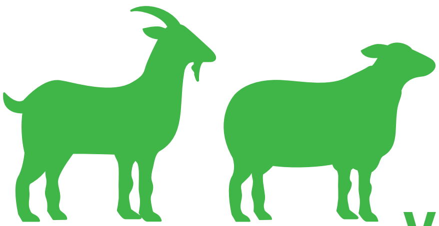
Feed supplementation: The project, through CIGs/ VMGs, supported feed supplementation, which were distributed to farmers in 77 CIGs/VMGs with 1,603 members. The supplements covered 953,650 kgs range cubes, 266,768 kgs drought pellets, 2,400 litres of urea, and 425,015 bales of hay, collectively supporting 72,476 animals within the initial emergency window of the project.

Re-stocking: A total of 2,188 CIGs/VMGs were provided with 78,042 small stocks, such as Galla goats and Dorper sheep, for the restoration of livelihoods, benefitting a total of 45,566 households in the project counties. To accelerate livestock improvement, 25,327 breeding stock comprising of sheep and goats were supplied to livestock keepers to enhance productivity.

Breed improvement and vaccination: The project, in conjunction with the Department of Veterinary Services and other stakeholders in participating counties, conducted an initial assessment of animal health challenges and defined the requisite interventions ensuring timely and accurate assessment of the veterinary needs. The interventions aimed to address livestock health problems identified by the veterinary Department. For cattle, Foot and Mouth Disease (FMD) and East Coast Fever (ECF) were common in the project areas while for small stock, Contagious Caprine Pleuropneumonia (CCPP) and Peste des Petits Ruminants (PPR) were prioritized. A total of 5,672,934 animals were vaccinated, including 532,602 small stock animals. The project supported the training of personnel involved in this exercise by offering short tailor-made refresher courses for participating officers.

Input packets and alternative livelihood support: To help rebuild the communities in terms of livelihoods and to strengthen their resilience, the project supported communities that had lost their crops including pasture, with inputs such as seeds, fertilizer and equipment. Depending on the identified needs, some communities received equipment such as Langstroth hives and agricultural tools. Communities were also supported to engage in alternative livelihood activities such as bee keeping, poultry keeping, weaving and beads making, and gum and resin harvesting.



A total of 2,188 CIGs/ VMGs were provided with 78,042 small stocks, such as Galla goats and Dorper sheep

The aftermath

Enhanced fodder production: The interventions boosted local fodder supply, reduced reliance on costly feed purchases, and strengthened dry-season livestock resilience. The fodder establishment has contributed to increased productivity and reduction in livestock mortalities during periods of feed scarcity. The water harvesting technologies have contributed to increased fodder production, land cover and improved livestock feed availability as compared to previous seasons when there was no pasture.

Reduced livestock mortality during droughts: The enhanced pasture and fodder conservation following the project interventions led to enhanced feed availability. The hay bans constructed by the project contributed to enhanced availability of livestock feeds even during drought. These resulted in reduced animal deaths due to food shortage. Additionally, the provision of feed supplements covering 953,650 kgs range cubes, 266,768 kgs drought pellets, 2,400 litres of urea, and 425,015 bales of hay, contributed to a reduction in livestock mortality and enhanced body condition. The animal health interventions also reduced mortality and disease incidences on the livestock.

Restoration of degraded lands: Increased area under pasture and fodder trees resulted in restoration of degraded lands, reduced soil erosion and improved feed conversion efficiency for livestock, leading to reduction in greenhouse gas emission. More than 121,498 ha of land was restored to productivity.

Garissa's Medina farm reaps from its fodder project

Halima Yussuf, a member of the group, feeding her cattle with the improved fodder.

For farmers at Medina Farm of Garissa county, every day has been a battle against nature and every season brought new challenges. In early 2020, desert locus descended on their farm, destroying about 70% of their crop fields and pastureland. For a region already struggling with floods and prolonged drought, this invasion intensified their losses.

Following the invasion, ELRP supported the Medina farmers with input packages including 5,000 Super Napier grass cuttings, 2 kg of Brachiaria seeds and 10 kg of Sudan grass, and a motorised chaff cutter. They were also given 5 high-yielding Saanen dairy goats to boost milk production. The farmers also received training and hands-on demonstrations on how to establish fodder plots, harvest effectively, make hay bales, and store and utilise the feed efficiently.

This helped in putting the farmers back on their feet. By 2024, the farmers had 5 acres planted with Super Napier and Brachiaria grass, and 20 acres under Sudan grass. The Super Napier and Brachiaria grass are harvested, chopped using the motorised chaff cutter and fed directly to the livestock, while Sudan grass is baled. As a result, the 20 acre-field has yielded 5,000 bales of hay, an increase from just 100 bales per acre before the intervention, all of which is used to feed the animals.

"The chaff cutter has really made a difference," she shares with pride. "Now my farm can sustain itself. It's a relief knowing my livestock will not go hungry again," says Halima Yussuf, a member of the group.

As a result, 128 out of the 5,000 hay bales have been sold to FCDC at KES 350 per bale, bringing in KES 44,800 in income. The hay is stored, in readiness for future droughts.

The farmers aim to produce more, sell more, and support not just their own livestock, but the entire region. Halima reflects: "I am more confident, my children are in school, and we are ready for whatever comes our way; rain or drought."

Enhanced socio-economic status:

The undertaken restocking enhanced the livelihoods of the affected communities, increased household livestock ownership and enhanced socio-economic status, thus contributing to their livelihood recovery. The restocked goats/sheep reported an average of 20% increase in kids/lambs across the project counties.

Diversified livelihood options

As a result of livelihoods diversification interventions, communities have identified and diversified their income streams, including in bee-keeping, poultry and fisheries to protect themselves from future shocks. For example, in Masinga, Machakos County, members of Kyangosi Horticultural and Beekeepers Self Help, with 20 members (2 females and 17 males), have adopted to bee-keeping after receiving support from ELRP, which included apiary kits comprising of 30 Langstroth bee hives, a centrifugal machine, 2 pairs of harvesting suits and other accessories, all valued at KES 250,000.

"We plan to acquire more beehives for individual farmers to foster increased honey production and enhance collective sales," says Simon Mutua Kisilu, the group's chairperson.

The beekeeping initiative has sparked a quiet revolution within the wider community, delivering benefits that go far beyond honey production.

Elsewhere, in Tiaty West sub-County of Baringo, members of Sokoyo Women Group are celebrating their success after diversifying into poultry keeping. *"We have the freedom to sell chicken, unlike goats and cattle, which are owned and controlled by men,"* states Purity Chepchuma, a member of the group. Purity has renovated her home, started saving through table banking, and mentored 12 other women.

The transformation of the Sokotyo Farmers Self-Help Group highlights capacity of households to bounce back when women are equipped with training, resources, and the freedom to act.

Purity Chepchuma With the egg collection of the day

Janet Kiptilit feeding her chicken

Animal health: As a result of animal health interventions; many farmers reported reduced mortalities, increased survival rates, reduced disease morbidity and improved body condition of marketable livestock.

"Before, community members had to travel over 60 kilometres to Merti town just to get basic animal medicine. "Now, they get what they need right here at home and with expert advice," explains Hassan Boru, the chairperson of Bassa Self-Help Group, in Merti Town, Isiolo County. This was after the group, through the ELRP support, established an agro-vet shop within the Bassa area to serve the local community.

Enhanced livelihood resilience: Communities have adopted sustainable and resilient alternative livelihood options including bee keeping, poultry, fishing, climate smart agriculture and among others. These interventions have reduced vulnerability and enhanced capacity of communities to bounce back and cope with the challenges of climate change. For example, in Marsabit County, members of Gurapau Women Group, from the El Molo community, who live along the shores of Lake Victoria have enhanced their resilience, through the project support. Their animal herd was wiped out following the DL invasion and the drought. They currently use the fishing gear, given through the support of the project, to support their livelihood.

"Our group has grown stronger. The boat from ELRP has been a game-changer. We can now fish more. With the income, we've been able to buy food during droughts, pay school fees, and provide our families with fresh water for drinking," says Teresa Lowa, a member of the group.

Lessons learnt

- Integration of the local communities in rangeland management has the potential to bridge gaps and challenges such as unchecked intrusion into areas being re-seeded.
- **Restocking using small stock** is useful in rapidly restoring livelihoods as part of emergency response since they are

prolific, have short generation intervals, and tend to multiply faster.

- **Community engagement targeting for greater impact:** The Participatory Integrated Community Development (PICD) process effectively identified community needs, challenges and potential solutions for rapid restoration. For example, women bear the burden of household livelihood. However, they have limited voice in household decision-making. Prioritizing them, therefore, in small stock re-stocking enhanced their involvement and pace in livelihoods restoration and resilience building.

Recommendations

- Documenting and scaling up successful initiatives, should be encouraged alongside institutionalizing monitoring and evaluation (M&E) learning platforms to support adaptive management and replication in other ASAL Counties.
- Vaccination campaigns should be well synchronised and coordinated among neighbouring counties to enhance disease control and herd immunity among the livestock populations, which normally move across county borders.
- Prioritize long term and sustainable drought intervention initiatives such as fodder production, storage and conservation.
- There is need for counties to customize the *Guidelines on sustainable ruminants feeds and nutrition security for Kenya (2023)* to suit county-context specific feed and fodder availability during drought and related emergencies.

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Improving Water Access and Restoring Land for Community Resilience

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Introduction

Water scarcity is a profound and growing challenge in Kenya's arid and semi-arid lands (ASALs). The challenge affects millions of people, particularly in areas prone to extreme drought and insufficient infrastructure. ASAL regions cover about 85% of Kenya's landmass and are home to approximately 38% of the population *(https://majinaufanisi.org/)*. These areas experience harsh climatic conditions, with minimal rainfall, which exacerbates the water crisis. These regions are characterised by extreme weather patterns, including prolonged droughts and occasional floods. Annual rainfall in ASAL regions often falls below 500 mm, with some areas receiving as little as 200 mm, compared to the national average of 630 mm (Maji na Ufanisi, 2025)

The arid nature of the land makes it difficult to entirely depend on rain-fed agriculture, leading to a reliance on livestock herding and irrigation, which is heavily dependent on water availability. This makes drought a critical factor influencing the livelihoods of the local populations.

Water needs and challenges in ASALs

Kenya's total annual renewable water resources per person is only 617m^3 (FAO, EU, CIRAD, 2023), which is below the water scarcity threshold of 1,700m^3. Over-extraction of groundwater has led to the depletion of aquifers, like Merti in Isiolo and Nairobi, due to high demand. Erratic rainfall and prolonged droughts have worsened the water shortages. Additionally, many ASAL communities rely on seasonal rivers and traditional wells, which dry up during droughts.

In Kenya, the worst locust invasion in 70 years primarily impacted the ASAL region, beginning in December 2019 when swarms crossed the border from Ethiopia and Somalia. The infestation spread to 28 counties in the country, destroying approximately 175,000 hectares of crops and pastureland, with 164,000 households suffering losses, and exposing 3 million vulnerable people to food insecurity.

FAO projected that, without significant intervention, 20%–35% of pastureland in the affected regions of East Africa would be depleted, forcing abnormal livestock migration, animal losses, and distress livestock sales. Additionally, the locust crisis threatened 30%–50% of cereal crops, leading to potential food shortages *(https://www.worldbank.org/en/news)*. The situation was made worse by a drought in 2022 that affected the region right after the locust invasion.

Being a predominantly water scarce and low precipitation area even in normal crop production seasons, therefore, underscored the need for irrigation infrastructure development and promotion of Sustainable Land Management (SLM) strategies.

Water scarcity and degraded lands

Water scarcity and land degradation are critical and interlinked challenges facing Kenya's arid and semi-arid lands, which cover 85% of the country's territory and are home to 38% of the population *(https://www.acted.org/en)*. These regions receive minimal and erratic rainfall, some as low as 200 mm annually, compared to the national average of 630 mm, leading to severe water shortages that undermine livelihoods dependent on agriculture and livestock. Simultaneously, unsustainable land-use practices and climate-induced shocks such as droughts and floods have accelerated land degradation, reducing soil fertility and productivity. The situation was aggravated by the 2019 –2021 Desert Locust (DL) invasion, which decimated crops and pastureland, pushing millions into food insecurity and exposing the fragility of ecosystems in ASAL regions. These overlapping crises underscored the urgent need for integrated water and land management interventions to restore degraded landscapes, improve water access, and enhance the resilience of rural communities.

Interventions

In response to the challenges brought about by the locust invasion and drought, interventions by the Emergency Locust Response Program (ELRP) aimed at helping the affected households to restore their productive assets for sustained food security and enhanced adaptation and resilience. Specifically, for this case, the interventions focused on improving water access through irrigation infrastructure, and SLM practices.

Identification of community priority challenges and potential interventions: As an entry point, ELRP used a Participatory Integrated Community Development (PICD) process to identify community priority challenges and potential interventions that would alleviate the situation. Among the interventions identified by the communities were: access to water for crops and livestock, appropriate soil and water conservation technologies, and SLM approaches. There was also a critical need to shift towards more sustainable and adaptive systems that reduce dependency on rain-fed agriculture and fossil fuel-powered irrigation. These interventions aligned to the County Integrated

Development Plan (CIDP) for each county and were prioritized based on their potential contribution to restoring livelihoods and building resilience for the communities who were recovering from the shocks of locust invasion and drought. To actualise the proposed interventions, communities, with the support of the county technical departments, presented project proposals. These proposals were then subjected to technical appraisal and verification before being recommended by the County Technical Advisory Committee (CTAC) and subsequent approval by the National Technical Advisory Committee (NTAC). For water trucking interventions, ELRP supported communities as an emergency response mechanism.

The interventions were rolled out in 15 counties that were severely impacted by the twin disasters of Desert Locust invasion and drought. Key water infrastructure projects were implemented in ten counties namely: West Pokot, Kitui, Machakos, Turkana, Marsabit, Garissa, Mandera, Tana River, Tharaka Nithi, and Samburu. The SLM activities were undertaken in eight counties; Elgeyo Marakwet, Embu, Garissa, Wajir, Kitui, Meru, West Pokot, and Machakos.

Each county implemented the activities outlined in the proposals submitted by the communities, through the support of relevant technical departments. The process of implementation depended mainly on the type of infrastructural development to be undertaken. They were mainly rehabilitation works for existing water infrastructural investments such as irrigation canals, water pans, borehole solarisation, farm ponds, and irrigation reticulation. Additionally, to support restoration of degraded crop and range lands, SLM practices were implemented. This included agroforestry, and soil and water conservation systems. The implementation of the interventions was done in compliance with the Environmental and Social Safeguards Standards developed by World Bank, taking into consideration inclusion of Vulnerable and Marginalized Groups (VMGs) and Indigenous Persons (IP).

Rehabilitating the water infrastructure: This involved rehabilitating water pans, farm ponds, boreholes and canals in West Pokot, Kitui, Machakos, Turkana, Marsabit, Garissa, Mandera, Tana River, Tharaka Nithi, and Samburu counties that cumulatively led to 1045 hectares under irrigation and availing water to 547,584 livestock heads.

- **Water pan rehabilitation:** The ELRP, working in collaboration with the communities and the respective county governments, rehabilitated and equipped 18 water pans with solar pumping systems in 8 counties namely Wajir, Garissa, Marsabit, Machakos, Kitui, Mandera, Turkana. The capacities of the rehabilitated water pans ranged from 20,000m^3 to 30,000m^3, adding 149 hectares under irrigation as well as availing water to 32,685 livestock heads.

- **Farm ponds:** To enhance access to water at the farm level, the project constructed reservoirs for the purpose of storing water, essentially from surface run-off. These reservoirs had a capacity of 300m^3. Farmers were able to establish small irrigation plots for kitchen gardens using the harvested water as well as watering livestock, especially the young stock that cannot trek to far-off watering points. For example, in Machakos, Embu and Meru counties, 113 farm ponds and solar-powered micro-irrigation systems were constructed. Through this initiative, a total of 30 hectares were put under irrigation for horticultural crops.
- **Borehole rehabilitation:** The project supported solarisation and equipping of 22 boreholes, which had been operating dismally due to high power costs. These were boreholes already existing in the communities. In these boreholes, ELRP facilitated the rehabilitation and installation of solar power. This intervention benefitted 10 counties. The boreholes were installed with climate-smart solar power systems, replacing costly diesel-powered pumps, and this ensured round-the-clock water availability. Water from the boreholes was utilized for small-scale irrigation and for livestock. The boreholes supported 506 hectares of horticultural crop farming and 514,899 livestock heads.
- **Canal rehabilitation:** To enhance water distribution and reduce seepage in the canals, the project, in Turkana and Meru counties, supported lining and intake repairs for 2.525 km of water canals to improve access to adequate water, which enhanced irrigation of 360 hectares of land for the entire cropping season.

Sustainable land management (SLM): The SLM interventions, aimed at improving the overall soil and water conditions, micro-climate and conservation of soil fertility for better water utilization, were implemented by the communities. These interventions encompassed soil and water conservation structures such as terraces, zai pits, and check dams. Agroforestry was promoted through the establishment of community tree nurseries and the distribution of high-value fruit tree seedlings. Conservation agriculture techniques such as composting, mulching and reduced tillage, were widely promoted by the project. Furthermore, the project supported cultivation of commercial tree crops like mango, avocado, macadamia and coffee, resulting in 2,741.2 hectares being restored to productivity through the SLM interventions:

- **Soil and water conservation:** Various integrated soil fertility management options were promoted by the project to improve soil fertility and increase water-holding capacity, complementing interventions targeting soil erosion and water management. Over 1,500 structures, including terraces, zai pits, and check dams, were constructed, reducing erosion and improving water retention in 6.2 hectares of denuded rangeland.

- **Agroforestry and tree nurseries:** By integrating trees with crops and livestock, the project aimed at contributing to soil fertility enhancement, improving water retention, and aiding biodiversity conservation. Farmers across the project areas raised and distributed more than 545,000 seedlings, including macadamia, *Grevillea,* mango and avocado. An additional 307,000 seedlings were produced in the nurseries after the first distribution due to the increase in demand for seedlings. In Meru County, for example, over 5,000 grafted mango and avocado trees were planted besides the re-introduction of coffee in areas that had abandoned growing the crop. Up to 62,356 hectares of land was rehabilitated using the various strategies mentioned above. For crop productivity improvement, farmers also received input packets and training.
- **Conservation agriculture:** Conservation agriculture was implemented as a SLM strategy to enhance soil health, improve water retention and increase agricultural productivity while minimizing environmental degradation. Using this approach, the project focused on three key principles: minimum soil disturbance, permanent soil cover, and crop diversification. The project promoted sustainable practices such as composting, mulching and reduced tillage, which were applied on over 485 hectares, particularly in Machakos, to reduce soil degradation and enhance productivity.
- **Rangeland rehabilitation:** Through community engagement and prioritization, the project identified sites, based on the level of degradation and through guidance by the county technical department, for range rehabilitation. This was for effective use of degraded rangelands through the development of pastures. Pasture establishment Technologies, Innovations, and Management Practices (TIMPs) were promoted for pasture production and natural pasture improvement through re-seeding with suitable adaptable seeds, notably Rhodes grass, Maasai love grass, and African foxtail *(Cenchrus ciliaris)*. A total of 121,492 hectares of degraded areas were re-seeded, and pastures grown and placed under SLM strategies in the counties of implementation.

Management of the water projects: The project facilitated the establishment of 81 Project Management Committees (PMCs), one for each water project investment, to oversee the implementation process and its future sustainability. The committees comprised 13 members, both male and female, and were tasked with the day-to-day running of the investment as it was being constructed. After the completion of the investments, the PMCs transitioned into Water Users Associations (WUAs). The PMCs and WUAs were trained on technical and governance issues to equip them with skills and knowledge needed to ensure efficient and sustainable utilization of the water resources. The PMCs and WUAs were required to register with the relevant statutory organisations managing the water bodies in the country. This was to enable them to function within the laws and regulations of the country.

Water trucking: The project used water trucking as a crucial short-term intervention for water provision in the hardest-hit areas of drought-stricken counties to minimize livestock mortality during the drought. This involved transporting water from permanent sources, such as boreholes or reservoirs, to communities lacking reliable access to water mainly for livestock use. This was a stop-gap mechanism as other more sustainable systems were put in place to alleviate the water shortage during prolonged dry spells. In Samburu, Marsabit and Garrissa counties, for example, emergency water trucking reached over 1,000 households and benefitted over 447,800 livestock heads.

The Results

Enhanced crop production and productivity through irrigation: The rehabilitated and constructed water infrastructure, including the 18 water pans and 113 farm ponds, have opened 179 hectares of land, previously not irrigated, for irrigation and improved crop and livestock production. As a result, communities have reported using the water sources to grow crops and rear livestock. This has contributed to enhanced food production and stabilized livelihoods. Additionally, with the availability of water and the PMCs in place, the communities can produce their food without having to rely solely on the erratic rains. For example, in West Pokot County, the Soibei Irrigation Scheme enabled all-year-round farming through gravity-fed water systems, opening 1,039 hectares of land for irrigation for over 300 households who began cultivating vegetables and cereals. This resulted in an increase of 80% production since they are able to do two seasons of maize production as opposed to one previously. Similarly, the Tot-Kolowa canal system in Elgeyo Marakwet County opened 960 hectares of land to gravity-fed irrigation, improving household food security associated with improved production. The 30 hectares put under irrigation for horticultural crops have been used by the communities to establish kitchen gardening and high-value horticulture, enhancing household nutrition and incomes.

In the course of project implementation, a total of 22 boreholes were drilled and equipped with solar-powered systems, effectively replacing diesel-powered pumps. This transition significantly improved reliability, promoted use of clean energy and reduced operational costs, while supporting horticultural farming across 506 hectares. This contributed to nutritional and food security, and access to diverse horticultural products for the community while providing incomes from the sales of surplus produce.

Desert Springs: Hope Flows from the Abakaile Borehole

A herder guides livestock to drink at the newly rehabilitated Abakaile borehole at Abakaile Village, in Garissa County

Abakaile Village, in Dadaab Sub-County of Garissa County is no stranger to hardship. The village is a vital stopover, serving as a watering point for thousands of livestock in need of water. When the Desert Locust invasion hit the village, followed by a circle of drought, the Abakaile borehole, the only source of clean water for the village, was barely functional. The diesel pump was broken, troughs were cracked and crumbling, and storage tanks were in disrepair. Over 18,000 households and more than 100,000 animals were left in dire distress as a result.

Amid the deepening crisis, the ELRP stepped in, and through the project's support, the borehole was rehabilitated and solarized to ease the growing burden of fuel costs for operating the pump. The project installed a solar-powered pump, fenced the borehole site, constructed two new animal watering troughs and renovated two elevated water storage tanks. The impact was immediate. The newly renovated elevated water tank now provides reliable storage for the village, Garissa County.

"Now, my animals drink every day and they are productive," says Bashir Dubow, a community member.

The transformation in Abakaile Village is not just physical. It is eeply emotional. The ripple effect is unmistakable; better livestock health, less time wasted on water treks, a renewed sense of dignity and hope, and prosperity to a community where water means survival.

Enhanced livestock production and reduced livestock mortality: The rehabilitation and construction of boreholes across target counties led to access to livestock water for 547,584 livestock heads. The water pans alone provided access to water for 32,685 livestock heads. In the counties, the improved irrigation channels, water pans, and boreholes enabled communities to access water for use and for pasture and fodder production just by the improved irrigation channels. Garissa, Isiolo, and Wajir counties reported a reduction of trekking distance for livestock of between 7 to 13 kilometers, thus improving body condition and livestock health. Emergency water trucking, which reached over 1,000 households and safeguarded over 447,800 heads of livestock during peak drought periods, proved critical in reducing livestock mortality, averting livestock losses and maintaining community stability during the acute drought following the locust invasion.

Quenching a community's thirst: The story of masukanioni community borehole

For the Masukanioni community, in Tyaa/ Kamuthale Location within Kitui County, it is a case of where clean water flows, life begins to thrive. The community, nested in the semi-arid region that receives 450 mm of rainfall per year, derives its livelihood mainly from livestock keeping (goats and chicken), and growing green grams when rains fall. In 2019 and 2020, Masukanioni area was hit by the Desert Locust invasion, destroying crops and pasture. This was followed by a biting drought. This left the community in a precarious situation. However, in 2021 the Government of Kenya, through the Emergency Locust Response Programme (ELRP) intervened in a bid to restore the livelihoods of the affected community. Working with the community members, the project rehabilitated the dysfunctional Masukanioni borehole. The borehole had been drilled and capped by the

County Government of Kitui in 2020 but was not completed. A solar water pumping system, reticulation, a water kiosk, cattle drinking trough and steel water tower with two 10,000 litre water tanks were constructed and installed. The borehole currently serves 1,500 households, 7,500 cattle and 15,000 goats. It has also reduced the distance travelled by community members to 2 km instead of 6 km, on average, to collect water. The borehole is managed by a Project Management Committee (PMC), which is in the process of transitioning into a water user association (WUA), for sustainability.

The water project has had a big impact as attested by the community members. Kukia Kilonzo, a local farmer says:

"Before this project, I planted my crops during the rainy season only. Now, I grow vegetables all year round and I am able to feed my family on a balanced diet, I sell the surplus and make KES 3,000 per month," says Charles Musyoka, a member of Masukanioni community, in Tyaa/ Kamuthale Location within Kitui County, who benefitted from the ELRP intervention.

Kukia Kilonzo, a member of Masukanioni community in Tyaa/Kamuthale Location within Kitui County, at her storey kitchen garden supported by the ELRP project.

Livestock quenching thirst from Masukanioni community livestock water trough in Tyaa/ Kamuthale Location of Kitui County.

Stabilised rangelands, enhanced fodder availability, and improved livestock health: In the realm of SLM, the over 1,500 soil and water conservation structures constructed led to the rehabilitation of over 62,777m2 of degraded rangeland. These rangelands were stabilised by planting fodder crops; 4,000 splits of Super Napier, 3,000 seedlings of *calliandra*, 2,000 seedlings of leuceana and 2,500 splits of Brachiaria. This resulted in enhanced fodder availability for the livestock.

"My land retains water much longer than before, and I have noticed reduced erosion. My crops appear healthier this season. After we were trained and implemented terracing on our farms, our crops have performed better. As the seasons pass, this area will not be the same," says Mary Mugo, Mbu's Kianjoya Village community member, Meru County.

Additionally, the more than 545,000 seedlings raised, distributed and planted helped stabilise the soil in the 2,741.2 hectares rehabilitated, resulting in reduced erosion of soils and siltation of water infrastructure, and improved micro-climates. They also generated alternative income streams for farmers through timber, fruits, fodder, and other agroforestry products, further bolstering resilience against climatic and economic uncertainties.

Sheila Cherop's journey in West Pokot has been marked by several key milestones that reflect her dedication and innovation in farming. She embraced SLM practices, such as contour farming, zai pits and organic composting, which have significantly enhanced soil fertility and moisture retention on her farm. In addition, Sheila has adopted regular monitoring and integrated pest management techniques, leading to a drastic reduction in crop loss due to pests and diseases. These improvements have translated into a *remarkable increase in income, with each mature mango tree yielding up to 300 fruits annually. As a result, Sheila now earns over KES 150,000 per year from fruit sales alone, representing more than a six-fold increase in her earnings.*

Conservation agriculture techniques were employed in over 1,200 acres, leading to slowed land degradation, increased water retention, and improved crop productivity. Re-introduction of coffee alongside 5,000 grafted mango and avocado trees supported both income diversification and resilience, particularly for smallholder farmers.

The 826 hectares of rangelands rehabilitated, through improved management strategies and re-seeding with Rhodes grass, Maasai love grass, and African foxtail *(Cenchrus ciliaris)*, enabled regeneration of livestock fodder and pasture leading to improved body condition, improved health conditions and lower mortality for the livestock.

This broad level results seen in improved productivity, community testimonials, and rehabilitated ecosystems demonstrate the effectiveness of ELRP's localised, data-driven investments. As Samuel Rono, a youth group leader from Elgeyo Marakwet, shares: *"We used to view these bare hills as useless, but now, with terraces and trees, they're green and earning us money."* Such experiences underscore the transformative potential of integrated climate resilience programming when tailored to local needs and driven by community participation.

Overall, the ELRP demonstrated that targeted water infrastructure is not only an essential input for climate-resilient agriculture, but also a catalyst for sustainable rural transformation.

Key impacts

Water availability through irrigation reduced the risk of crop failure. This, in turn, increased the expected return on complementary investments, such as seeds and fertiliser (Gebregziabher et al., 2012; Namara et al., 2005) further increasing yields and incentives for investment.

Sustainable irrigation strategies, such as efficient water management and soil conservation, are crucial to maximising benefits while minimising harm. The ELRP embraced the approach of supporting the provision of irrigation infrastructure with technical support in capacity development for the community. This ensures sustained use of the facilities for maximum benefits and posterity. Realized impacts were inclusive of but not limited to:

- **Improved water access:** Reduced water fetching time by up to 70% in target communities enabled extra time to be dedicated for agricultural activities, for example, kitchen gardening.

- **Enhanced food security:** Year-round irrigation enabled increased vegetable and cereal production.
- **Increased income and resilience:** Fruit farming, bee-keeping, and poultry ventures provided communities with alternative sources of livelihoods and boosted household incomes as illustrated above in the success story of Sheila Cherop from West Pokot.
- **Restored landscapes:** Vegetative cover, of up to 829 hectares realized, increased significantly, improving soil structure and biodiversity.
- **Empowered groups:** Community-based institutions, such as WUAs and nursery cooperatives took root, reaffirming sustainability.

Implications

The success of ELRP underscores the value of **community-led, integrated approaches**. Combining water infrastructure with climate-smart agriculture has yielded tangible economic, social, and environmental benefits. The lead farmer approach, the PMCs and WUAs ensured knowledge transfer and sustainability. However, challenges such as initial skepticism toward new practices and equipment delays were mitigated through engagement and flexibility.

Sustainability has been built through user-fee models, community savings, and local leadership supporting maintenance and expansion. To further increase impact, future interventions should invest in digital advisory services, expand solar irrigation and strengthen FPOs to absorb increased production.

Further Reading

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Strengthening Response to Crises and Restoring Livelihoods: The Case of Community Institutions

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Introduction

Community-based institutions, including community driven development committees, common interest groups (CDDCs), common interest groups (CIGs), vulnerable and marginalized groups (VMGs), and farmer producer organizations (FPOs), water user associations (WUAs), irrigation water user associations (IWUAs), project management committees (PMCs), and savings and credit cooperative societies (SACCOs) are central to local development and empowerment in Kenya, serving as the backbone of resilience efforts. These institutions are often organized around common needs, shared livelihoods and access to local resources. Studies show that SACCOs, for instance, play a crucial role in the economic development of Kenya (Sydney & Gachau, 2024).

In times of disasters, such as invasions by migratory pests or extreme climate events, community-based institutions play a crucial role by providing trusted and inclusive spaces for decision-making, resource pooling, and collective action among community members. Embedded within the community, these institutions are capable of raising early alerts, mobilizing community responses, sharing knowledge and implementing practical, locally-grounded interventions. Their deep understanding of local realities positions them as essential partners in developing timely, effective and sustainable interventions.

This case study examines the significant role of community-based institutions in responding to the impacts of the desert locust invasion, from 2019 to 2021, as well as the subsequent drought, in 2022, that resulted in substantial losses of crops, pastures, and livestock, destabilizing livelihoods and food security. The response was coordinated by the Emergency Locust Response Program (ELRP), with funding support from the Government of Kenya and the World Bank, covering 15 counties in the arid and semi-arid lands (ASALs). This case study highlights the effectiveness of these institutions in fostering resilience and adaptive capacity within vulnerable communities during the crisis situation in Kenya.

Despite the desert locust invasion and the subsequent drought's devastating impact, community efforts to mitigate these challenges were significantly hampered by a lack of robust community-based institutions. The limited cohesion and integration among affected communities made it difficult to present a united front for resilience building. Additional obstacles included inadequate technical knowledge and skills within existing community organizations, poor governance, low membership and insufficient capital, particularly in Savings and Credit Cooperative Organizations (SACCOs) and Farmer Producer Organizations (FPOs). Moreover, farmers faced challenges in accessing essential farm inputs that could have aided in restoring their livelihoods.

Strengthening Community Institutions for Resilience

In response to the dual challenges of locust invasions and drought, ELRP implemented strategic interventions designed to enhance community-based institutions, fostering effective livelihood restoration and resilience building. This included the following.

Community Mobilization: A key initial step was the introduction of a participatory integrated community development (PICD) process. This approach aimed to identify and empower local institutions to spearhead resilience-building and livelihood restoration initiatives. In each county, PICD teams were established, comprising representatives from various county departments of crops, livestock, cooperatives, social services, development partners, and community members from diverse wards. These teams underwent training on the PICD methodology before engaging with community members to facilitate meaningful dialogue and collaboration. Each ward was divided into four zones, from which two representatives, one male and one female, were selected to join the PICD teams. The engagement process lasted between 7 to 14 days in each ward, depending on whether a partial or full PICD approach was applied.

The culmination of this collaborative effort was the development of Community Integrated Action Plans (CIAPs). These plans not only directed the prioritization and implementation of project interventions but also fostered the formation and/or strengthening of community-based institutions. Such institutions played a crucial role in enhancing local resilience and ensuring effective responses to crises, thereby aiding in the restoration of livelihoods amid adversity.

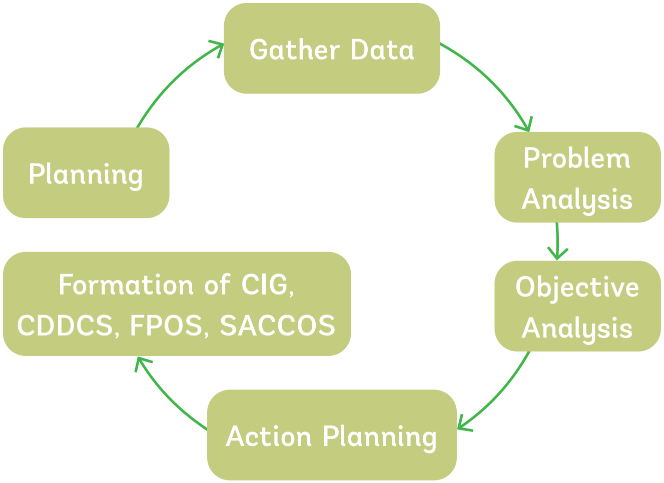


Figure 1: An illustration of the PICD Process

Establishing and or strengthening community-based institutions

The ELRP implemented interventions aimed at establishing and strengthening community-based institutions, which was triggered by the development of Community Integrated Action Plans (CIAPs). These institutions were essential for enhancing productivity and supporting livelihoods in the face of ongoing crises and beyond.

Common Interest Groups (CIGs) and Vulnerable and Marginalized Groups (VMGs): Throughout the PICD process, county technical teams sensitized community members on the potential project investments and opportunities available for formation of CIGs and VMGs in targeted wards. These groups served as critical access points for production inputs, collective aggregation, marketing and knowledge transfer regarding technologies, innovations and management practices (TIMPs). Over the project period, 13,555 institutions were enlisted of which 5,981 CIGs/VMGs received micro-project funding from the ELRP. The funding was based on the proposals developed, and included crop-based or livestock-based groups. They received tailored input packages including seeds, fertilizers, tools and equipment, alongside training on TIMPs to enhance production and management. As a result of the TIMPs training and the provision of input packets, 160,084 households adopted more than two TIMPs, accounting for 80% of the project's direct beneficiaries, which led to diversification of livelihood sources and increased agricultural production, ultimately boosting household incomes.

Lead farmers and champions were identified and trained in various TIMPs. This training was cascaded within farming groups, promoting peer-to-peer learning. As a result, lead farmers cascaded localized on-farm demonstrations, enhancing service delivery in agricultural extension. This approach improved TIMPs adoption among group members, leading to increased production and strengthened community collaboration.

Community-Driven Development Committees (CDDCs): The project established CDDCs as key entities to support Common Interest Groups (CIGs) and Vulnerable and Marginalized Groups

(VMGs) at the ward level. A total of 144 CDDCs were formed, comprising representatives from the four zones in each project ward, with 62% of members being men and 38% women, ensuring gender and social inclusion. The committees had sub-committees including: the executive, the finance, the procurement and the social accountability and integrity committee (SAIC).

CDDCs played multiple roles, including serving as vital links between communities and development partners, mobilizing farmers into CIGs and VMGs, appraising existing groups for support, vetting micro-project proposals for county technical committee approval, procuring and distributing inputs, and monitoring their utilization. The committees also addressed grievances among group members, resolving issues at the source or escalating them as needed.

The project undertook an assessment of the capacity of CDDCs and provided specialized training for the members in leadership and governance, financial management, public procurement procedures, group dynamics, grievance management, and networking skills, which enhanced their capacity to effectively fulfill their roles. This intervention resulted in improved community engagement, better resource allocation, and strengthened collaboration between farmers and development partners, ultimately fostering greater resilience and productivity within the community.

Project Management Committees (PMCs), Irrigation Water Users Associations (IWUAs) and Water Users Associations (WUAs): These committees were established and strengthened to serve as a bridge between the community and the County Project Coordination Unit (CPCU). Elected from within the community, these committees were responsible for monitoring the day-to-day management of priority community investments at county level, particularly in water infrastructure and sustainable land management.

A total of 81 PMCs were formed and trained to oversee the implementation and maintenance of water infrastructure, ensuring its long-term sustainability. Upon completion of the sub-projects, the PMCs were transitioned into Irrigation Water Users Associations (IWUAs) and Water Users Associations (WUAs) with the help of training and registration support.

This intervention enhanced local governance and community engagement in water management, resulting in improved sustainability of water resources and greater community ownership of infrastructure projects.

Farmer Producer Organizations (FPOs): FPOs played a crucial role in facilitating farm input supply, produce aggregation, and organized marketing. The project identified 85 Farmer Producer Organizations (FPOs) and subjected them to a grading process based on specific parameters, including membership levels, enterprise diversification, and operations as shown in Table 1 below. This assessment resulted in the categorization of the FPOs into three bands. Subsequently, each of the 15 implementing counties selected four FPOs that demonstrated readiness to receive inclusion grants. The grading process informed the development and implementation of a comprehensive capacity-building marshal plan aimed at strengthening the FPOs for effective commercial engagement in markets.

Table 1: The ELRP FPO grading tool

A. Background	No of services FPO offers its members.
	No of years the FPO has been in existence as a registered entity?
	No of years FPO has operated bank account(s)?
	No women in the FPO Mgmt. Committee:
B. Farmer Organization	How many CIGs/VMGs are federated to the FPO?
	What is the total no of Farmers served by FPO?
	Coverage: No of Wards served by FPO
	No of current project partnerships with different agencies e.g. WB
C. Capacity of PO	Management & Staff portfolio
	No of mechanization services being offered by FPO?
	FPO involved in processing or value addition/ no of brand names in use?
	No of sub aggregation /collection centers to support collective marketing?
D. PO Financials	No of FPO revenue streams in 2022?
	No of years FPO has been audited?
	Annual turnover in the last audit?
	Did the last audit show profit or loss?

E. Other Issues	
	No of key activities performed by other partners?
	How many policies are in use by the FPO?
	How many digital technologies/tools are in use ?
	No of AGMs held by the FPO in the last ten years?

Fifty-nine (59) Farmer Producer Organizations (FPOs) were geotagged following their grading, and 33 of these FPOs were automated with computers and digital weighing scales, which improved transparency and accountability. To further enhance these organizations, they received inclusion grants designed to enhance FPO management capacity by training leadership and management committees in business planning, financial management, marketing, governance, and agricultural practices (TIMPs). This support also encompassed the recruitment of new members and the acquisition of computers to aid in automation. Consequently, 1,007 Community Interest Groups (CIGs) and Vulnerable and Marginalised Groups (VMGs) were federated into FPOs, leading to an 65% increase in total membership.

Savings and Credit Cooperative Organisations (SACCOs) served as a vital platform for savings and credit services to individual farmers and FPOs to enhance access to agricultural inputs. A total of 48 SACCOs were automated. Additionally, 1,900 CIGs/VMGs were affiliated to SACCOs, which led to a 40% increase in membership. This development significantly enhanced financial inclusion and support for community members.

Through these initiatives, ELRP not only strengthened community-based institutions but also supported their capacity to respond to crises and restore livelihoods.

Results

Strengthening of the community institutions led to significant results in fostering resilience to crisis and restoring livelihoods. The key results include the following:

- **Improved crop and livestock productivity:** The interventions restored and strengthened the livelihoods of 385,914 households across the 15 ASAL counties, significantly increasing their resilience to future shocks. The input packages and training provided to farmers through the CIGs and VMGs led to improved crop and livestock production. The community groups also facilitated collective access to inputs, markets, and technical support and training. This helped in enhancing productivity and in stabilising and restoring livelihoods while building resilience of the communities affected by locust invasion and drought. TIMPs encompassed a range of techniques and strategies aimed at improving agricultural productivity. Enhanced training on TIMPs led to increased agricultural and livestock yields, contributing to greater food security and household incomes. Cascading of TIMPs through the lead and champion farmers ensured a wide coverage, therefore increasing adoption of TIMPs and leading to increased productivity and livelihood diversification, and restoration of agricultural and pasture land.

- The integration of Common Interest Groups (CIGs) and Vulnerable and Marginalized Groups (VMGs) into Farmer Producer Organizations (FPOs) facilitated new income-generating activities, reducing dependency on single sources of income through diversified livelihoods.
- **Capacity-building initiatives** strengthened the leadership and management skills of community institutions, enabling them to effectively and collectively advocate for their needs and manage resources leading to empowered groups and communities. The case of establishing and strengthening PMCs, IWUAs and WUAs improved oversight of water infrastructure projects, ensuring long-term sustainability and responsible resource use.
- The formation of Community Driven Development Committees (CDDCs) and the emphasis on gender inclusion ensured that marginalized voices were represented and engaged in decision-making processes, fostering social cohesion and more inclusive structures.

Clucking back to life: How Ywalakip Cooperative turned despair into resilience

Ywalakip Farmers' Cooperative Society Limited, situated in the heart of the bustling town of Chepareria, in West Pokot County, boasts of 245 dedicated members (162 women and 83 men). Started as a self-help group by the name Kaywala Self-help group, the cooperative's formation was driven by the need to break free from the cycle of poverty and disempowerment among smallholder farmers in Chepareria ward. Their dream was simple: grow more, sell better, and earn more.

But the group members faced persistent challenges that significantly limited their progress. Fragmented production was a major issue, as most members operated individually, making it difficult to meet market demand consistently or to negotiate fair prices. This disjointed approach left them vulnerable to exploitation by middlemen, who purchased birds at KES 250 – 300, far below their actual market value. This was compounded by a lack of training; many members had limited knowledge of biosecurity, proper feeding practices, and disease control, which led to high poultry mortality rates. The group also suffered from poor infrastructure, with no central meeting space, storage facility, or office. This hindered coordination and reduced their visibility in the formal market. Furthermore, limited savings and lack of access to credit made it nearly impossible for members to scale up production or invest in improvements.

The 2019–2021 desert locust invasion added to their misery. The voracious pests devoured fields and pastures, wiping out cereals and green fodder. This meant the loss of their main source of food and their cash crops, pushing them further into poverty.

In 2023, the SACCO, through the ELRP support, received an inclusion grant of KES 500,000. SACCO used the funds to rent and furnish an office in Chepareria town. It also purchased office furniture, computers, connected to the internet, acquired stationery and acquired other tools critical for record-keeping. It embraced digital communication, and acquired branding and promotional materials, including a branded banner, improving their visibility and appeal to formal markets. They also used the funds to conduct member mobilization drives and training sessions across 16 CIGs and VMGs, and trained members on production planning, biosecurity measures, record keeping, and market negotiation skills. This enabled the SACCO to evolve from a scattered cluster of farmers to a coordinated, market-ready entity. As a result, poultry flock sizes have increased more than two-fold, with the average household now rearing between 50 and 100 birds, a significant rise from the previous an average of just 12. This growth, coupled with collective marketing efforts, has enabled members to sell chickens at improved prices, ranging from KES 850 to 1,500, up from the earlier KES 300 on average, greatly boosting their earnings. Monthly income for individual group members has risen by 30% to 40%, from an average of KES 3,500 to over KES 5,000.

Additionally, the SACCO has secured a contract with a local egg distributor, which has ensured steady sales and minimized post-harvest losses. As a result, over 65% of members have reported significant improvements in household welfare, including timely payment of school fees, access to healthcare without relying on loans, and the ability to upgrade poultry shelters and improve the quality of feed. *"The cooperative changed my life. I now sell in bulk and plan my production better. My children haven't missed school in two terms,"* says Pauline Lotelemoi, the cooperative's secretary and member. The cooperative also became a central hub for learning, attracting youth and women who had previously been excluded from formal farming networks.

"We now dream beyond just selling chicken. We want to process, brand, and even export someday," adds Dorcas Cheptoo, the cooperative's treasurer.

The SACCO members outside their office

The cooperative's chairlady, treasurer and members inspecting their poultry

In Elgeyo Marakwet County, Peninah Cheruiyot, a member of Kapsigot Self-Help Group, stands as a real testament to the resilience of smallholder farmers built through the project's intervention. Her story of diversified livelihoods started the moment members of her CIG, from an onion farming enterprise, decided to share dividends equally among the 12 group members, with each member receiving KES 30,000. Majority of the members used their share to pay for their children's school fees, while a few invested in purchasing livestock for diversification of income sources. In her case Peninah, using dividends she earned, bought a dairy cow. Currently, she is milking 5 litres per day and selling part of the milk for extra income. In addition, her family nutrition has greatly improved due to consumption of the milk.

These results indicate that well-functioning community-based institutions can serve effectively as first line of defence against climate and pest-related shocks. They also suggest that strengthened local capacities can translate to better planning, resourcing, utilization and stewardship of natural and financial resources. The targeted inclusion of vulnerable groups can also ensure equitable development and also strengthen community cohesion and mutual support systems.

Penninah Cheruiyot (middle) stands before her dairy cow purchased using proceeds from onion farming. With her is a CPCU staff who was on a M&E exercise.

Lessons learnt

The implementation of these interventions to improve the functioning and role of community institutions provide the following lessons for similar and future projects.

- Engaging local communities in planning, designing and in implementation decision-making processes fosters ownership and enhances the effectiveness of interventions.
- Capacity building is crucial to community leaders and institutions as it helps in strengthening their ability to manage projects and respond to challenges. Establishing and integrating robust systems for monitoring and evaluating interventions helps identify successes and areas for improvement, ensuring continuous learning.
- Inclusive participation enhances resilience: Ensuring that vulnerable and marginalized groups are included in community initiatives leads to more equitable outcomes and strengthens social cohesion.
- Collaboration with community institutions: Building strong partnerships between community institutions and local governments enhances accountability and resource allocation. The transition from PMC to WUAs/IWUAs exemplifies a successful model for community-driven management of investments. By fostering local leadership and accountability, the initiative not only enhanced ownership but also paved the way for sustainable development in the community.
- Adaptability of interventions: Tailoring interventions to the specific needs and contexts of communities increases their relevance and effectiveness.

Recommendations

To build on the gains realized through ELRP and sustain community resilience, the following recommendations are highlighted:

- Foster community engagement, ensuring inclusive participation and collaboration among all stakeholders. This initiative should be complemented by ongoing capacity-building programmes to empower community members effectively.
- Develop a policy framework that officially recognizes and provides resources for Community-Driven Development Institutions, ensuring their role in local governance and sustainable development is prioritized.

Further Reading

Sydney, John & Gachau, John. (2024). The Dynamics and Impact of Savings and Credit Cooperative Societies (SACCOS) in the Kenyan Financial Landscape. 10.13140/RG.2.2.12328.96005. Accessed at: https://www.researchgate.net/publication/377534667_The_Dynamics_and_Impact_of_Savings_and_Credit_Cooperative_Societies_SACCOS_in_the_Kenyan_Financial_Landscape

Capacity Building in Mitigating Adverse Effects of Desert Locust and Drought on Community Livelihoods

Authors: Catherine Kinyanjui, Charles Lung 'aho, Muthoni Muta, Susan Muawiya and Reagan Jephters.

Maalim Mohamed (background) at his farm with Mandera County Director for Agriculture. Maalim is one of the lead farmers trained by the ELRP in Areas farms, Mandera County.

Kenya's Arid and Semi-Arid Lands (ASALs) occupying 80% of the total land mass in 29 counties are ecologically fragile yet critically important for both national food security and economic development. The 2019–2021 desert locust upsurge, one of the worst in decades, devastated crops, pastures, and rangelands, exacerbating food insecurity and threatening the livelihoods of millions in these already vulnerable regions. The locust crisis, compounded by climate change and limited adaptive capacity, underscored the urgent need for innovative and sustainable interventions to restore livelihoods and build resilience among ASAL communities.

The Emergency Locust Response Program (ELRP) 2020 to 2025 was designed to address both the immediate and long-term impacts of the locust invasion. One of its core components focused on initiatives for livelihood restoration and the protection of adversely affected communities in 15 counties. These vulnerable communities were supported through training and capacity building on best practices in relevant Agricultural Technologies, Innovations, and Management Practices (TIMPs).

The problem

Responsive technologies and strategies such as Climate Smart Agriculture (CSA) TIMPs exist and have been successfully applied to mitigate adverse effects of disaster situations such as invasive migratory pests and drought globally. Despite government positive intension to enhance technology dissemination through various policies and strategies, the cascading and adoption of CSA TIMPs is yet to optimised. A significant gap exists in knowledge levels, awareness and accessibility of CSA TIMPs, contributing to the limited uptake of the TIMPs.

ELRP targeted food insecure, vulnerable, marginalized and female-headed households in wards that were adversely affected by DL invasion and drought. The targeted households had inadequate knowledge and skills in the application of CSA TIMPs. The situation was exacerbated by inadequate training, low digital literacy, and cultural reliance on traditional methods of pest control and management. The knowledge gap was further worsened by systemic barriers such as inadequate extension services, with extension officer to farmer ratio of 1:1,000 against the FAO recommendation of 1:400. This was in addition to limited involvement of youth and nomadic pastoralists and other logistical constraints. At the institutional level, lack of coordination and fragmentation among government agencies and departments, Non-Governmental Organizations (NGOs), and private sector partners further led to inconsistent CSA TIMPs dissemination, thus reducing scalability. This gap perpetuated vulnerability, as communities had inadequate skills for sustainable CSA farming practices including diversification. Addressing this knowledge gap required inclusive, localized training, strengthened extension systems, and coordinated stakeholder efforts that would ensure CSA TIMPs offered practical and accessible pathways for fostering resilience and livelihood recovery in ASAL counties.

Interventions

To enhance restoration and resilience for the target communities, the project designed and supported implementation of capacity building interventions with focus on TIMPs with greater impact. The specific interventions were as follows.

Assessing community training needs: In February 2022, the project conducted a training needs assessment (TNA) to identify community priority training areas based on the approved community project proposals. The TNA targeted counties and the Common Interest Groups and Vulnerable and Marginalised Groups (CIGs/VMGs), and identified livelihood restoration interventions, diversification options, and income generation as the priority training areas. A total of 151 Climate-Smart Agriculture Technologies, Innovations and Management Practices (CSA TIMPs) were identified to address the priority training areas, based on their cost-effectiveness, ease of application/use, and capability to meet Climate-Smart Agriculture (CSA) objectives.

Development of training resources. A training manual and user's guide, *Sustainable Agricultural Livelihoods Restoration, Rehabilitation, and Resilience in Kenya* was developed, published online, and hard copies printed and widely disseminated to guide TIMPs training across different levels. The training manual was designed to promote best practices in the design, implementation and evaluation of response and impacts on the livelihood and food security shocks arising from natural disasters. In particular, the training manual focused on equipping trainers with the necessary knowledge and skills to conduct training sessions, including details on course content, facilitation techniques, and evaluation methods. The manual contained five modules on interventions for livelihood restoration and rehabilitation, and five additional modules on alternative livelihoods.

- The modules on *Interventions for livelihood restoration and rehabilitation* include: Climate Change and Variability; Natural Resources Management; Crop Production and Management; Livestock Production and Management; and Rangelands Improvement and Rehabilitation. Each of the five modules has several sub-modules totalling to 53.
- The modules on *Interventions for livelihood restoration and rehabilitation* include: Beekeeping, Aquaculture, gums and resins, Rabbit production and management, weaving and beading.

To complement these modules as well as facilitate their delivery, the project facilitated the development of other guidelines such as on livestock feed preparation- *'Guidelines on Sustainable Ruminant Feed and Nutrition Security for Kenya.*[1]

Establishing a TIMPs delivery architecture: The project established a TIMPs delivery architecture, which consisted of Master trainers who trained TOTs at Tier 1, ToTs who trained Sub-County Technical Teams (SCTTs) at Tier 2, SCTTs who trained Champions and Lead farmers at Tier 3, and Lead farmers who trained members of CIGs/VMGs at Tier 4. The cascading training is shown in Figure 2 below.

Model for cascading training on Technologies, Innovations and Management Practices (TIMPS)

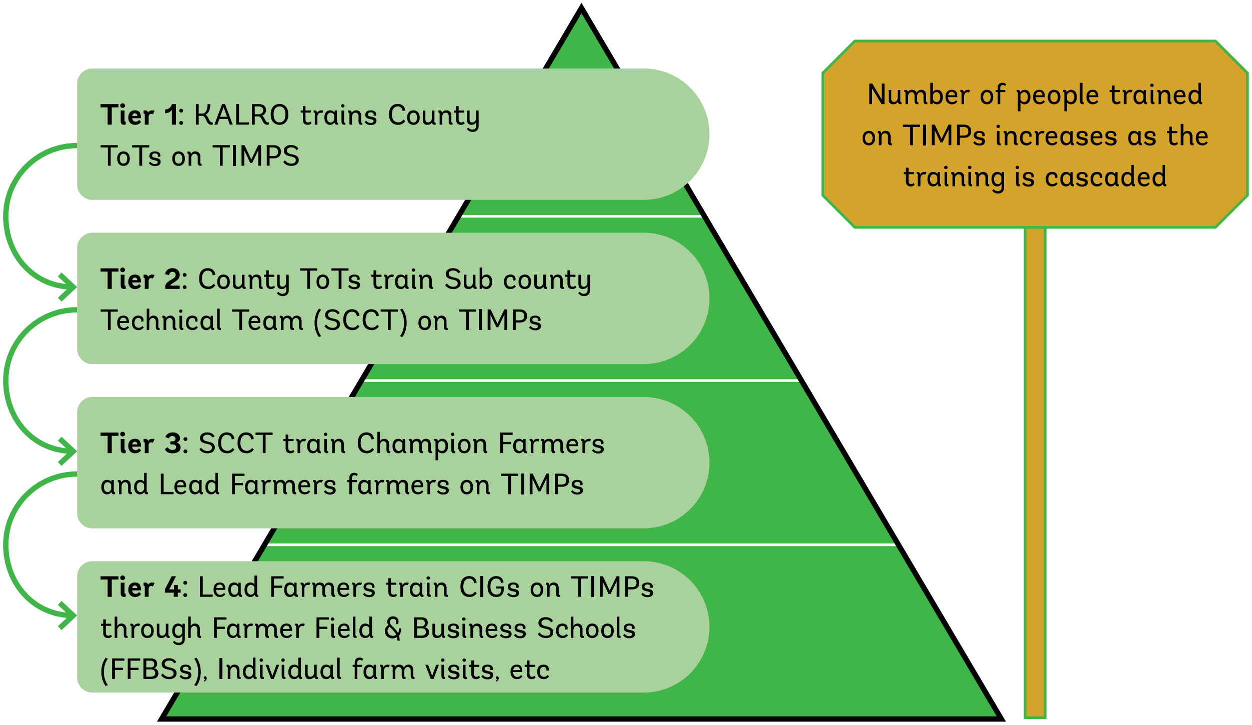


Figure 2: Model for cascading training on CSA TIMPs.

1 'https://www.kalro.org/elrp/feed/contentfiles/Guidelines-on-Sustainable-Ruminant-Feeds-for-Kenya-18072023.pdf

Delivering Training on TIMPs

Master trainers. The project identified and trained 26 subject matter specialists drawn from KALRO and the Ministry of Agriculture and Livestock Development as Master trainers and deployed them to train the TOTs on CSA TIMPs.

Trainers of Trainers: The Training of Trainers (ToTs) was undertaken through collaboration between KALRO, KCSAP and the counties. The aim was to provide new and relevant knowledge, technologies and skills on TIMPs targeting 594 trainees from each county.

Champion farmers: Champion farmer selection prioritized individuals with demonstrated commitment to agricultural innovation, had influence within their communities, and practical skills in farming. Key criteria included their ability to adopt and disseminate new technologies, their willingness to lead by example on their own farms, and their role in empowering fellow farmers through training and extension. A total of 8,910 champion farmers were targeted. Each champion farmer was responsible for 15-20 lead farmers.

Training of Lead farmers: This level of training targeted 5,940 Lead Farmers selected from among members of the CIGs and VMGs. Requirements for a Lead farmer included having a combination of agricultural expertise, effective communication skills, and a genuine commitment to sharing knowledge. These traits collectively contribute to the effectiveness of the lead farmer as a trainer, able to create a positive and impactful learning experience for fellow farmers. Table 2 shows the criteria used.

Table 2: Summary of guidelines for Lead farmer selection

Category	Criteria/Description	Rationale	Selection Process
Community engagement	• Active member of a Common Interest Group (CIG) or local farmer/ pastoralist cooperative. • Respected and trusted by community members. • History of participating in community agricultural initiatives.	Ensures lead farmers have strong community ties and influence to promote TIMPs and training.	• Community meetings to nominate candidates. • Verification by CIG leaders and local elders. • Approval by ELRP county coordinators.

Category	Criteria/Description	Rationale	Selection Process
Agricultural experience	• Minimum 3–5 years of farming or pastoralist experience in the ASAL region. • Demonstrated success in crop or livestock production. • Familiarity with local agro-ecological conditions.	Ensures practical knowledge to effectively demonstrate and teach TIMPs, such as pest-resistant seeds or fodder management.	• Review of farming history through interviews. • Field visits to assess farm/pasture productivity. • Endorsement by agricultural extension officers.
Training and Communication skills	• Ability to communicate effectively in local languages (e.g., Swahili, Somali, Borana). • Willingness to undergo ToT training on locust control and TIMPs. • Basic literacy skills to record training outcomes and monitor adoption.	Facilitates clear dissemination of knowledge and ensures lead farmers can train others effectively.	• Assessment during ToT workshops. • Role-playing exercises to evaluate training delivery. • Feedback from trainees during pilot sessions.
Commitment to ELRP objectives	• Willingness to train at least 20–50 farmers/ pastoralists in their community. • Commitment to monitor TIMPs adoption and report outcomes. • Dedication to promoting climate-smart and sustainable practices.	Aligns with ELRP's goal of restoring livelihoods and strengthening preparedness through community-driven efforts.	• Signed agreement with ELRP outlining roles. • Regular monitoring by ELRP field officers. • Inclusion in ELRP's performance evaluation system.

Category	Criteria/Description	Rationale	Selection Process
Gender and Inclusivity	• Prioritization of women and youth (at least 30–40% representation). • Inclusion of marginalized groups, such as female-headed households or persons with disabilities.	Promotes equity and ensures vulnerable groups benefit from capacity-building initiatives.	• Targeted outreach to women and youth groups. • Consultations with community leaders to identify marginalized candidates. • Gender-disaggregated selection data tracking.
Geographical representation	• Representation from all targeted wards in the 15 ELRP counties (e.g., Mandera, Wajir, Isiolo). • Proximity to locust-affected areas for accessibility.	Ensures coverage of all affected regions and maximizes impact of training and TIMPs adoption.	• Mapping of locust affected wards. • Selection based on ward-level nominations. • Coordination with county agricultural offices.

Training of CIG farmers: CIG farmers were trained by Lead farmers.

Training Methodology

The training was tailored to suit the needs of the trainees based on four tiers, providing a progression from traditional lecture-based approaches to more participatory and practical methods focused on leadership development and community-based learning. These methodologies reflect a shift towards empowering individuals to become trainers and leaders within their respective communities.

Tier 1: The training methodology at tier 1 incorporated a diverse range of approaches, including:

- Lectures and PowerPoint presentations: Providing foundational knowledge and theoretical understanding.

- Group work: Fostering collaboration and teamwork skills.
- Demonstrations and practical sessions: Offering hands-on experience and skill development.
- Field exercise: Applying learned concepts in real-world scenarios.
- Videos and pictorial aids: Enhancing understanding through visual learning.
- Case studies: Analysing real-life situations and developing problem-solving abilities.
- Simulations and role plays: Practicing skills and decision-making in a safe and controlled environment.

Tier 2: The training methodology at tier 2 mirrored that of tier 1, but with an adaptation to suit SCTTs.

- The content and delivery were specifically adjusted to meet the needs and context of the SCTTs, ensuring relevance and effectiveness.

Tier 3: The training methodology at tier 3 shifted towards a more participatory and leadership-focused approach. It involved training the champions and lead farmers on the specific agricultural practices and technologies and then equipping them with the skills to train others. Specifically, it emphasized:

- Practical, participatory learning–hands-on experience and active engagement.
- Developing both the technical expertise and the leadership abilities necessary for success.
- Providing skills necessary to effectively disseminate knowledge and train others.
- Cultivating leadership qualities to empower individuals to lead and inspire their communities.

Tier 4: The training methodology at tier 4 was heavily focused on community-based learning and practical application using:

- Skits and storytelling: Using stories and proverbs to spark discussion and encourage participation, creating a relatable and engaging learning environment.
- Field demonstrations: Showing farmers how new technologies work in practice, providing visual and practical understanding.
- Farmer Field Schools (FFSs): Providing a platform for farmers to learn, adapt and improve new technologies through collaborative experimentation and knowledge sharing.
- Group Discussions and Problem-Solving: Encouraging farmers to collaborate and develop solutions together, fostering a sense of ownership and collective responsibility.

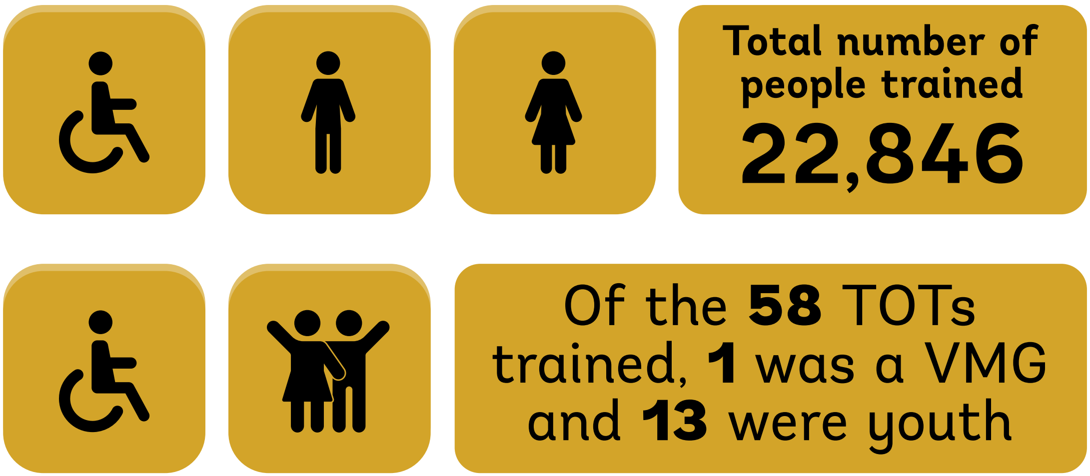
Gender-sensitive training

The project tailored training methodologies including schedules to accommodate women's domestic responsibilities. Through collaboration with partners such as the International Livestock Research Institute (ILRI) Mazingira Centre, it promoted women's leadership in community-based locust surveillance committees by using participatory and community-sensitive methods. By integrating financial literacy and access to credit schemes, ELRP empowered women to adopt TIMPs, enhancing their livelihoods and resilience. These interventions not only bridged gender gaps but also aligned with the World Bank's Gender Action Plan, ensuring equitable benefits and strengthening women's roles as key stakeholders in disaster risk management and sustainable agriculture.

Table 3: Number of TOTs trained per Tier

Training	Target	Achievement - total trained	No. Trained	
			F	**M**
Tier 1 – ToTs	58	58	13	45
Tier 2 – SCTTs	363	314	87	227
Tier 3 - Lead farmers	6,229	1,717	846	871
Tier 4 – CIG Members	37,774	20,757	12,897	7,860
Total	**44,424**	**22,846**	**13,843**	**9,003**

Notes:



Of the **314** trained,**1** was a VMG and **73** were youth

Of the **1717** lead farmers trained, **85** were VMGs and **430** were youths

Of the **20757** CIG members trained, **1880** were VMGs and **9627** were youth

RESULTS

Enhanced adoption of TIMPs: Documentation of TIMPs and their dissemination using various approaches and levels/tiers ensured timely access of training resources thus enhancing capacity building initiatives. Digitalization of content contributed to broader access through online platforms and applications in addition to cost effectiveness in terms of time and other related costs such as printing and travel costs for both farmers and service providers.

The capacity-building initiatives have contributed to promoting farmer-to-farmer learning. The training of frontline staff and lead farmers has strengthened their capacity, resulting in a significant increase in the adoption by farmers with enhanced productivity. A total of 162,902 farmers adopted at least two TIMPs.

Empowering Communities through Common Interest Groups (CIGs) in Mandera County

The ELRP supported the formation of 120 CIGs/VMGs in Mandera, comprising 3,000 members, including women and youth. Each CIG/VMG received seed-fertilizer packages for crops like green grams and fodder seeds for pasture rehabilitation. Training focused on group dynamics, savings and loan schemes, and on TIMPs like rotational grazing and soil mulching. The CIGs/VMGs also participated in rehabilitating 7,000 hectares of degraded land through terracing and tree planting. The ELRP provided storage facilities to preserve surplus produce and fodder, ensuring year-round availability.

By 2023, the CIGs/VMGs increased crop production by 28%, with green gram yields rising from 0.6 tonnes to 0.8 tonnes per hectare. Fodder production supported a 35% increase in livestock productivity, with 70% of CIG members reporting improved milk and meat yields. Group savings enabled 65% of CIGs/VMGs to purchase additional inputs, such as irrigation pumps, boosting productivity by 20%. Land rehabilitation reduced erosion by 30%, enhancing pasture sustainability. Women-led CIGs/VMGs, which made up 35% of the groups, reported a 15% increase in household income through vegetable sales.

In Mandera East, Mandera County, the Barwaqo CIG, with 25 members, restored 200 hectares of pastureland using fodder seeds and rotational grazing. Their livestock herd size grew by 20%, and group savings funded a small-scale irrigation system, enabling year-round vegetable farming. The group's success attracted 10 new members, expanding their impact.

Yabicho Sorghum CIG, with 20 members, was trained on climate-smart TIMPs, including crop husbandry, integrated pest management and post-harvest handling. In 2023, they cultivated 20 acres, up from 15 acres previously, which is a 25% increase in land under production, harvesting 140 bags of sorghum. Out of these, 60 bags were set aside for household consumption, significantly improving nutrition. The remaining 80 bags were sold collectively through a local Cooperative earning them KES 200,000.

A team of extension officers inspecting sorghum crop in Yabicho.

Improved household food security, diets and diversified livelihoods: The TIMPs enabled farmers to adopt a mix of enterprises, thus diversifying agricultural production and overall food supply. The diversification resulted in the availability of a variety of food sources such as grains, vegetables, fish and poultry, leading to nutritional benefits and contributing to food and nutritional security. Diversification ensured continuous and reliable net revenue of each type of product. Farmers who do integrated farming are more resilient than those practicing mono-cropping. In addition, better knowledge and access to improved seeds ensure more resilient sources of income. The adoption of resilient crops and animals further intensified risk mitigation.

Strengthened capacity to train and disseminate TIMPs: The project created a pool of 22,846 competent TIMPs trainers by strengthening capacity through a tier process. Lead farmers can sustainably teach and share information on TIMPS practices thereby creating a multiplier effect in climate-smart agriculture and scaling up of respective technologies. The developed training capacity includes materials development, preparing trainers, and evaluating how well the information is being adopted and used.

Scaling impact through Training of Trainers in Isiolo County

The ELRP trained 60 agricultural extension officers and lead farmers as ToTs in Isiolo, equipping them with skills in locust biology, applicable TIMPs and community engagement. Training modules covered Integrated Pest Management (IPM), fodder production, and climate-smart crop cultivation. These ToTs then conducted 150 workshops, reaching 3,500 farmers and pastoralists across Isiolo's sub-counties.

Post-training evaluations showed 90% of ToTs effectively transferred knowledge, with 85% of trainees correctly identifying locust breeding sites and applying biopesticides like *Metarhizium anisopliae*. The ToT model reached 80% of targeted communities, reducing locust response times from 10 days to 3 days. Women, who comprised 40% of trainees, reported increased confidence in managing farm activities.

Hassan Abdullahi a ToT from Merti Sub-County, trained 200 farmers on IPM and fodder conservation. His group's adoption of biopesticides reduced locust damage by 60%, and their maize yields increased by 25%, enabling sales at local markets. Hassan's mentorship continued beyond the project thus sustaining knowledge dissemination.

Awareness and adoption of sustainable farming practices: Natural resources in the project counties are fragile and should sustainably be exploited for farmers living from rural-based livelihoods. The design of resilient farming activities and training followed environment-friendly principles and integrated concept of climate change, its impacts, different climate-smart agriculture technologies and practices.

Enhancing productivity through TIMPs in Wajir County

In Wajir, 6,000 pastoralist households received fodder seed packages, including drought-resistant grasses like *Cenchrus ciliaris* (African foxtail grass) and Chloris gayana (Rhodes grass). Training programmes introduced climate-smart practices such as water harvesting through micro-dams and soil conservation using contour bunds. The Locust Command Centre (LCC), supported by ICT tools, provided real-time locust surveillance data to guide TIMPs implementation. Additionally, 2,000 farmers received drought-resistant sorghum and cowpea seeds to diversify food sources.

By 2023, TIMPs contributed to the restoration of 12,000 hectares of degraded pastureland in Wajir. Livestock productivity increased by 40%, with milk yields rising from 1.5 litres to 2.2 litres per cow daily, boosting household incomes by 20% through dairy sales. Crop yields for sorghum increased by 30%, from 0.8 tons to 1.1 tons per hectare, enabling farmers to achieve food security and surplus for local markets. The adoption of water harvesting reduced reliance on erratic rainfall, sustaining pasture growth during dry spells. Community-led monitoring, supported by LCC data, reduced locust damage to pastures by 50%.

In Eldas Sub-County, pastoralist Amina Mohamed adopted Rhodes grass and water harvesting techniques. Her family's herd of 50 goats saw a 25% increase in weight gain, fetching higher market prices. Amina's success inspired 200 neighbouring households to adopt similar TIMPs, amplifying productivity across the sub-county.

The TIMPs transformed Wajir's agricultural landscape by integrating climate-resilient technologies, ensuring sustainable productivity and resilience against future locust outbreaks.

LESSONS LEARNED

- **Training of county technical staff, and Lead Farmers increased their knowledge and confidence to advise and support farmers.** This effort created a pool of trained facilitators who will sustain extension service delivery. Training of Lead farmers also created a platform for farmer-to-farmer learning, accelerating the adoption of TIMPS.
- **The use of a hybrid extension system approach where public extension staff and Lead farmers are trained on TIMPs and**

cascade the same to farmer's enhanced access to the TIMPs resulting in increased adoption. It has also created a pool of trainers and facilitators at the grassroots level to sustain the dissemination of TIMPs beyond the project life. Hybrid extension is highly effective. Combining public extension staff (ToTs) with Lead farmers and Champion farmers leverages trust, local knowledge, and scalability far beyond government capacity alone.

- **Participatory training methodologies:** Hands-on, participatory training approaches proved far more effective than lecture-based methods. Farmer Field Schools, demonstration plots, and peer-to-peer learning achieved 85% higher knowledge retention than conventional extension approaches.
- **Gender-inclusive programming:** Ensuring equal participation of men and women enhanced programme effectiveness and sustainability. Women's participation in technology training was particularly valuable for food security technologies and post-harvest management practices.
- **Technology appropriateness:** Simple, affordable technologies achieved much higher adoption rates. Mobile phone-based systems, bio-pesticide production, and water conservation technologies were most successful.
- **Community ownership:** Strong community ownership of training programmes ensures sustainability and local adaptation. Communities that took ownership of training

Hands-on, participatory training approaches proved far more effective than lecture-based methods. Farmer Field Schools, demonstration plots, and peer-to-peer learning achieved 85% higher knowledge retention than conventional extension approaches.

centres and technology demonstration sites maintained higher success rates after the initial training ended.

- **Institutional partnerships:** Multi-stakeholder partnerships combining universities, research organizations, government agencies, and community organizations created comprehensive support systems that enhanced program effectiveness and sustainability.

Recommendations

- **Backstopping and refresher of TIMPs training:** Backstopping, or providing ongoing support and guidance, is crucial for the success of farmer training programmes and should be strengthened. Refresher training at all tiers involved in TIMPs training is crucial for keeping all trainers updated on the latest agricultural technologies, techniques, and best practices. It helps all trainers maintain their skills and ensures they stay abreast of new developments.
- **Strengthen use of digital agro-advisories:** Digital tools can reach a wider audience of farmers, including those in remote areas, at a lower cost than traditional methods. They enable farmers to access information and services on demand, anytime and anywhere thus offering increased accessibility and efficiency.
- **Invest in development of new TIMPs:** Agricultural research is essential for sustainable and inclusive agricultural development. Investment in research is necessary to generate new technologies and improved policies which are essential for small-scale farmers who face the interconnected challenges of climate change, land degradation, gender biases, hunger and exploitation.
- **Incorporate Agri-preneurs in TIMPs dissemination architecture:** Agri-preneurs are dynamic young professionals who are expected to conduct farm visits, provide guidance on soil health, and promote modern farming techniques. These agri-preneurs are not just advisors; they are change agents, bridging the gap between research and practice, ensuring that every farmer has access to cutting-edge agricultural knowledge. Including agri-preneurs in delivery of TIMPs will improve the sustainability and effectiveness of their dissemination.

Surveying and controlling the 2019-2021 desert locust invasion: A Case Study of Kenya

Introduction

The 2019–2021 desert locust *(Schistocerca gregaria)* upsurge, the worst in decades, originated from breeding grounds in the Arabian Peninsula before spreading to Southwest Asia, Yemen, and eventually the Greater Horn of Africa. Unusually wet conditions, particularly in Somalia, fuelled rapid breeding, leading to the formation of massive immature swarms that swept across East Africa, including Kenya, Ethiopia, Somalia, Djibouti, Tanzania, and parts of the Democratic Republic of Congo. The combination of inadequate early control in the breeding areas and favourable climatic conditions, partly attributed to climate change, created ideal conditions for the spread of the desert locust into Kenya and neighbouring countries.

The desert locust remains the world's most destructive migratory pest, capable of devastating crops and pastures due to its massive swarms, insatiable feeding, and transboundary movement. This pest crisis underscores the importance of coordinated cross-border control measures. Since swarms easily move across national boundaries, isolated national responses were insufficient. Without synchronized action, local interventions risked being undermined by fresh invasions from neighbouring countries.

In Kenya, the first immature swarms were reported in December 2019 in Mandera, Wajir, Samburu and Marsabit counties. Consequently, the infestation expanded to 28 counties, severely impacting hundreds of thousands of hectares of farmland and rangelands. By early 2020, some swarms covered areas up to 2,400 km^2, capable of consuming approximately 1.8 million metric tonnes of vegetation daily; enough to feed over 80 million people. The scale of the challenge far exceeded Kenya's existing surveillance and control capacity, exposing critical gaps in preparedness and resource mobilization

The main gaps

Kenya's response to the 2019–2021 desert locust invasion was severely hampered by weak preparedness and fragmented institutional capacity. The country lacked an effective surveillance and early warning system, as well as coordinated structures for timely detection, monitoring, and response to invasions. Critical gaps included inadequate technical expertise, limited operational resources, lack of standardized policy guidelines, and insufficient spraying equipment. Control operations were further constrained by the absence of decentralized structures to support high-risk regions, leading to delayed reporting and ineffective tracking of control efforts. These institutional weaknesses allowed the swarms to multiply unchecked, escalating the crisis across multiple counties.

Moreover, the control efforts between the national and county governments were disjointed, lacking a unified coordination framework for planning, resource mobilization and execution of field operations. This fragmentation led to inefficient resource utilization, inconsistent data reporting, and poor decision-making during the critical phases of the invasion. The situation was further aggravated by the onset of the COVID-19 pandemic, which diverted national attention, disrupted logistics, and delayed delivery of essential supplies. Collectively, these gaps led to the extensive spread of the locusts resulting in significant livelihood losses, heightened food insecurity, and prolonged recovery for affected communities. This, therefore, underscored the urgent need for strengthened coordination, enhanced technical capacity, and investment in modern surveillance and control systems to improve future preparedness and resilience.

Addressing the gaps

To address the critical gaps in surveillance and control revealed by the desert locust invasion, the Government of Kenya, through the Ministry of Agriculture and Livestock Development (MoALD), rallied the support of development partners. These efforts prioritized strengthening surveillance systems, building technical capacity, and improving operational preparedness for future invasions through targeted interventions.

Planning and resource mobilization

To effectively respond to the desert locust invasion, the Government of Kenya established a multi-sectoral technical team, supported by FAO and international experts, to lead the national emergency response. The team developed a Desert Locust Emergency Management Plan that provided strategic guidance for technical operations, policy decisions and stakeholder coordination. This plan also served as a resource mobilization framework, outlining priority interventions and defining the roles of government agencies, development partners and other stakeholders.

Guided by the plan, the MoALD mobilized emergency resources from both internal sources, such as the National Treasury, and external partners, including the FAO, World Bank, and others. These resources supported key interventions such as procurement of pesticides, Personal protective equipment (PPE), spray equipment, aircraft for aerial operations, training of personnel, and logistical facilitation for surveillance and control activities.

Establishing coordination structures

At the National level

The MoALD established the Desert Locust Emergency Operations Coordination Office (command centre) to coordinate all the activities. A technical team manned the command centre. The technical team was headed by the Director-Plant Protection and Food Safety Directorate (PP&FSD), and supported by Data and Information specialist, Desert Locust expert and a Logistics specialist. This team provided strategic guidance and coordinated logistics with County Steering Committees and the decentralized eight control bases.The operations were backed up by experts from FAO. The director was responsible for briefing policy-makers on a regular basis.

At the National policy level, an inter-ministerial steering committee, chaired by the Cabinet Secretary, MoALD, provided oversight in the overall DL management operations in the country. The Cabinet Secretary worked closely with County Commissioners from the affected counties.

At the County level

Management of DL at the county level was guided by a multi-sectoral County steering committee. The committee was chaired by the County Commissioners and County Executive Committee Members (CECMs) for Agriculture and Livestock Development in the respective counties. The government decentralized desert locust control efforts by establishing eight control bases across the affected counties during both first and second waves of invasion as shown in Table 4 below.

The control bases enhanced access to trained personnel and control materials in DL management, while supporting rapid response. Each control base was manned by personnel seconded from both the National and County governments. The team composition included a base manager, logistics officer, nurse, drivers and stores clerk supported by the FAO field officer. The base manager submitted regular reports to the County Steering Committee and the Command Centre.

Table 4: Regional Desert Locust control bases established

Location of Control Base	Counties Covered
1. Wajir	Wajir
2. Mandera	Mandera
3. Isiolo	Isiolo, Meru, Samburu, Laikipia and Nakuru
4. Marsabit	Marsabit
5. Masinga	Embu, Tharaka Nithi, Kitui, Makueni, Machakos, Kajiado and Murang'a, Kirinyaga
6. Garissa	Garissa and Tana River
7. Turkana – Lodwar	Turkana, Baringo and West Pokot
8. Lamu – Witu	Kilifi, Lamu and Taita Taveta

Note: While DL swarms were reported in 28 counties, control operations were not undertaken in four counties - Bungoma, Nyeri, Nyandarua and Trans Nzoia - because the pests spent less than a day or two in these counties. The bases were established primarily to decentralize control.

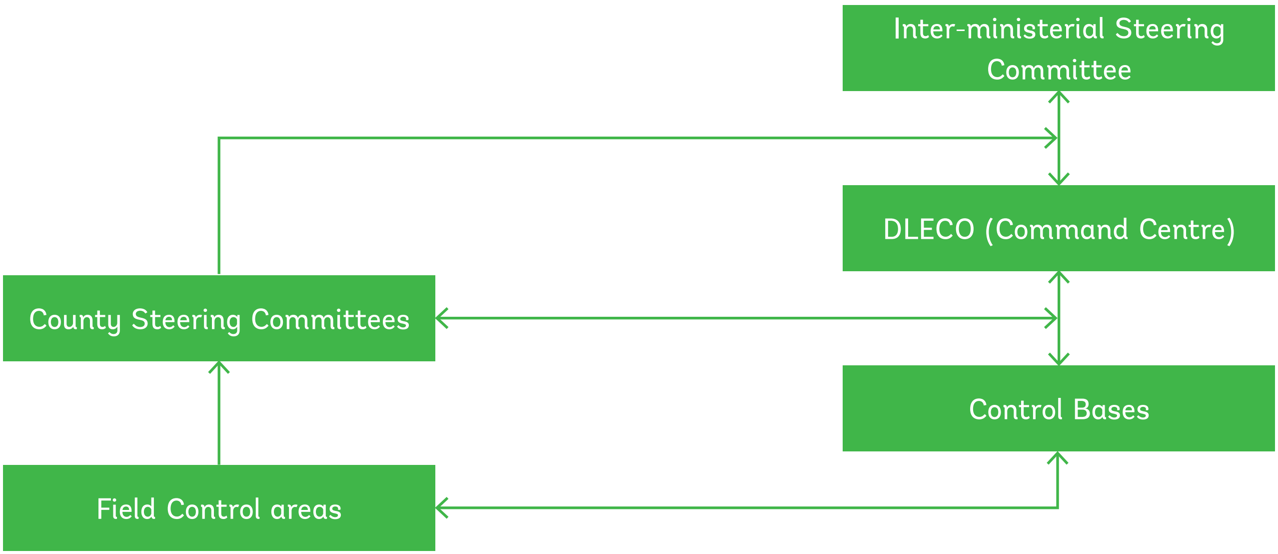


Figure 3: DL Management Coordination structure

Enhancing capacity for DL control and management

In response to the skills and capacity gaps in DL control and management in the country, the Government of Kenya, with support of FAO, sourced external experts on DL management, who came to support the country in responding to the invasion. Furthermore, a series of activities, as narrated below, were held with the aim of building the capacity of the country to enable it deal with the DL invasion.

Trainings: It was critical to build DL management capacity for the country. Various trainings were undertaken beginning with training-of-trainers (TOTs), who were charged to undertake further training for other teams in their respective counties. Thematic training was also conducted for field survey teams and control operation teams. These trainings were supported by funds from the MoALD, ELRP and FAO. The trainings focused on desert locust biology, ecology and behaviour, surveillance techniques, digital data collection with *eLocust3M*, control operations, sprayer calibration and responsible use of pesticides. To minimize environmental and human health risks, the MoALD, in collaboration with regulatory bodies and international agencies, established environmental and social safeguards, protocols, and trained control teams on the same including on environmental protection.

The personnel trained included:

11	National ToTs
16	Journalists
20	Young professionals
20	NYS control supervisors
503	NYS servicemen (as control team)
37	DL control TOTs
696	Field scouts
11	DL control VMS operators
24	ESS supervisors
20	County control teams
74	and technical staff

The National Youth Service (NYS) servicemen focused on control methods using Emulsifiable Concentrate (EC) insecticides with knapsack sprayers. Community scouts were identified and trained to support the DL management. The scouts were selected based on a criteria; ownership of motorcycles and smartphones compatible with *eLocust3M*, which were critical to enable the person undertake field-level surveillance.

Left: Training of NYS Servicemen: Right; Community Sensitization

Developing technical information materials: The Multi-Institutional Technical Team (MITT), with the support of FAO experts, developed assorted DL technical information materials such as fliers, posters and DL pocket handbook, which were used during public awareness meetings, media campaigns and training forums.

Creating public awareness: The project prioritized community sensitization activities to disseminate information to affected communities. The communities were sensitized on their roles, such as keeping livestock and human beings away from treated areas. The sensitization aimed at strengthening community-level engagement, which was essential for reducing unnecessary exposure to pesticides, reporting any observed swarms to field scouts, and therefore contributing to effective DL management.

Desert locust surveillance

During DL invasion, surveys were undertaken to establish the exact DL invasion site or confirm DL absence, ultimately informing the control operation. During the DL invasion, Kenya significantly improved its surveillance systems through the deployment of digital tools and trained scouts. Field surveys were conducted using digital tools and applications such as *eLocust3M*, *eLocust3g* and GPS-enabled smartphones. The collected data was uploaded onto platforms like

PlantVillage and *Garmin Explorer*, which fed into *EarthRanger* dashboards for real-time visualization and analysis. This system allowed for early detection of locust presence and timely decision-making on where and how to deploy control teams. The surveillance information guided prioritization of response efforts and ensured efficient and effective resource use.

Further, collaborative forecasting efforts, supported by regional and international partners including FAO's Desert Locust Information Service (DLIS), Desert Locust Control Organization-Eastern Africa (DLCO-EA), and the International Red Locust Control Organization for Central and Southern Africa (IRLCO-CSA), were put in place to analyse climatic and ecological conditions conducive to locust breeding and migration. Information gathered from this analysis was used to anticipate swarm movements and prioritize surveillance in high-risk areas. Counties in the Arid and Semi-Arid Lands (ASALs) regions, particularly Turkana, Marsabit, Wajir, Isiolo and Garissa, received focused attention due to their suitable ecological conditions for breeding.

Control Operations

Desert locust control operations were led by the MoALD with support from the MITT, and the Ministry of Interior and National Administration. A wide range of public and private agencies as well as international organizations were also involved. The control operations involved the following.

Stakeholder engagement: The key institutions that participated in the field control operations are listed in Table 5 below. Each of these organizations played a critical role in the implementation of control operations, ranging from survey, provision of equipment, technical expertise, aerial and ground control, logistics support, and community engagement. Their collective efforts contributed to minimizing the impact of the DL invasion in the affected counties.

Table 5: Stakeholders in DL management.

Category	Agencies	Key Roles
National Government ministries	MoALD - Plant Protection & Food Safety Directorate (PP&FSD) Ministry of Interior and National Administration	• Policy guidance on DL control operations in the country • Coordination and Logistical support during control operations • Mobilization of resources to support control operations • Multi-Sectoral agencies coordination for effective control operations
	National Youth Service (NYS)	• Personnel and equipment to undertake aerial and ground spraying of infested areas
Research Institutions	Kenya Agricultural and Livestock Research Organization (KALRO) International Centre for Insect Physiology and Ecology (ICIPE), University of Nairobi (UoN), Centre for Agriculture and Biosciences International (CABI)	• Members of MITT - technical guidance on control operations • Research on biological control products and efficacy trials for new pesticides • Post -spray impact assessment of the control operations
Regulatory institutions	Kenya Plant Health Inspectorate Service (KEPHIS), Pest Control Products Board (PCPB)	• Technical guidance on compliance to standards and protocols during control operations • Registration of pest control products for use in control operations • Members of MITT - technical guidance in control operations

Category	Agencies	Key Roles
Development partners	Food and Agriculture Organisation of the United Nations (FAO)	• Offer technical expertise on DL control operations • Mobilize resources to support control operations
Regional bodies	Desert Locust Control Organization for Eastern Africa (DLCO-EA), International Red Locust Control Organization for Central and Southern Africa (IRLCO-CSA)	• Support control operations by offering technical expertise and aircrafts • Support control operations by undertaking aerial survey to identify infestation sites, especially in expansive areas with rough terrain
County Governments		• Policy and technical support to control operations • Community mobilization and awareness creation in control operation areas • Mobilization of resources to support control operations

Procurement of control materials: The required control materials for DL management were procured by the Kenyan Government, FAO and World Bank. Additionally, the Government of Kenya received materials, as donations, from other countries and development partners. The type of materials procured included: assorted range of pesticides; spray equipment (VMSs, ULVA, motorized sprayers); PPE; aircraft for survey and control operations; survey equipment (mobile phones and *eLocust3g*); suitable vehicles for the rough field terrain, a lorry for transporting materials; and other accessories.

Mobilizing control personnel and teams: It was critical to mobilize enough manpower to undertake the control work. FAO supported the Government of Kenya, and through this support, the government engaged the trained National Youth Service (NYS) recruits to undertake ground DL control operations in the affected counties. Control teams consisted of NYS personnel, Plant

Protection and Food Safety Officers, County spray teams, trained vehicle-mounted spray operators, spray aircraft providers, Kenya Airforce (KAF) and the DLCO-EA spray team. Through the project, the control teams were trained on the use of assorted spray equipment such as vehicle-mounted sprayers, hand-held sprayers and motorized sprayers in addition to safe use of pesticides. All the personnel involved in locust control were provided with required equipment (sprayers and PPE). The deployment of spray teams was coordinated from the DL Command Centre and the decentralized control bases, with the support of the County Department of Agriculture, local administrators, and community leaders. This collaboration ensured that both ground and aerial control measures were well coordinated and implemented effectively and efficiently.

Adhering to safeguards: During the control operations, teams strictly adhered to the environmental and social safeguards. This was intended to minimize negative impacts on ecosystems and local communities. The control team safety was ensured by use of appropriate personal protective gear. No persons were allowed to undertake control operations unless they had been trained and equipped appropriately.

Distributing control materials and equipment: Ground control equipment was deployed to various bases to support desert locust management in the affected counties. The Command Centre coordinated the deployment. The equipment included motorized sprayers, vehicle-mounted sprayers distributed across several bases, land rovers mounted with sprayers at specific locations, handheld ULV sprayers, knapsack sprayers, and camping tents donated. Additionally, the Government of Kenya, through the Kenya Forest Service (KFS) and Kenya Wildlife Service (KWS), and in collaboration with FAO, the DLCO-EA

Left: Loading pesticides into spray aircraft. Right: Ground spray operation and IRLCO-CSA, provided aircraft for aerial surveillance and control, which included both fixed-wing aircraft and helicopters. Over 2 million hectares were surveyed.

Managing logistics and equipments: To manage logistics and equipment during the control operations, the project followed the laid down government procurement guidelines during emergencies. The project undertook continuous stock-taking and distribution of the materials based on control base requests. Donations from other countries and development partners were also entered into the records of the central store, based at Kabete, Kiambu county. All the procured control materials (pesticides, PPE and spray equipment) were first stored at the MoALD pesticide store in Kabete before being dispatched to the control bases stores for onward use in the field. Through FAO's support, fabricated mobile storage containers that met pesticide storage safety standards were procured for all the control bases.

The equipment and pesticides were transported from the Kabete central store to the control bases using the national government lorries and pick-up trucks, while transportation from the control base stores to the field control sites was done using county government vehicles. Even though government vehicles were used to distribute the control materials, some of these vehicles lacked certification for transporting hazardous materials. This shortcoming was addressed by FAO donating a truck to the Government of Kenya specifically for this purpose.

Communication and public engagement: Effective communication was key to the success of the DL control campaign. At the national level, strategic instructions were issued by the Principal Secretary (PS) to the Director, PP&FSD and Head of the National Locust Control Command Centre, who then engaged CECMs and Control Base managers. The CECMs convened steering committee meetings for briefing and consultations with control base managers and field control teams.

Based on information emanating from control operations, the Director (head of Command Centre) constantly briefed the PS, State Department for Agriculture (SDA) and the National steering committee on progress made. The control base teams also constantly briefed the CECM and the County steering committee on the progress of control campaigns in their respective counties. Critical aspects covered in the reports included: Developmental stage of the pest, GPS location, nature of terrain, approximated area infested, types of crops/pasture under threat, approximate amount and types of pest control products required, most suitable control method, community awareness creation sessions, and whether there were ecological sensitive areas within infested areas.

A variety of communication channels were used to relay information, including virtual meetings, emails, SMS, WhatsApp, printed bulletins, media broadcasts and community meetings. This ensured continuous updates, stakeholder engagement, and public awareness, reducing resistance and mis-information to affected communities. Community sensitization efforts were conducted to raise awareness about control operations, ensuring the locals were informed and actively involved during the control process.

Post-Control interventions

Impact assessment: FAO conducted environmental and socio-economic impact assessments to evaluate the effectiveness of the DL control campaign, to inform livelihood restoration initiatives.

Disposal: The ELRP procured services of certified hazardous waste handlers who were engaged to mop and dispose expired pesticides, contaminated PPEs and empty containers, including cleaning of the pesticide stores.

Early warning systems: The establishment of Desert Locust Information Office (DLIO) at PP&FSD institutionalized early warning capabilities and strengthened Kenya's preparedness for future invasions.

Livelihood restoration and rehabilitation: In April 2021, the Government of Kenya announced that 1.4 million Kenyans risked starvation, hunger and acute food insecurity with close to a million people in need of humanitarian food assistance (MoA&LD, 2021) due to DL damage. As a result, the MoALD, County Governments, NGOs and other stakeholders initiated restoration and recovery programmes to safeguard and improve the livelihoods of affected pastoralists and agro-pastoralists during the desert locust invasion.

The support given included provision of agricultural inputs to facilitate rehabilitation of farms and grazing lands, distributed in form of relief seeds, fertilizer, livestock feed, feed conservation materials, water tanks, veterinary drugs and hand-washing equipment for COVID-19 prevention. Additionally, the ELRP project supported livelihood restoration and recovery through micro-projects and sub-projects to communities.

Close-up audit: The ELRP undertook a close-up audit of the control operation. This involved auditing issues such as pesticide and equipment handling and storage; adherence to ESS protocols; protection of ecological sensitive areas; environmental, animal and human health safety compliance; pesticide waste management; local community involvement, and grievance management. The audit identified positive and negative effects of the control activities and made recommendations for consideration during any future DL control operation.

Livelihood Restoration Initiative seeds

Strengthening preparedness and response mechanisms: The Government of Kenya undertook strategic interventions aimed at strengthening long-term preparedness for future DL invasions. The government developed the Migratory and Invasive Pests and Weeds Management (M&IPWM) Strategy, which provides a comprehensive framework for coordinated management of trans-boundary pests beyond the desert locust. To operationalize this strategy, the MoALD, with support from key institutions, developed the Standard Operating Procedures (SOPs), contingency plans, and a Kenya Food and Nutrition Security Crisis Preparedness Plan. These tools are intended to guide surveillance, early warning, rapid response and recovery efforts when handling any future invasions.

Results

The combined efforts of government agencies, private sector, development partners and affected communities bore fruits, resulting in eradication of desert locust in Kenya by the year 2021. Key result areas included the following.

Livelihood Restoration Initiative dam Liners

Safeguarded livelihoods: As a result of effective desert locust control and management operations, livelihoods were safeguarded by preventing what could have escalated into a major food crisis. Through coordinated efforts, over 212,000 hectares were treated, successfully protecting 426,800 metric tonnes of cereals and securing the productive assets of vulnerable pastoralist households. This intervention not only reinforced livelihoods but also protected the income and food security of 198,100 households, equivalent to 990,700 livestock units (TLU), with an estimated US$ 128 million in income saved. Additionally, the strengthened capacity of governments will ensure faster, more effective responses to future locust threats, reducing the risk of similar crises recurring.

Improved national DL surveillance system: The over 600 field scouts recruited, trained and deployed across affected counties by the MoALD and FAO, and equipped with phones loaded with *eLocust3m* App, have helped improve Kenya's surveillance system for DL. Additionally, this intervention facilitated timely and more accurate reporting on locust presence, reducing delays and significantly improving on control response. The regional control bases served as satellite stores, making it possible to access the required control materials within a short time.

Controlled DL spread and impact: The efforts of experts from FAO, trained national and county teams, integration of NYS personnel, and engagement of local community scouts was instrumental in suppressing DL breeding and limiting further spread. The stakeholders combined efforts, targeted control operations in the 28 outbreak counties, helped to protect pasture and crops under threat, alleviating economic damage and loss of livelihood. Active community engagement during control operations improved trust and cooperation. However, some pasture and crop losses was inevitable, especially at the initial phase of DL invasion.

Strengthened institutional coordination and governance: The establishment of the Desert Locust Command Centre at the MoALD headquarters and decentralized control bases improved the flow of information, resource allocation, and decision-making. Steering committees established at national and county levels enhanced effective collaboration and partnership across the multi-sectoral partners, ensuring unified operations with participation from sectoral multiple players.

Knowledge and skills transfer: The numerous training sessions held have imparted knowledge and skills on DL management to all teams engaged. The trainings not only increased technical capacity but also fostered ownership of DL control campaigns. Community awareness creation and engagement during control operations improved community knowledge on DL, and community trust and cooperation, reducing resistance to aerial spraying and increasing the effectiveness of ground-based interventions.

Future preparedness and response system to crises mainstreamed: The development of the Migratory and Invasive Pests and Weeds Management Strategy, along with SOPs and contingency plans, has established a formal structure for future preparedness and response to migratory pest invasions. Further, the Kenya Preparedness Plan for Food and Nutrition Security Crises has established a formal structure for future preparedness and response to migratory pests. These policy guidelines marked a shift toward a proactive approach to response preparedness and migratory pest management.

Enhanced DL management infrastructure: Infrastructure capacity at national and county levels of government has been enhanced. At both national and county levels, a Locust Control Unit exist, which is equipped with ICT equipment with capacity to receive and analyze real time data.

Enhanced environmental and social safeguards standards: The promotion of environmental and social safeguards by the project is a best practice that remains etched for future learning. The environmental safeguards/protocols and community sensitization helped mitigate the risks associated with contamination and community exposure.

Lessons Learnt

The DL coordination and management operations served as a critical learning experience. The key lessons learnt include:

Early planning and resource mobilization is critical: The swift mobilization of resources such as pesticides, equipment, personnel, and aircraft was crucial for launching an effective control operation. However, the experience underscored the importance of having pre-established contingency plans and strategically pre-positioned resources. This would significantly reduce response time and enhance preparedness for future locust emergencies

Effective coordination structures contribute to effective response: The establishment of a centralized Desert Locust Command Centre, complemented by decentralized control bases, proved critical for effective coordination of planning, logistics and decision-making during the desert locust response. This structure ensured timely resource deployment, improved communication between actors and enhanced operational efficiency. Future pest management interventions should adopt similar centralized and decentralized frameworks to strengthen coordination and response capacity.

Digital surveillance systems are game-changers: The deployment of *eLocust3m* and *eLocust3g*, integrated with platforms like *PlantVillage* and *Garmin explorer* respectively, proved instrumental in strengthening early warning systems. Real-time data collection and visualization in *Earthranger* enabled faster detection and more precise targeting of locust control interventions. This experience highlighted the critical importance of leveraging digital tools for timely, data-driven decision-making in managing trans-boundary pests.

Decentralized control operations improve efficiency: Establishing regional control bases near affected areas significantly reduced logistical delays and improved the speed and effectiveness of response operations. This approach demonstrated the importance of decentralizing control efforts to ensure timely interventions during future locust invasions.

Logistics require specialized planning: The experience of transporting hazardous materials during the desert locust control operations underscored the critical importance of establishing dedicated logistics infrastructure. Future control efforts will benefit from investing in specialized vehicles and certified handlers to ensure the safe, efficient and timely movement of pesticides, especially to remote and hard-to-reach areas.

Stakeholder communication and community engagement are essential: Effective and transparent communication, through both modern platforms and traditional community gatherings, proved critical in building community trust and acceptance of control measures such as aerial spraying. Regular updates and public sensitization campaigns not only kept communities informed but also fostered collaboration, reducing misinformation and resistance during locust control operations.

Environmental and social safeguards is a best practice: While the desert locust control campaign successfully averted major food insecurity, it also highlighted significant concerns regarding the environmental and ecological impacts of pesticide use. The development and implementation of Environmental and Social Management Plans (ESMPs), along with dedicated training on environmental safeguards, were effective in minimizing these risks.

Preparedness requires strategic, long-term investment: The establishment of the Migratory and Invasive Pests and Weeds Management Strategy, along with supporting Standard Operating Procedures (SOPs), demonstrated the critical importance of shifting from reactive to proactive pest management. This experience highlighted that having structured, forward-looking strategies in place significantly enhances the country's ability to prevent and respond to pest invasions before they escalate into full-blown emergencies.

Post-intervention clean-up is integral: The safe disposal of expired pesticides and used PPEs through certified waste handlers proved essential in preventing environmental contamination, highlighting the importance of incorporating proper waste management planning into locust control operations.

Integrated response delivers economic and food security benefits: Effective desert locust control in the country demonstrated that targeted, data-driven operations are essential for maximizing impact while minimizing costs. By using real-time data to guide interventions, unnecessary pesticide use was avoided, reducing environmental risks and safeguarding human and animal health. This approach played a critical role in protecting livelihoods and stabilizing food security in the affected areas.

Recommendations

Establish a national integrated early warning system: There is need to establish a permanent, well-funded early warning system that integrates real-time digital surveillance (e.g., *eLocust3m*, GIS, satellite imagery) with local indigenous knowledge. This system should operate continuously—not only during outbreaks—and be integrated into national disaster risk management frameworks.

Institutionalize regular preparedness exercises: Mandatory annual simulations and drills involving all relevant stakeholders (government, county teams, private sector, and communities) should be conducted to assess and improve readiness for future trans-boundary pest invasions. These drills should specifically test logistical capacity, coordination, communication protocols, and rapid deployment of resources.

Strengthen community-based surveillance and control networks: The engagement of local communities should be formalized and expanded by providing continuous training, resources, and incentives. Local scouts should be integrated into official response structures with clearly defined roles, ensuring community ownership and faster response at the grassroots level.

Develop and operationalize a centralized data analytics hub: There is need to establish a dedicated data analytics and modeling center within the Locust Control Unit to manage real-time surveillance data, perform predictive modeling of pest movements, and assess potential economic impacts. Collaboration with academic institutions and private sector tech firms should be promoted to enhance analytical capabilities.

Enhance environmental safeguards and sustainable control methods: Research into safer, environmentally friendly pest control methods should be prioritized. Additionally, future interventions should institutionalize and prioritize mandatory environmentally friendly pest control methods and post-intervention environmental audits to continually refine safeguard protocols and reduce ecological risks.

Strengthening early warning systems for migratory and invasive pests in Kenya

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Introduction

The desert locust is a trans-boundary migratory pest that poses significant threats to food and nutrition security, as well as the socio-economic livelihoods of communities in over 60 countries in Africa, the Middle East, and the Southwest Asia regions. Historical outbreaks of the pest include the plague of 1986-1989 and upsurges in the 1990s, 2004, 2007, and 2019-2021 that affected the eastern Africa region, demonstrating their continued potential to threaten and disrupt agriculture and food systems across many countries.

Past destruction from the desert locust has been extensive. In 2004, crop damage from the pest caused famine, impacting approximately 8 million households in North Africa and the Sahel region. Between November 2019 and 2021, hopper bands and swarms of locusts originating from Yemen infested approximately 1.5 million hectares of crop and pasture land in eastern Africa, mainly in Somalia, Ethiopia, Kenya, Uganda, Djibouti, and Eritrea, risking the livelihoods of 13 million farmers, of which 2.1 million were in Kenya.

Due to the widespread damage caused to crops and forage, desert locust invasions remain one of the biggest threats to agricultural production and human livelihoods. In Kenya, between 2019 and 2021, a significant desert locust invasion was witnessed, the worst in over 70 years. The invasion spread across 28 counties, causing extensive damage to crop and forage, especially in the arid and semi-arid lands (ASALs) of northern and eastern Kenya.

The desert locust has predictable migratory patterns. Their catastrophic impact can be minimized through accurate predictive models and early warning systems for timely responses and control. Globally, early warning systems and structures have been promoted and widely used to avert and mitigate the effects of invasive and migratory pests such as the desert locust. Early warning systems help in collecting relevant and current pest information and disseminate it to control units for control and management (Noar et al, 2021). Regionally, in the eastern Africa region, each country has developed an early warning system to track the movement of trans-boundary pests.

Amid escalating climate variability and increasing migratory pest outbreaks, Kenya's experience in developing its early warning structures for desert locust control offers a scalable model for enhancing preparedness and response. This case study chronicles the country's transition from reactive emergency management to a more integrated, data-driven approach to desert locust control.

The problem

Kenya's capacity to detect, monitor, and respond to desert locust invasion in November 2019 and the preceding months was fragmented, slow, and predominantly reactive. The invasion exposed the absence of a structured, real-time surveillance and early warning system across the country. The existing data was insufficient, inconsistent, often delayed, and depended on manual reporting from under-staffed government departments. Without suitability modelling and digital mapping, breeding areas were often identified too late, by which time locusts had already laid eggs and hatched into destructive hoppers and formed swarms.

Compounding these challenges was the absence of a reliable early warning system and limited access to reporting tools. County agricultural teams had minimal training and equipment to identify and report locust sightings accurately. Traditional local methods relied heavily on sporadic ground patrols and unreliable reports from communities. In most cases, there was no clear protocol for reporting, verifying and escalating pest threats from the county to the national level, which led to major delays in mobilizing control resources such as aerial spraying or pesticide distribution.

The absence of a clear framework for cross-sectoral collaboration significantly hindered the effectiveness of the response efforts. In most cases, counties operated in isolation, with little to no coordination with the national government. The lack of effective collaboration led to the absence of established mechanisms for coordinating key activities such as data collection, surveillance planning, capacity building and standardized training for field teams. As a result, critical information was not shared in a timely and consistent manner. This disjointed approach majorly contributed to delays in decision-making and reduced the overall impact of the interventions.

The result was widespread damage to food crops and pasture lands, with over 175,000 hectares of crops and pasture affected and exposing 3 million people and 164,000 households to food insecurity. The experience underscored the urgent need for a digital and decentralized pest monitoring system for real-time reporting and response.

Interventions

To strengthen early warning systems for migratory and invasive pests, the following interventions were undertaken.

Forming and equipping coordinating units (at National and County Level): The Ministry of Agriculture and Livestock Development (MoALD), through the Emergency Locust Response Project (ELRP), formed the National Locust Control Unit (NLCU) under the Plant Protection and Food Safety Directorate (PP&FSD). The unit was set up to oversee surveillance, reporting, logistics and coordination. The NLCU was equipped with modern ICT infrastructure, GPS devices, field vehicles, and other essential resources to support both office and field operations.

At the county level, County Locust Control Units (CLCUs) were established in 15 affected counties, namely Elgeyo Marakwet, Embu, Meru, Isiolo, Wajir, Garissa, Mandera, Marsabit, Turkana, Baringo, West Pokot, Kitui, Machakos, Samburu, and Tharaka Nithi. The CLCUs were furnished with digital tools, surveillance kits, office equipment, and transport logistics, enabling effective coordination of surveillance teams at community and ward levels.

Developing monitoring and reporting tools: In collaboration with the Regional Centre for Mapping of Resources for Development (RCMRD), a customized data collection toolkit and geoportal were developed to enhance real-time reporting. The system enabled spatial data capture, analysis, and visualization, thus improving surveillance planning, reporting, and decision-making. The system was further leveraged to develop suitability maps for migratory pests, helping stakeholders identify high-risk areas to allocate resources more efficiently.

Building the capacity

Extensive capacity-building initiatives were undertaken through joint efforts of the MoALD, the Food and Agriculture Organization (FAO), the Desert Locust Control Organization for Eastern Africa (DLCO-EA) and other partners. A total of 660 scouts and 74 technical staff were trained on desert locust biology, identification, monitoring, and reporting procedures. The training emphasized the use of digital tools such as *eLocust3g* and *eLocust3m*, thus strengthening real-time field data collection and coordination. National Government Administrative Officers (NGAOs), County agricultural officers and extension staff also received targeted training to strengthen monitoring operations and enhance local reporting capacity.

In addition, the FAO provided technical experts, drawn from the region, thereby enhancing the quality and relevance of the capacity-building efforts. The ELRP, in collaboration with RCMRD, provided the equipment for mapping and plotting, further enabling effective analysis and visualization of surveillance data.

Developing of a Migratory Pests and Invasive Weeds Management Strategy: The project facilitated the formulation of a national pest management strategy, the Migratory Pests and Invasive Weeds Management Strategy 2022-2027. The strategy offers a comprehensive and structured framework that brings together key actors from national and county governments, research institutions, regional bodies, development partners, and community stakeholders to collectively plan, implement, and monitor pest management interventions. It responds to the growing complexity of threats from migratory pest, such as desert locusts, *ELocust3m ELocust3m ELocust3m* birds, fall armyworms and invasive weeds, by aligning actions with the latest scientific knowledge and global standards. It clearly defines stakeholder roles, outlines standard procedures for monitoring and reporting, and aligns national efforts with regional and global best practices. The objective of the strategy is to provide long-term direction and coordination for addressing trans-boundary pest and weeds challenges in Kenya.

Strengthening coordination and linkages: A multi-stakeholder coordination mechanism was established and strengthened through the Multi-Institutional Technical Team (MITT), which brought together national, county and development partners. The MITT's role was to provide technical coordination, advisory support and oversight in the management of migratory and invasive pests and weeds in the country.

The team established strong linkages with regional entities such as the FAO and the DLCO-EA, facilitating timely information exchange, regional surveillance, and joint planning. This network enabled Kenya to align its reporting with regional early warning systems and receive technical and logistical support.

Institutionalising preparedness and response

To institutionalise preparedness in the country, the following activities were undertaken.

Developing training materials and protocols: The project developed technical guidelines, including training manuals, surveillance protocols, and Standard Operating Procedures (SOPs) to standardize field operations. This was done in collaboration with Centre for Agriculture and Bioscience International (CABI), the International Centre of Insect Physiology and Ecology (ICIPE), Kenya Agricultural & Livestock Research Organization (KALRO), DLCO-EA, Kenyatta University, FAO, MoALD, Inter-Governmental Authority on Development (IGAD) Climate

Prediction and Applications Centre (ICPAC), and the Pest Control Products Board (PCPB).

These technical documents served as capacity-building resources, enabling counties to conduct local training sessions, onboard new personnel, and hold refresher courses without external technical support. Their operationalization helped mainstream preparedness by embedding clear reporting mechanisms into county pest management structures, thereby enhancing Kenya's early warning and readiness to tackle future invasions.

Developing contingency plans for key migratory pests: In response to the threat posed by other migratory species, the project supported the development of contingency plans for *ELocust3m ELocust3m* birds, and African armyworms. The plans provide early warning frameworks, response mechanisms, and coordination structures for rapid deployment during future outbreaks. It is anticipated that the plans will be reviewed biannually or as need arises.

Development of the Kenya Preparedness Plan for Food and Nutrition Security Crisis: To address the broader implications of pest invasions on the country's food systems, the project contributed to the processes that led to the development of the Kenya Preparedness Plan for Food and Nutrition Security Crises. The plan integrates surveillance and response mechanisms with food security indicators, thereby enhancing national readiness to mitigate the impacts of pests and other agricultural emergencies on vulnerable populations. The Preparedness Plan is a government-led initiative informed by extensive consultations with stakeholders at both levels of Government. The purpose of the Plan is to mitigate the impact of food and nutrition security (FNS) crisis, safeguard lives and livelihoods, and ensure efficient and effective resource mobilization and allocation, guided by lessons learned from past shocks and hazards. It aims to enhance early warning systems by strengthening data collection and analysis capabilities, to enable data-driven decision-making. Its objectives are to establish protocols that create a cohesive operational framework at both levels of government, improve coordination among stakeholders, and improve resource mobilization strategies.

Results

As a result of the interventions above, Kenya has made significant progress in strengthening its early warning and preparedness capacity to report on desert locusts and other migratory pests due to the interventions implemented by the project, as detailed below.

Enhanced capacity for detection and reporting: The training and deployment of county-based scouts, equipping surveillance teams with digital tools such as *eLocust3g* and *eLocust3m*, and the establishment of geoportals significantly improved the country's ability to detect, monitor, and report desert locust invasions and other migratory pest threats. As a result, field data can be collected in real time, allowing for quicker analysis and response planning. The technical materials developed through this project have enhanced consistency in data collection and reporting across the counties.

Further, the development and operationalization of digital monitoring and reporting tools, along with the geoportal created in partnership with RCMRD, enabled structured and centralized reporting of pest outbreaks. These tools improved the accuracy, timeliness, and consistency of surveillance data, providing a reliable basis for decision-making and resource deployment. The development and operationalization of the various documents and tools mainstreamed preparedness and readiness for future invasions.

Strengthened coordination structures: The formation of the National Locust Control Unit (NLCU), County Locust Control Units (CLCUs), and the operationalization of the Multi-Institutional Technical Team (MITT) led to more structured and cohesive coordination of pest management activities. At the regional level, Kenya's collaboration with FAO and DLCO-EA enhanced cross-border surveillance, information sharing, and joint planning, improving regional preparedness and response.

Institutionalization of preparedness plans: The development of the Migratory and Invasive Pests and Weeds Management Strategy, Standard Operating Procedures (SOPs), contingency plans for key pests, and the Kenya Preparedness Plan for Food and Nutrition Security Crises provide a comprehensive framework for proactive pest management. These instruments ensure that the country is better prepared for future invasions, with clear roles, protocols, and coordination mechanisms in place.

Lessons Learnt

The establishment of institutional structures with clear and defined roles at both national and county levels - the Locust Control Unit (LCU) and County Locust Control Units (CLCUs), coupled with the oversight of the Multi-Institutional Technical Team (MITT), provided a strong governance framework for harmonizing efforts.

Additionally, effective coordination between national and county governments, and among key stakeholders including FAO and DLCO-EA, is instrumental in delivering a successful desert locust response. Clear coordination structures, defined roles, and frequent communication enable organized and timely interventions.

Real-time information exchange among member states, neighbouring countries and partners enhances regional preparedness, early warning, and synchronized control operations.

Adoption of digital reporting tools, geospatial platforms and data collection tools such as drone technology demonstrated the need for timely and accurate information that can inform resource allocation, control operations, and policy formulation.

Recommendations

There is an urgent need to formalize and institutionalize early warning systems and preparedness frameworks within national and county governments. This will ensure that surveillance, risk assessments, and response mechanisms are embedded into regular agricultural planning to effectively mitigate future food security crises.

Efforts should be made to bridge the gap between scientific knowledge and local understanding, particularly regarding locust behaviour, surveillance, and control protocols. Tailoring technical guidance into locally understandable formats and involving communities in knowledge-sharing platforms will foster better adoption and cooperation.

There should be scaling up of early warning systems and tools to all counties to strengthen resilience.

Prioritization and deployment of advanced tools, such GIS, remote sensing, drones, and AI-powered platforms, to enhance predictive capabilities and real-time response. Parallel investments in capacity building are essential to ensure that technical personnel at both the national and county levels are proficient in using and maintaining such tools.

The government should consider creating a dedicated and ring-fenced contingency fund for managing migratory and invasive pests and weeds. Such a fund would provide readily available resources for rapid response, avoiding delays often associated with emergency funding mobilization during crises.

There is need to shift from reactive to proactive pest management approaches. Policies should promote early interventions when infestations are still localized and manageable.

Suggested Further Reading

Noar. D.R., Jahant-Miller, C., Emerine. S, & Hallberg. R. 2021. Early Warning Systems as a Component of Integrated Pest Management to Prevent the Introduction of Exotic Pests. *Journal of Integrated Pest Management*, (2021) 12(1): 16; 1–7 doi: 10.1093/jipm/pmab011. Accessed at: *www.Early_Warning_Systems_as_a_Component_of_Integrated.pdf*

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EMERGENCY LOCUST RESPONSE PROGRAM