DESERT LOCUST CITIZEN REPORTING

Driving Response through
Digital Technology & Citizen Reporting

AGRIFIN CASE STUDY: NOVEMBER 2020

PlantVillage Dalberg MERCY CORPS | AGRIFIN

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ABOUT AGRIFIN

Mercy Corps' AgriFin programming (MCAF) represents USD 35 million in innovation funding from the MasterCard Foundation, Bill and Melinda Gates Foundation and the Swiss Development Corporation to support development, testing and scale of digitally-enabled services for smallholder farmers.

- Our objective is to develop sustainable services that increase farmer income and productivity by 50%, with 50% outreach to women
- MCAF works as an innovation partner with private sector scale partners and such as banks, mobile network operators, agribusinesses, as well as technology innovators and governments committed to serving smallholders at scale
- We help our partners develop, test and scale bundles of digitally-enabled financial and non-financial services supporting partnership development between market actors that leverage their strengths
- We combine MCAF team expertise with strategic subsidy to jointly implement iterative, fail-fast engagements with partners on a cost-share basis, sharing public learnings to drive market ecosystem growth
- Since 2015, we have completed more than 200 engagements with over 120 partners across Africa
- With the onset of the Desert Locust in East Africa, the Skoll Foundation funded AgriFin's first emergency response work leveraging digital tools
- **With this support, AgriFin now reaches more than 8 million smallholders**

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ABOUT DALBERG

OUR MISSION

Our mission is to bring the best of private sector strategy to address global development challenges

WHO WE ARE

We are entrepreneurs and innovators, designers and creative problem solvers, thinkers and doers, idealists and pragmatists from everywhere, at home anywhere

WHAT WE DO

- Offer an innovative mix of advisory, investment, research and design services
- Offer an approach that combines rigorous analytical capabilities with deep knowledge and networks across emerging and frontier markets

WHY WE DO IT

Our shared mission is a positive and optimistic one; we work to uncover, build fuel and sustain the potential in people everywhere

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THIS CASE STUDY MAPS THE DESERT LOCUST RESPONSE AND DRAWS BEST PRACTICES TO INFORM FUTURE CITIZEN REPORTING

Context

- In 2020 the Horn of Africa suffered its **worst desert locust outbreak in 70 years** which – coinciding with **COVID-19** – posed a serious **threat to food security** in the region
- AgriFin mobilized and coordinated a **consortium of partners** to develop citizen reporting tools through **digital technology** to fill critical gaps in **field level data** to inform the locust response

Objectives & Approach

- This case study is intended for potential stakeholders of future citizen reporting efforts and seeks to achieve three main objectives:
  1. Map the **desert locust reporting ecosystem**
  2. Identify **best practices** in citizen reporting
  3. Develop **recommendations for future** citizen reporting efforts
- We focused on citizen reporting of **desert locusts** but also drew upon **wider applications** to derive **broader best practices**

Key partners

- The response was founded on a consortium of key partners:

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Ethiopian ATA Agricultural Transformation Agency የኢትዮጵያ ግብርና ትራንስፎርሜሽን ኤጀንሲ
PlantVillage
turn
CABI
THE MEDIAE COMPANY MEDIA FOR EDUCATION AND DEVELOPMENT
SHAMBA SHAPE-UP
iShamba

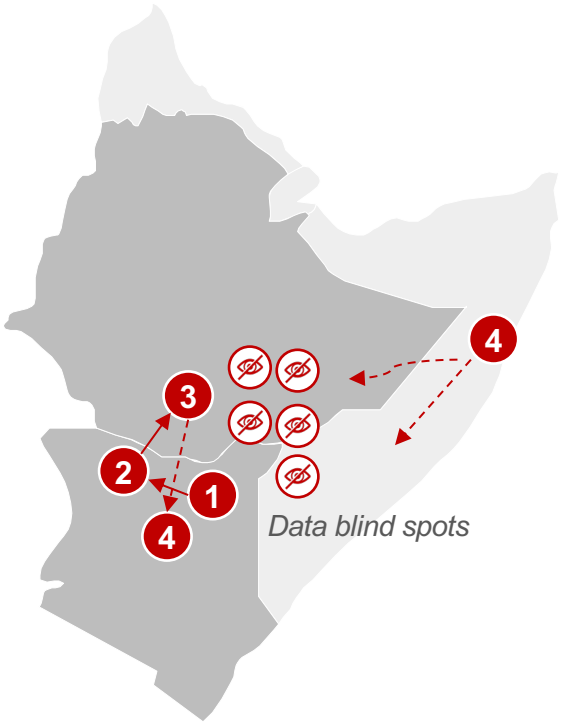
Research Overview

- Over four weeks, Dalberg used a combination of research methods:
  - We conducted 32 virtual interviews with stakeholders across the desert locust ecosystem and with broader experience of citizen reporting models (see Appendix)
  - We conducted desk-based research and analyzed available data

EXECUTIVE SUMMARY (1/3)

Context

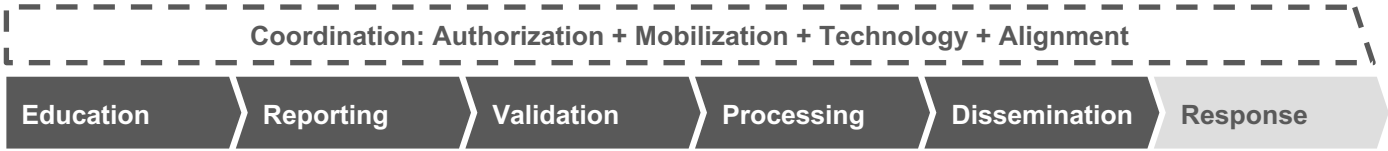
- In 2020 the Horn of Africa suffered its **worst desert locust outbreak in 70 years**, posing a **serious threat to local food security and livelihoods** – once locusts have hit it is too late to prevent damage with each sq km of locusts able to eat as much in a day as 35,000 people
- In January, **locusts moved into Northern Kenya** from the Horn of Africa (1), **moving to the North Western region** (2) and **further into Ethiopia** in July 2020 (3), whilst they are **expected to return to Kenya** from November onwards (4)
- Response institutions lacked adequate **historical locust data on the Horn of Africa** region, thus there were **significant data blind spots** in the most affected regions of the Desert Locust invasion
- Farmers in the region also **lacked adequate information** on Desert Locusts, how it affected their crops and livestock and how to respond to the devastating crisis
- The **traditional locust reporting model** could **not generate data of the scale and breath required** and was impaired by the **logistical constraints of COVID-19,** limiting its ability to provide a target response



EXECUTIVE SUMMARY (2/3)

Citizen Reporting: Desert Locusts and Lessons Learned

- Citizen reporting **crowdsources** information through technology to **fill data gaps** and **inform agricultural responses**; it has previously been applied in **different contexts,** such as wheat rust, elections and bird migration
- The coordination of the response included:
  - Securing **government buy-in and approval** for the citizen reporting model
  - Mobilizing a **consortium of partners** with the **capabilities required to deliver the response**
  - Deploying complementary **communication channels** to **target different audiences** and **maximize outreach**
  - Continuously **aligning stakeholders** to ensure the **clear designation of roles and responsibilities**
- The citizen reporting model comprised several stages of **data communication** across **nine technology channels**:
  - The **education** of farmers about the **locust threat** and **citizen reporting system available** to them
  - The **reporting** of locust sightings through technology channels **serving different levels of digital literacy**
  - The **validation** of reported data to ensure **accuracy and scientific robustness**
  - The **processing** of validated data and **integration with wider data** to **predict locust swarm activity**
  - The **dissemination** of expected locust swarm activity to **inform education and response efforts**



EXECUTIVE SUMMARY (3/3)

Framework for Applying Citizen Reporting

- Three steps can be followed in **applying a strategic approach** to deploying citizen reporting models in the future:
  - **Lay the foundations** by **identifying enablers and blockers**
  - **Remain flexible to variables** that can differ by context
  - **Deploy the model** with a **structured approach and general best practices**

1 Lay the foundations

- **Identify the enablers and blockers** of a potential citizen reporting model in advance
- **Pro-actively develop plans** to address these so that a citizen reporting model can be **rapidly mobilized as and when it is required**

2 Remain flexible

- No one size fits all – **Understand the variables** that can differ across citizen reporting contexts
- **Remain agile** and able to **adapt to the specific context** as it evolves

3 Deploy the model

- **Apply a structured approach and general best practices**, which can be tailored to the specific context, at each stage of the citizen reporting model

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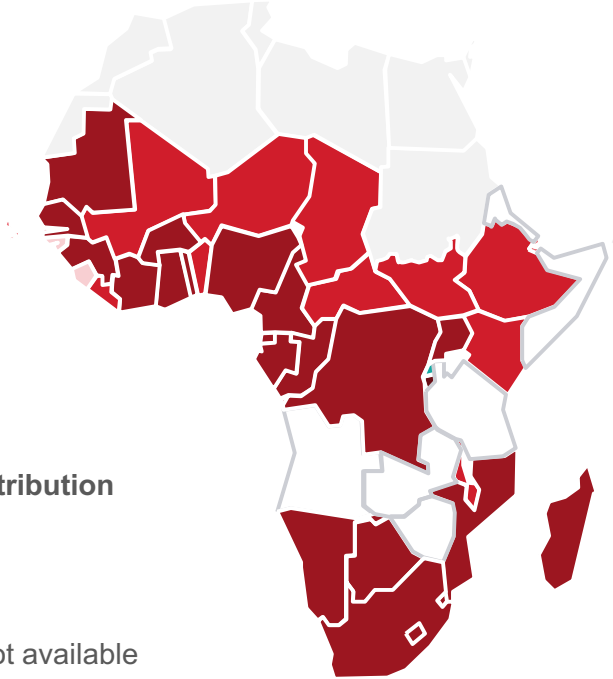
Context

AGRICULTURE IS KEY TO SUB-SAHARAN AFRICA'S ECONOMY AND IS VULNERABLE TO DAMAGE FROM DESERT LOCUSTS

Agriculture's contribution to GDP in Sub-Saharan Africa (2019)[1], %



Agriculture is central to Sub Saharan Africa's economy, with smallholder farmers playing a central role

- Agriculture contributes 15% of GDP
- Employs >50% of the population
  - c. 80% of the agriculture output is contributed by c. 33m of Small Holder Farmers (SHF)
  - 40-50% of SHF are women
- Forms the bedrock of food security and nutrition
  - 75% and 80% of the population in Kenya and Ethiopia respectively are dependent on agriculture for their livelihoods
  - Production of diverse and nutrient dense foods increases resilience against malnutrition and improves health outcomes
- Desert locusts pose a significant threat to food security and once they have hit crops it is too late to prevent damage, with each sq km of locusts able to eat as much in a day as 35,000 people (and some swarms measuring >2,000 sq km)

Source: World Bank Data Indicator on Agriculture and Employment; FAO; African Postharvest Losses Information System (APHLIS); World Bank, 'Arable land (hectares per person) - Sub-Saharan Africa', 2017. Relief Web, 2020, Desert Locusts threaten food security in Ethiopia

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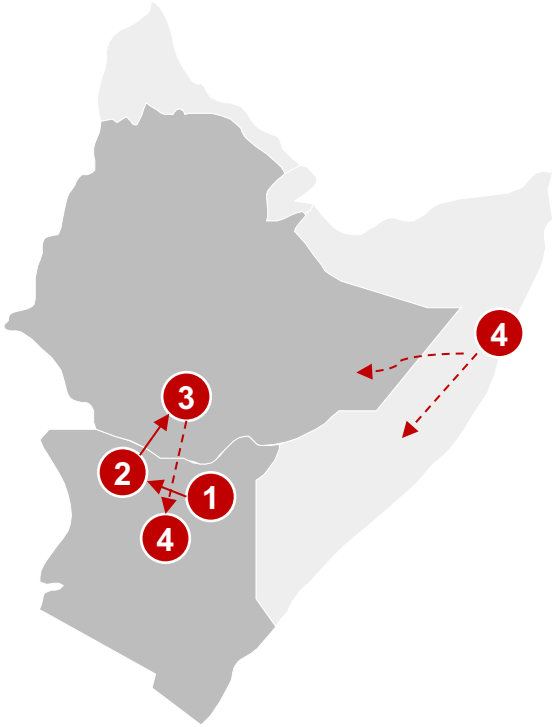
Context

THE HORN OF AFRICA SUFFERED ITS WORST DESERT LOCUST OUTBREAK IN 70 YEARS ALONGSIDE THE OUTBREAK OF COVID-19



In 2020 Kenya and Ethiopia were hit by the worst desert locust outbreak in 70 years, which coincided with the outbreak of COVID-19:

1 **December**
Locusts appear in northern Kenya from the Horn of Africa and hopper bands begin to swarm

! **March**
COVID-19 is declared a global pandemic and travel restrictions are imposed between Kenyan counties

2 **July - September**
Locusts are present in North-West Kenya

3 **July**
Locusts migrate to Ethiopia

4 **November onwards…**
Locusts are expected to return to Kenya from Ethiopia and Somalia

The desert locust outbreak – twinned with the logistical challenges imposed by COVID-19 – posed an imminent threat to food security in East Africa

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Context

THE TRADITIONAL REPORTING MODEL WAS UNABLE TO RAPIDLY SCALE DATA AMIDST A HISTORIC LOCUST SWARM AND COVID-19

A traditional response was led by extension services tracking locust swarms (to direct aerial spraying of pesticides), which deployed alone would have suffered:

- Narrow breadth of reporting amidst a widespread swarm
- A slow response to the high speed of the swarm's travel (up to 150km per day)
- Difficulty in identifying hopper bands with conventionally-used satellite imagery
- Limited support from farmers who were unfamiliar with desert locusts, which had not struck in 70 years

A rapid, targeted and resource-efficient response to the locust swarm would not have been possible due to the limited visibility of locust activity across Kenya and Ethiopia

Moreover, the traditional model of response was impaired by logistical constraints due to COVID-19, including:

- Delays in sourcing of pesticide chemicals to fight locusts from limited global supply chains
- Restrictions of movement under lockdown (although international field experts were already in the region and local field experts exempt from national travel restrictions)

A new approach was required to augment the traditional model and tackle the locust emergency

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CITIZEN REPORTING ENABLES THE RAPID, SCALABLE AND COST-EFFECTIVE COLLECTION OF DATA FOR EMERGENCY RESPONSE

Citizen reporting crowdsources information through digital technology to generate widespread data that can inform agricultural response efforts

Agricultural disaster response efforts can be inhibited by data blind spots, particularly in rural communities…

…citizen reporting mobilizes citizens at the frontline of an event (e.g. smallholder farmers, pastoralists) and deploys digital technology to provide visibility that can inform the response effort

*"PlantVillage from one of our US Land Grants (Penn State) has shown the important role of Artificial Intelligence, cloud computing, analytics and satellite intelligence in cost-effectively fighting the Desert Locust and other threats African farmers face. Data is critical for both the current threat but future ones when they occur. You must measure and monitor digitally if you want to control." – **US Ambassador Kip Tom***

Citizen reporting has been applied to many different past contexts[1)]

- Predicting and mitigating **wheat rust** diseases
- Monitoring **election activity** and voter turnout
- Monitoring of **advocacy and human rights** activity
- Responding to **earthquakes**
- Tracking of **bird migration**
- Prediction of **coffee yields** (planned for launch January 2021)

1) See Appendix for further detail

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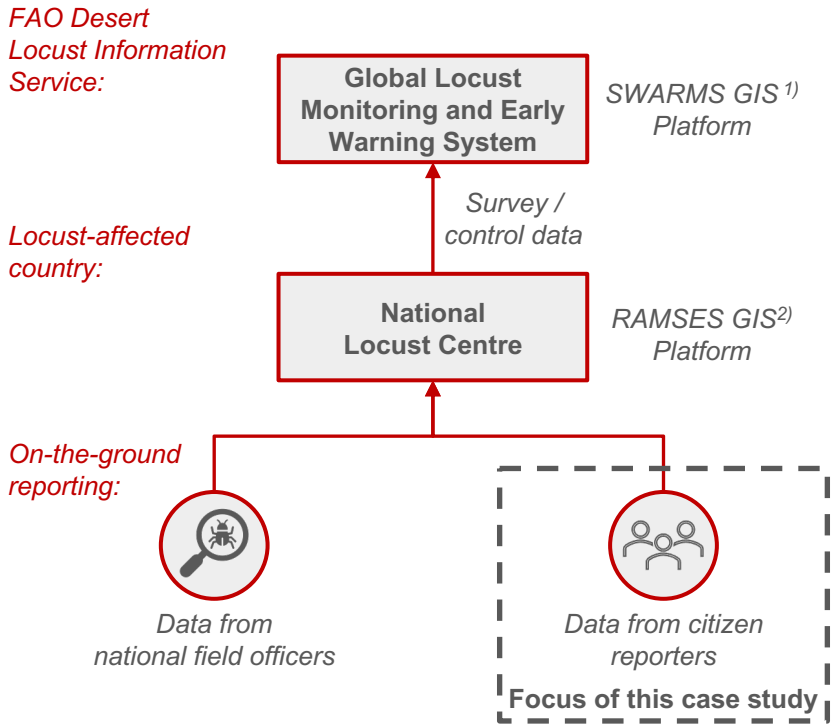
CITIZEN REPORTING AUGMENTED UN FAO'S DESERT LOCUST MONITORING, EARLY WARNING AND INFORMATION SYSTEMS

- Citizen reporting supported FAO's pre-existing Desert Locust Information Service (FAO DLIS) – an early warning system that monitors weather and ecological conditions and locust infestations in potentially affected areas
- Citizen reporting provided additional sources of on-the-ground reporting – in addition to national field officers – which were:
  I. Aggregated, validated and processed by PlantVillage
  II. Transmitted in real time via satellite to National Locust Centres (NLCs) for data analysis
  III. Forwarded to the Global Information System managed by FAO in Rome for analysis and forecasting

"Data reported by citizens who have been taught the basics of Desert Locust and know how to use eLocust3m can be a valuable contribution to the global system used for monitoring locusts, organising field operations, conducting control campaigns, and providing accurate and timely early warning." – ***Keith Cressman, FAO Senior Locust Forecasting Officer***



1) Schistocerca Warning and Management System (SWARMS) is used by FAO in Rome on a daily basis to manage and analyze environmental and locust data 2) Reconnaissance and Management System of the Environment of Schistocerca (RAMSES) GIS developed for frontline countries and runs on a personal computer.

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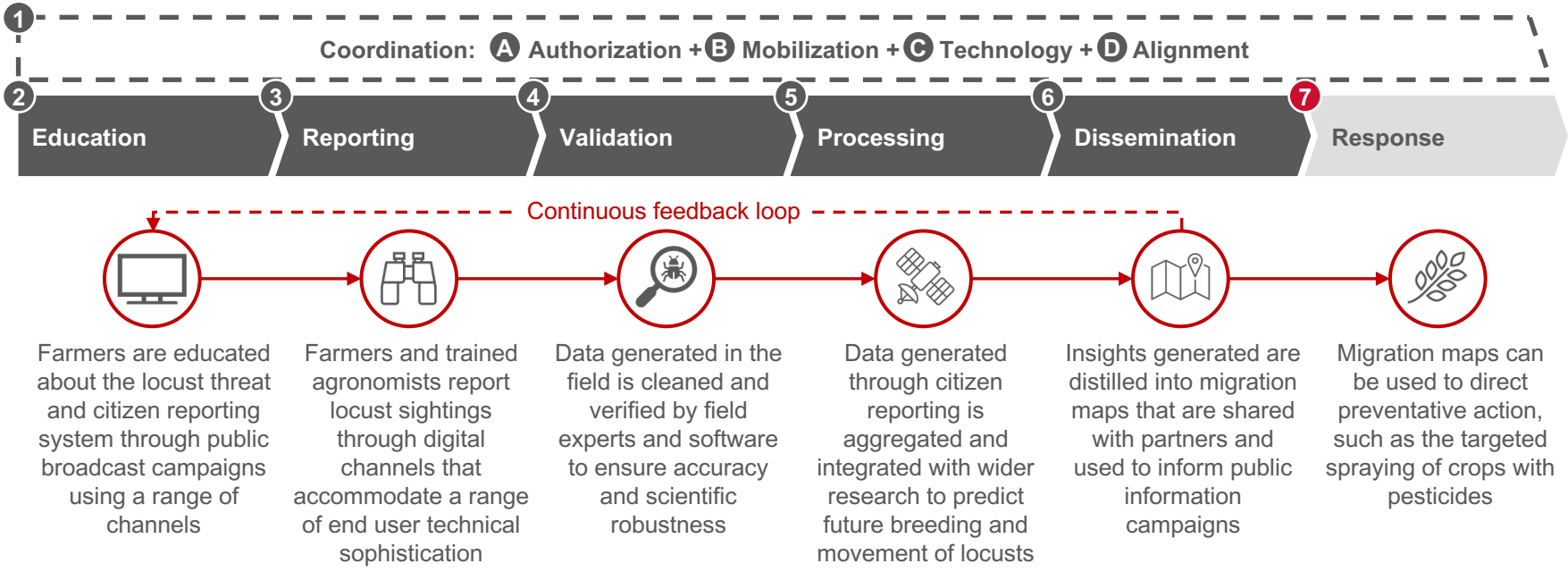
DESERT LOCUST CITIZEN REPORTING WAS FORMED OF SEVERAL STAGES OF DATA COLLECTION AND COMMUNICATION



A range of enabling bodies, channel partners and end users were mobilized and coordinated to enable data exchange across the ecosystem

x xx Citizen reporting – In scope

x xx Out of scope

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AGRIFIN AND ATA SECURED CRUCIAL GOVERNMENT BUY-IN AND APPROVAL TO ENABLE THE NEW CITIZEN REPORTING MODEL

Desert locust findings

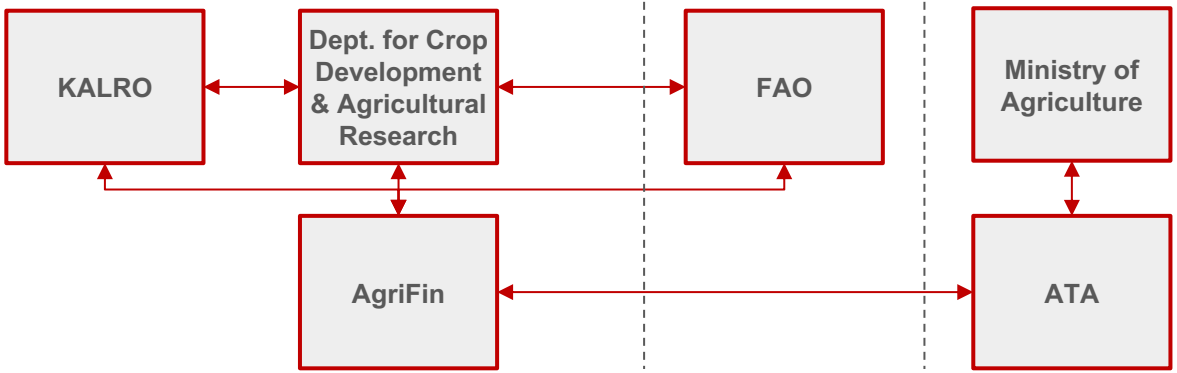
AgriFin and ATA secured government approval for citizen reporting due to:

- Pre-existing networks that enabled access to key decision-makers
- Technology solutions that complemented FAO's global monitoring and early warning system
- Assurances that citizen data would remain secure and not change ownership

Kenya: AgriFin leveraged its network to influence the ongoing desert locust response effort and secure government approval for the use of new technology channels to improve citizen reporting

Data integrated with FAO DLIS

Ethiopia: ATA secured direct approval from the MoA



Broader lessons learned

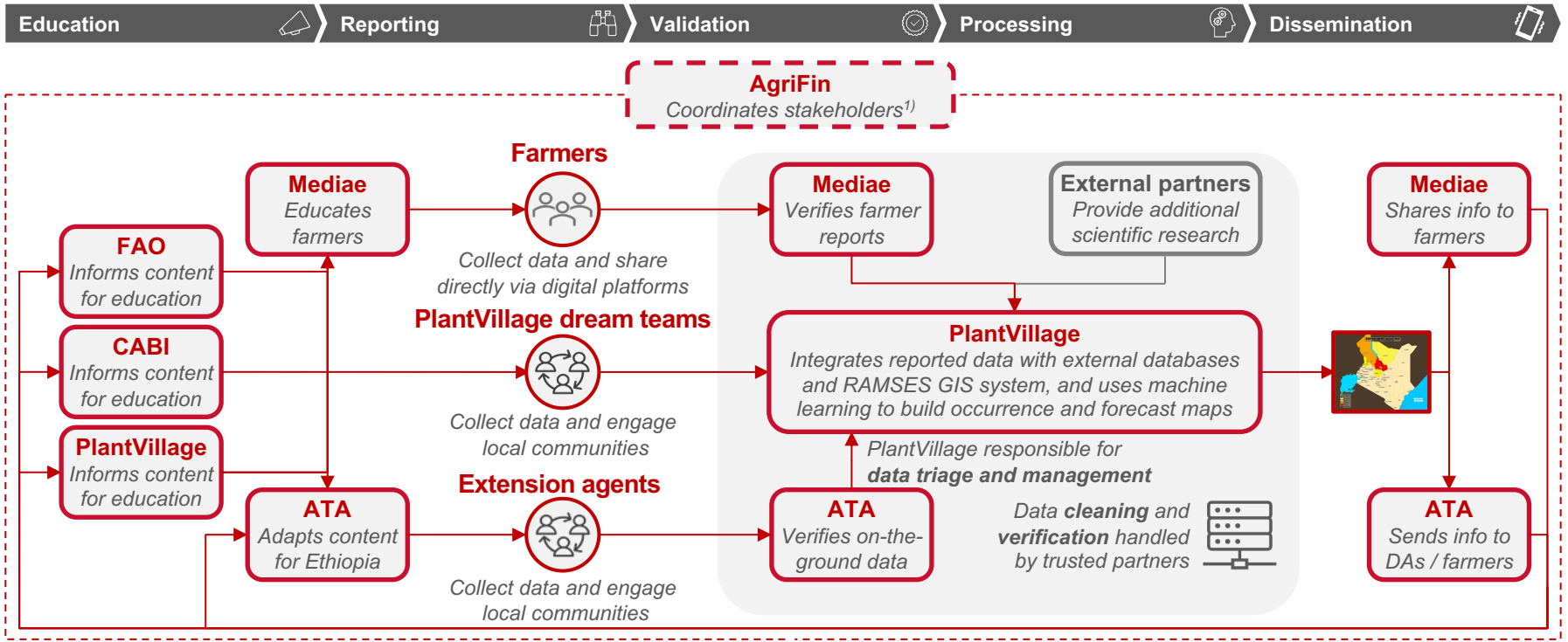
Key Challenges

- Influencing decision-makers in **opaque bureaucratic processes**
- Convincing governments of the **secure use of citizen data**
- Preventing **slow decision-making processes** from acting as bottlenecks

Best Practices

- **Complement pre-existing systems** already supported by the government
- **Provide transparency** over citizen **data ownership, use and security**
- **Involve enabling bodies from the beginning** of the process to limit delays
- **Provide impact updates** to sustain buy-in

A CONSORTIUM OF PARTNERS WAS MOBILIZED WITH THE CAPABILITIES REQUIRED TO DELIVER THE REPORTING MODEL (1/2)



1) AgriFin mobilized and coordinated stakeholders through consultation with enabling partners, including FAO, the Government of Kenya and Government of Ethiopia

A CONSORTIUM OF PARTNERS WAS MOBILIZED WITH THE CAPABILITIES REQUIRED TO DELIVER THE REPORTING MODEL (2/2)

Desert locust findings

AgriFin – which consulted PlantVillage in the conceptual design of the ecosystem – mobilized partners with complementary technical capabilities and domain expertise (i.e. sectoral/regional knowledge) to:

- Reach a range of disparate end users in Kenya and Ethiopia
- Remain flexible to the locust swarm and its movements (e.g. when locusts unexpectedly hit northern Kenya)

	Education		Reporting		Validation		Processing		Dissemination	
ATA	☐	☑	☐	☑	☐	☑	☐	☐	☐	☑
PlantVillage	☑	☐	☑	☐	☑	☑	☑	☑	☐	☐
Mediae/iShamba	☑	☐	☑	☐	☑	☐	☐	☐	☑	☐
CABI	☑	☑	☐	☐	☐	☐	☐	☐	☐	☐
FAO	☑	☑	☑	☑	☑	☑	☐	☐	☐	☐
Full ecosystem	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑

☑ Provides capability in Kenya ☑ Provides capability in Ethiopia

Broader lessons learned

Key Challenges

- **Rapidly mobilizing** the relevant partners if in the context of an emergency
- Planning which partners are required given the **unpredictability of crises**
- Mobilizing partners that provide sufficient breadth to **engage disparate end users**

Best Practices

- Determine a matchmaker with a **pre-existing network of partners**
- Identify required partners by **segmenting end user needs** from the **bottom-up**
- Engage partners who have **established trust and authority** with end users
- **Remain flexible** in engaging partners depending on how the crisis evolves

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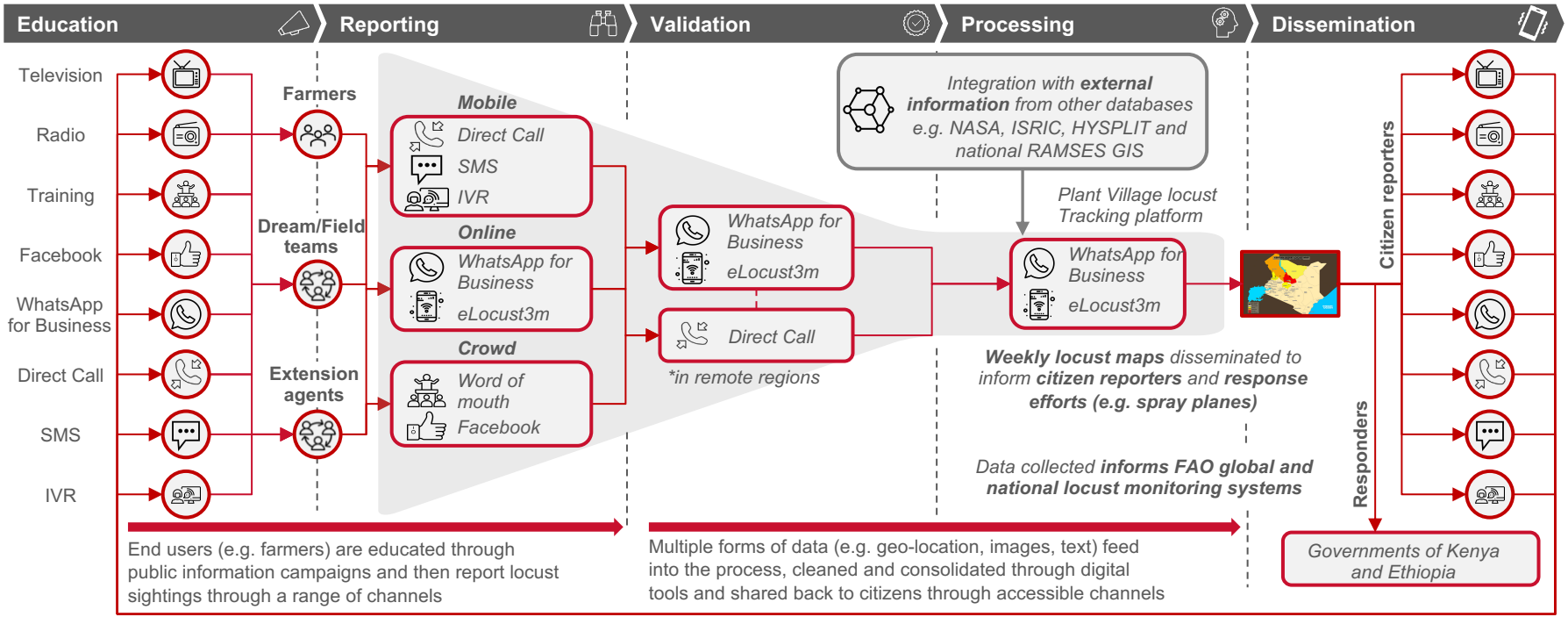
THE CONSORTIUM RAPIDLY SCALED A COMPLEMENTARY RANGE OF TECHNOLOGY CHANNELS TO MAXIMIZE OUTREACH (1/2)



Disseminated locust insights used to educate citizen reporters

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THE CONSORTIUM RAPIDLY SCALED A COMPLEMENTARY RANGE OF TECHNOLOGY CHANNELS TO MAXIMIZE OUTREACH (2/2)

Desert locust findings

		Description	Advantages	Disadvantages
Mobile	**WhatsApp for Business**	Platform developed by Turn.io and managed by Mediae/iShamba and ATA	• Highly programmable • Multiple data formats • Easy to scale / translate	• Requires smartphone • Not intuitive to users • Limited awareness • Data not standard/geo-referenced
Mobile	**eLocust3m**	Locust sighting app developed by PlantVillage	• Records geo-location • Provides imagery	• Requires smart phone • Requires trained user
Mobile	**SMS**	Short text messaging that comes with most phones	• Used on feature phone • Flexibility for recipient	• Lengthy verification • Requires basic literacy • Data not standard/geo-referenced
Mobile	**IVR**	Automated Interactive Voice Response (IVR)	• Simple to use • Used on feature phone	• Lengthy reporting and verification • Data not standard/geo-referenced
Media	**TV**	Shamba Shape Up show & 5 Ethiopian channels	• Wide coverage • Inclusive reach	• Specific scheduling times
Media	**Radio**	National and Local radio channels	• Wide national coverage • Inclusive reach	• Specific scheduling times
Personal	**Facebook**	Use of established Facebook groups	• Wide and rapid reach • Multiple data formats	• Noise from unverified sources • Data not standard/geo-referenced
Personal	**Call center**	Run by iShamba following up on farmers	• Allows for audience targeting	• Limited by team capacity • Data not standard/geo-referenced
Personal	**Training**	In-person training of farmers	• Enables community capacity building	• Limited by team capacity

Broader lessons learned

Key Challenges

- Varying **digital literacy** and **technology penetration** across regions
- **Integrating data** and **closing the feedback loop** across different channels
- **Obtaining standard data** that is geo-referenced

Best Practices

- Apply a strategic approach so that **each channel has a designated purpose** within the ecosystem
- Select channel based on **timeliness of messaging** and **audience targeting**
- Select channels **trusted in local communities**
- Use **standard geo-referenced** data format

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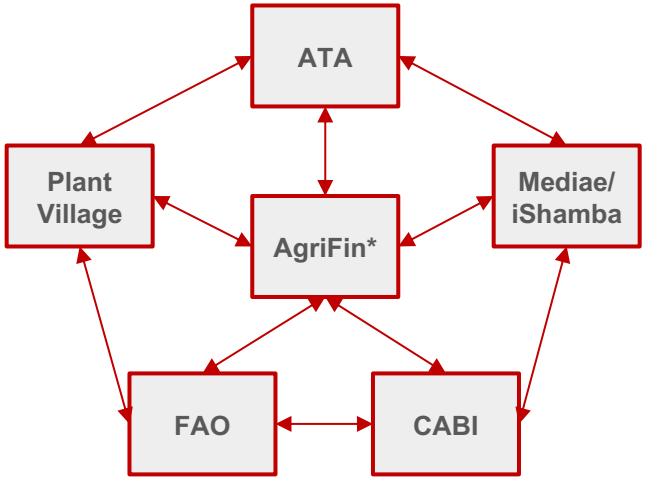
STAKEHOLDERS WERE COORDINATED TO ENSURE CONTINUOUS ALIGNMENT ON ROLES, RESPONSIBILITIES AND DATA SHARING

Desert locust findings

AgriFin coordinated the ecosystem throughout the response effort to ensure:

- Partners were continuously aligned on responsibilities and response developments (e.g. through weekly partner coordination meetings)
- Visibility between ecosystem partners and end user requirements
- Continuous sharing of data between partners through a single platform



*AgriFin also engaged several additional scale partners, including:

- Turn.io
- ECOM
- One Acre Fund
- KALRO

Broader lessons learned

Key Challenges

- **Ensuring alignment** between a range of stakeholders to **avoid duplication**
- **Providing visibility** between supply-side partners and end user requirements
- **Integrating data** across different partners' platforms

Best Practices

- Hold regular **partner alignment meetings**
- Establish **clear data sharing protocols and standards** from the outset
- Appoint a **dedicated full-time data manager** to coordinate data sharing
- Deploy an **open-source data hub** that all partners can access

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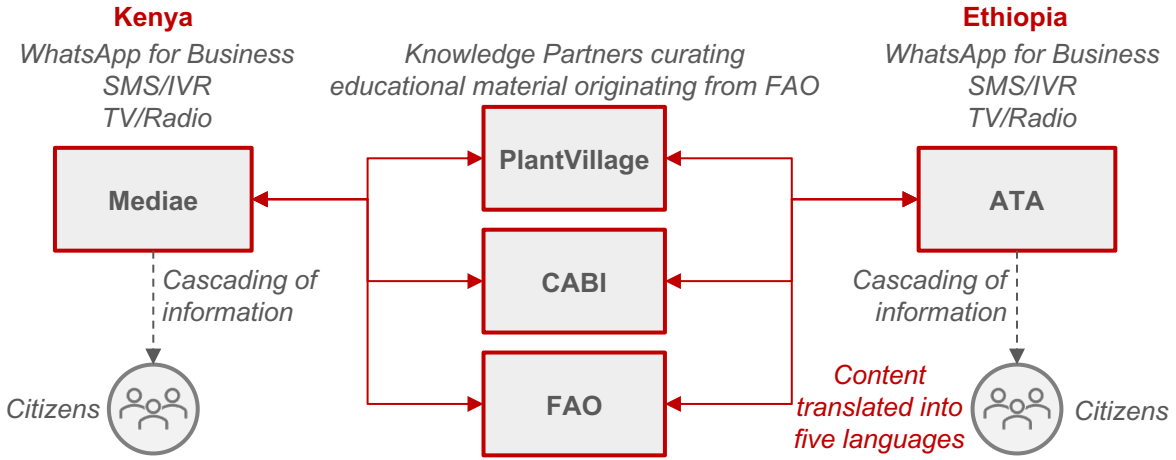
AWARENESS OF LOCUSTS WAS RAISED THROUGH TAILORED CONTENT CASCADED THROUGH A RANGE OF CHANNELS

Desert locust findings

Educational content was distributed to empower over 11 million farmers and address the knowledge gap on desert locusts through:

- The creation of scientifically-accurate content (e.g. how to correctly identify locusts, myths/misconceptions, reporting channels, promoting safe use of pesticides)
- The tailoring of messaging to end users across different regions and languages
- The use of multiple technology channels to accommodate different levels of digital literacy (e.g. WhatsApp vs SMS/IVR vs TV/Radio)



Broader lessons learned

Key Challenges

- Potential **spread of misinformation**
- Varying **partner channel coverage** by region
- Varying **literacy levels** by region/end user

Best Practices

- Have **well-segmented audiences** and use **complementary channels** to reach groups
- **Tailor and localize information** to serve target audiences (incl. type of imagery used)
- Use selected channels to **build trust** within local communities

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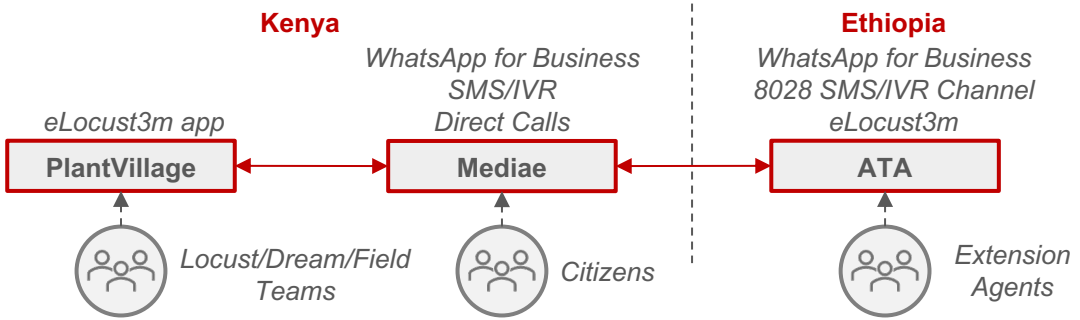
DATA WAS COLLECTED THROUGH MULTIPLE CHANNELS AND NETWORKS, BOTH ONLINE AND OFFLINE TO BUILD INSIGHTS

Desert locust findings

Pre-existing infrastructure and new complementary platforms were used to crowdsource sightings:

- In Kenya, farmers could report locust sightings through WhatsApp for Business, direct calls from Mediae team and SMS, which was the most preferred channel due its trust with farmers
- In Ethiopia, ATA leveraged its extensive network of development agents to collect information through surveys, but have seen little uptake of WhatsApp for Business
- FAO's eLocust3m app, which was developed by PlantVillage, was accessed through smartphones provided to trained teams that were recruited from local universities

"In the fight against locusts we have deployed youth to carry out surveillance aided by advanced tools in the form of digital apps like the eLocust3M from PlantVillage and FAO aiding the science of forecasting of trends and movements" – ***PS Boga, Principal Secretary, State Department for Crop Development & Agricultural Research***



Broader lessons learned

Key Challenges

- **Inaccurate sightings** (that are not geo-referenced) from community members
- Trade-off between capturing **maximum insights** and **simplicity for end users**
- Diminishing **motivation to report over time**, especially for negative reports

Best Practices

- Leverage **community networks** and **build trust** to have bottom up understanding of community challenges
- Build on **existing infrastructure** to be complementary rather than competitive
- **Create awareness** of reporting channels through coordinated marketing

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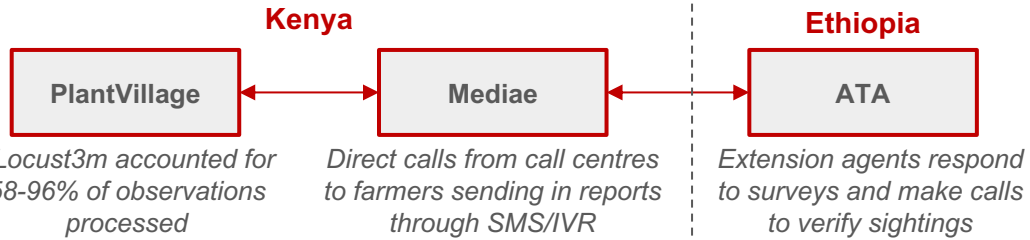
ACCURACY, CLARITY AND DETAILS OF REPORTED DATA WERE VERIFIED TO FACILITATE PROCESSING AND TARGETED RESPONSE

Desert locust findings

- The multi-step data validation process involved:
  I. Identifying where farmers or development agents have seen locusts
  II. Clarifying the information with farmers (from a long-list of reports through Mediae and ATA call centers) or on-the-ground verification by field scouts (from community reports) and advising farmers on how to share relevant data
  III. Plant Village and FAO conducted the final verification of locust reports (e.g. through image and geo-location data) feeding into data processing stage
- Artificial intelligence supported the verification of locust sightings by determining whether a reported image contained a locust and, if so, whether it was a hopper or adult locust
- Established networks (e.g. through eLocust3m Dream Teams) in rural and pastoralist communities supported validation processes in remote areas

'Ground-truthing data, verifiable with an image and GPS coordinates, are critical for validating sighting reports' – ***Dr Hughes, PlantVillage***



Broader lessons learned

Key Challenges

- **Logistical challenges** in reaching remote areas
- SMS reports can be **time consuming** to validate and **lack location accuracy**
- **Images and GPS data** can only be shared with smartphone

Best Practices

- Put **diagnosis power** in the hands of citizen reporters
- **Triangulate reports** from multiple channels to support with precision
- **Flexibility in movement** of partners to validate on-the-ground sightings

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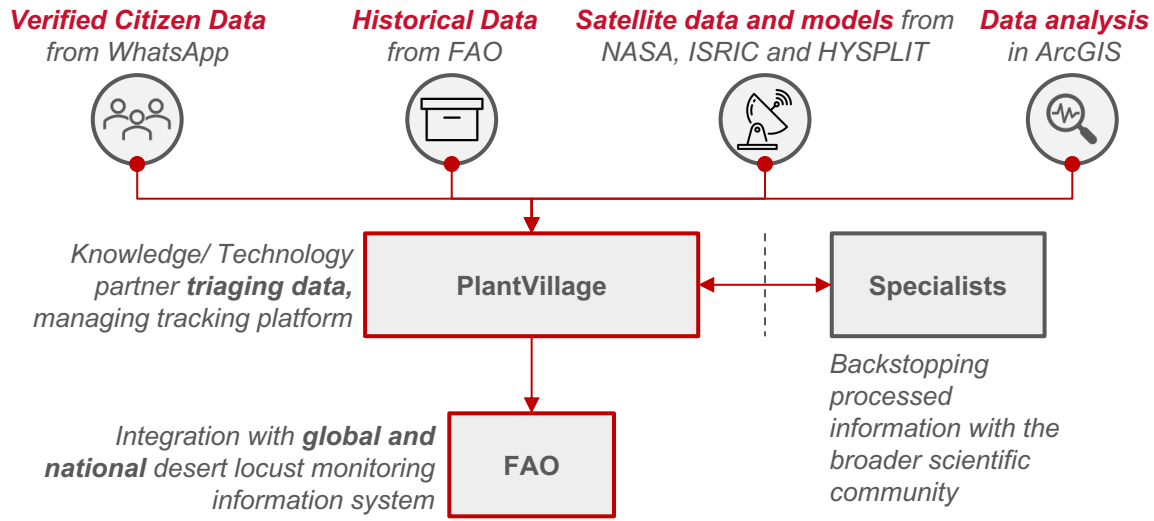
VERIFIED DATA WAS INTEGRATED WITH EXTERNAL DATABASES TO STRENGTHEN SITUATION ANALYSIS AND FORECASTING

Desert locust findings

PlantVillage led the analytical stage of the citizen reported data through:

- Triaging different data points from validated citizen reports, historical, forecasting and satellite data
- Integration with data from other sources into current FAO DLIS situation and forecast maps



Broader lessons learned

Key Challenges

- **Limited negative sighting reports** to support accurate predictions
- Consolidating varied data formats from multiple channels is **time-consuming**
- Complicated **data sharing protocols** across different countries

Best Practices

- **Crowdsource insights** from the scientific community to support effective response
- Engage a **trusted data intermediary** to simplify data sharing and triage
- Establish a **centralized data repository** to integrate multiple sources of data

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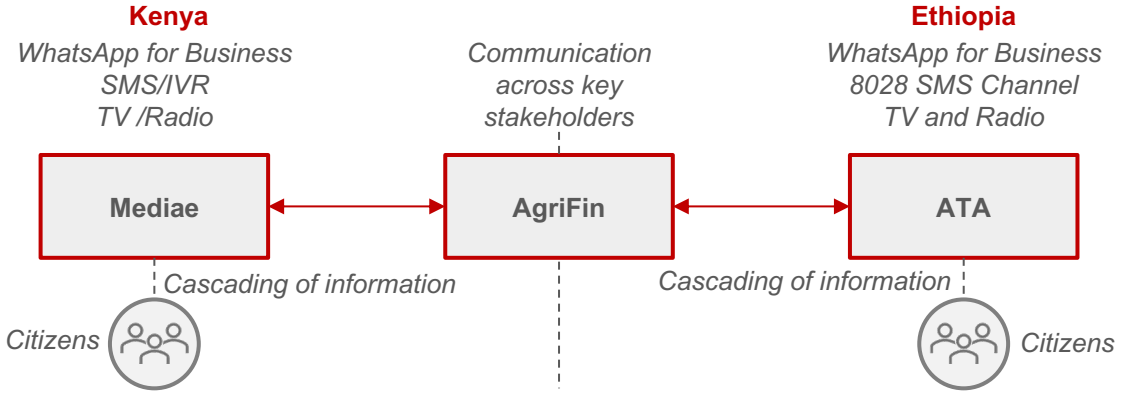
PROCESSED INFORMATION WAS SHARED WITH DECISION-MAKERS AND CITIZENS TO UPDATE THEM ON THE RESPONSE STATUS

Desert locust findings

Findings generated by Plant Village were shared with decision-makers and communication partners to forward to farmers and the public:

- Information was shared with farmers through weekly TV and Radio bulletins
- Updated maps and visuals were shared on WhatsApp and SMS platforms
- Integration with FAO SWARMS Warning and Management system in Rome, Locust Hub and national locust information systems

*"This step is essential to show citizen reporters where and how the reported data is used and to communicate the benefits of sharing it" – **Sarah Mackay, Producers Direct***



Broader lessons learned

Key Challenges

- **No clear timelines** on response times; **expectation of immediate action**
- There are **many actors** sending information to end users, sometimes resulting in duplicative efforts
- **Mass response** takes longer; difficult to cascade information back to each reporter

Best Practices

- **Empower local youth** (e.g. from local universities) to build capacity and cascade information back to local communities
- Understand the **cultural contexts** and **preferred language** for engagement
- **Provide feedback and evidence of action** to sustain end user motivation
- Apply a strategic approach so that **each channel targets designated end users**

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THREE STEPS CAN BE FOLLOWED IN APPLYING A STRATEGIC APPROACH TO CITIZEN REPORTING MODELS IN THE FUTURE

1 Lay the foundations

- **Identify the enablers and blockers** of a potential citizen reporting model in advance
- **Pro-actively develop plans** to address these so that a citizen reporting model can be **rapidly mobilized as and when it is required**

2 Remain flexible

- No one size fits all – **Understand the variables** that can differ across citizen reporting contexts
- **Remain agile** and able to **adapt to the specific context** as it evolves

3 Deploy the model

- **Apply a structured approach and general best practices**, which can be tailored to the specific context, at each stage of the citizen reporting model

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THE RAPID DEPLOYMENT OF CITIZEN REPORTING IS CONTINGENT UPON IDENTIFYING ENABLERS AND BLOCKERS IN ADVANCE

	Potential obstacle	Best practices
Funding 	Shortage of funding or resources required to deliver an adequate response	• **Secure flexible funding** that can be deployed as and when the potential citizen reporting model is required • Pro-actively **build relationships with donors**, informing them of the **benefits of citizen reporting** and the **importance of flexible funding**
Enabling bodies 	Refusal to authorize the citizen reporting model and/or cumbersome bureaucratic processes	• **Identify and engage key decision-makers** in advance • **Provide transparency** over the potential usage of data to **assuage security concerns** • **Complement systems** that are already favored by decision-makers
Partners 	Inability to mobilize partners with the required technical or domain expertise	• **Pro-actively build a network** of partners that can be pivoted according to the context as it evolves • **Identify required partners** through a **bottom-up segmenting of potential end user needs**
Digital landscape 	Limited ability to crowdsource accurate information due to lack of digital infrastructure	• **Map the technology landscape** to understand which channels can be used to access different end users and which have been proven to be most effective • Develop a **strategic approach** so that each technology channel has a **designated purpose**

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THE DESIGN OF A CITIZEN REPORTING MODEL MUST REMAIN FLEXIBLE TO VARIABLES THAT CAN DIFFER ACROSS CONTEXTS

Sector focus		Citizen reporting models can be applied across different sectors (e.g. agriculture, healthcare, financial services) and so will require different domain expertise to ensure scientific robustness
Geographical range		The geographical range can have implications for the required breadth of data gathering and stakeholder engagement (e.g. cross-border response efforts pose additional challenges with enabling bodies)
Predictability		The extent to which an event can be predicted can influence the level of preparedness that can be achieved (e.g. a drought can provide more visibility than an unexpected earthquake)
Technology environment		The types of technology that can be deployed varies across contexts as new technologies emerge, end user sophistication evolves and penetration changes
Data types		The type of end user data required to inform a response effort can vary in sensitivity, which could in turn influence the willingness of enabling bodies to approve of data sharing

A STRUCTURED APPROACH AND GENERAL BEST PRACTICES CAN BE APPLIED AT EACH STAGE OF A CITIZEN REPORTING MODEL

Education	Reporting	Validation	Processing	Dissemination	Response
• **Tailor and localize information** to serve target audiences • Use selected channels that have **already built trust within local communities**	• **Leverage community networks** and build trust to have bottom up understanding of community challenges • **Build on existing infrastructure** to be complementary rather than competitive	• Put diagnosis **power in the hands of citizen reporters** • **Triangulate reports** from multiple channels to support with precision • **Maintain flexibility** in movement of partners to validate on-the-ground sightings	• **Crowdsource** insights from the **scientific community** • Engage a **trusted data intermediary** to simplify data sharing and triage • Establish a **centralized data repository** to integrate multiple sources of data	• **Tailor and localize information** to serve target audiences • **Empower local youth** to build capacity and cascade information back to local communities • **Provide feedback** and evidence of action to sustain end user motivation	• **Ensure linkage** between citizen-reported data and response action taken to be able to **demonstrate tangible impact** generated

Stakeholders should be coordinated across the ecosystem by:

- **Securing and sustaining government buy-in** throughout the process and **providing regular impact updates**
- Holding regular partner coordination meetings to **continuously align on role, responsibilities and end user needs**
- Establishing **clear data sharing protocols and standards** across different partners and channels

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Conclusion

WHAT IS NEXT FOR CITIZEN REPORTING IN AGRICULTURE AND CLIMATE-RELATED EMERGENCY CONTEXTS?

- Mercy Corps AgriFin leveraged its network of partners in Kenya and Ethiopia to mobilize a complementary range of technical and domain expertise to deliver a widescale, multi-channel citizen reporting effort
- Lessons from this study imply that **smallholder farmers can be instrumental in rapidly scaling ground-truthing data** to build **rapid, targeted and resource-efficient responses** to future agricultural disasters and beyond
- Given the pace of change and evolving contexts for applying citizen reporting, AgriFin is continuously **learning** and **building knowledge** around the application of citizen reporting in future agricultural emergency contexts that could include:
  - Pest outbreaks (e.g. fall army worm)
  - Drought
  - Floods
  - Soil damage

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Broader Applications of Citizen Reporting

CITIZENS CAN BE EDUCATED AND EMPOWERED TO RESPOND IN NATURAL HAZARD MANAGEMENT AND ACROSS OTHER CONTEXTS

	Description	Key Learnings	Further reading
Wheat rust early warning system	Automating real-time data flows from field and mobile surveillance data, spore dispersal and environmental sustainability models of wheat rust through an Early Warning System (EWS) and cascading information to decision-makers, and small holder farmers in Ethiopia	Importance of strategic collaboration and proper implementation of a logistics strategy	Read more here
Tracking of bird migration	Empowering citizens to share observations on biodiversity, including birds on an interactive online mapping platform, paired with a community of scientists who share knowledge, as well as use data to assess environmental impacts on bird populations and migratory patterns	Community scientists can fill the gap where scientists lack adequate capacity	Read more here
Responding to earthquakes	Responding to projections by pre-mapping health facilities and developing a crisis map to support relief efforts in affected regions for response by government, non-government and volunteer groups	Support adaptive capacity to respond to emergency situations through pre-emptive mobilization	Read more here
Monitoring election activity	Infusing trust and transparency of election and democratic activities by aggregating reports through technology and responding with real-time information, giving citizens a voice in the process	Importance of timely information in rapidly evolving situations	Read more here
Monitoring advocacy and human rights	Crowdsourcing reports of human rights violations and systematically keeping a record of ground-truthing information	Streamline communication in moments of shared crisis and emergency	Read more here
Prediction in coffee yields	Gamifying and gathering real time data from smallholder coffee farmers, and through machine learning, generate insights to share with farmers on predictions for yields in actionable formats	Pending launch in January 2021	Read more here

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Stakeholder Engagement

WE INTERVIEWED 32 STAKEHOLDERS WITH EXPERIENCE OF BOTH DESERT LOCUST AND BROADER CITIZEN REPORTING SYSTEMS

Type	Organization	Name	Role
Convenor	Mercy Corps AgriFin	Leesa Schrader	Program Director
		John Mundy	Locust and COVID Digital Response Manager
		Elias Nure	Ethiopia Project Management and Regional Technology Expert
		Samuel Karanja	Agriculture Manager, Kenya
Communication Channel Provider	Mediae/iShamba	Sophie Rottmann	Project Coordinator
		Martin Aketch	Product Manager
Government	Agriculture Transformation Agency (ATA)	Habtamu Hailemariam	Senior Project Help Desk and Surveys Officer
Locust Response	PlantVillage/ Penn State	Dr David Hughes	Associate Professor
		Annalyse Kehs	Executive Director
		Derek Morr	Systems Design Specialist
		Fei Jiang	Postdoctoral Researcher
	Centre for Agriculture and Biodiversity International (CABI)	Dr David Onyango	Communications Specialist
	Food and Agriculture Organization (FAO)	Dr William Hamisi	Deputy Country Representative
Industry Expert	Mercy Corps AgriFin	Kristen Peterson	Advisor
	Ushahidi	Ory Okolloh	Co-Founder
	ISF Advisors	Christine Ribeiro	Advisor
	Cambridge University	Chris Gilligan	Professor, Epidemiology and Modelling
		Rebekah Hinton	Department of Plant Sciences
	Producers Direct	Sarah Mackay	Advisor
	International Maize and Wheat Improvement Centre (CIMMYT)	Dave Hodson	Senior Scientist
End – Users e.g. field scouts, Development agents	PlantVillage Dream Teams (Kenya)	Dr John Chelal	eLocust3m Country Lead
		Melodine Jeptoo	Scout Coordinator
		Tyson (Samburu County) and Fofen (Marsabit County)	Field scout team leaders
	Agricultural Transformation Agency (Ethiopia)	Development Agents from the Oromia (x2), Amhara Region (x3) and SNNP (x3) regions	Development Agent (DA)

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