Conceptual Framework for the Design of the National Agriculture Management Information System (NAMIS)

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List of Acronyms

3G	Third Generation
ADD	Agriculture Development Division
ADMARC	Agricultural Development and Marketing Corporation
AEDCs	Agriculture Extension Development Coordinators
AEDOs	Agriculture Extension Development Officers
AISP	Agriculture Infrastructure Support Project
AMIS	Agricultural Market Information System
AMP	Aid Management Platform
API	Application Programming Interface
ASWAP	Agriculture Sector-Wide Approach Programme
AVOs	Assistant Veterinary Officers
APES	Agricultural Production Estimates Survey
CISANET	Civil Society Agriculture Network
CMED	Central Monitoring and Evaluation Division
CPU	Central Processing Unit
CSO	Civil Society Organization
CSS	Cascading Style Sheets
DADOs	District Agriculture Development Officers
DAES	Department of Agriculture Extension Services
DAHLO	District Animal Health & Livestock Development Officer
DC	District Commissioner
DG	Development Gateway
DHIS	District Health Information System
DoDMA	Department of Disaster Management Affairs
EPA	Extension Planning Area
EPD	Economic Planning and Development
EDGE	Enhanced Data rates for GSM Evolution
FAO	Food and Agriculture Organization
FEWSNET	Famine Early Warning Systems Network
FISP	Farm Input Subsidy Program
GAP	Guide for Agricultural Production
GB	Gigabyte
GDP	Gross Domestic Product
GIS	Geographical Information System
HA	Hectare
HISP	Health Information Systems Program
HR	Human Resource
HRMIS	Human Resource Management Information System

HTML	Hyper Text Markup Language
HQ	Head Quarters
ID	Identification
IFMIS	Integrated Financial Management Information System
IFPRI	International Food Policy Research Institute
IT	Information Technology
J2ME	Java 2 Platform, Micro Edition
JICA	Japan International Cooperation Agency
KG	Kilograms
LRCD	Land Resources Conservation Department
MGDS	Malawi Growth and Development Strategy
M&E	Monitoring and Evaluation
MoAIWD	Ministry of Agriculture, Irrigation and Water Development
MoFEPD	Ministry of Finance, Economic Planning and Development
MoITT	Ministry of Industry, Trade and Tourism
NAMIS	National Agriculture Management Information System
NAIP	National Agriculture Investment Plan
NAP	National Agriculture Policy
NFRA	National Food Reserve Agency
NSO	National Statistics Office
NGO	Non-Governmental Organization
REST	Representational State Transfer
RWD	Responsive Web Design
SDGS	Sustainable Development Goals
SIVAP	Smallholder Irrigation and Value Addition Project
SMS	Short Messaging Service
SSD	Solid State Drive
SQL	Structured Query Language
TWG	Technical Working Group
USAID	United States Agency for International Development
USB	Universal Serial Bus
UNDP	United Nations Development Programme
WASH	Water, Sanitation and Hygiene
WFP	World Food Programme

Introduction

The agriculture sector is the largest contributor to economic growth and development in Malawi. It employs over 64 percent of the total national workforce[1], represents nearly 28 percent of the Malawi's Gross Domestic Product (GDP), and comprises over 75 percent of the country's foreign exchange. The sector is guided by two key strategic documents: the National Agriculture Policy (NAP, 2016-2020) and the National Irrigation Policy (NIP, 2016-2020). These policies provide a framework of priorities for state and non-state actors implementing agriculture-related activities.

The goal of the NAP is to "achieve sustainable agricultural transformation that will result in significant growth of the agricultural sector, expanding incomes for farm households, improved food and nutrition security for all Malawians, and increased agricultural exports." The NAP will be implemented through the National Agriculture Investment Plan (NAIP, 2017-2022), a successor to the Agriculture Sector Wide Approach Programme (ASWAP) investment framework.[2]

Key to achieving the NAP will be a sound monitoring and evaluation (M&E) system in which timely, quality data are collected, analyzed, and used to inform the decisions of implementers, policymakers, and development partners at national, district, and community levels. But **currently, there is no sound M&E system capable of informing stakeholders on the progress of NAP and NAIP implementation**. In 2017, the Ministry of Agriculture, Irrigation and Water Development (MOAIWD) developed a concept paper to address this gap, highlighting the need for a robust National Agriculture Management Information System (NAMIS).

To further the objectives of MoAIWD, this report outlines processes and key deliverables required to implement a fully-functional NAMIS. The NAMIS will inform decision-making in the agriculture sector by digitizing existing data collection systems within MoAIWD and integrating external agriculture data systems. It will increase the efficiency of data collection; improve the quality of existing data; and facilitate analysis by providing easier access to data through reports and dashboard visualizations. Ultimately, NAMIS will be the single sector-wide system for monitoring the Malawi NAIP.[3]

The system will be divided into 15 modules and implemented in three phases.[4] In the first phase of NAMIS implementation, MoAIWD intends to focus on the Agriculture Statistics, Animal Health and Livestock, and the Fisheries modules; and digitizing data collection for the Agriculture Production Estimates Survey (APES) and the Agriculture Market Information System (AMIS). The first phase will also incorporate a Climate Change and Meteorology module that will integrate digitized data collection on rainfall and weather patterns, in coordination with the Department of Climate Change and Meteorological Services in

[1] Malawi Labour Force Survey 2013
[2] The ASWAP was discontinued in 2015.
[3] A forthcoming handbook of Agriculture Indicators will inform the minimum dataset to be collected and managed through the NAMIS.
[4] The full list of modules can be found in Table 2: NAMIS modules.

the Ministry of Natural Resources, Energy and Mining. The second phase will focus on modules with data systems internal to MoAIWD, and the third phase will integrate data systems external to MoAIWD.

To ensure NAMIS responds to the needs of MoAIWD and the wider agriculture sector in Malawi, the system's design is centered around the needs of potential users. This study contributes to the user-centered design of the NAMIS by analyzing the application of data for decision-making in the sector; the availability of needed data; and the current flow of data and information.

This report will present key findings and provide recommendations on a structure for NAMIS modules and software technical implementation. First, the **Background and Methods** section introduces the agriculture sector in Malawi and describes the methodology used in this study. Next, the **Key Findings Overview** section summarizes main findings regarding existing data systems in the sector. The **Recommended Structure for the NAMIS** section presents findings from the study – describing how data are used for decision-making at different levels in the agriculture sector – and providing recommendations for module structure, including existing data elements and data flow. The **Technical Assessment** section considers existing technical capacities at different levels of the agriculture sector, and recommends appropriate open source software options for the NAMIS. Lastly, the **General Recommendations for Implementation** section outlines key recommendations for the design and implementation of the NAMIS.

Background and Methods

This section provides background on why MoAIWD identified a need to develop the NAMIS, and describes the methods used to collect information for this report.

NAMIS Background

MOAIWD is organized into eight technical departments and four support departments:

- Technical – Agriculture Extension Services; Crops Development; Animal Health and Livestock; Agriculture Research; Land Resource and Conservation; Fisheries; Irrigation; and Water Development
- Support – Department of Agriculture Planning Services; Department of Administration; Department of Finance; and Department of Human Resources Management and Development

Several evaluations of the ASWAP program have revealed serious gaps in the M&E of agriculture interventions in Malawi. Separate reviews of two large scale projects – the ASWAP Support Project (ASWAP-SP)[5] and the Agriculture Infrastructure Support Project (AISP)[6] – as well as a Mid-Term Evaluation of the Smallholder Irrigation and Value Addition Project (SIVAP)[7], identified similar M&E challenges.

Repeatedly-identified challenges include: delays in data reporting, poor data quality, limited data utilization across all levels, weak M&E governance, weak data systems, and weak project evaluations. Programs generally lacked evidence to justify their activities. Where evidence was used, the data was often outdated or of poor quality. Limitations to the M&E system, identified by JICA in the 2016 Agriculture Policy Monitoring and Evaluation framework, included the paper-based nature of data collection that led to delays in reporting timelines, poor data quality, and incomplete data. Finally, numerous independent M&E systems of various projects and programs weakened MoAIWD's capacity to monitor results across projects. M&E results were often lost once projects were finished, and project impact was not evaluated.

The NAMIS conceptual framework responds to many of these gaps, providing an efficient M&E System that meets the needs of all sector stakeholders. The ultimate aim of the NAMIS is to

> *"facilitate development of the Agricultural Sector through timely provision of high-quality data to all stakeholders at each level of the Agriculture Sector, including farmers, EPA staff, managers, policy makers, researchers, development partners, private sector players, and the general public."*

[5] MoAIWD (2017), 'ASWAP-SP Project Completion and Results Report'
[6] MoAIWD (2017), 'AISP Project Completion Report'
[7] MoAIWD (2017), 'SIVAP Mid-Term Evaluation Report'

The NAMIS aims to achieve three specific objectives at all levels of the sector: 1) facilitate real-time data collection and reporting through streamlined, electronic data collection tools; 2) improve access to agriculture information through the operationalization of an electronic data bank, dashboards, and websites to meet various users' needs; and 3) to improve data utilization and facilitate evidence-based decision-making.

Among other outcomes, use of the NAMIS will reduce data reporting errors; improve the availability of quality data; provide a platform to track the implementation of activities against planned milestones and budgets; and facilitate work for the M&E staff in the sector.

METHODOLOGY

Development of this NAMIS conceptual framework was informed by two main components:

1) a concept paper and an implementation plan developed by the Ministry, which provided the basis for this work; and
2) an in depth study designed jointly by MoAIWD Department of Agriculture Planning Services officials and Development Gateway (DG), to understand the needs of the future user of the NAMIS[8].

Following initial concept paper review and consultations, DG and MoAIWD jointly kicked off the study by holding a workshop with the Technical Working Group (TWG) on Agriculture Monitoring and Evaluation to refine the NAMIS Concept Paper and review the methodology for the study. After integrating TWG feedback into the study methodology (see Annex C), a research team composed of DG and the MoAIWD's Department of Agriculture Planning Services conducted field visits and interviews during March and April 2018.

In total, the research team conducted 75 key informant interviews at different levels of the agriculture sector (see Annex D). Interviews were conducted with officials from non-governmental organizations (NGOs), civil society organizations (CSO), MoAIWD, and the Ministry of Trade. In total, MoAIWD interviewees represented ten Extension Planning Areas (EPAs), five District Agriculture Development Offices, eight Agriculture Development Divisions (ADDs), and the central level in Lilongwe. These interviews allowed the research team to identify (i) what information are used for decision-making in agriculture, and (i) how these data are collected, validated, and shared at different levels of MoAIWD and within the sector more broadly. In addition, the team analyzed examples of reports and databases collected during interviews to better understand existing sectoral systems.

At the central level, economists, planners, and directors from MoAIWD, Ministry of Trade and Marketing, and Department of Fisheries were interviewed. Economists and planning officers were interviewed at the

[8] The study was executes using DG's Custom Assessment and Landscaping Methodology (CALM) https://www.developmentgateway.org/sites/default/files/2018-12/CustomAssessmentLandscapingMethodology_December2018.pdf

ADD level. District Agriculture Development Officers (DADOs), livestock officers, crops officers, land resource officers, agribusiness officers, irrigation officers, and fisheries officers were interviewed at the District level. Lastly, at the EPA level, Agriculture Extension Development Coordinators (AEDCs), Agriculture Extension Development Officers (AEDOs), Assistant Veterinary Officers (AVOs), and enumerators were interviewed. Non-state actors from the Famine Early Warning Systems Network (FEWSNET) and Civil Society Agriculture Network (CISANET) were also interviewed.

Table 1: List of key informants interviewed

State Agents				**Non-State Agents**
Central Level	**ADD Level**	**District Level**	**EPA Level**	
Principal Economists, Economists, Planners, Deputy Directors	Planning Officers, Economists, Livestock Officers, Crops Officers, Land Resource Officers, Agribusiness Officers, Irrigation Officers, Fisheries Officers	DADOs, Livestock Officers, Crops Officers, Land Resource Officers, Agribusiness Officers, Irrigation Officers, Fisheries Officers, Extension Methodologies Officers,	AEDCs, AEDOs, AVOs, Enumerators	CSOs

Through the interview process, the research team identified how data are currently collected and shared throughout the sector (data flow). To analyze the information from interviews, user journeys (see Annex E) were prepared for each key decision interviewee mentioned (See Annex F). The user journeys outline how future NAMIS users currently interact with data elements to make key decisions. User journeys were categorized by key decision and matched to the objectives of priority NAMIS modules identified during the TWG workshop. In addition, existing technical capacities at the different levels of the sector were assessed to inform recommendations about the technical implementation of the NAMIS.

Key Findings Overview

NAMIS is intended to serve as a data system for the entire agricultural sector that puts future users at the center of the system's design. Intended NAMIS users include MoAIWD staff at every level (central, ADD, district, and EPA), to inform decisions and monitor the work of all actors across the sector; and external actors, such as development partners, CSOs, and state agents, in order to inform work planning. Information to be included in the NAMIS includes a range of topics: from statistics about agriculture production and land management; to MoAIWD human resources needs and monitoring of budget execution; to information on the investments of non-state actors. The system will make this information accessible to users through a structure of 15 data modules.

In order to ensure that the NAMIS design is truly user-centered, the research team mapped user journeys – a process that details what data elements are required for key decisions by potential system users, and what the sources of data are needed to inform those decisions. Based on commonalities across user journeys, needed NAMIS modules and functionalities were identified. For example, the Agriculture Statistics module will provide users with APES, AMIS, and weather data to inform decision-needs related to farmer trainings and food security. A complete list of user journeys, organized by NAMIS module, can be found in Annex F.

Based on the user journeys, the research team also identified existing data systems that could be integrated into NAMIS modules. The section below describes the existing data systems that could be included in the NAMIS by phase of implementation, the system's modular data structure, and needed system functionalities.

NAMIS: Data to be Included

This section provides an overview of data systems that could be integrated with the NAMIS; the functionalities to be included in the NAMIS; and how NAMIS will be structured into 15 information modules through a phased approach to system implementation.

Data Systems

Two types of data for decision-making were identified during the interviews and workshops: (i) data currently being collected and managed by MoAIWD, and (ii) data currently being collected by external actors, such as development partners and other ministries.

Internal MoAIWD data systems

The following internal data sources are used to inform decisions that guide resource allocation, planning and implementation of activities, and reporting at every level of MoAIWD: the APES and AMIS; post-harvest losses survey and the cost production survey; food security assessment and food and nutrition

survey; Human Resource Management Information System (HRMIS); national policies and strategies; annual work plans; and farmers' organization information.

All internal MoAIWD information is generally collected through paper surveys, site visits, or by key officers at the EPA and District offices. The information is then shared through a wide variety of channels, including soft- and hard-copy reports – either printed or handwritten. Soft-copy information is shared via USB, email, picture messages (in the case of the AMIS), and sometimes informally via phone calls.

External data systems

Data and information produced outside of MoAIWD are also key for decisions made within the agriculture sector. Interviewees reported needing access to the following information:

- **Budget information**, which is collected by the Ministry of Finance, Economic Planning and Development (MoFEPD) through their Integrated Financial Management Information System (IFMIS). The MoAIWD Planning Department uses IFMIS data to compile their annual report and for monitoring their expenses. Officials from MoAIWD cannot access the IFMIS directly: MoAIWD officials must prepare requests for data and await a response from MoFEPD. This limits MoAIWD's ability to report, respond to policies, and make decisions regarding resource allocation.
- **Information on projects implemented by NGOs** – including budget, location and activities – informs decisions made by the Government of Malawi at every level. This information is currently collected informally across levels by MoAIWD, through contact with development and implementing partners.

How Existing Data Systems will be Integrated into the NAMIS

Each module will require its own processes for collecting and validating data, and will allow users to access information in different formats (reports, dashboards or raw data). Standards and protocols specific to each module are necessary to accommodate different data flows. For example, data for the Agriculture Statistics module are collected directly by EPAs and may need to be validated by the Districts; meanwhile, data for the Human Resources module are collected by administrative units known as "cost centers." MoAIWD has 49 cost centers in total, including ADDs, MoAIWD departments, research stations, regional water offices, regional irrigation offices, government farms, regional fisheries offices, and the Malawi College of Fisheries.

Data and data systems internal to MoAIWD will be progressively integrated into the NAMIS in three phases. Data will be collected electronically using computers, mobiles, and handheld devices connected to the internet.

The first phase of the NAMIS implementation will focus on the Agriculture Statistics module and digitizing the APES and AMIS. Data collectors will use mobile and handheld devices to input information collected via surveys directly into the NAMIS. This addresses a key recommendation from the Satellite Imagery for Agriculture and Land Management Pilot in Malawi, which suggested introducing an electronic data transmission system for APES. Additionally, MoAIWD intends to digitize rainfall data collection and

integrate information on weather from the Department of Climate Change and Meteorological Services in the first phase of implementation.

The second phase of implementation will integrate data from other surveys, such as the post-harvest losses survey and the cost production survey; as well as the data regarding human resources, annual work plans, and farmer organization information. Work plans and human resource information will be directly entered into the NAMIS by the responsible government officials at each level of MoAIWD. A repository of documents regarding national policies and strategies, as well as agriculture research and evaluations, will also be added to the NAMIS during this phase.

The third phase will involve integrating data and data systems external to MoAIWD into the NAMIS. To integrate information from systems like the IFMIS and donor project files, MoAIWD will need to develop Memorandums of Understanding (MoUs) with data owners (development partners or ministries) and develop a system of integration that will allow users to access the external data directly from the NAMIS. To achieve this objective, MoAIWD developed a code of conduct for implementing partners and a framework for MoUs with funding partners. These documents require that all projects and programs in the agriculture sector align their M&E systems to the NAIP M&E framework, and thereby with the NAMIS. As the NAMIS is already aligned to the NAIP, this requirement will facilitate interoperability – or the ability of computer systems or software to exchange and make use of information [9]– of different systems.

9 https://www.designingbuildings.co.uk/wiki/Interoperability:_The_ability_of_computer_systems_or_software_to_exchange_and_make_use_of_information

Table 2: NAMIS Modules[10]

Module Name	Description	Target users	Phase
Agriculture Statistics	Monitors production and productivity of both crops and livestock in the agriculture sector, through the data primarily collected in the APES, the post-harvest losses survey, and other non-routine, national-level surveys meeting the requirements of the National Statistics Office (NSO)	MoAIWD, MoITT, MoFPED, development partners, DoDMA, CSOs, private sector	1
Trade and Marketing (currently the AMIS)	Monitors local and international agricultural trading activities and commodity prices; provides real time feedback to stakeholders, including farmers	MoAIWD, MoFPED, development partners, CSOs, private sector	1
Climate Change and Meteorology	Provides timely data on weather and climate	MoAIWD, farmers, CSOs, development partners, private sector	1
Animal Health and Livestock	Monitor national production and productivity of livestock, livestock prices, and animal health	MoAIWD, Ministry of Trade, MoFPED, development partners, CSOs, Private sector	1
Fisheries	Monitors national aquaculture production, fishery catches, and fish prices	MoAIWD, development partners, CSOs	1
Water and Irrigation	Monitors availability and use of water resources for purposes of irrigation by geographical location, and associated agricultural production	MoAIWD, development partners, CSOs, MoFPED	2

[10] The structure and names of the modules are the result of consultations between MoAIWD, DG and the Technical Working Group (TWG) on monitoring and evaluation in the agriculture sector.

Human Resources	Tracks availability and distribution of staff at each level of the public agriculture sector, as well as workload and factors determining workload at implementation level; for providers of agriculture extension services, the module will cover all frontline staff regardless of employer	MoAIWD, development partners	2
Public Agriculture Activity Monitoring	Monitors adherence to implementation of annual work plans by cost center and project; this should be linked with the institutional and individual performance contracting arrangements across all Ministries Department Agencies (MDAs)	MoAIWD, MoFPED, development partners	2
Library	A repository of key policies, strategies, and policy research papers for the sector	Public	2
Farmers' Organizations	Tracks information on individual farmers and farmers' organizations, and improves the targeting of agriculture programs and projects; tracks the number of farming households and their demographics, such as gender, age, socioeconomic status, marital status, geographical location of household members, and contact details for each farmer in the household	MoAIWD, MoITT, development partners, CSOs	2
Land Resources Management	Provides data on land resources for agriculture and monitors management of arable land, including utilization and conservation practices	MoAIWD, development partners, CSOs	2
Budget: Resource Mapping	Monitors implementation of annual budgets and expenditures within the public sector	MoAIWD, MoFPED	3

Non-State Actors: Resource Mapping	Tracks the investments made by development partners in the agriculture sector; module will include information on donor pledges in the medium-term (three to five years), disbursements made to various implementing organizations, and the activities and expenditures of implementing organizations	MoAIWD, MoFPED, development partners, CSOs	3
Non-State Activity Monitoring	Monitors projects and programs being implemented in the agriculture sector by non-state actors	MoAIWD, development partners, CSOs	3
Social Accountability	Collects data on community participation and client feedback on government performance and services in the agriculture sector; this empowers communities to be active participants in the design, implementation, monitoring and evaluation of agriculture projects and programs delivered in the community by both government and development partners.	MoAIWD, CSOs	3

NAMIS: FUNCTIONALITIES OVERVIEW

Based on the feedback from future NAMIS users interviewed in the user journey study, the team identified a series of key functionalities necessary for the system. This section provides a non-exhaustive list of recommended functionalities.

Structuring the NAMIS into modules

The NAMIS's data will be collected through multiple sources (field surveys, reports, forms, etc.) with different frequencies (weekly, monthly, quarterly, etc.) and varied intended users. Therefore, it is recommended that the NAMIS be structured in different modules. Through a modular structure, users would only access the data relevant to their work. For example, an AVO may not need to access the Fisheries module, and a Human Resources Officer might not need to access the APES module. As a result, the amount of data in the system will be less overwhelming and easier to manage.

In order to define user access to modules, MoAIWD will need to create a clear classification of user roles for the NAMIS. These roles should determine distinct categories of users; define modules accessible to each category; and specify actions that could be executed by users in each category (editors, validators, viewers, system administrators, etc.). Role-Based Access Control (RBAC) is one approach to restricting system access to authorized users.

Functionalities to visualize data

Once the data have been collected and validated in the system, users will need to access the information for analysis. Data should be accessible in the following formats:

- **Interactive dashboards**. Dashboards enable users to visualize NAMIS data and gain insights in an easy-to-understand format. Users can also easily filter data based on their needs, and should also be able to export graphics from the NAMIS for integration into reports.
- **Predefined reports.** Standardized documents that include predefined data analyses (as identified by users) should be available for download.
- **Excel exports of raw data**. Users should be able to download data in .xls or .csv format, allowing for the manipulation of data and creation of graphics.
- **Documents repository**. One of the NAMIS modules will be a repository of relevant policy and strategy documents; authorized users should be able to upload documents into the NAMIS, and other users should be able to download documents.

Data collection on mobile and handheld devices

Data that will be compiled in the NAMIS include information that is directly collected from the field by EPA agents – for example, from the APES and AMIS. Currently, these data are collected on paper at the

EPA level and often digitized at the district level. Instead, the research team recommends that this data be collected via mobile or handheld devices and entered directly into the system by frontline staff. Digitizing the data collection process will improve its speed and efficiency. Electronic data collection not only reduces the possibility of error during in-field data collection, but can also automate data auditing. Processing data and conducting quality checks is also much faster when data are electronic.

Data collectors using mobile and handheld devices should be able to collect data without an internet connection, as farmer interviews often take place in remote locations where maintaining an internet connection drains the battery of electronic devices.

Functionalities to respond to internet connection challenges

During interviews, the research team noted that some MoAIWD offices did not have access to the internet, and others with access to internet often experienced intermittent connection. To respond to this challenge, it is recommended that the NAMIS:

- **Develop an offline application** for mobile and handheld devices that allows user to input data with or without a stable Internet connection. This feature will be discussed in detail in Section 4.
- **Develop an offline desktop version** of the NAMIS that allows users to input data into the system and access data modules on computers without an internet connection. The offline application should demand a mandatory synchronization with the online database at least every 10 days to ensure the data are up-to-date. Users should also be able to synchronize the application voluntarily whenever they have access to an internet connection. When adding new data into the NAMIS, the server should indicate if there are any conflicts (for example, if someone else has modified the same data since the last synchronization).
- **Design graphics taking into account slow internet connection** for many system users. The system should have an alternate basic HTML version with simple graphic design that loads easily and quickly. The system could automatically identify slow connections, sending those users directly to the basic HTML version of the website.

Recommended Structure for the NAMIS

The NAMIS will be implemented in 3 phases and will be structured in 15 modules. This section will provide details on the intended objective and target audience of each NAMIS module; an overview of how data envisioned for each module are currently used for decision-making; and the envisioned data flow across modules.

Phase One

This phase of NAMIS implementation will focus on developing data collection tools and visualizations for the information currently being collected by MoAIWD to calculate production estimates and market prices. Five modules will be completed during this first phase of development: Agriculture Statistics, Trade and Marketing, Animal Health and Livestock, Fisheries, and Climate Change and Meteorology modules.

Agriculture Statistics

This module's objective is to monitor production and productivity of crops and livestock in the agriculture sector. Its data will be primarily sourced from the APES, as well as other non routine commissioned surveys meeting the requirements of the NSO. The target audience includes MoAIWD statisticians, planners, economists, academics, and development partners.

Agriculture Statistics

Monitors production and productivity of crops and livestock, primarily through the Agriculture Production Estimates Survey.

Target Users and Sample Journey

MoAIWD; Ministry of Industry, Trade and Tourism; Ministry of Finance, Planning and Economic Development; Department of Disaster Management Affairs; development partners; non-governmental organizations; private sector

As Agriculture Extension Development Officer, I need to identify areas where there are low production estimates of livestock or crops so that I can provide support to farmers to increase production.

Data to be included in the module

There are five key surveys that that would be included in the Agriculture statistic module: (i) the APES, (ii) the post-harvest losses survey, (iii) food security assessment, and (iv) the nutrition survey. It is recommended that data from each of these surveys be integrated into the module in order to produce a repository of all available data that can be used to generate agriculture statistics. The module should include GIS information that identifies the data collection points for cultivated fields and households.

The APES is the key source of agriculture sector production data and the basis for a wide variety of decision-making. The APES covers multiple topics in the agriculture sector including crops, livestock, fisheries, and irrigation. It collects information on numbers of farming households and locations, hectarage farmers intend to cultivate, hectarage actually cultivated, crops planted, crop output, inputs used, number of livestock, etc. (see Annex B). The APES is conducted three times a year. The focus of the first survey round is to identify farming households, hectares of farmland, and planting intentions of famers (what crops and how many hectares). The second survey round collects information on hectares planted, types of crops planted, and growth of crops. The third survey round is the measurement round where output is measured in order to allow for the calculation of yields. Livestock is evaluated in the first and third survey rounds.

The post-harvest losses survey is a new survey managed by the MoAIWD Central Level Statistics Department. The objective of the post-harvest losses survey is to provide data on post-harvest losses for policymakers, to help determine government interventions to reduce losses. The survey is conducted bi-annually, and captures data such as quantity of crop losses post-harvest.

The food security assessment measures the number of food-insecure households. The information is collected by extension workers on a fortnightly basis, and informs MoAIWD and other stakeholders on the food security situation.

The food and nutrition survey aims to ensure that nutrition interventions benefit targeted groups. It also provides information on national nutrition trends. The type of information that is collected includes heights, weights, and middle-upper arm circumference of children under-five; the weight of pregnant mothers; and quantity and quality of available household food.

Uses of APES data in decision-making

At the EPA level, APES data are generally used to inform guidance for farmers. AEDOs have a unique role as both data collectors and data users. They use the information they have collected through APES to inform programmatic decisions. For example, AEDOs use farmer household data from the first round of APES to identify which areas to target with trainings and best methods for reaching farmers. APES data are also used by AEDOs to inform farmers about crop yields from the previous season and rainfall patterns.

At the district level, officials are often intermediaries in the data flow process. They verify and validate data, conduct quality checks, and aggregate the data from EPAs before passing them on to the ADD level. District officials also use APES results in their work. For example, in order to develop appropriate interventions, they consult with stakeholders in the agriculture sector and provide information on challenges faced by farmers in the field. In addition, APES results inform programmatic decisions at the District level, such as what types of trainings to hold and which areas to target. The information for these decisions – namely, the challenges faced by farmers in the field – often come from AEDOs and AEDCs in routine reports.

At the ADD and central level, APES data are used to inform programmatic decisions and to monitor the food security situation of the country. At the central level, the data are key for the planning of interventions to address food insecurity in coordination with external stakeholders.

Food security information is used by the Department of Disaster Management Affairs (DoDMA), within the Ministry of Homeland Security, to plan humanitarian activities related to cash and food distribution.

Data Flow

APES data has a clearly defined collection and validation flow; the agriculture statistics module in the NAMIS should be designed around the following:

- **Field:** APES is implemented by AEDOs at the EPA level. The AEDC from each EPA assigns AEDOs 30 farmers each to survey. Interviews are conducted in person and AEDOs collect data on a paper template. During this study, several AEDOs noted that they often interview more than 30 farmers because their EPAs are understaffed.
- **EPA:** Once the AEDOs have finished interviews, they meet with the AEDC and consolidate the APES data for the EPA. This is generally done by hand in paper format as EPAs often lack access to laptops and/or electricity. However, where EPAs are equipped with a laptop and/or electricity, data aggregation is done electronically. The AEDC validates the data for the EPA and shares it with the district office.
- **District:** At the district level, data from multiple EPAs are consolidated electronically by district MoAIWD officials. Districts do not have a standardized process for obtaining data from the EPAs and addressing data quality issues. Interviewees from some districts said that they call a meeting with all AEDCs to facilitate the data aggregation, whereas other interviewees noted that they rely on phone calls or emails for clarity on data issues. In all districts interviewed in the study, officers from each department (crops, livestock, fisheries, irrigation) consolidate information specific to their area of expertise. The DADO then validates the data for the district.
- **ADD:** After data are consolidated at the district level, it moves to the ADD. At this stage, the data are electronic in Excel format, with an accompanying report presenting explanations for observed trends and any issues. The ADD acts on behalf of the central level, and, notably, does not have the right to approve or reject the data. The ADD's role is to check data quality and revert to the districts where there are questions. The Head of the Planning, Monitoring and Evaluation Unit at the ADD is responsible for this work.
- **Central:** From the ADD level, the data are transmitted to the statistics department at the central level of MoAIWD, where it is aggregated on a national scale and presented in a report to national policymakers. The M&E Unit within the Planning Department is the owner of the compiled database at the national level.

The post-harvest losses survey is managed directly by the Statistics Unit at the central level of MoAIWD. The Statistics Unit dispatches enumerators (or any available worker at EPA level) every year for data collection, cleaning, aggregation, and analysis. Sometimes, there are losses after farmers have finished

the harvest, and quantities reported during third round estimates might not be the same quantities that are available three months later.

The food security assessment is led by the MoAIWD Crops Department at the central level. Data are collected every two weeks by frontline staff and sent to the crops officer at district level for validation in paper format. The crops officers compile and enter the data into an Excel sheet before sharing it with ADD planning officer and crops officer. Finally, the data are shared with the MoAIWD Food Security Unit within the Planning Department and the planning officer in the Crops Department.

The food and nutrition survey is collected annually by frontline staff who share the data in paper form with the extension officer at the district level. The extension officer validates and compiles the data before sharing with the extension officer at ADD level in Excel format. Finally, the extension officer receives the information and shares the data with the Nutrition Unit at the Department of Agriculture Extension Services at MoAIWD central level.

Recommendations

APES data are also used to inform Goal 1 of the Malawi Growth Development Strategy (MGDS) III: achieve sustainable agricultural transformation that is adaptive to climate change. The NAMIS should be designed to provide the following key performance outcome indicators:

- Proportion of farm households which are using recommended agricultural technologies
- Annual growth in agricultural GDP
- Maize crop yield (kg/ha)
- Rice crop yield (tonnes/ha)
- Ground nuts crop yield (tonnes/ha)
- Proportion of agriculture area under productive and sustainable agriculture[11] (National: % of arable land under productive and sustainable agriculture)
- Hectarage under legumes
- Percentage of food-insecure households
- Percent of population with food consumption below minimum dietary requirement[12] (Prevalence of undernourishment)
- Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale[13]

Data from this module should be updated in real-time when data for the APES, post-harvest losses survey, food security assessment, and nutrition survey are collected.

[11] This indicator also corresponds to SDG 2.4.1
[12] This indicator also corresponds to SDG 2.1.1
[13] This indicator also corresponds to SDG 2.1.2

Trade and Marketing

The objective of this module is to provide data on pricing of key agricultural commodities and information on trade of commodities. This module will be developed in collaboration with the Ministry of Trade, and include data from the AMIS and institutions such as ADMARC, the National Food Reserve Agency (NFRA), and other private traders.

Trade and Marketing

Monitors local and international agricultural trading activities and commodity prices; provides real-time feedback to stakeholders, including farmers. Data are collected through the Agricultural Market Information System.

Target Users and Sample Journey

MoAIWD; Ministry of Trade; Ministry of Finance, Planning and Economic Development, development partners; non-governmental organizations; private sector

As an Assistant National Technical Manager for the Famine Early Warning System, I need to analyze commodity market price data to determine our national production targets.

Data to be included in the module

The trade and marketing module will include data collected through the AMIS. The AMIS collects data on prices of agriculture commodities throughout the country. Data elements include: number of people selling key commodities in markets, prices of key commodities in markets, prices of livestock in markets, prices of seasonal commodities (such as tobacco and fruit), and farm gate prices of key commodities (see Annex B). Market prices are collected weekly, and farm gate prices are collected monthly.

Uses of AMIS data in decision-making

At the EPA level, AMIS data are generally used to inform agricultural guidance for farmers: when to plant, what seeds to use, new technologies to use and fertilizers. AMIS data are also used by AEDOs to inform farmers about farm-gate and market prices of key crops; and by NGOs, international development partners, and central level government to assess food availability.

Data flow

The AMIS is conducted weekly. While the data flow should be similar to the APES, the intermediary steps at the District and ADD levels are often bypassed to meet deadlines. Enumerators are dispatched to markets throughout the country on a weekly basis to conduct the survey in a paper format. The data then

either flows like the APES[14], or are sent directly by the enumerator to the MoAIWD Agro-economics Surveys Unit, where it is aggregated and analyzed by statisticians at the central level. These data are often shared as photos via WhatsApp from tablets or personal mobile phones. Enumerators also share the price data they have collected informally from markets with AEDOs and AEDCs, who integrate information into their guidance to farmers.

Recommendations

Market information is currently being collected by multiple actors. The International Food Policy Research Institute (IFPRI), the World Food Programme (WFP) and the Famine Early Warning Systems Network (FEWSNET) are doing daily collection of market information and working as a parallel system. Efforts should be made to ensure the NAMIS becomes the main source for market price data. Data collected by other actors could be used for quality control within the NAMIS.

This module should be updated weekly.

In the future, the module can include the data from the Agriculture Cost Production Survey. This survey is currently being developed in collaboration with the African Development Bank and the Food and Agriculture Organization (FAO). The methodology is still being finalized, but the stakeholders have committed to implementing this survey during the current financial year (2018-2019). For this project, they have used the Computer Assisted Personal Interviews (CAPI). The objective is to determine minimum prices for production of key agriculture commodities and to calculate the unit cost of production for key crops. The survey is intended to be conducted annually, and data collected will include the costs of inputs used to cultivate the crop during the season.

Climate Change and Meteorology

The objective of the Climate Change and Meteorology module will be to provide timely data on weather and climate. The target audience will include users at all levels. This module will be developed in coordination with the Department of Climate Change and Meteorological Services in the Ministry of Natural Resources, Energy and Mining.

[14] Data flows to the AEDC for aggregation at the EPA level then to the district, ADD, and finally to the MoAIWD Agro-economics Surveys Unit, which is under the MoAIWD Statistics Unit.

Meteorology

Provides timely data on weather and climate.

Target Users and Sample Journey

MoAIWD; farmers; development partners; non-governmental organizations; private sector

As an Agriculture Development Division Economist, I need information on weather patterns and an evaluation of last year's outputs in order to set output targets in this year's budget.

Use of climate change and meteorological data for decision-making

Meteorological information is integral for decisions at all levels of the sector. At the EPA level, AEDOs need to know rainfall patterns in order to provide guidance to farmers on when to plant crops and to identify risks, such as dry spells. At the district, ADD, and central levels, meteorological information is important to prepare interventions to address these risks.

Data flow

Currently, meteorological data are collected by both MoAIWD (through AEDOs) and the Department of Climate Change and Meteorological Services in the Ministry of Natural Resources, Energy and Mining.

Within MoAIWD, AEDOs collect data on number of rainy days and rainfall amount. This data comes from tools at different locations in the EPA. AEDOs are responsible for collecting the information. However, for tools that are located in remote communities, AEDOs rely on a community member to track data in a rainfall booklet that is collected by the AEDO during a visit. These data from the AEDOs are compiled at the EPA level by the AEDC and passed to district crops officers in a fortnightly report. Rainfall data are also included in routine and APES reports from the EPAs. These data then flow to the ADD and the central level.

The Department of Climate Change and Meteorological Services collects data on rainfall, temperature, wind direction, and air pressure. The department has two sources of data collection: conventional stations and automatic weather stations. There are 21 conventional stations throughout the country with personnel responsible for collecting and transmitting the data, as well as maintaining the instruments. In addition, the Department has 63 automatic weather stations with instruments that continuously collect data. The data flow for the conventional stations involves monthly reports sent to the central level department, generally in hard-copy form. The data are then digitized at the central level and entered into a database management system called ClimSoft. For the automatic weather stations, the data are stored in a server at the central level, but not integrated into ClimSoft. The department is in the process of calibrating the automated instruments, as there are data quality issues regarding differences in measurements between the conventional and automated stations.

Certain data are shared between MoAIWD and the Department of Climate Change Meteorological Services. The department has a data policy in place to govern data sharing, and also publishes data to its website. As the rain gages used by MoAIWD are sometimes different from those used by the department, discrepancies in data may arise.

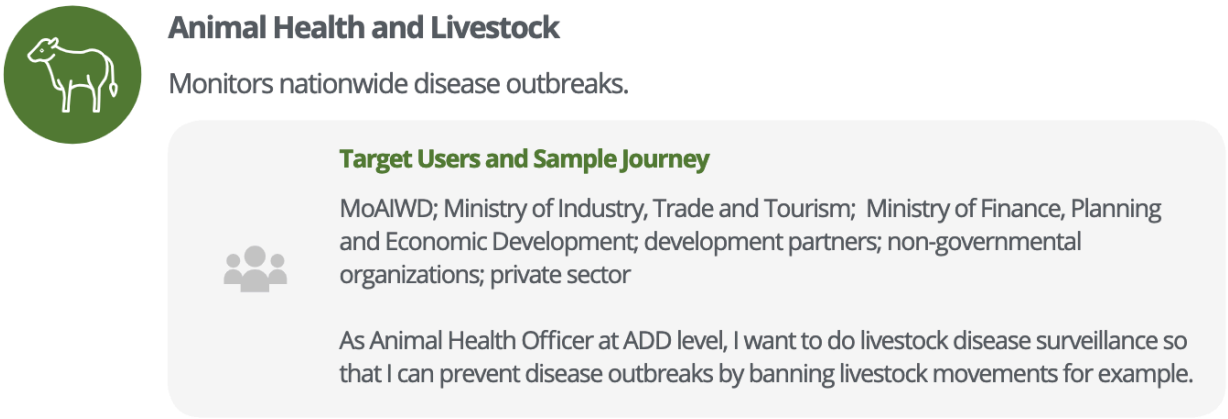
Recommendations

The Climate Change and Meteorology module will need to be developed in close coordination with the Department of Climate Change and Meteorological Services. The module can interface with the ClimSoft database from the department. A protocol for data sharing between MoAIWD and the Ministry of Natural Resources, Energy and Mining will be necessary for the purposes of this module.

To address potential issues with data quality, rain gage usage should be standardized across the two institutions. Ensuring the same methodology and instruments are used will reduce discrepancies in data collected. A protocol for checking data quality and consolidating data will be necessary for resolving discrepancies, as will be a protocol to agree at what frequency the module will be updated.

Animal Health and Livestock

The objective of the Animal Health and Livestock module is to monitor livestock productivity and disease. The design of this module will be based on consultation with the Department of Animal Health at all levels, and will include information on animal health that is already included in trimestral reports. The module is intended to be a stand-alone management information system, based on the data collected through the APES on livestock production, AMIS data on prices, and information on diseases.



Data to be included in the module

The Animal Health and Livestock module will include three sets of data:

- **Production**: data from the APES related to livestock will be accessible through the Animal Health and Livestock module; APES data will also be displayed in the Agriculture Statistics module.

- **AMIS:** price data related to livestock will be accessible through the Animal Health and Livestock module; AMIS data will also be displayed in the Trade and Marketing module and Agriculture Statistics module.
- **Health and disease**: currently, disease outbreaks are reported through phone calls and monthly reports. The Animal Health and Livestock module will create a database on livestock health and disease. This will require the design of a data collection form, which will capture information about the number of livestock affected by disease type and location.

Uses of animal health and livestock data for decision-making

During the study, monitoring and responding to pests and disease outbreaks emerged as an important aspect of decision-making in the sector. Decisions related to pest and disease management depend on data that are collected in processes outside of the four surveys mentioned above. At the EPA level, there is a process in place for the reporting of potential incidents of pests and disease; verification of pests and diseases using laboratory testing; and response mechanisms to control outbreaks. Key decisions made by livestock officers include disease responses (such as vaccinations, surveillance of affected areas, and movement bans), and providing trainings for farmers to increase awareness about pests and diseases.

Data flow

The reporting mechanism for pests and disease follows the same data flow as the APES – the information is collected at EPA level and communicated to district, ADD, and central levels. The main difference is that, due to urgency, this information is often communicated via phone or email. All information regarding pests and disease that is communicated through phone call or email is followed by a report that provides context on the outbreaks.

Recommendations

The data for the Animal Health and Livestock module should be updated every three months.

Fisheries

The objective of the Fisheries module is to monitor national fishery production and prices. The design of this module will be based on (i) consultations with the Department of Fisheries at all levels, (ii) existing and planned surveys, and (iii) international reporting requirements. Based on the comprehensive database housed at the Fisheries Department at MoAIWD, the module is intended to be a stand-alone management information system, but will be interoperable with the NAMIS.

It is important to note that the information collected by the fisheries department follows a different data flow than the information collected by APES, but the fisheries department provides information for the APES on the first and third rounds.

Fisheries

Monitors nationwide fisheries production and prices.

Target Users and Sample Journey

MoAIWD; development partners; non-governmental organizations

As a District Fisheries Officer, I need to know good practices in fish farming, new technologies, and which farmers have ponds so that I can encourage and train new fish farmers.

Data to be included in the module

The Fisheries module will include data from three sources:

- **Annual Frame Survey:** is a complete census of basic fishery characteristics[15], the annual frame survey is a routine activity of the Department of Fisheries of Malawi for the purpose of planning and management. The annual survey is executed between August and September. During this survey, the research team visits all landing sites within main water bodies (i.e. Lakes Malawi, Chilwa, Malombe and Chiuta, Upper and Lower Shire) to enumerate fishermen, fishermen's gear, and fishing crafts. This survey does an inventory of fishing economic units per Minor Stratum[16]. Results from this survey identify the complete list of fishing landing sites, which will be used as a basis for the sample selection of the Fisheries Catch Assessment.
- **Fisheries Catch Assessment:** Conducted within a sample selected via the annual frame survey, the assessment provides estimates of the fish caught in Lake Malawi, Lake Malombe, Lake Chilwa, and the Shire River. The assessment includes a predefined list of 13 fish species (chambo, kasawala, kambuzi, mbaba, utaka, mlamba, kampango, sanjika, mpasa, ntchila, usipa, ncheni, other tilapia); other species are recorded under "others". Information collected includes (i) monthly fishing return by species, (ii) vessel description, (iii) fishing gear, (iv) fishing areas, (v) dates of fishing, and (vi) average beach prices.
- **Aquaculture or Fish Farming Estimates:** To calculate production estimates, data collectors need access to the total pond area under fish farming at district level. The data collection form captures (i) name of farmer, (ii) location (EPA, section, village, traditional authority, district), (iii) pond number, length, width, and area, (iv) species name, (v) local unit measure, number of units per harvest, total units harvested, estimated weight/unit, total weight, and unit price.

[15] The Annual Frame Survey has two component forms. The first form tracks (i) fishermen names, (ii) fishermen ages, (iii) number of crew members, (iv) type of fishing craft, and (v) type of fishing gear used. The second form tracks gear used for fishing: (i) name, gender, and age of gear owner, (ii) boat type, length, and age, (iii) boat engine make, horsepower, and age, and (iv) gear type, head and foot rope, mesh size, depth, number of hooks, and hook size.

[16] There are 56 minor stratums in Malawi, which correspond to selected areas within the shores of Lake Malawi, Lake Malombe, Lake Chilwa, and the Shire River.

Uses of fisheries data for decision-making

At the EPA level, fisheries data are used to inform decisions on fish farming trainings. At the district level, fisheries officers work in collaboration with irrigation officers, using data on fish ponds and available water resources to make programmatic decisions about which regions to target for fish farming training. At the central level, fisheries data are used for monitoring programs in the fisheries sector, such as the Aquaculture Development Program.

Additionally, fishermen's phone numbers – collected through the annual frame survey – are used in the Early Warning System project, developed with the United Nations Development Program (UNDP). This project alerts fisheries of dangerous lake weather conditions. At the central level, fisheries information is used to report to the Food and Agriculture Organization (FAO), and by the MoAIWD Agriculture Research Department to develop policy recommendations.

Data flow

Each fisheries data source follows a different validation and approval scheme.

- **Annual Frame Survey**: Data are collected by District Fisheries Officers through fish scouts and fisheries assistants, and are shared with the planning department of fisheries at the central level for consolidation.
- **Fisheries Catch Assessment:** Data are collected monthly by fish scouts or beach recorders, who work at the minor stratum level. Fishermen selected as part of the sample assessment maintain logbooks of their fishing returns as a condition of obtaining a fishing licence. Each fish scout collects and shares information in hard copy with a fisheries assistant. Each fisheries assistant oversees multiple fish scouts, supports data collection, reviews and consolidates data, and sends data to the District Fisheries Officer. District Fisheries Officers share data with the MoAIWD Department of Agriculture Planning Services and the Director of Fisheries in soft copy, and all data are compiled in a national-level Excel database within the Department of Fisheries' Planning Division. This database is used to prepare monthly reports that are presented to the Director of Fisheries and the MoAIWD M&E Unit.
- **Aquaculture Estimates:** Data are collected monthly at EPA level by AVOs and AEDOs, and validated jointly with AEDCs. Validated information is then shared in hard-copy with District Fisheries Officers, who consolidate and validate data from EPAs and share it in soft copy with the Department of Fisheries' Planning Division. The division consolidates this data monthly and shares it with the Director of Fisheries and the MoAIWD Department of Agriculture Planning Services. At central level, a comprehensive Excel database of fish production is housed in Department of Fisheries. Monthly information about aquaculture production estimates is integrated into the first and third rounds of the APES.

Recommendations

The Fisheries module of NAMIS should be fully integrated with the Department of Fisheries' database. The NAMIS team should work hand-in-hand with the Department of Fisheries' Planning Division. As data

collected in the annual frame survey includes fishermen's gender, and the NAMIS could also include a dashboard to visualize fishermen gender ratios and changes over time.

Additionally, MoAIWD also conducts non-routine surveys to collect information for a particular project or program. It should be mandatory that these surveys be incorporated within the NAMIS.

Fisheries data are also used to inform MGDS III, and are associated with "Goal 1: Achieve sustainable agricultural transformation that is adaptive to climate change." The NAMIS Fisheries module should include data that informs the key performance outcome indicator, "Sustainable fisheries as a percentage of GDP."[17]

Data from the annual frame survey should be updated annually; data from the fisheries catch assessment should be updated monthly; and data from aquaculture estimates should be updated twice a year, during the first and third round of the APES.

PHASE TWO

The second phase of NAMIS development will focus on five modules that use data collected by the MoAIWD: Water and Irrigation, Human Resources, Library, Farmers, and Land Resources. This phase will build on lessons learned during Phase One.

Water and Irrigation

The Water and Irrigation module will monitor the availability and use of water resources for irrigation purposes by geographical location and associated production. It will be developed in consultation with the MoAIWD Water and Irrigation Department, taking into account existing databases and data collection processes. The target audience for the module includes irrigation and water resource technicians and sector planners.

[17] This indicator corresponds to SDG 14.7.1

Water and Irrigation

Monitors the availability and use of water resources for the purposes of irrigation by geographic location and associated production levels.

Target Users and Sample Journey

MoAIWD; Ministry of Finance, Planning and Economic Development; development partners; non-governmental organizations

As the District Fisheries Officer, I need to know the location of new irrigation schemes and available water sources so that I can encourage the adoption of fish farming.

Data to be included in the module

The irrigation department collects data on land developed for irrigation and land utilization. As NAMIS mainly focuses on the agriculture sector, this module will only collect data related to irrigation. In the future, there will be efforts to build a standalone system for the department.

Overview of how water and irrigation data are used for decision-making

Irrigation data are generally used for programmatic investment decisions. These decisions may include which irrigation schemes to rehabilitate; which farmers to target for training; which resource areas should be targeted for the construction of new irrigation schemes. At the central level, the MoAIWD Water and Irrigation Department uses data to provide guidance to districts about which areas hold potential for irrigation schemes.

Data flow

The MoAIWD Water and Irrigation Department has various data flows. Water supply and sanitation data are collected in collaboration with the Ministry of Health through community-level health surveillance assistants. Data are then shared with water officers at district level, who then share the data with the central level. Data on water resources are collected by officers at the district level and by the National Water Resources Authority, which has information on licenses given to organizations to exploit water resources. Information on the utilization of irrigated land and area developed for irrigation is collected by district irrigation officers, in collaboration with agriculture extension workers in EPAs.

Once collected, several databases are used to manage data. A Microsoft Access database that contains information about existing irrigation schemes and conducted trainings is updated monthly by irrigation officers at the district level. Information in this database originates from AEDOs and AEDCs, who may also pass on informal information about areas suitable for irrigation scheme construction or rehabilitation. Information in the database is ultimately shared with the MoAIWD Irrigation Services Department at the central level.

The National Water Resources Authority has several Excel- and Oracle-based databases that contain information from groundwater monitoring and hydrologic stations. The National Water Resources Authority is a public entity intended to provide advice on water resources policy and implement regulatory functions.

Finally, the central level MoAIWD Water and Irrigation Department has an advanced database in MySQL format that allows for the calculation of headline sector statistics, which are reported to ministry planners and decision-makers.

Recommendations

This module should integrate key data elements from the multiple data systems currently used in the MoAIWD Water and Irrigation Department. The combination of databases from the Water Resources Authority and Irrigation Services is essential for the module to effectively inform irrigation programmatic decisions. When possible, the module should include information on the potential interest of farmers in irrigation, as this information is sometimes captured in routine reports from the EPAs. Potential areas for new irrigation schemes are an important data element for programmatic decisions at the district level.

Irrigation data are also used to inform Goal 1 of the MGDS III, "Achieve sustainable agricultural transformation that is adaptive to climate change." As such, the module should collect data to inform the MGDS III key performance outcome indicator "area under irrigation (ha)." As such, the Water and Irrigation module should also be complemented by information on the number of hectares under irrigation.

The data in the Water and Irrigation module should be updated quarterly, to align data collection with the routine reports from EPAs.

In the longer term, the Water and Irrigation module should become broader and should be developed in consultation with the various data owners and collectors, as some of these stakeholders are external to MoAIWD. MoAIWD will need to decide which aspects of the sector to include in the NAMIS, and how to integrate data collection processes conducted by officials from the Ministry of Irrigation and Water Development.

Human Resources

The objective of the Human Resources (HR) module is to (i) track availability and distribution of staff at each level of the public agriculture sector, and (ii) track workload and factors determining workload at implementation level. For providers of agriculture extension services, the module will cover all frontline staff, regardless of employer. The target audience for this module includes the MoAIWD Human Resource Department and the DADOs.

Human Resources

Tracks human resources information like staff availability, distribution, and workload across MoAIWD.

Target Users and Sample Journey

MoAIWD; development partners

As District Agriculture Development Officer, I need to know what positions are vacant so that I can ask for the deployment of new personnel.

Data to be included in the module

This module will focus on HR needs across all levels of MoAIWD, with a particular emphasis on recruitment. As such, the module should include data on vacant and filled positions, down to the EPA level – giving HR decision-makers a complete picture of in-country recruiting needs. This will require pulling data from the excel based HRMIS system from the MoAIWD HR department. At minimum, this data should be updated and validated quarterly so that NAMIS can provide timely information for HR decision-makers.

At a later stage, MoAIWD would also benefit from including payroll and disciplinary data in this module.

Overview of how HR data are used for decision-making

HR information is largely used for recruitment, planning, and budgeting. HR officers use data to evaluate staffing needs and identify vacant positions; provide staff salary inputs for budget requests; and evaluate staff qualifications to identify what trainings are needed for which personnel.

Data flow

At the central level, the MoAIWD HR Department has an Excel-based HRMIS. This registry of personnel data includes personnel gender, date of first employment, and qualifications. The central HR department receives and consolidates this information from the ADD and departmental cost centers; within each cost center, a senior HR officer is responsible for entering data into HRMIS. Cost centers also share their staff returns with the central HR department, which allows the department to identify the number of vacant positions across the ministry. The central HR director validates system data monthly and shares it with MoAIWD senior management.

The data flow in the HR sector is shifting as Malawi pursues devolution. In 2016, the Department of Human Resource Management and Development issued Establishment Warrants, marking the formal devolution of district and EPA-level civil servant management from the central government to district councils. As of January 2017, government employees – such as DADOs, AEDOs, and AEDCs – fall under the responsibility of district commissioners. Consequently, the district commissioner manages all aspects of human resources in the district, including payroll, recruitment, and disciplinary issues.

The district council still shares HR information with the central level. However, because the central level is no longer responsible for management of personnel at the district and EPA level, the department at the central level does not capture district- and EPA-level HR information in the HRMIS.

Recommendations

As responsibility for HR management is decentralized, collaboration with the district council will be key in developing this module. Collaboration will require a data-sharing protocol between the central level HR department and the district commissioner. District commissioners should be included as users for this module, and should have rights to input and validate information for their district. This module should also be accessible to HR officers at the central level who are responsible for recruitment.

The HR module should be updated monthly to reflect staff changes and prompt agile decision-making in the allocation of personnel.

Public Agriculture Activity Monitoring

The objective of this module is to monitor implementation of annual work plans by cost center and project. Ideally, the module would be linked with institutional and individual performance contracting arrangements carried out across all MDAs.

Public Agriculture Activity Monitoring

Monitors adherence to implementation of annual work plans by cost center and project.

Target Users and Sample Journey

MoAIWD; Ministry of Finance, Planning and Economic Development; development partners

As the District Crops Officer, I need access to monthly work plans so that I can decide how to manage my allocated resources.

Data to be included in the module

This module should include work plans prepared by each level of MoAIWD, as well as user-added comments. Preset activities will be pre-loaded into the system, as work plans are currently being created in paper form with a preset range of values that correspond to NAIP indicators. For each activity in the work plan, a planned date of execution should be added. The system should alert users of upcoming and missed deadlines, and allow users to indicate when a work plan activity has been executed. A “traffic light” color scheme showing whether a project is on- or off-track vis a vis its timeline would help managers visually mark progress.

Overview of how public agriculture activity monitoring data are used for decision-making

The MoAIWD Planning Department uses work plan information to set annual targets and monitor work across the ministry. Work plan information also informs allocation of budgetary resources, and are used at every level to plan annual activities. For example, work plans allow district officers to identify the support EPAs will require throughout the year, in order to coordinate and deliver farmer trainings. As work plans include valuable information for all departments of MoAIWD, this module should be accessible across the ministry.

Data flow

The AEDC at the EPA level prepares an annual work plan with support from AEDOs and enumerators after conducting a needs assessment. Each AEDC sends their work plan to the district, either via email or hard copy. District officials consolidate activities, and the DADO approves a district-wide work plan. Next, the planning officer at the ADD receives and consolidates work plans from the districts, then shares with the central level. The central level economic planning and M&E units consolidate work plans in coordination with the MoAIWD Deputy Director of Planning, who is responsible for creating the national work plan and budget.

In terms of work plan implementation, the AEDC at the EPA level must prepare a monthly report outlining the EPA's progress in activities set out in the work plan. The progress report is sent via email or hard copy to the district, where it is consolidated for the entire district and approved by the DADO. District officials monitor the progress of EPAs in achieving work plan targets, and identify and respond to problems. The districts send progress reports to the ADD level, where reports are consolidated and submitted to the central level.

Recommendations

Data in this module should be broken up into two components: planning and implementation. On the planning side, annual work plans that set targets for activities and activity timelines for all levels of the sector should be uploaded to the NAMIS. These work plans are created annually by the responsible officials at the EPA, district, ADD, and central level departments. The implementation component of the module is integral for monitoring work plan progress. For each activity included in the annual work plan, an implementation tracker can indicate when an activity has been executed, as well as the number of gender-disaggregated beneficiaries.

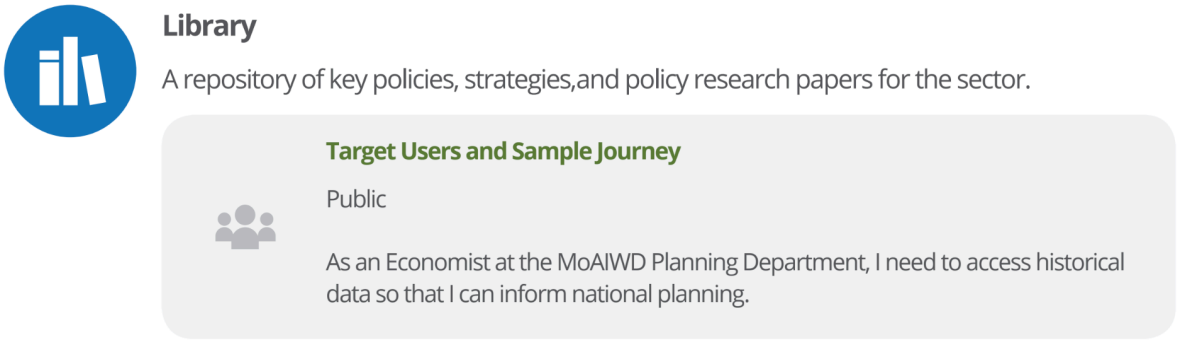
In a future iteration of the NAMIS, this module could include budget information and link to the IFMIS. This linkage would require a thorough design and requirements-gathering, and would require additional custom or purchased software, as DHIS2 is not designed for budget tracking. It is important to note that budget tracking within MoAIWD is done through cost centers. Cost centers at the district level oversee spending within their district, including their associated EPAs. At central level, there are multiple cost centers that track expenditures. Currently, each cost center tracks its own expenditures and there is no aggregation of this information within MoAIWD.

Additionally, the government is currently implementing a system of performance contracts that set objectives for all government employees. Activities within the performance contracts could also be tracked through work plans, as performance contract activities are linked to activities implemented by MoAIWD.

Data in the planning component of the Public Agriculture Activity Monitoring module should be updated annually, while data in the implementation component should be updated monthly.

Library

This module is envisioned as a repository where users will be able to access key documents and selected policy research papers of national relevance.



Data to be included in the module

This module should include the following key documents:

- **Policies and strategies.** Policies and strategies are used to prioritize and plan activities at each level of the MoAIWD. Currently, this information is accessed by users through hard copies or pen drives while meeting with central level officers. In the NAMIS, the MoAIWD Department of Planning, Policy Development Unit will be responsible for uploading the newest policies and strategies. The MoAIWD Department of Planning, Central Monitoring and Evaluation Unit will upload policy research papers, working papers, and evaluation reports. For districts, the district planning officer will be in charge of uploading key documents and frameworks guiding implementation.
- **Research.** The MoAIWD Department of Agriculture Research Services conducts and coordinates technical research across the sector. Results of this work influence policies at national level and implementation at all levels. During interviews, EPA workers mentioned promoting technologies recommended by researchers among farmers. To facilitate broader access to research findings, reports published by the MoAIWD Department of Agriculture Research Services and other research institutes should be uploaded into the NAMIS library.

- **Reviews and evaluations.** During interviews, staff across MoAIWD departments identified a dearth of evidence from evaluations, despite every project undertaking routine mid-term and final evaluations. This was attributed to the absence of a central repository for review and evaluation reports. The Library module should address this, by facilitating access to reviews and evaluations of on-going and completed projects. This will allow lessons learned to become widely available and more easily inform ongoing and anticipated programming.
- **Working papers.** Working papers will include documents in draft form, such as draft policies, strategic plans, guidelines, concept papers, project proposals, and cabinet papers. This module component will be restricted to high level government technicians and related partners. In limited cases, some documents could be made available to a wider audience. This component will mitigate institutional memory loss and personalization of work, which is linked to personnel working and storing information on personal computers.

Overview of how HR data are used for decision-making

During interviews, the limited access to key documents and policy research papers was mentioned as a challenge when planning new activities, programs and policies in the Agriculture sector. These documents could be used within the Department of Agriculture Planning Service to plan the key activities in the agriculture sector.

Recommendations

To ensure the module is a comprehensive repository, it will be important to revamp the library function of the MoAIWD and have dedicated officers assigned to curate the repository. The team managing the module should also partner closely with librarians in public universities involved in agriculture research. The module should be updated at least twice a year to ensure the latest information is accessible for all actors.

Land Resource Management

This module's objective is to provide data on land resources for agriculture and to monitor the management of arable land, including utilization and conservation practices. Potential users include communities, the MoAIWD Department of Land Resources Conservation, and planners and decision-makers at all levels.

Land Resources Management

Provides data on land resources for agriculture; monitors management of arable land, including utilization and conservation practices.

Target Users and Sample Journey

MoAIWD; development partners; non-governmental organizations

As District Land Resource Conservation Officer, I need access to training materials so that I can teach staff about soil fertility.

Data to be included in the module

The MoAIWD Department of Land Resources Conservation collects data through surveys, which capture data on land resources, soil water conservation, rain water harvesting, soil fertility, agro-forestry, and climate-smart agriculture technologies.

Overview of how land resource data are used for decision-making

The MoAIWD Department of Land Resources Conservation uses land resource data to plan interventions that maintain land productivity and prevent degradation. These interventions promote sustainable land and water management practices, and include agroforestry, rainwater harvesting technologies, manure making and use, conservation agriculture, new climate-smart agriculture technologies, and trainings for staff and farmers. The department also monitors and evaluates land use/cover changes.

Data flow

This sub-sector's data flow follows a similar path as that of other agriculture statistics. An AEDO within the EPA is designated to focus on land issues and is trained by MoAIWD. Data is collected by AEDOs using a paper-based template for the land resource survey. This information is then sent to the district land resource officer, who consolidates the data on a quarterly basis. The district officer transmits aggregate data to the chief lands officer at the ADD level, and the ADD submits to the central-level land resource conservation M&E officer. The MoAIWD Department of Land Resources Conservation shares data with the MoAIWD Department of Forestry and the MoAIWD Department of Environment, as well as the central MoAIWD Department of Agriculture Planning Services and development partners.

Information on farmers' training needs comes from routine reports of EPAs, flowing through district, ADD, and central levels.

Recommendations

As the MoAIWD Department of Land Resources Conservation interfaces regularly with the Ministry of Lands and Land Tenure, this module should be developed in joint coordination with both entities.

Interviewees emphasized a need for the module to include geo-referenced intervention points on land resources. This would allow the department to effectively monitor land use and communities' land management practices in real time; and assess intervention impact, including impact of land resource projects, road construction, and other projects relevant to land conservation. The department is also interested in developing the ability to remotely track land under conservation, agro-forestry initiatives, etc. Finally, this module should be linked to the Water & Irrigation module, as irrigation is relevant to land conservation analysis.

Data in the Land Resource Management module should be updated quarterly, in line with EPA data collection.

Farmer Organizations

This module aims to track information on individual farmers and farmer organizations, and improve targeting of agriculture programs and projects. It will also track the number of farming households by collecting basic background characteristics – including gender, age, socioeconomic status, marital status, geographical location, and contact details – of each farmer in a household.

Farmer Organizations

Tracks information on individual farmers and farmer organizations by demographic and geographic information; improves the targeting of agriculture programs and projects.

Target Users and Sample Journey

MoAIWD; development partners; Ministry of Industry, Trade and Tourism; non-governmental organizations

As Field Coordinator for a non-governmental organization, I need to know the number of farmers interested in a new technology so that I can form farmer clubs.

Data to be included in the module

Data on farmer organizations is currently being collected through the farmer household registry. This census is updated every year by AEDOs under the guidance of the extension department. Ideally, farmers' national IDs and other information would be pre-uploaded on each survey, as the registry already links to the national ID.

Currently, the MoAIWD Department of Agriculture Extension Services collects data regarding three types of organizations:

- Category 1: Farmers, informal farmer groups, or organizations like clubs and clusters. Data collected includes organization name, legal registration, membership by gender, organization location, type of enterprise, and volume of production (if the group is involved in value addition).

- Category 2: Associations and cooperatives; the MoAIWD Department of Agriculture Extension Services (DAES) organizes farmers into these groups.
- Category 3: Umbrella organizations like the National Smallholder Farmers Association in Malawi and the Farmers Union of Malawi.

Overview of how farmer organization data are used for decision-making

Government and implementing partners need farmer organization data for developing programming and tracking interventions. The Ministry of Industry, Trade and Tourism (MoITT) will also use this data to plan activities.

Data flow

Currently, there is no stand-alone data collection instrument for farmer organizations. Data are currently collected at EPA level and included in quarterly and annual reports from districts. The DAES uses district reports to populate a database and create monthly reports that are shared with the planning department at central level.

Recommendations

The DAES should be consulted during the future development of a data collection tool, in order to improve and complete the farmer organization information currently being gathered. Such collaboration would enable the system to also collect data on organizational membership, member gender, enterprise links, and organizational networks.

This module needs to be developed in line with any existing data protection laws in Malawi. A supplementary level of security should be added to further safeguard farmers' privacy.

Data in the Farmer Organization module should be updated annually.

PHASE THREE

The third phase of NAMIS implementation will focus on data collected from actors outside of the MoAIWD, and include the following modules: Budget, Non-State Actors: Resource Mapping, Social Accountability, and Non-State Activity Monitoring.

Budget: Resource Mapping

The objective of this module is to monitor annual budgets and expenditures within the public sector.

Budget: Resource Mapping

Monitors implementation of annual budgets and expenditures in the public sector.

Target Users and Sample Journey

MoAIWD, Ministry of Finance, Planning and Economic Development

As Principal Economist, I need access to project progress and M&E reports so that I can do end-of-project budget reviews to inform the development of new projects.

Data to be included in the module

The resource mapping module will pull the planned budget information from the annual plans created by the 49 cost centers and information on expenditures from the IFMIS by the Ministry of Finance.

Overview of how budget data are used for decision-making

Budget information is used throughout MoAIWD to plan activities and track expenditures. At ADD level, information on available resources is used by ADD economists to set output targets when planning yearly work plan activities. At district level, budget information is used similarly by the DADO and other officers within districts to plan activities. Outside of MoAIWD, the Ministry of Trade uses expenditure information to evaluate the impact of investment on agriculture sector growth. At the central level, the M&E team uses expenditure information in the sector for quarterly reports on MoAIWD activities and to track implementation of the MoAIWD budget. As the budget is linked to the NAIP, this data also allows MoAIWD to monitor progress towards achieving NAIP objectives.

Data flow

The budgetary preparation cycle begins in November, when the central level ministry budget department conducts a detailed budget analysis and each cost center reviews its budget. The MoAIWD has 49 cost centers in total, including ADDs, departments, research stations, regional water offices and irrigation offices, government farms, regional fisheries offices, and the fisheries college. The cost centers prepare their budgets using an Excel template provided by the central level budget department, which includes information on each of their allocated budget ceilings. Generally, cost centers submit their budgets electronically, but it can also be done via USB. Afterwards, the central budget department consolidates the 49 individual budgets into a single budget. In April, the combined budget is submitted to the Ministry of Finance, and is generally approved by Parliament in June or July.

Information on expenditures is managed through cost centers and tracked in the IFMIS by the Ministry of Finance.

Recommendations

The MoAIWD prepares its budget in alignment with the NAIP. However, when the budget is submitted to the Ministry of Finance, it must be in a format compatible with the MGDS III. Therefore, the budget department must transform the NAIP budget format to an MDGS budget format before submission. This budget transformation should be automated in the NAMIS Budget module. Users would be able to choose to view the budget in either NAIP or MDGS III format, which will facilitate linkages between the two national strategies and lessen the budget department's workload.

In the past, the budget department has been linked to the IFMIS through Activity Planner. This system allowed the budget department to develop the MoAIWD budget using the same formatting as the Ministry of Finance and IFMIS. However, the Activity Planner has been idle for several years. In building the new system, the MoAIWD can consider re-exploring the use of Activity Planner to link the NAMIS to IFMIS.

Additionally – as budget is closely linked to work plan implementation throughout the year – the Public Agriculture Activity Monitoring module and the Resource Mapping module should be linked to ensure data consistency.

Lastly, at a later phase of development, the module should include a second component covering expenditures in the sector. This will allow for monitoring the implementation of allocated budget. Data in this component should include actual expenditures per department at the central, ADD, district, and EPA levels. These data should be updated monthly.

Non-State Actors: Resource Mapping

Development partners play a key role in the Malawi agriculture sector. To build an effective sector-wide approach, the MoAIWD must have timely information on both current and planned investments by development partners. This module will track donor investments in the agriculture sector, including information on donor pledges in the medium-term (three to five years), disbursements made to various implementing organizations, and activities and expenditures of implementing organizations. This information is currently collected by two information systems: the Aid Management Platform (AMP) from the Ministry of Finance, and the tracking system from the Donors Group for Agriculture Coordination.

Non-State Actors: Resource Mapping

Tracks investments made by development partners in the sector; will include information on medium-term commitments, disbursements, activities, and expenditures.

Target Users and Sample Journey

MoAIWD; Ministry of Industry,Trade and Tourism; Ministry of Finance, Planning and Economic Development; development partners; non-governmental organizations

As a Project Manager at the Ministry of Industry, Trade and Tourism, I need to access information on agriculture expenditures to assess the relationship between expenditures and sectoral growth.

Data included in the module

The module should include information on budgets for donor-funded projects and actual disbursements made by development partners. The data will be disaggregated by donor and updated yearly.

Overview of how non-state actor resources data are used for decision-making

Economists from the MoAIWD Department of Agriculture Planning Services prepare an annual report on the agriculture sector, which includes information on projects from development partners.

Data flow

Currently, information on work executed by development partners in the agriculture sector is not officially collected by the MoAIWD. This information is collected by the Ministry of Finance, Economic Planning and Development through the AMP[18]. Development partners report information quarterly on planned and executed budgets in the agriculture sector. This information is published on AMP and is accessible to the public. Additionally, the Donors Group for Agriculture Coordination also collects financial information on their investments.

Recommendations

The MoAIWD should align this module with the AMP by introducing interoperability between the two systems. This will prevent duplication of effort by the Government of Malawi and development partners, ensuring a more efficient use of resources. Additionally, introducing interoperability will serve to strengthen the existing AMP system.

Data in this module should be updated quarterly in accordance with the AMP module.

[18] http://malawiaid.finance.gov.mw/

Non-State Activity Monitoring

To effectively monitor implementation of the NAIP, MoAIWD will require a strong mechanism for tracking activities implemented by non-state actors.

Non-State Activity Monitoring

Monitors projects and programs being implemented in the sector by non-state actors.

Target Users and Sample Journey

MoAIWD; development partners; non-governmental organizations

As a District Agriculture Development Officer, I need to know which farmers could benefit from development partner activities, in order to guide targeting of new programs.

Data included in the module

This module will include information on agriculture activities being implemented by non-state actors per geographical area. The NAMIS will track the activities, implementer, funder, and beneficiaries of each activity.

Overview of how non-state activity monitoring data are used for decision-making

The module will be used at central level by the MoAIWD's Department of Agriculture Planning Services for preparation of annual and quarterly agriculture sector reports. At district and EPA level, users will access this module to coordinate activity locations with program and project implementors, like NGOs and CSOs. Development partners and NGOs already consult with the MoAIWD at every administrative level to help them target the best location to implement their projects.

Data flow

Information is currently being collected informally by extension workers at EPA level, and is included in reports to the AEDC. The AEDC then shares this information with the district. In parallel, the MoAIWD Planning Department with the Donors Group for Agriculture Coordination – and with development partners bilaterally – to coordinate donor activities in the sector. There is no formal database within the MoAIWD that aggregates this information. However, this information is collected by the Ministry of Finance, Economic Planning and Development through AMP. Development partners report information quarterly on activities, implementers, and activity locations.

Recommendations

This module should integrate data collected currently through AMP, supplemented by information collected at district and EPA levels. Before developing this NAMIS module, MoAIWD should meet with the AMP team to prevent duplication of effort.

Data in the Non-State Activity Monitoring module should be updated quarterly.

Social Accountability

The Social Accountability module is a new initiative by MoAIWD that aims to empower communities to be active participants in the design, implementation, and M&E of agriculture projects and programs. Specifically, it will collect data on community participation and collect client feedback on government performance and services in the agriculture sector.

The module will be based on a predetermined community scorecard and clients charter, which will provide feedback on interventions to government and will allow validation of community-level data on delivered services. The scorecards are to be filled out by agriculture committee leaders within an EPA catchment area. Community scorecards are currently collected in certain communities supported by local CSOs.

Social Accountability

Collects data on community participation levels, and feedback on government and service delivery.

Target Users and Sample Journey

MoAIWD; non-governmental organizations

As an Economist at the MoAIWD Planning Department, I want to access to social accountability data to improve project design and implementation.

Technical Implementation

This section will provide a basic capacity assessment regarding information technology (IT) at different levels of the MoAIWD and implications for NAMIS technical implementation. In addition, this section will present a recommendation for open source software to be used in system development.

IT Capacities Assessment

The research team encountered a wide variety of IT infrastructure and resources within the MoAIWD, across different levels. In what follows, we provide an overview of capacities across levels, and attendant implications for the NAMIS implementation.

Capacities Assessment

EPA IT capacities assessment

At the **EPA level**, IT resources are the most varied and most limited. As of December 2017, 146 out of 206 EPAs nationally did not have electricity. One EPA of the six selected for this study had no access to electricity and no access to computers. As a result, this EPA must prepare handwritten, hard copy reports and travel in-person to the district office to deliver them. Another selected EPA had desktop computer access, but no electricity – so it must also rely on hard copy data transfer. The other four selected EPAs had periodic access to electricity, and either personal laptops or office desktops. However, only two of the four stored and I some data electronically, and none of the EPAs had IT staff to support data management.

Notably, the EPAs sampled in this exercise are unique: at the time of study, five of the six were supported by projects that had distributed tablets to AEDOs for the purpose of project data collection. Tablets were provided by development partners, including the World Food Program, Save the Children, CARE Malawi, Catholic Relief Services, and the Ubale project. In all cases, development partners established that the tablets must be used specifically for project purposes. At time of assessment, the EPAs were unsure whether the tablets will remain once projects end. EPA staff received minimal trainings that focused on using the tablets for project M&E purposes. In all cases where tablets were available, AEDOs purchased data with their own money to access the internet on their tablets.

In all EPAs visited, internet access was available through the telecommunications network. AEDOs and AEDCs used dongles for laptops or purchased data bundles for their tablets or smartphones in order to access email and – sometimes – to transfer photos of paper surveys via WhatsApp.

District IT capacities assessment

District level offices have slightly higher levels of technical capacity, as district officers are responsible for digitizing information and sending it electronically to the ADD. All of the districts in this study had access to computers, and regularly managed and I data electronically. District officers are also responsible for aggregating data from EPAs, and thus have higher levels of computer and Excel skills.

Similar to the EPA level, the majority of districts face periodic electricity blackouts and internet connection problems. In three out of five districts studied, there was no internet connection in the office. As a result, staff must use dongles with their personal laptops or smartphones to access e-mail and transfer reports. While no district in this study had an IT staff member in the office, several district officers mentioned having remote access to an IT technician at the district council.

ADD IT capacity assessment

At the **ADD level**, some IT units have technicians in the office. Two ADDs mentioned having previously had a server in the office that was maintained by the IT unit. Yet while technical capacities are higher at the ADD level, offices still face challenges with electricity and internet access. Four ADDs in this study mentioned lacking access to electricity, due to failing to pay for the service or terminating a contract without renewal. One ADD reported having no access to electricity, while three others reported frequent blackouts and rare usage of a generator.

Central level IT capacity assessment

Finally, at the central level in Lilongwe, MoAIWD offices are fully equipped with desktops, electricity access, and internet. IT staff are readily available to maintain physical infrastructure and provide support to staff. However, at time of assessment, the MoAIWD Planning Department did not have an operating server.

Implication for the NAMIS Requirements

Internet access

As internet connection is not widely available across MoAIWD sub-national offices, future users could face limitations in accessing the NAMIS system. In response to this risk, the MoAIWD should consider undertaking the following:

- **Ensure internet accessibility in every sub-national and sub-district office.** In locations where office internet is impossible due to remote location or unreliable connection, MoAIWD could purchase dongles or data bundles. Previous experience proves that not all companies' dongles and data bundles provide uniform internet quality in all locations. Therefore, the MoAIWD should allow each locality to select the company that provides the best internet quality and the most coverage in their area.
- **Develop a mobile app with offline capability for data collection.** EPA-level data collectors regularly interview farmers in remote locations that lack connectivity. If the MoAIWD decides to

collect data directly through mobile and handheld devices, data collectors should be able to conduct surveys on their devices through an offline mobile app. When their devices connect to the internet upon reaching an area with internet connection, the app will automatically synchronize the data collected into the NAMIS server. This will also allow data collectors to preserve battery on their devices while in the field, as connecting to internet drains battery quickly.

- **Design a website with a low-bandwidth demand.** The website designer will need to consider that future NAMIS users will often not have fast internet connections. Website design should use features that do not require a fast connection to load: for example, it should use the minimum number of images and low CSS. When users become frustrated by the slow speed of an online data management system, there is an increased risk of them reverting to old processes for data collection, management, and sharing. For example, users might stop using the online data system in favor of Excel sheets, due to time required to load each website page. To further mitigate this risk, NAMIS could also automatically detect the user's connection speed, sending users with slow connections to a basic HTML version of the NAMIS. This would require building two versions of the NAMIS, with one designed specifically with basic HTML for low bandwidth.
- **Provide offline access to dashboards and reports**. Because future NAMIS users might not have stable internet connections, or might run out of credit on their data bundles and dongles, NAMIS dashboards or reports should be accessible while offline. The MoAIWD can create an offline desktop version of the NAMIS that allows users to access a limited set of dashboards and reports without an internet connection.

Electricity access

Electricity access is not guaranteed throughout MoAIWD offices at sub-national level. Some offices have no access to electricity, and others have intermittent access due to a lack of network stability. As electricity is required to power devices needed access the NAMIS, this poses a risk to use of the system. To account for this, the MoAIWD can take the following steps:

- **In offices with limited electricity access, prioritize mobile and handheld devices over computers.** If the MoAIWD decides to provide IT materials such as desktop computers, laptops, or mobile and handheld devices to offices at sub-national level, it should consider access to electricity. In offices with limited or no access to electricity, mobile and handheld devices should be prioritized as they can be easily charged in charging stations outside of the office. These devices also charge faster than computers.
- **Responsive web design (RWD).** Users will access the NAMIS from a variety of devices (computers, mobile, and handheld devices), each with its own screen size. For this reason, NAMIS should be built using RWD. RWD has a predefined design for each type of device, which optimizes the user's visual experience. In addition to having a design for laptops and desktop computers, the website should also have a design specifically for mobile and handheld devices. A mobile-optimized website does not require users to "pinch and zoom" to read text; its navigation is built for efficiency; images and media are optimized to load quickly; and content is succinct for maximum effectiveness. RWD should not be confused with mobile compatibility. A mobile-compatible site is an HTML based website that does not contain Flash. While a mobile-compatible site can be

viewed on mobile and handheld devices, it is not specifically optimized for them. To ensure RWD, a web designer should join the team of developers.

- **Install solar panels for offices without electricity access.** Due to their locations, certain sub-national offices lack access to an electrical network. As an alternative for these offices, the MoAIWD could install solar panels or procure solar charging stations so that NAMIS users can charge their mobile and handheld devices. Solar panels should be installed in strategically-selected locations to reduce the risk of theft.

Access to computers, laptops, mobile, and handheld devices

Access to a desktop computer or laptop is not guaranteed for all employees within MoAIWD sub-national offices. At EPA level, some offices have no computers. Where computers are available, they can be slow and/or have viruses. As the NAMIS will be an online data management system, employees will need to have an electronic device – like a desktop computer, laptop, mobile, or handheld device – assigned to them in order to access, input, and extract data from the NAMIS. To access the system efficiently, the electronic devices will need to be in good health. If not, some MoAIWD employees may be unable to access the NAMIS quickly, which creates a risk for the system's data quality and jeopardizes the system's longevity. The MoAIWD can take the following steps to diminish these risks:

- **Conduct an inventory of existing IT infrastructure** in each sub-national office, including desktop computers, laptops, mobile, and handheld devices, and access to electricity and the internet. Before procuring IT infrastructure, the MoAIWD should assess the number of existing devices and the condition of each. For example, a computer that is unable to connect to the internet cannot be used for the NAMIS. During the inventory assessment, the MoAIWD should also identify whether each sub-national office has access to electricity and the internet. This will allow the MoAIWD to determine the number and types of devices that should be procured for the offices.
- **Procure desktop computers, laptop, mobile, and handheld devices**. These devices will be necessary to ensure successful NAMIS deployment. During interviews, several MoAIWD employees mentioned that laptops are more likely to be stolen than desktop computers. Therefore, desktop computers might be a good option for offices with a stable electricity connection. However, for offices without electricity, desktop computers should not be procured and priority should be given to laptops. Additionally, a code of conduct should be established in regards to the use of this devices.
- **Provide basic training on computers, laptops, mobile, and handheld device usage**. To ensure the devices are used properly, the MoAIWD should provide a basic training to ensure all employees are capable of using them. During interviews, some employees noted that they do not feel comfortable using computers, laptops, mobiles, and handheld devices.

RECOMMENDED OPEN SOURCE SOLUTIONS TO IMPLEMENT THE NAMIS: DHIS2

To implement the NAMIS, the MoAIWD has three software possibilities: create custom software, purchase an existing software, or adapt an existing open source software. A custom solution is not recommended, as starting a software from scratch increases costs; increases the risk of having a system that is never fully

implemented; and requires more time to implement than the other solutions. Previous experiences within the Government of Malawi have proven that developing fully custom data management solutions can be risky. For example, a custom system was developed for the water and sanitation sector, but it was never finalized as the consultant hired for development was unable to deliver a finished product. Purchasing the licence for an existing software requires high initial investments and can entail high costs for associated activities, like trainings and long-term support services. The open source solution provides a middle ground: there is no license cost, and developers have a fully functional system to start to work on. This allows for developers to focus their work on customizing the open source software, which reduces overall cost of the technical solution.

For this reason, the research team recommends pursuing an open source solution for the NAMIS. One of the leading open source solutions available is DHIS2. DHIS2 is currently used in Malawi by the Ministry of Health, which sets a positive precedent for use of the software. Using DHIS2 also reduces risk of inability to sustain the system, as developer knowledge about the software already exists in Malawi. The MoAIWD believes that there is sufficient capacity in-country to develop the NAMIS with support from the University of Malawi, which has already been supporting DHIS2 in the health sector.

DHIS2: General Description

DHIS2 – which stands for district health information system, version 2 – is a flexible system for data capture, management, analysis, and dissemination, currently used in over 40 countries. The system works through web browsers, mobile devices, and SMS. It supports a variety of data types, such as aggregated data (staffing, equipment, infrastructure, population estimates, etc.) and event data (such as disease outbreaks, survey data, longitudinal patient records, etc.)[19]. DHIS2 can I any frequency of data collection, and has a high degree of input and output customization, including tailored dashboards for data analytics. The initial scope of DHIS2 was to manage routine monthly data from primary health centers, but it has since expanded to manage data in a variety of sectors including water, sanitation, and hygiene (WASH), education, and land tenure. The software is open source and can be used by third parties through an open API. DHIS2 can be obtained at no cost by the Government of Malawi. It runs on any platform with a Java Runtime Environment (JRE 7 or higher) installed.

DHIS2 Experience by the Ministry of Health in Malawi

Variations of DHIS2 have been used by the Ministry of Health in Malawi for the Health Information Systems Program (HISP) for over a decade. The system allows for online and offline access by health centers, clinics, hospitals, and central-level ministry offices across the country. In the first stage of the HISP, which used the DHIS1 software, health information officers in each district were responsible for the core of data collection. In parallel, health program officers collected programmatic data and reported to the national level program offices.

[19] DHIS2 implementer guide: https://docs.dhis2.org/2.31/en/implementer/html/dhis2_implementation_guide_full.html.

The current DHIS2 HISP system can be accessed at all levels of the health sector, but only by registered users with internet access. Paper reporting is used at the community and health facility level, and data are entered into DHIS2 system by health program coordinators at the district level. The coordinators are responsible for verifying health facility data and entering it into DHIS2 with support from the data clerks. DHIS2 Mobile was introduced to the HISP in 2012, with the objective of improving the timeliness of data collection and reporting. At the time, the mobile system was not available in all health districts. Paper data entry forms are still used as a backup due to perceived instability of the system. This has increased the workload of data clerks who must report both in paper and electronic forms.

In the pilot of DHIS2, 500 program coordinators in 28 districts were trained on use of the program. Dongles and wireless routers were distributed to the district, and credit was loaded on them monthly, to allow for data entry in areas with limited internet connectivity. The ministry also established a central monitoring and evaluation division (CMED) to collect, analyze, and use the HISP data. In 2015, the Ministry of Health introduced a GIS component to DHIS2 to improve data analysis and offer mapping visualizations.

Challenges in the DHIS2 system in Malawi's health sector include unreliable internet connectivity, slow implementation, lack of adequate information communication technology, lack of supervision, increased workload due to double reporting in paper and electronic form, and variations among districts in reporting rates and technical competence. A quality assessment of the system three years after its implementation showed that the missing information from districts and slow reporting posed a risk to reaching the system's objectives.

DHIS2 Experiences in Non-Health Sectors

In the past several years, DHIS2 has been adapted by Akros in Zambia for use in the education, WASH, and land tenure sectors. The Zambia Education Management System captures aggregate data on school enrollment and attendance on a monthly basis[20]. The system calculates indicators and presents visualizations in dashboards. In the WASH sector, DHIS2 is used to monitor progress towards eliminating open defecation at the community level. The system involves community-level data collection and feedback systems to government officials and local chiefs. It has been extended to over 20,000 villages. Community champions consolidate and verify paper-based data from communities, then submit via a mobile phone running the DHIS2 platform. In the next level, data are available to key stakeholders, including the local chief, via an Android DHIS2 application. At the district level, officials can log on to DHIS2 through web browsers to monitor progress and share information with stakeholders. Akros found that low-technology, robust phones were better for this system as they had a higher battery life, lasted longer, and were easier to use. These phones can use a DHIS2 Java-based application.

In agriculture, Akros developed a land tenure reporting system using DHIS2 that was deployed in eastern Zambia, in partnership with TetraTech and funded by USAID. The system is a mobile tool where Zambian citizens can track changes to their land claims and submit forms for land certificates electronically. It also

[20] https://docs.dhis2.org/master/en/user-stories/html/user_story_akros_EMIS.html

appears that the Ministry of Agriculture in Rwanda has adapted DHIS2 to be used as an information management system in the agriculture sector (https://github.com/minagri-rwanda/DHIS2-Agriculture). Unfortunately, it was not possible to obtain more information about this initiative in Rwanda.

Data Collection Tools for Mobile or Handheld Devices

To collect NAMIS data on a mobile or handheld device, the MoAIWD will have to develop or use an existing mobile application. DHIS2 offers two solutions to collect data from phones or tablets called DHIS mobile: DHIS2 Light and J2ME GPRS/3G client. Another option for the NAMIS would be to use an open source solution developed by Open Data Kit – Open Data Kit Collect – that is compatible with DHIS2. Each of these solutions are described below.

DHIS2 Light

DHIS2 Light is a mobile-optimized data entry module for all devices. This means that it is not an application that users download into their handheld devices, but a module specifically designed to be accessed through a browser using a mobile or handheld device in order to input data. DHIS2 Light supports a wide variety of browsers: Opera mini 3 & 4 (basic and advanced), Nokia S40 mobiles, Windows Phone 7, Window Mobile 6, Palm Pre, Blackberry (v5 and v6), Firefox mobile, iOS (iPhone) devices and Android devices.

Using DHIS2 Light is not recommended as it does not allow for offline data entry. EPA workers would need an active and stable internet connection on their phones, which is unlikely for most workers collecting data in the field.

DHIS2 J2ME GPRS/3G client.

DHIS-mobile includes two separate J2ME[21] clients supporting GPRS/EDGE/3G as a transport mechanism. One client supports aggregated reporting by location or facility, and the second client supports name-based program tracking. These clients are split into separate applications to make deployment easier. The NAMIS will likely need to use the client that supports aggregated reporting by location for its agriculture statistic data collection.

Both of these clients support offline storage of data, and work on mobile and handheld devices. An active internet connection is required in order to send data to the DHIS2 database, but users are able to enter data offline and share it with the server when they connect to the internet. This client is intended primarily for low-end devices which support J2ME applications.

Although users can collect data offline, an active internet connection would be required for communication between the NAMIS server and the mobile phone to:

- initialize the mobile application for the first time on the phone;

[21] J2ME (Java 2 Platform, Micro Edition) is a technology that allows programmers to use the Java programming language and related tools to develop programs for mobile wireless information devices such as cellular phones and personal digital assistants

- update the mobile application; and
- load the collected data into the NAMIS system. The phone stores all entered data locally, so it is able to work in an environment with regular – yet temporary – access to a data connection.

As users collect data offline, the system creates a data version to ensure coherence in the database. To make it possible to compare and update the datasets on the mobile phone with the version on the server, datasets are automatically versioned when users edit the dataset structure.

The DHIS2 J2ME GPRS/3G client responds to all the functionality requirements that have been identified for a mobile application. Nevertheless, this client has been developed to collect data by health facilities and will need to be customized for the agriculture sector.

More information on DHIS2 Mobile can be found here:
https://docs.dhis2.org/2.26/en/user/html/ch21.html.

General Recommendations for Implementation

The previous sections focused on recommendations on the NAMIS design and technology that could be used for its development. This section will focus on additional process recommendations for implementing the NAMIS.

User testing during development

A user test asks involves asking future system users to execute a set of tasks that would be typical for them to perform in the system. The objective of the user test is to collect feedback on the system as it is being developed. Additionally, problems identified during the development process are less expensive to fix than problems that are identified after the system has been deployed. Through user tests, MoAIWD will be able to identify areas of improvement, allowing it to develop a NAMIS that can be easily used by future users.

Below is a list of recommendations for implementation of user testing:

- A test should be designed for each type of user, and tasks given to each type of user should correspond with tasks they will be expected to perform.
- Testers should be given a pre-established list of tasks to accomplish in the system. For example, when testing the data entry modules, testers should include AEDOs, AVOs, and/or enumerators.
- Ideally, users should accomplish each task successfully.
- Test should take between 30 minutes and an hour.
- The tests should be recorded so that they can be analyzed later. The free software https://screencast-o-matic.com/ can be used to record testing sessions.

Recommended composition of the team working on the NAMIS

The MoAIWD Department of Agriculture Planning Services should lead efforts to develop, deploy, and manage the NAMIS. The director of planning would provide overall policy direction, while the deputy director of planning would be responsible for providing effective leadership and coordination among relevant units and partners during NAMIS implementation.

Development of the NAMIS will require a permanent member of the agriculture planning services department to undertake the role of project owner. The project owner should be a senior staff member within the MoAIWD Department of Agriculture Planning Services. The project owner would be responsible for the overall implementation and ongoing conceptualization of the NAMIS. Further, the following additional NAMIS project team members are recommended:

- **Project coordinator.** The project coordinator will be responsible for ensuring timelines and budgetary restrictions are met; hiring and coordinating staff; the effective execution of NAMIS implementation; the establishment of strategic partnerships; and the sustainability of the system. The project coordinator should be a member of the department of agriculture planning services.
- **Lead developer.** The lead developer will be responsible for making technical decisions; managing the team of developers; assigning tasks to each developer; developing the system and reviewing code from the other developers; and reviewing and providing feedback on requirements. The lead developer should also prepare the initial technical project structure and define the system architecture. The lead developer should have 7+ years of experience with Java, HTML, CSS, JavaScript, REST services, and SQL. Experience in the development of applications from generic tools and open metadata models; experience working with DHIS2 would be an asset.
- **Team of developers/ programmers.** The developers will be in charge of building the code, and reviewing and providing feedback on requirements. The developer team must have experience in JAVA, HTML, CSS, JavaScript, REST services, and SQL. Experience working with DHIS2 would be an asset.
- **Technical analyst.** The technical analyst will be responsible for developing the technical specifications for the system and testing the system as it is being developed. The technical analyst will lead user tests, write documents and manuals, develop trainings, and work as a coordination assistant by supporting the Project Manager on day-to-day tasks. The technical analyst should have a deep understanding of the agriculture data ecosystem, strong writing skills, and a clear idea of how the NAMIS should work.
- **Graphic designer.** Need for a graphic designer will depend on the level of customization to be applied to DHIS2. The graphic designer will be responsible for creating wireframes and the navigation architecture; reviewing HTML implementation; suggesting improvements to the user interface, and ensuring that the product reflects the design. The graphic designer should have experience designing data visualizations and user interfaces for open source software.
- **System administrator.** The system administrator will be responsible for managing the NAMIS server and the network connections to the installed system. The system administrator should have at least one year of experience in network administration and maintenance, and familiarity with the operating system that the NAMIS server is installed on (Linux or Windows).

DOCUMENTATION

The development of the NAMIS should be accompanied by thorough documentation. The role of documentation is twofold: to build written institutional memory of the software, and to create a resource for training new NAMIS users, administrators, and developers. We recommend the following documents be developed:

- **Data Management Plan**: This document should detail who is responsible for collecting, uploading, and validating the data in each NAMIS module. It should clearly outline all data that will be included in the NAMIS, as well as the existing dashboards.
- **Technical Administrator Guide**: This document should detail the basic technical information for the system administrator, such as the server information and the server codes.

- **Administrator Guide**: This document should outline all actions for which the administrator is responsible, and should describe how each can be accomplished. For example, activities could include adding a new user, blocking a user, and modifying basic content in the interface.
- **User Guide**: This document should outline all functionalities of the NAMIS. A new NAMIS user should be able to understand how to use the system by reading this guide.

SERVER RECOMMENDATIONS

DHIS2 is a database-intensive application and requires that the server has an appropriate amount of RAM, appropriate number of CPU cores, and a fast disk. These recommendations should be considered as rules-of-thumb, and not exact measures. DHIS2 scales linearly on the amount of RAM and number of CPU cores, so the more one can afford, the better the application will perform.

RAM: At least **1 GB memory per 1 million captured data records** per month or per 1000 concurrent users. **At least 4 GB for a small instance**, **12 GB for a medium instance**.

CPU cores: **4 CPU cores for a small instance**, **8 CPU cores for a medium or large instance**.

Disk: **Ideally use an SSD**. Otherwise use a 7200 rpm disk. Minimum read speed is 150 Mb/s, 200 Mb/s is good, 350 Mb/s or better is ideal.

TRAININGS

The implementation of the NAMIS should be accompanied by a detailed and thorough training plan. The MoAIWD has identified the Center for Agricultural Research and Development from the Lilongwe University of Agriculture & Natural Resources as the sub-contractor that will provide trainings for staff at frontline, districts, ADD and central level. The trainings should focus on data input, data validation, and data analysis.

DATA QUALITY

To ensure data quality and increase trust in NAMIS data, we recommend that the MoAIWD include a data quality assessment plan that clearly details the frequency and methodology with which data quality assessments of the NAMIS will be carried out. A senior-level official, such as the head of M&E, should be responsible for determining the data and systems requirements for effective monitoring of the agriculture sector, and advising the ministry on these requirements.

OTHER FUNCTIONALITIES

Based on DG's experience building similar data systems, following functionalities are valuable in system management:

- A dashboard that allows visualization of missing data. For each cycle of data collection, this dashboard would enable the user to visualize each module in which districts or EPAs have uploaded data, to identify actors in the process of uploading data and actors who have not yet started uploading data.
- A data lock feature that can control when users are able to modify or upload new data into the NAMIS, temporarily activating or deactivating access.
- A built-in mechanism to flag data that has not been uploaded on time.

Annexes

USER JOURNEYS

The user journeys compiled in this annex describe how the stakeholders interviewed for this report currently use data for their decision-making needs. For user journey we have identified the stakeholder and data sources. Some decisions were mentioned more than once, when this is the case we have added at the end of the user journey the number of times the decision was mentioned in brackets.

Agriculture Statistics

As Enumerator, I need to collect market prices so that I can share this information with the AEDC and the agro economics survey team at Central Level. I collect this information for the Agriculture Market Information System (AMIS).

As AEDO, I need access to market prices so that I can share this information with other AEDOs who advise farmers on prices. I can access this information from random sampling of traders for the Agriculture Market Information System (AMIS).

As Planning Officer at the district, I need to collect market price data to prepare the monthly and quarterly reports. I can access this information through a monthly report sent by enumerators.

As Statistician, I need to monitor the prices of commodities to determine if there is a risk of food insecurity. I can access this information through the AMIS.

As Economist – Food Security at Central Level, I need to know the market prices of specific commodities so that I can share it with stakeholders. I can access this information by asking the Statistics Unit.

As Assistant National Technical Manager-Famine Early Warning System, I need to analyze price data of commodities from markets so that we can determine our production targets. I can access this information from the AMIS, I complete this information with our own project assessments.

Planning

As Economist at ADD level, I want to analyze APES survey results so that I can provide guidance to districts on their work (ex: crop production). Currently I can access this information through the APES statistics and routine reports from districts (ex: info on inputs and dry spells).

As Economist at ADD level, I want to identify the seeds needed in each district so that I can procure them. I can access this information through a list of households, locations, and expected yields in the APES survey results.

As Economist at ADD level, I want to access the production figures for crops, livestock, and fisheries so that I can prepare a report for HQ. I can access this information through APES data.

As AEDO, I need to use the APES data to understand how crops vary from one year to the other to understand the reasons for variations. I can access this information through the APES.

As AEDO, I need to identify areas where there is a low estimate of livestock production or crop production so that I can provide support to farmers to increase their production. I collect this information for the APES.

As AEDO, I need to know the weather, the planting data, and how many crops were planted per ridges so that I can determine the best technologies to demonstrate for farmers. I collect this information from the field. (x3)

As AEDO, I need to know the number of farming households in each section so that I can share this information with the DADO and the NGOs. I collect this information for the APES.

As AEDO, I need to analyze the Agricultural Production Estimates and have information on farmers households so that I can allocate the resources from programs such as Farm Input Subsidy Program (FISP) and help NGOs target farmers. I can access this information through the APES.

As AEDC, I need to compile information on the irrigated crops estimates (yield for each crop) so that I can prepare reports. I can access this information from AEDOS collecting the APES Data.

As Assistant AEDC, I analyze APES data so that I can allocate resources. I can access this information from reports sent by EPAs.

As ADD economist, I need information on weather patterns and an evaluation of last year in order to set output targets in the budget. I can get this information from reports on weather and on pests or diseases from the ADD.

As Drought Animal Handler at EPA level, I need to know the estimated area requested per farmer for work so that I can coordinate how our animals can help farmer prepare their lands.

As AEDC, I need to compile information on the field crops estimates so that I can prepare reports. I can access this information from AEDOS collecting the APES Data. (x2)

As Crops Officer at the District, I need to monitor food security (crop estimates, weather, crop pest and diseases) and identify hot spots so that I can inform stakeholder in case of need and help farmers with mitigation measures like irrigation. I can access this information through reports and the APES. (x5)

As Crops Officer at the District, I need access to rainfall data so that I can aggregate data from EPA and include it in the APES report. I can access this information from reports sent by EPAs.

As Economist at ADD level, I need to know crop production estimates so that I can advise Central Level on possible actions. I can access this information from EPA reports.

As Planning Officer at ADD level, I need to collect production estimates so that I can guide the farmers on timely planting, quantities to be planted, and types of crops to be planted. This is information is shared by EPAs.

As Planning Officer at ADD level, I need to know the amount of rainfall received by areas so that I can plan activities. I can access this information in reports from EPAs.

As Statistician, I need to analyze the APES data to determine if there is a deficit or surplus of crops in order to advise farmers where to sell when there is a surplus. I can access this information in the APES survey results and EPA reports. (x2)

As Statistician, I need to analyze the data from the post-harvest losses so that I can identify intervention to reduce harvest losses. I can access this information from the APES.

As Economist for the M&E Unit, I need access to weather information (climate change department); crop production (APES); animal production (APES); fisheries production (APES); water sector (including how many connections have been made, issues to do with lack of payment from government to the water); other issues with the non-revenue water (leaks for example); and bills and policies that have been created to make the sector better (Department of Agriculture Planning Services), so that I can prepare the Annual Economic Report.

As AVO, I need to know the types and number of livestock owned by households in order to identify beneficiary communities and coordinate with NGOs on livestock distribution. I can get this information from EPA reports.

As AEDO, I need to identify areas where there is a low estimate of livestock production or crop production so that I can provide support to farmers to increase their production. I collect this information for the APES.

As AEDO, I need to know the number of farmers with livestock and number of animals they own so that I can guide NGOs on where to implement their projects by identifying what villages have low quantities of livestock. I can access this information through the APES data I collect door to door.

As Animal Health and Livestock Development Officer at district level, I need to know the number of livestock farmers; number of animals per species; and variation dynamics (birth and deaths), so that I can

know the economic status of the district. I can access this information through monthly reports sent by EPAs.

As Assistant Animal Health and Livestock Development Officer (AAHLDO) at the district, I need to access the needs assessment report so that I can identify relevant trainings for field staff and farmers. I can access this information in EPA reports and direct contact with farmers.

As Planning Officer at ADD level, I need to know the number of births, deaths, and sale of livestock so that I can know where to target investments. I can access this information in the livestock census.

As AVO at EPA level, I need to know farmer needs, areas affected by disease, and number of affected livestocks so that I can target the awareness campaigns on pests, diseases, vaccinations, deworming and trainings. I can access this information through the APES and direct contact with farmers. (x3)

As AVO, I need to know the number of livestock infected with a pest or disease in order to treat the livestock and do pest control. I can access through interaction with the farmers and inspection of the livestock. (x4)

As Assistant AEDC, I analyze APES data on livestock so that I can monitor diseases. I can access this information from reports sent by EPAs.

As Assistant AEDC, I analyze APES data on livestock so that I can provide information to NGOs. I can access this information from reports sent by EPA.

As Animal Health and Livestock Development Officer at District level, I need to know prevalence rates of the diseases so that I can plan the activities of my department (vaccinations, deworming, animal movement control, etc.). I can access this information through monthly reports sent by EPAs. (x2)

As District Animal Health & Livestock Development Officer (DAHLO), I need to access information on disease outbreaks so that I can help sick livestock to get better. I can access this information through informal reports by the AVO.

As a crops officer, I need to know what pests and diseases pose risks in order to know which assistance to provide EPAs and AEDOs. I can access this through training booklets, and sometimes from the Guide for Agricultural Production (GAP).

As Planning Officer at district level, I need to identify the available pesticides and the areas and farmers affected by a disease do that I can coordinate the distribution of pesticides. I can access this information through EPA reports.

As Animal Health Officer at ADD level, I want to do livestock disease surveillance so that I can prevent disease outbreaks (movement bans, for example). I can access this information through informal channels like phone calls and emails or through emergency reports.

As Animal Health Officer at ADD level, I need to access information on past disease outbreaks by area so that I can prevent disease outbreaks (movement bans, for example). I can access this information from the Epidemiology department at Central Level.

As Planning Officer at ADD level, I need data on pest and diseases collected by the APES so that I can share it with relevant stakeholders and include in APES report. I can access this information in reports from EPAs.

Fisheries

As AEDC, I need to compile information on the Fisheries production estimates (number of ponds; level of water in ponds, etc.) so that I can prepare reports. I can access this information from AEDOS collecting the APES data.

As Fisheries Officer at district level, I need to know the best practices in fish farming and new technologies (feed formulation, pond management, how to raise fingerlings, etc.) and which farmers have ponds, so that I can encourage and train farmers to adopt fish farming. I can access this information from the fish farming database with area and ponds.

As Fisheries Officer at district level, I need to know the location of new irrigation schemes and available water so that I can encourage farmers to adopt fish farming. I can access this information from the irrigation officer.

As Fisheries Officer at district level, I need to access the catch data (number of fishers, quantities fish harvested, beach price) and data from previous years, so that I can incorporate it in the monthly report to the DADO and Department of Fishery at Central Level.

As District Fisheries Officer, I need to know the resources that will be available so that I can plan which farmers are to be targeted for trainings on fish farming. I access this information through AEDOs reports.

As Chief Fisheries Officer at Central Level, I need information on implementation of the program so that I can monitor the realizations of programs. I can access this information from district reports.

As Planning Officer at ADD level, I need to know the number of imported fish and the number of ponds so that I can plan activities. I can access this information from EPAs in APES report.

Land Resources

As Project Manager at the Ministry of trade, I need to analyze agriculture exports (no indication of use).

As Enumerator, I need to collect input Prices (resources for farming like seed, fertilizers) so that I can share this information with the AEDC and the Agro economics survey team at Central Level. I collect this information for the Agriculture Market Information System (AMIS).

Budget

As ADD Economist, I need information on resources available in order to set output targets in the budget. I can access this information from the MoAIWD or MOF in a yearly briefing.

As Project Manager at the Ministry of Trade, I need to access information on expenditures in agriculture so that I can assess the impact of expenditure in the sector and link it with growth in the sector. I can access the information on recurrent expenditures from Treasury and MoA, development partners, and the National Local Government Finance Committee.

As DADO, I need to know the annual plan of activities for my district and by EPA – including budget – so that I can allocate the funding to ensure the implementation of our activities. I can access this information in the work plans formulated by EPAs.

As Economist at Central Level, I need to know the M&E technical team budget approved by parliament so that I can prepare quarterly reports. I can access this information from M&E reports.

As Economist at Central Level, I need access to IFMIS data from districts and core centers so that I can track expenditures. I can access this information by visiting core centers and from the IFMIS system.

As Extension Methodologies Officer, I need access to the cash flow, budget, and annual work plan so that I can plan activities based based on cash flow and budget. I can access this information by going to the planning and accounts offices.

As Crops Officer at the district, I need to know the work plans so that I can decide on what to do with allocated resources for the month. I can access this information from EPA staff.

As Planning Officer at ADD level, I need access to funding allocations and actual expenditures so that I can work on the budget. I can access this information by asking finance officers.

As Planning Officer, I want to analyze cash flow availability so that I can decide on everyday office operations. Currently, I can access this information through accounts.

As DADO, I need to access the proposal documents of donor projects in order to coordinate agriculture activities in my district. I can get this information from the DPD (Director of Planning and Development) at the District Council.

As an economist responsible for budgeting, I need to access information on new procedures for the budgeting processes in order to train core centers. I can get this information from the budgeting team for Economic Planning and Development (EPD).

As ADD Economist, I need information on the activities of each department in order to decide on the allocation of resources. I can get this information by asking staff in the office.

As Economist at ADD level, I need to know the resources that are available so that I can determine how much each department will get. I can access this information from MoAIWD or MoF in an email, or in the yearly briefing on the budget template.

As DADO, I need to know who has been paid and who has not been paid so that I can determine the best way to use the financial resources and verify the respect of the budget. I can access this information in the payroll sheet.

As Irrigation Officer, I need to access draft budget plans so I can know what resources are available to decide which irrigation schemes can be rehabilitated. I can access this information from the Director of Finance.

As Economist for the M&E Unit, I need to know expenditure by programs so that I can prepare a report on the MDGs. I can access this information from a document shared by the Ministry of Finance.

As Program Director for a CSO, I need to check budgetary allocation of the sector of agriculture against overall budget and by sector so that I can monitor the effective execution of projects. I can access this information by checking budget data from government.

As Planning Officer at ADD level, I need to analyze project activities, implementation, and funding so that I can identify challenges and solutions to ensure the project is implemented as planned. I can access this information from the work plans.

Human Resources

As Economist at ADD level, I need to know the number of staff per department so that I can allocate budget resources to each department. I can access this information by asking HR.

As DADO, I need to know the establishment positions that are vacant so that I can lobby for Central level to deploy officers where needed. I can access this information through the AEDC reports.

Policies and Strategies

As DADO, I need to access information on the strategic plan of the District Council in order to coordinate agriculture activities in my district. I can get this from the DC office.

As ADD Economist, I need to know the new policies and guidelines so I can present them to stakeholders and answer questions. I can get this information from the Ministry HQ.

As Program Director, I need to know if the government has changed policy priorities, in order to align the resources non-state actors bring to the agriculture sector with the achievement of national and international goals. I can get this information through budget documents and questionnaires.

As AEDO, I need to know the best manures to use and varieties of seeds to plant for identified problems (such as dry spells), so that I can decide which activities to plan for in my annual work plan. I can access this information from government brochures and seed sellers.

Programmatic

As ADD Economist, I need information on last year's output targets in order to set output targets in the budget for the current year. I can access this information from my own records.

As Agrigender Roles and Extension Support Officer, I need to access gender-disaggregated data for planned activities in order to ensure district work plans and budgets are gender-sensitive. I can get this information from AEDCs in a gender-disaggregated template.

As ADD economist, I need access to the calendar of planned department activities in order to identify and respond to problems. I can access this information from my own records.

As Acting Planning Officer, I need to access work plans from each department so that I can consolidate the information. I can get this information from the departments through email or usb.

As ADD Economist, I need access to routine reports in order to identify and respond to problems. I can access this information from the districts.

As Agrigender Roles and Extension Support Officer at the district, I need to know the gender of training participants. I can access this information from DAES and ADDs.

As Principal Economist, I need to access work plans, strategy documents, and reports on policy implementation in order to prepare policy analysis. I can get this through past reports on implementation and through policy consultation.

As Economist at Central Level, I need access to the annual work plans with activities and targets so that I can monitor project implementation. I can access this information by asking ADDs.

As Deputy Director of Planning, I need access to work plans, with activities, timelines, expected results and outputs, so that I can monitor policy implementation and programs. I can access this information from my planning team.

As Extension Methodologies Officer at the district, I need to know the knowledge gaps in technology by sectors and EPA so that I can coordinate technology demonstrations. I can access this information through EPAs.

As Assistant Land Resource Conservation Officer at the district, I need to know the resources available among the team so that I can know how to select participants among AEDOs for trainings. I can access this information in the work plan.

As AEDC, I need to know the areas of interest for farmers so that I can determine the best way to transfer technologies. I can access this information form the work plan.

As Animal Health Officer, I need information on the ability of farmers to be involved in dairy farming in order to promote the uptake of dairy farming. I can get this information from the districts.

As Crops Officer, I need to know the needs of farmers and frontline staff so that I can decide on trainings to hold. I can access this information from the AEDOs.

As Crops Officer, I need to access farmer needs assessments in order to make my annual work plan. I can get this information from the AEDC.

As AVO at the EPA, I need to access the needs assessment report so that I can identify relevant trainings for livestock farmers. I can access this information through direct contact with farmers.

As Crops Officer, I need to know what gaps exist in order to decide on what trainings to hold in extension. I can obtain this information from supervisory visits.

As Crops Officer, I need to know what new approaches exist in crops production, in order to decide what trainings to hold to fill extension gaps. I can obtain this information from trainings from the ADD.

As Crops Officer, I need to know what new approaches exist in crops production, in order to decide what trainings to hold to fill extension gaps. I can obtain this information by asking the AEDC and from quarterly review meetings

As AEDC, I need to access information on good practices and technologies that can be promoted in order to address priority challenges that farmers face. I can get this information from AEDOs.

As Crops Officer, I need to know the best agronomic practices for crops in order to give guidance to EPAs. I can access this from the GAP or from trainings and courses on new technologies.

As Field Coordinator, Total Land Care (NGO), I need to know the number of farmers interested in a new technology so that I can form farmer clubs. I can access this information in the M&E Booklet (?).

As Crops Officer, I need to know the needs of farmers and frontline staff so that I can decide on trainings to hold. I can access this information from the AEDOs.

As Crops Officer, I need to know the challenges EPAs face in order to decide which guidance to give in the form of trainings. I can access this information from EPA reports.

As Crops Officer, I need to know the stock and sale of inputs so that I can assess if the district has enough inputs available and decide how to coordinate with suppliers. I can access this information from input assessment studies.

As Field Coordinator, Total Land Care (NGO), I need to know the needs of farmers and available new technologies so that I can identify relevant trainings to provide. I obtain this information from the EPA.

As AVO at the EPA, I need to access the needs assessment report so that I can identify relevant trainings for livestock farmers. I can access this information through direct contact with farmers.

As Extension Methodologies Officer at the district, I need to know the knowledge gaps in technology by sector and EPA so that I can coordinate technology demonstrations. I can access this information through EPAs.

As Communications Officer at district level, I need to be informed on new existing approaches and technologies so that I can create messages on new technologies.

As Land Resource Conservation Officer at the district, I need access to training materials (GAP Manual) and to know what the trainings need so that I can decide how to train staff on soil fertility. I can access this information from EPAs.

As Land Resource Conservation Officer at the district, I need to know the annual training targets so that I can source the inputs for the demonstrations. I can access this information in the DADO's reports on targets.

As Senior Assistant Land Resource Officer at the district, I need to know the technical messages that need to be shared with farmers so that I can organize awareness meetings. I can access this information from GAP (?) and from my own knowledge.

As Economist at ADD level, I need to know the number of beneficiaries for each project, disaggregated by gender and other indicators, so that I can track project performance. I can access this information by asking M&E Officers and Programme Officers.

As a Principal Economist, I need to access project performance reports in order to evaluate the project's impact. I can get this information from the PIUs and M&E teams.

As Deputy Director of Planning, I need access to technical outputs (project indicators) so that I can monitor policy implementation and programs. I can access this information from reports prepared by implementing national technical departments (which is consolidation of ADD).

As Economist for the M&E Unit, I need access to reforms that need to be implemented so that I can create a report on reform implementation. I can access this information from each department and program.

As Economist for the M&E Unit, I need access to outputs and targets by program so that I can create a budget-based program report. I can access this information from each department.

As Economist for the M&E Unit, I need access to technical outputs by NAIP target so that I can prepare a monthly report that is used for the president's speeches. I can access this information from each department.

As Economist for the M&E Unit, I need access to indicators from the NAIP, disaggregated by pillar, to prepare the agriculture sector performance report, that is then used during sector review to identify solutions to problems. I can access this information from departments.

As Economist for the M&E Unit, I need to know the performance management results so that I can prepare a Performance Contract Report. I access this information from the departments that receive it from the ADDs.

As Economist for the M&E Unit, I need to know advances in SDG objectives regarding fisheries, water sector and sustainable land management, so that I can prepare an SDG quarterly report. I access this information from the Ministry of Finance and Water in the Department of Water Supply and Water Resources.

As Land Resource Conservation Officer at the District, I need to know the existing technologies so that I can coordinate technology demonstrations. I can access this information in reports shared by EPAs.

As Assistant Animal Health and Livestock Development Officer at the district, I need access to the training needs assessment so that I can coordinate livestock trainings for farmers. I can access this information in EPA reports and through training information shared by the Central Level.

As Deputy Director of Planning, I need access to evaluation reports at baseline, mid-implementation, and post-implementation, so that I can evaluate projects. I can access this information through Technical Assistance Consultants.

As Principal Economist at Central Level, I need access to project progress reports and M&E reports, so that I can do end of project budget reviews and inform new projects. I can access this information by asking each team.

Water and Irrigation

As Irrigation Officer, I need to know if a farmer group has already received training or if it is a new group, so that I can decide which irrigation schemes can be rehabilitated and what trainings are needed. I can access this information from the AEDO and AEDC.

As Irrigation Officer, I need to know what irrigation schemes exist in the district and what new irrigation schemes have been constructed, so that I can decide what trainings are needed. I can access this information from the AEDO and AEDC.

As Senior Irrigation Engineer, I need to access information on the feasibility of irrigation schemes and interest from farmers in order to prepare the design of a scheme. I can obtain this information from observation and sample collection.

Outreach Farmers

As District Animal Health & Livestock Development Officer (DAHLO), I need to know what livestock farmers in my district want to buy and whether they have enough pasture for those purchases, so that I can link farmers with government or other farmers selling livestock.

As a Field Coordinator for Total Land Care, I need to know the number of existing farmer clubs and the quantity of seeds they require in order to distribute seedlings for the project. I can access this from the M&E booklet.

Non-State Activity Monitoring

As DADO, I need to know which farmers could benefit from activities implemented by a donor in order to guide development partners on who to target with their activities. I can access this information from the EPAs and the Civil Society Network at the district level.

As Animal Health Officer, I need to know which stakeholders to contact in order to mobilize resources to treat and monitor potential disease outbreaks. I get this information from my own contacts and knowledge.

As AVO, I need to know the types and number of livestock owned by households in order to identify beneficiary communities and coordinate with NGOs on livestock distribution. I can get this information from EPA reports.

As ADD Economist, I need information on stakeholders so I can present new policies to them and answer questions. I can get this information from a stakeholder database, from quarterly meetings with stakeholders, or from the DADO.

As DADO, I need to know what activities are planned in the district and their budgets, in order to guide NGOs and development partners on areas of intervention. I get this information from yearly reports from the district.

As DADO, I need to know what activities NGOs have planned in order to coordinate and harmonize activities in my district. I get this information quarterly when I meet the NGOs and when we do joint monitoring visits.

APES DATA ELEMENTS

APES Form	Data Element	Disaggregation	Organizational Unit	APES Round
FORM A	NAME OF SECTION			1
FORM A	NAME OF BLOCK			1
FORM A	SERIAL No. OF BLOCK			1
FORM B	SERIAL No. OF HOUSEHOLD			1
FORM B	NAME OF HOUSEHOLD HEAD			1
FORM B	MALE OR FEMALE			1
FORM B	NUMBER OF GARDENS OPERATED	FC, HC		1
FORM B	LIVESTOCK KEPT	Indigenous Chicken, Other Livestock Species		1
FORM B	SERIAL No. OF AGRICULTURAL HOUSEHOLDS			1
FORM B	REMARKS			1

FORM 1	SERIAL No. SELECTED AGR. H.H		Household	1
FORM 1	NAME OF HEAD OF HOUSEHOLD		Household	1
FORM 1	GARDEN No.		Household	1
FORM 1	GARDEN AREA		Household	1
FORM 1	PLOT No.		Household	1
FORM 1	PLOT AREA		Household	1
FORM 1	AREA PLANTED OR TO BE PLANTED	Crops*	Household	1
FORM 2	TOTAL NUMBER HOUSEHOLDS		Block	1
FORM 2	RELATIVE YIELD ASSESSMENT	Crops***	Block	1
TABULATION SHEET 1	CROP AREAS (HA) MAJOR CROPS IN SELECTED HOUSEHOLD	Crops***	Household	
TABULATION SHEET 1	TOTAL AREA CULTIVATED		Household	1
TABULATION SHEET 1	TOTAL AREA	Crops***	Block	1
TABULATION SHEET 1	AVERAGE AREA PER HECTARE	Crops***	Block	1
TABULATION SHEET 1	ESTIMATION OF BLOCK AREA	Crops***	Block	1
TABULATION SHEET 1	BLOCK YIELD ASSESSMENT	Crops***	Block	3
TABULATION SHEET 2	CROP AREA (HA) (from tabulation sheet 1)	Crops*	Block	1, 2
TABULATION SHEET 2	TOTAL CROP AREA	Crops*	Block	

TABULATION SHEET 2	TOTAL CROP AREA	Crops*	EPA	
TABULATION SHEET 3	CROP YIELD ASSESSMENT	Crops*	Block	1,2, 3
TABULATION SHEET 4	CROP AREA (HA)	Crops*	EPA	1,2, 3
TABULATION SHEET 4	CROP AREA (HA)	Crops*	District	
TABULATION SHEET 4	CROP YIELD (KG/HA)	Crops*	EPA	
TABULATION SHEET 4	CROP YIELD (KG/HA)	Crops*	District	
FORM 3	CROP YIELD ASSESSMENTS RELATIVE TO THE PREVIOUS SEASON FOR THE SELECTED HOUSEHOLDS	Crops**	Household	2
FORM 3	AVERAGE CROP YIELD ASSESSMENT FOR SELECTED BLOCK	Crops**	Block	
FORM 3	REMARKS	Crops**		
FORM 4	AREA (HA)	Crops***	Household	3
FORM 4	Yield Sub-Plot (YSP) PRODUCTION	Crops***	Household	
FORM 4	GARDEN PRODUCTION	Crops***	Household	
FORM 4	TOTAL AREA (HA)	Crops***	Block	
FORM 4	TOTAL PRODUCTION (KG)	Crops***	Block	
FORM 4	AVERAGE YIELD (KG/HA)	Crops***	Block	

* Crops included in the form are maize (local, hybrid, composite), rice, groundnuts, pulses, tobacco, cotton, sorghum, millet, cassava, other

** Crops included in the form are maize (local, hybrid, composite), rice, groundnuts, pulses, tobacco,

cotton, sorghum, millet, cassava, sunflower
*** Crops included in the form are maize (local, hybrid, composite), rice, groundnuts, pulses, tobacco, cotton, sorghum, millet, cassava, sunflower, and any other crops

AMIS DATA ELEMENTS

AMIS Form	Data Element	Disaggregation	Organizational Unit
Retail Market Form	Average price (Kwacha / KG)	Retail Commodities	Market
Livestock Market Form	Average price (Kwacha / KG)	Livestock Commodities	Market
Horticulture Form	Average price (Kwacha / KG)	Horticulture Commodities	Market

Retail Commodities = maize, polished rice, sorghum, finger millet, bulrush millet, unshelled g/nuts, shelled g/nuts, beans general, ground beans, soya beans, dolichos beans, white haricot, cow peas, pigeon peas, nsawawa, mixed beans, cassava root, cassava dry, cattle steak, steak and bone meat, goat meat, pork meat

Livestock Commodities = goat skin, sheep skin, cattle hide, live hen, live cock, live broiler, local egg, hybrid egg, live guinea fowl, guinea fowl egg, live cattle, live goat, live pig, live sheep

Horticulture Commodities = cabbage, tomatoes, eggplant, rape, chinese cabbage, mustard, pumpkin leaves, okra, peas, pawpaw, banana, avocado pears, lemons, oranges, tangerines, pineapple, mangoes, cucumber, guavas, pumpkins, green pepper, chillies, sweet potato, irish potato, carrot, onions, garlic

ASSESSMENT METHODOLOGY

Data User / Decision Mapping

This interview guide should be used for Decisions Makers (DADO, Deputy Directors...) and data aggregators (Planning Officers, AEDOS, M&E Officers...).

1. Introduction to Data User Study
    a. Date and time:

b. Interviewer:
c. Note-taker:
d. Provide Overview of study (Interviewer)

As part of the development of the NAMIS, we are conducting a series of stakeholder interviews, meetings, and consultations to elaborate a data mapping study of current data collected in the agriculture sector and a use case study to understand the data needs of future NAMIS users. This study will focus on defining what data are currently being collected and the information flow, as well identifying the technical requirements for the NAMIS. The outcome of this study will help improve the planning for the NAMIS, to ensure the final system is built in a way that can respond to key data user needs.
You have been identified as a key stakeholder for this study and we have several questions to ask you. This interview should take between 30 minutes and an hour. We greatly appreciate your time and support of this study.

2. Interviewee information
    a. Name:
    b. Position:
    c. Number of years in position:
    d. Key responsibilities:

3. **Decision-making:** *the objective is to identify decisions made by future NAMIS users*
    a. What decisions / actions do you make in your work?

    For EACH decision identified above ask the following questions:
    b. Describe this decision/action
    c. How often is this decision/action made?
    d. What information do you need to make this decision / action?

4. **Data mapping:** t*he objective is to identify the information that is used for each decision made by the users and the data flow for those decisions.*

    Ask this question for EACH of the information items identified in 3.D
    a. How do you obtain this information?
    b. How often do you get this information, or how often is it updated?
    c. How is this data collected (by whom, at what level)?
    d. Is it part of a survey? Specific to a project?
    e. What tool is used to collect the data (paper, template, tablet)?
    f. Do you consolidate the data? How, what format?
    g. What challenges do you encounter when collecting data?
    h. What challenges do you encounter with data quality? How do you deal with them?
    i. Do you analyze the data? How?
    j. Who do you share this data with? In what format? How often?

Data Collector Methodology

This interview guide should be used for Enumerators and Extension workers.

1. Introduction to Data User Study
    a. Date and time:
    b. Interviewer:
    c. Note-taker:
    d. Provide Overview of study (Interviewer)

As part of the development of the NAMIS, we are conducting a series of stakeholder interviews, meetings and consultations to elaborate a data mapping study of current data collected in the agriculture sector and a use case study to understand the data needs of future NAMIS users. This study will focus on defining what data are currently being collected and the information flow, as well identifying the technical requirements for the NAMIS. The outcome of this study will help improve the planning for the NAMIS, to ensure the final system is built in a way that can respond to key data user needs.
You have been identified as a key stakeholder for this study and we have several questions to ask you. This interview should take between 30 minutes and an hour. We greatly appreciate your time and support of this study.

2. Interviewee information
    a. Name:
    b. Position:
    c. Number of years in position:
    d. Key responsibilities:

3. **Data Collection:** *the objective is to understand how the data that will be integrated into the NAMIS is collected in the field, it's data flow and the challenges.*
    a. What data do you collect?
    b. How do you obtain this information?
    c. How often do you get this information, or how often is it updated?
    d. How is this data collected (by whom, at what level)?
    e. Is it part of a survey? Specific to a project?
    f. What tool is used to collect the data (paper, template, tablet)?
    g. Do you consolidate the data? How, what format?
    h. What challenges do you encounter when collecting data?
    i. What challenges do you encounter with data quality? How do you deal with them?
    j. Do you analyze the data? How?
    k. Who do you share this data with? In what format? How often?

l. Do you use this data in your work? How?

Interview List

Name	Organization / Department	Position	District	EPA	Interview Date
Jane Nkhomo	ADD	Planning Officer	BLANTYRE		March 15
Alwin kayira	ADD	Planning Officer	KARONGA		March 15
Ali Twaibu	ADD	Planning Officer	SALIMA		March 15
Dr. Joseph Nkhoma	ADD	Planning Officer / AVO	LILONGWE		March 15
Vivian Mtima	ADD	Planning Officer	MZUZU		March 15
Joseph Malinki	ADD	Planning Officer	MACHINGA		March 15
Linda Msisuka	District	Crops officer	BLANTYRE		March 20
Martha Mwbawe	District	Crops officer	BLANTYRE		March 20
Patrick Makombola	District	AVO	CHIKWAWA		March 22
Linda MPHANDE	District	DADO	BLANTYRE		March 20
Joseph. H RUKUNYA	District	District Animal Health & Livestock Development Officer (DAHLO)	BLANTYRE		March 20
Evans MTEWGULA	District	DAHLO Assistant	BLANTYRE		March 20
Lupakisyo Ngosi	District	Planning Officer	NSANJE		March 21
Precious Chantsi	District	DADO	MCHINJI		March 26
David Gondwe	District	Land Resource Conservation Officer	MCHINJI		March 26

Rhoda Njikho	District	Land Resource Conservation Officer	MCHINJI		March 26
Potiphar Chakana	District	Assistant Animal Health and Livestock Development Officer	MCHINJI		March 26
Edward Mkandawire	District	Senior Irrigation Officer	NSANJE		March 21
Robert Malemba	District	Crops officer	NSANJE		March 21
Tiyankhulanji Chinkhande	District	Irrigation officer	BLANTYRE		March 20
Roger Kanyimiri	District	Crops officer	CHIKWAWA		March 22
Daniel Binga	District	Acting Assistant Fisheries Officer at DADO & fisheries officer at Zomba EPA	NSANJE	Zunde	March 21
Nthamyo Mbeye	District	Agrigender roles and extension support services officer	MCHINJI		March 26
Isaack Karongonda	District	Communication officer	MCHINJI		March 26
Pauline Chiwoko	District	Crops Officer	MCHINJI		March 26
Malikano Chingeni	District	Crops Officer	MCHINJI		March 26
Mphatso Bumulukwa Kafuwa	District	Extension methodologies officer	BLANTYRE		March 20
Daniel Mataula	District	Planning officer	BLANTYRE		March 20
Charles Mtchoka	District	Assistant Land Resource Conservation Officer	BLANTYRE		March 20

Paul Madizukusamba	District	Fisheries Officer	BLANTYRE		March 20
Hastings Yotam	District	DADO	LILONGWE WEST		March 29
Christopher Banda	EPA	AVO	NSANJE	Nyachirenda	March 21
Maxon Kumbuyo	EPA	AVO	BLANTYRE	Lirangwe	March 20
Fortunes Kapingili	EPA	Field Coordinator	BLANTYRE	Lirangwe	March 20
Zex Kalema	EPA	AEDC	CHIKWAWA	Mitole	March 22
Jericho Chihana	EPA	Enumerator	CHIKWAWA	Mitole	March 22
Christopher Shohomali	EPA	AHSA	NSANJE	Nyachirenda	March 21
Maxon Saini	EPA	AHSA	NSANJE	Nyachirenda	March 21
Benjamin Kankhande	EPA	AVO	MCHINJI	Mkanda	March 26
Daniel Nyang'wa	EPA	Assistant Irrigation Engineer	CHIKWAWA	Mitole	March 22
Milcah KHONJE	EPA	AEDO	BLANTYRE	Kuthembwe	March 20
Thriza LIPATO	EPA	AEDO	BLANTYRE	Kuthembwe	March 20
Edgard Banda	EPA	Enumerator	MCHINJI	Mkanda	March 26
Alick E. Nthyolamwendo	EPA	AEDC	CHIKWAWA	Kalembo	March 22
James Clement Chisoni	EPA	AEDC	MCHINJI	Mkanda	March 26
Leah Chunga	EPA	AEDO	MCHINJI		March 26
Chisom Mthyoka	EPA	AEDO	MCHINJI	Mkanda	March 26
Hamson Kachale	EPA	Fishery Assistant	NSANJE	Nyachirenda	March 21
Wole Mlungu	EPA	Enumerator	NSANJE	Nyachirenda	March 21
Chriphode Malunga	EPA	AEDO	BLANTYRE	Kuthembwe	March 20
Mildred Thinwa	EPA	AEDO	BLANTYRE	Kuthembwe	March 20
Kigan Nkhoma	EPA	AEDO	BLANTYRE	Kuthembwe	March 20

Jika Chawona	EPA	AEDO	CHIKWAWA	Chapananga	March 22
Paul Kananji	EPA	AEDO	CHIKWAWA	Chapananga	March 22
Kenson Kamoto	EPA	AEDO	CHIKWAWA	Chapananga	March 22
Maximso Mafunga	EPA	AEDO	CHIKWAWA	Chapananga	March 22
Chancy Nota	EPA	AEDO	CHIKWAWA	Chapananga	March 22
Innocent Kapesi	EPA	AEDO	CHIKWAWA	Chapananga	March 22
Cosmas Musolr	EPA	AEDO	NSANJE	Nyachilenda	March 22
Foster Mmangisa	EPA	AEDO	NSANJE	Nyachilenda	March 22
Frank Nasanger	EPA	AEDO	NSANJE	Nyachilenda	March 22
Hannock Matiki	EPA	AEDO	NSANJE	Nyachilenda	March 22
Worry Mulungul	EPA	AEDO	NSANJE	Nyachilenda	March 22
Mr Nixon Phiri	EPA	AEDC	BLANTYRE	Lirangwe	March 20
Harold Thayo	EPA	AEDO	BLANTYRE	Lirangwe	March 20
Michael Pakondikana	EPA	AEDO	BLANTYRE	Lirangwe	March 20
Albert Khoriyo	EPA	AEDO	BLANTYRE	Lirangwe	March 20
Ernest Mkonya	EPA	AEDO	BLANTYRE	Lirangwe	March 20
Indaba Quoma	EPA	AEDO	BLANTYRE	Lirangwe	March 24
Powel Mbirima	EPA	Enumerator	CHIKWAWA	Chapananga	March 22
Chifundo Mtimuni	EPA	Enumerator	CHIKWAWA	Chapananga	March 22
Jimu mwadala	EPA	Drought animal handler	CHIKWAWA	Chapananga	March 22
Edmond Thepeya	EPA	Drought animal handler	CHIKWAWA	Chapananga	March 22
Mr. Imrani Nedi	Famine Early Warning System (FEWSNET)	Assistant national technical Manager	LILONGWE		April 5
Clement Komwa	Ministry of Agriculture	Economist	LILONGWE		March 27

Prisca Kanjere	Ministry of Agriculture	Principal Economist	LILONGWE		March 28
Suzgo Ngwira	Ministry of Agriculture	Economist	LILONGWE		March 28
Maurice Makuwila	Ministry of Agriculture	Chief Fisheries Officer	LILONGWE		March 28
Timothy Ntumbuka	Ministry of Agriculture	Economist	LILONGWE		March 27
Reedwell Musopole	Ministry of Agriculture	Deputy Director, Department of Agriculture Planning Services	LILONGWE		March 27
Mr. Doshani Kadokera	Ministry of Agriculture	Economist	LILONGWE		April 4
Dr. Chance Mwabutwa	Ministry of Trade	Program Manager, SADC Trade Related Facility Project	LILONGWE		March 27
Emmanuel Mwanaleza	NSO	Statistician	LILONGWE		March 15
Mrs. Nangwiya	Ministry Of Agriculture	Chief Human Resources	Lilongwe		July 11
Mr. Kasim Mponda	Ministry of Agriculture	Principal Human Resources	Lilongwe		July 11
Mrs. Mercy Msowoya	Department of Water and Irrigation	Economist	Lilongwe		July 11
Mr. Maurice Makuwila	Department of Fisheries	Acting Chief Fisheries Director	Lilongwe		July 16
Mr. Given Manjawila	Department of Animal Health and Livestock Development	Chief Animal Health and Livestock Development Officer	Lilongwe		July 16
Mr. Hermes Mauwa	Ministry of Agriculture	Policy and Budget	Lilongwe		July 12

Dr. Christone Nyondo	New Alliance Policy Acceleration Support Project (NAPAS)	Policy and Research Analyst	Lilongwe		July 18
Mr. Zephania Nyirenda	New Alliance Policy Acceleration Support Project (NAPAS)		Lilongwe		July 18
Mazanga Mhone	Ministry of Agriculture	Principal Livestock Development Officer	Lilongwe		July 16
Dr. Tennyson R. Mzengeza	Department of Research	Senior Deputy Director-Chitedze	Lilongwe		July 23
Dr Mackson Banda	Department of Research	Project Coordinator Agricultural Productivity Programme for Southern Africa (APPSA)	Lilongwe		July 23
David Luka-	Department of Research	Deputy Director(TechnologyTransfer);	Lilongwe		July 23
Ben Chisama	Department of Research	Coordinator(Technology Transfer)	Lilongwe		July 23

List of attendants at TWG workshop

No	Name	Title	Organization
1	Alwin Kayira	Planning Officer	Karonga ADD
2	Viven Mtima	Planning Office	Mzuzu ADD
3	Timothy Mtumbuka	Economist (M&E)	MOAIWD HQ
4	Jayne Nkhono	M&E Officer	BT ADD
5	Joseph Maliki	Economist	MADD
6	Francis kalonga	Ass. Statistics	MoAIWD HQ
7	Maganizo Monawe	MoH CMED/ Kunika	Senior Ass.TA
8	Olivetta Mupara Soko	QI Officer Kuunika	Kuunika
9	Tyler Smith	TECH Director	Kuunika
10	Dickson J.Chonongela	Chief Drag	Land Resources Conservation Department (LRCD)
11	Kilness Kapeleta	Accountant	MoAIWD HQ

12	Readwell Musopele	ADD	MoAIWD HQ
13	Evince Mphepo	Ass. Statistics	MoAIWD HQ
14	Emmanuel Mwanaleza	Principal Statistician	Min.of Agri
15	Emma Gausi	Local Consultant	DG
16	Alfred Chilinda	Statistician	MoAIWD
17	Zephania Nyirenda	Research Analyst	NAPAS
18	Suzgo Ngwira	Economist	MoAIWD
19	Amoni Manda	Economist	Shire Valley ADD
20	Twaibu Ali	Economist	MAIWD
21	Yuda Kanjira	Economist	KADD
22	Joseph Kanyamuka	Research & Policy Analyst	NAPAS MALAWI
23	J. Nkhoma	Ass. Planner	LL ADD
24	Jennifer Nkosi	Economist	MOAIWD

25	Symon Madula	Driver	Karonga ADD
26	Madalitso Chikopa Chikapa	Economist	MOAIWD

Project Background

This report and the underlying landscape study was undertaken jointly by Development Gateway (DG) and Ministry of Agriculture, Irrigation and Water Development (MoAIWD) as part of the Results Data Initiative (RDI). Through RDI, DG has worked with development agencies and country governments to assess current results information use – and is now working to co-create, test, and scale made-to-measure tools and processes. RDI is supported by a grant from the Bill & Melinda Gates Foundation.

The Malawi Results Data Initiative project team included Carmen Cañas, Dominic Nkhoma, Jennifer Nkosi, Viwemi Chavula, Marina Tolchinsky, and Vinisha Bhatia-Murdach.

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For more information about the Results Data Initiative, please visit https://www.developmentgateway.org/expertise/results.

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