

Implementation of the Science Agenda:

Malawi Theory of Change and Measurement Framework

August 2017

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1 Executive Summary

This report describes the Theory of Change developed through the Science Agenda's national consultation in Malawi organized through a collaboration of FARA and CCARDESA. CCARDESA played a critical role in convening a range of key stakeholders in Malawi, driving discussion, and unpacking the Science Agenda and its relevance to Malawi. This provided a crucial opportunity to explore how the Science Agenda can be best implemented in Malawi, and how it can benefit the entire research value chain - from researchers through to farmers.

The Theory of Change details the participatory process that was undertaken in the consultation as well as the challenges, priorities, and areas of value add for the Science Agenda identified by participants in Malawi. A Measurement Framework, with initial indicators that can be used to identify whether or not the above priorities have been achieved, accompanies the Theory of Change.

The initial draft of the Theory of Change was developed during the Science Agenda National Consultation, held in Lilongwe 17th – 21st July 2017. It brought together 45 stakeholders from Research, Education (including Universities), Extension, the Private Sector, Farmer Organizations, Ministries of Agriculture, Policy-based institutions, the CAADP Country Representative, as well as invited guests. The National Consultation featured presentations providing an introduction to the Science Agenda, a series of parallel sessions focused on planning and coordination, the policy and innovation platform, youth and agribusiness, Innovation Platforms; and a structured workshop focused on developing a tailored Science Agenda Theory of Change for Malawi.

The Theory of Change process in Malawi ran across 1.5 days. Typically, an initial Theory of Change would be developed over the course of one week - and then followed by further refinement. The time available to develop the Theory of Change in Malawi therefore presented a significant limitation to this work. The Theory of Change process needs to be systematic, and with suitable time available, particularly to ensure that the views of all stakeholders are taken into account. Despite this challenge, there was a high level of engagement from the wide variety of participants in the room – and initial validation of the Theory of Change following the National Consultation. Development of the Theory of Change is also an iterative process, and the National Consultation marked the beginning of this work.

The Theory of Change was further refined at the Continental Synthesis and Validation of the Science Agenda for Agriculture in Africa Implementation meeting in Ghana during 26th – 28th July 2017.

The Theory of Change for the implementation of the Science Agenda in Malawi is split into four main stages: challenges and megatrends; the value add of the Science Agenda; a set of priority outcomes identified by participants during the National Consultation (split across three stages of the research value chain); and an impact goal of achieving the CAADP targets (through the realized benefit of the Science Agenda).

The Theory of Change is founded on responding to a series of challenges and megatrends, discussed in more detail later in this report. In tackling these, the value add of the Science Agenda was seen to be its role in mobilizing or providing funding for Malawi priorities; enabling national, regional, and international collaboration; building skills and evidence; and

shaping better and more effective interventions. The Theory of Change focuses on three stages of the research value chain: research and development (upstream), roll-out and delivery, and adoption and usage.

Underpinning these three areas, is a cross-cutting focus on building an enabling environment – in particular, providing the foundations and requirements for the private sector and markets to play an effective role in agricultural development – and the importance of strengthening data and knowledge management skills and infrastructure.

As identified throughout all National Consultations and reaffirmed at the Continental Synthesis meeting, ownership of the Theory of Change (and Measurement Framework) by national stakeholders in Malawi is critical. The Consultant highlights the importance of ensuring that there is sufficient time to enable satisfactory validation of these tools and the ownership by the agriculture sector more broadly in order to ensure successful implementation of the Science Agenda and its expected outcomes for the country.

2 Introduction and background

Agricultural development provides one of the greatest opportunities for large-scale economic development in many African countries. However, its potential remains largely unrealized across the continent and this has resulted in persistent issues of poverty, as well as food and nutrition security.

The challenges that have impacted upon agricultural development are varied, and those of most relevance to Malawi are discussed later in this report. However, many of these challenges can be solved, mitigated, reduced or diverted through the effective application of science, technology and innovation in the agricultural sector. Moreover, many countries including Malawi are already investing in and championing the role of science, technology and innovation in agriculture - efforts that will be further supported through the implementation of the Science Agenda.

In this context, the Science Agenda has evolved into the framework for enhancing the application of science, technology and innovation to achieve agricultural development priorities (notably the CAADP goals), with a particular focus on improving agricultural productivity.

The Science Agenda sets out a vision for Africa – that by 2030, Africa ensures its food and nutrition security; becomes a recognized global scientific player in agriculture and food systems and the world's bread basket – and beyond setting out this 'enduring vision', has six further 'strategic thrusts':

- CAADP as a short term priority;
- Research themes that connect institutions and policies with producers, consumers, and entrepreneurs;
- Strengthening solidarity and partnerships at national, regional, and international levels;
- Sustainable financing of science and technology;
- Creating a favorable policy environment for science;
- Establishing a special fund for the Science Agenda.

With regard to taking the Science Agenda forward, and exploring the practicalities and requirements of implementation, a series of 'Tier 1' countries were identified by FARA due to their strengths in applying science, technology and innovation in agricultural development; their strategic role in the region; and/or their particular agricultural context. The countries are Malawi, Egypt, Ghana, Rwanda, and Senegal.

These countries each hosted a National Consultation, bringing together stakeholders from the national and sub-regional levels, to identify how the Science Agenda could be implemented in the country. Successful implementation of the Science Agenda requires a coordinated effort among range of stakeholders at the local, regional and continental level.

In this context, the Consultant¹ was commissioned by FARA to attend the National Consultation in Lilongwe as an independent facilitator to support the above stakeholders in thinking through the process of implementing the Science Agenda in Malawi. In particular, this focused on facilitating the process of developing a national-level Theory of Change and Measurement Framework linked to the implementation of the Science Agenda.

However, it is important to note that the consultation was just the start of the process for determining how the Science Agenda can be implemented in Malawi. The process, including the Theory of Change and Measurement Framework – must be owned by the above stakeholders, particularly those in Malawi. Judging by the engagement of participants, and the interest in implementing the Science Agenda in Malawi, this ownership has begun.

While implementation of the Science Agenda will be through work at the country level, the driving impetus for the Science Agenda is to improve the comparative advantage, coordination, and coherence of science, technology, and innovation initiatives in the agriculture sector across Africa. To this end, the Consultant synthesized the discussions in the Malawi National Consultation - and the priorities, challenges, and areas of value add for the Science Agenda identified in the Theory of Change – with those generated in the National Consultations in the other Tier 1 countries – Egypt, Ghana, Malawi, Rwanda, and Senegal. This was undertaken in order to develop an initial Theory of Change (and associated Measurement Framework) to guide the implementation of the Science Agenda at the continental level.

3 About Theories of Change

At its simplest, a Theory of Change is, an often, visual representation of how we think change will happen. It illustrates how an intervention can transform a situation from the current state, to a desired end-state. They can illustrate one or many pathways through which this change can be delivered, and can work at multiple levels – from high-level strategic overviews of change, through to very detailed roadmaps that can be used to track implementation.

Theories of Change are one tool in the monitoring, learning, and evaluation toolkit. Theories of Change allow the testing of hypotheses – so can be decidedly non-linear – and describe **how** any **why** change happens. In this sense, they articulate justification and causality. Theories of Change are also often constructed in participatory settings, enabling diverse stakeholders to discuss and debate how change might happen from very different vantage

¹ The Agricultural Learning and Impacts Network (ALINE)

points and perspectives. They are living instruments that also require continual validation and regular refinement as situations evolve.

The Theory of Change approach was used in Malawi in order to identify priority areas along the science, technology, and innovation value chain: From research and development, through roll-out, to adoption and sustainable usage. The approach was used to facilitate dialogue among stakeholders on possible intervention points or areas where the Science Agenda could add value in Malawi – whether through supporting, enabling, or catalyzing activities and interventions. The final Theory of Change is a tool that can be used to ensure that Science Agenda efforts are aligned to the right priorities for Malawi.

3.1 About the workshop

The workshops provided participants with an introduction to the basic principles of monitoring, evaluation, and learning – with a particular focus on the Theory of Change methodology and its application for understanding how the Science Agenda could be implemented in Malawi.

This work centered around understanding the context in Malawi, particularly the megatrends and challenges relevant to Malawi – drawing on one of the key themes in the Science Agenda. This was used as the foundation to identify a series of priorities in Malawi that participants in the National Consultation considered important, and which could be tackled, mitigated, or managed through the usage of science, technology, and innovation. Finally, these areas were drawn together to identify where and how the Science Agenda could add value in Malawi – including through alignment with existing national programmes and policies, but also the role it could play in positively impacting on Malawian national agricultural development.

More widely, the Malawi National Consultation built on the Theory of Change introduction provided at the Regional Consultation – which introduced how the Theory of Change process could be used to understand the impact that the Science Agenda could deliver. In addition, the Regional Consultations helped to ensure that issues beyond Malawi – and the other Tier 1 countries – were also included in discussions.

4 Country challenges

The consultation highlighted a range of challenges in Malawi, in particular a range of environmental concerns – notably a significant drought period affecting agricultural productivity (exacerbated by low soil fertility), soil erosion, air pollution, and deforestation. More widely there is little baseline data around agriculture, and the data that is collected is often unreliable and can sometimes be collected incorrectly.

Participants identified challenges particular to each stage of the research value chain. Notable challenges in upstream research and development include inadequate human and technical capital, as well as weak coordination and collaboration between research stakeholders. With regard to rollout and delivery, challenges focused particularly around government – with participants highlighting poor coordination between departments, a lack of harmonisation of agricultural messages, and a lack of wider regulation and standards. Outside of the public sector, out-dated and non-standardised extension curriculums, and limited farmer access to financial services, were also noted as issues.

Finally, challenges impacting on adoption and usage of science, technology, and innovation solutions included ensuring effective demand for these solutions – which may be achieved through farmer participation in the earlier design stages – and ensuring equitable access to technology. The sustainability of interventions was seen to be a particular challenge. Building farmer skills – including financial literacy and business skills – are likely to also prove advantageous.

In addition, participants highlighted that it is crucial for the Science Agenda to build-on and integrate with existing policies and programmes – notably the Agriculture Sector Wide Approach (ASWAp) – to deliver maximum benefits and to avoid duplication or wasted efforts.

Many of the megatrends and challenges synthesised at the Continental meeting are also highly relevant in Malawi. For the Continent-level Science Agenda Theory of Change, these megatrends and challenges were grouped into six main areas: shocks, stresses, and ensuring sustainability (focusing in particular on environmental challenges and constraints); developments in science, technology, and innovation; building an enabling environment (including evidence-based policymaking, effective regulatory environments, and joined-up government approaches to agriculture); shifting population demographics and dynamics (particularly migration, urbanisation, and population growth); economic changes and challenges; and skills and abilities - including ensuring the provision of effective extension systems, and reducing information asymmetry at all levels of the value chain.

5 Malawi – Science Agenda Theory of Change

The Theory of Change for the implementation of the Science Agenda in Malawi is split into four main stages. First, the Theory of Change is founded on tackling the above challenges and megatrends – such as those relating to the environment and the research value chain. In particular, engaging with these challenges and megatrends will require the application of science, technology, and innovation. This is a core tenet of the Science Agenda.

In response to this, the second element of the Theory of Change focuses on the value add of the Science Agenda in Malawi. This was seen to be its role in:

- **Mobilising or providing funding for Malawi priorities:** including the provision of financial support (such as agricultural credit) for farmers, and wider financial support to incubate and scale-up agribusinesses
- **Enabling national, regional, and international collaboration:** including developing research collaboration between countries, and building multi-stakeholder Innovation Platforms
- **Building skills and evidence:** this includes actual recruitment of expertise, as well as expansion and standardisation of key curricula (notably those in the extension system), as well as developing feedback mechanisms to understand what's working, and what isn't
- **Shaping and supporting interventions:** including identifying and providing suitable technologies to support agricultural development, providing opportunities for current and retired experts, and facilitating the scaling-up of promising technologies
- **Developing an enabling policy environment:** including developing policies and legislation that facilitates a conducive business environment

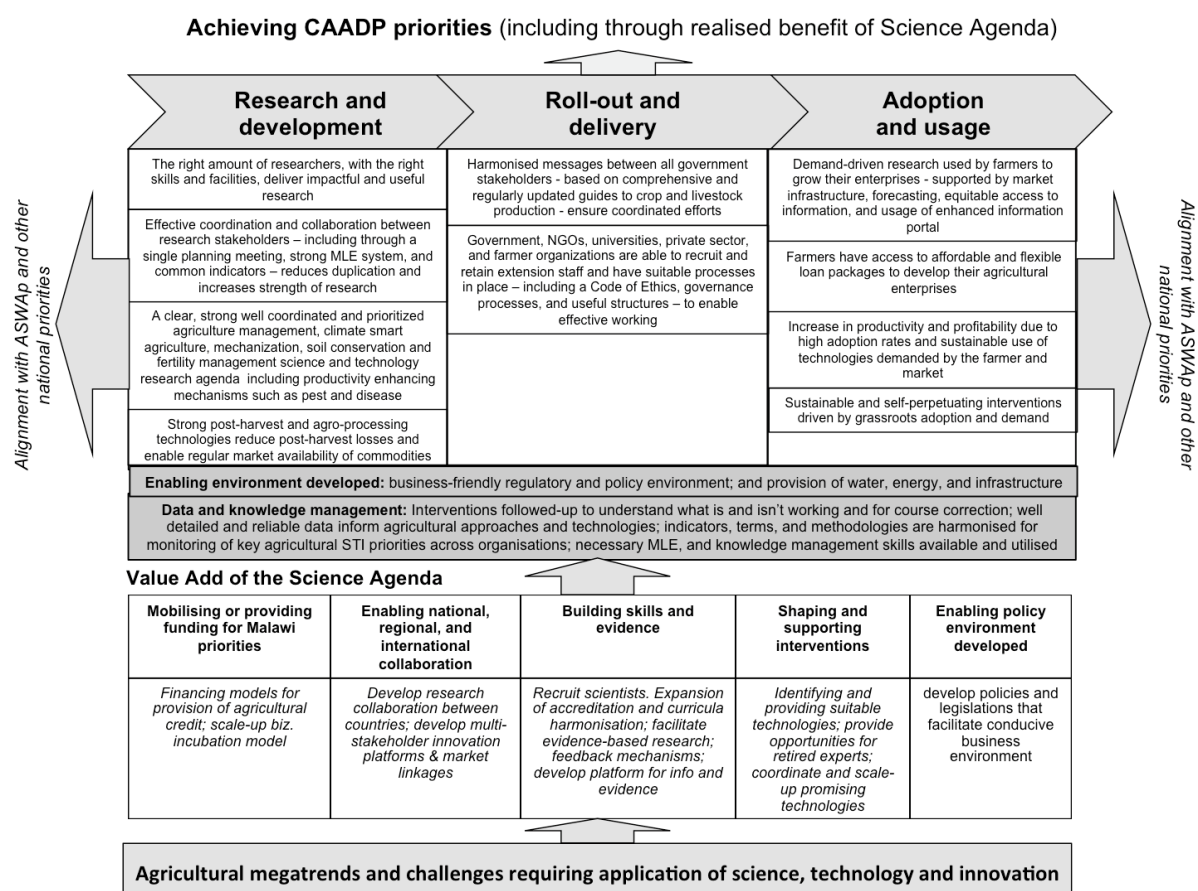
The third stage of the Theory of Change focuses on the outcomes achieved through applying the Science Agenda. These were grouped into stages of the research value chain:

- **Research and development:** upstream priorities, including the provision of skills and knowledge to enable the research development of technologies to support agricultural priorities
- **Roll-out and delivery:** particularly focusing on ensuring collaboration and effective working across the many stakeholders focusing on developing and implementing scientific, technological, and innovative solutions
- **Adoption and usage:** ensuring that all solutions are useful and sustainable

Within each of these categories is a set of priorities that can be achieved through the application of science, technology, and/or innovation. Across all three of these areas, participants of the National Consultation repeatedly highlighted that achieving these priorities will require alignment between the Science Agenda and existing national efforts and priorities (particularly ASWAp). Underpinning these three areas, is a cross-cutting focus on building an enabling environment – in particular, providing the foundations and requirements for the private sector and markets to play an effective role in agricultural development – and the importance of strengthening data and knowledge management skills and infrastructure.

The final element of the Theory of Change is the anticipated impact goal – in this case, achieving the CAADP targets through the realized benefit of the Science Agenda. Beyond this, a wider impact – not displayed on the Theory of Change - is the role of the Science Agenda in meeting the wider agricultural and development priorities in Malawi

5.1 The Theory of Change



6 Malawi – Science Agenda Measurement Framework

The Measurement Framework sets out the data that a project seeks to collect and defines how, when and by whom this data will be collected, managed and stored. It is structured around the results expected if the identified priorities, the outcomes, in Malawi are achieved.

Malawi is not starting from scratch in this area. There are a range of existing monitoring, evaluation, and learning systems and processes that are tracking progress towards key agricultural priorities. It is important that the Measurement Framework aligns with these, minimizing any excess efforts in order to make it as simple as possible to monitor the implementation of the Science Agenda in Malawi. Therefore, the implementation of the Science Agenda should be seen in the context of these existing programs, policies, and interventions.

Too often, we find that not enough data or information is translated into learning. This can be due to collecting data that isn't useful (or even isn't the right data at all), collecting it at times that do not align with decision-making processes, when Measurement Frameworks and data collection and not properly implemented or embedded, or because of weak knowledge management and not having the internal organizational skills to leverage data effectively. Ensuring that monitoring, learning, and evaluation are at the heart of this work is central to ensuring correct implementation – and to ensure that Malawi can leverage the value-add of the Science Agenda.

With regard to the Science Agenda Measurement Framework for Malawi, each of the broad areas in the Theory of Change – research and development; rollout and delivery; and adoption and usage - feature a set of priority outcomes identified by participants during the National Consultation. For example, '*sustainable and self-perpetuating interventions driven by grassroots adoption and demand*' within the '*adoption and usage*' domain. Indicators have then been identified that align with these outcomes, measurement of which will confirm whether or not the respective outcome has been achieved.

The Measurement Framework is founded on indicators drawn from Malawi's National Agricultural Policy (2016) – this is to reduce duplication, and to minimize the data collection efforts required by stakeholders. The below Framework is split into four areas:

1. **Outcome:** the priorities that have been identified in the Theory of Change
2. **Indicator:** what data will be used to assess whether the outcome has been achieved
3. **Source:** whether the indicator is drawn from the National Agricultural Policy, or whether it is a new indicator
4. **Who collects:** the institution that will be directly responsible for reporting against this indicator

In addition, several outcomes do not have associated National Agricultural Policy indicators. This is due to the outcome not aligning exactly with a suitable indicator from this document. In these cases, indicators may be found in other documents or sources, or constructed. However, in any such case, agreement with a wide range of continent-level stakeholders is crucial to ensure that the indicators can identify whether or not the outcome has been achieved. It has not been possible to begin the process of identifying indicators outside of the National Agricultural Policy due to the limited time available to complete this work.

Later drafts of the Measurement Framework should also consider including additional information for each indicator:

- **Tool:** what kind of tool or instrument will be used to gather the data (e.g. household survey, in-depth interview, verification of records, observation, mobile survey, etc.)
- **Frequency:** how often will this data be collected and at what time in the year? As discussed above, it is key that data collection happens in line with appropriate timing and reporting

This is an initial draft of the Measurement Framework, and it requires further discussion and validation amongst stakeholders to ensure that indicators are SMART (Specific, Measurable, Attainable, Relevant, and Time-bound), that data collection is done correctly – particularly to minimize any logistical, contextual, ethical or technical issues – and to understand how data will be collected (including the role of technology in collecting more real-time data).

This Measurement Framework identifies areas where research and skills are necessary to help Malawi deliver on its agricultural growth targets. Under each of these outcome areas, there are a series of investments that have been prioritized by the Malawi Agriculture Ministry as specific sets of activities where data collection is necessary. This lower level of the measurement framework is not represented in this report but is a necessary next step to enable Malawi as a country to implement and track the progress of its relationship with science and innovation and technical skills to address challenges it faces in the sector.

A further nationally convened workshop with a much more diverse set of stakeholders working at a national forum level to discuss the activities of the public, private and NGO sectors in agriculture is necessary to identify which activities contribute to this Measurement Framework, and who is best placed to collect data to track the performance of the sector as a whole towards the national agriculture priorities as well as reporting on the success of the Science Agenda.

6.1 Research and development

Outcome	Indicator	Source	Who collects
The right amount of researchers, with the right skills and facilities, deliver impactful and useful research	Number of researchers with identified skills	NEW	TBC
	Number of facilities with required equipment	NEW	TBC
	Value of agricultural imports displaced by domestic agricultural production	National Agricultural Policy (2016)	MoAIWD, Private Sector, MoIT, Farmer Organisations
	Vacancy rate; staff returns; scientist database; inventory of laboratory equipment; and established posts	Various - Identified by National Consultation participants as being currently collected	Various
	Skills gap; staff attrition rates; succession plans; remuneration data	NEW - Identified by National Consultation participants as being useful for collection	TBC
Effective coordination and collaboration between research stakeholders – including through a single planning	Capacity building and institutional architecture efficiency index	National Agricultural Policy (2016)	MoAIWD, MoFEP&D, Private Sector, Development partners, civil society, NGOs
	Number of Memorandums-of-	Various - Identified by National Consultation	Various

meeting, strong MLE system, and common indicators – reduces duplication and increases strength of research	Understanding; Number of exchange visits	participants as being currently collected	
	Attendance lists; Acts of Trust incorporated	NEW - Identified by National Consultation participants as being useful for collection	TBC
A clear, strong well coordinated and prioritized agriculture management, climate smart agriculture, mechanization, soil conservation and fertility management science and technology research agenda including productivity enhancing mechanisms such as pest and disease	Average farm yields of maize, rice, tobacco, legumes, sunflower, sorghum, millet, cassava, Irish potatoes, and sweet potatoes	National Agricultural Policy (2016)	MoAIWD (DARS), academic and research institutions
	Simpsons Index of Agricultural production diversification	National Agricultural Policy (2016)	MOAIWD, MoFEP&D, MoIT
	Number of evidence-based new or revised policies, legal frameworks, regulations, administrative procedures or institutional systems approves for implementation through stakeholder consultative and inclusive processes	National Agricultural Policy (2016)	MoAIWD, MoIT
	Number of new or revised evidence-based policies, legal frameworks, regulations, administrative procedures or institutional systems implemented	National Agricultural Policy (2016)	MoAIWD, MoIT
Strong post-harvest and agro-processing technologies reduce post-harvest losses and enable regular market availability of commodities	Annual growth in Agricultural Gross Domestic Product	National Agricultural Policy (2016)	MoAIWD-DARS, DCD, DAES, PVHES, Ministry of Local Government, TEVETA, Private Sector
	Annual growth in agricultural value addition and agro-processed output	National Agricultural Policy (2016)	MoAIWD, Ministry of Labour, NGOs, Farmer Organisations
	Percentage of labour force employed in value addition and agro processing	National Agricultural Policy (2016)	MoAIWD, Ministry of Labour, Private Sector, MoIT, Farmer Organisations
	Annual post harvest losses; catalogue of technologies	Various - Identified by National Consultation participants as being currently collected NEW - Identified by National Consultation participants as being useful for collection	Various
	List of companies; cost of technologies	NEW - Identified by National Consultation participants as being useful for collection	TBC

6.2 Roll-out and delivery

Outcome	Indicator	Source	Who collects
Harmonised messages between all government stakeholders - based on comprehensive and regularly updated guides to crop and	Capacity and Institutional Efficiency Index	National Agricultural Policy (2016)	MoAIWD-DAWS, MoIT, Farmer Organisations, NGOs

livestock production - ensure coordinated efforts			
Government, NGOs, universities, private sector, and farmer organizations are able to recruit and retain extension staff and have suitable processes in place – including a Code of Ethics, governance processes, and useful structures – to enable effective working	Ratio of Agricultural Extension Service Agents to Farmers	National Agricultural Policy (2016)	MoAID (DAES, DAHLD, DARS, Fisheries), MoLGRD, Private Sector, Development Partners
	Percent of investments in the agriculture sector directed to agriculture extension services	National Agricultural Policy (2016)	MoAIWD0DAES, DAHLD, DARS, Fisheries; Private Sector; Development Partners
	Development of governance processes and structures (including Code of Ethics)	NEW	TBC
	Agricultural extension standards and regulatory framework in place	National Agricultural Policy (2016)	MoAIWD (DAES): Parliament

6.3 Adoption and usage

Outcome	Indicator	Source	Who collects
Demand-driven research used by farmers to grow their enterprises - supported by market infrastructure, forecasting, equitable access to information, and usage of enhanced information portal	Public agricultural extension database in place and accessible	National Agricultural Policy (2016)	Database and Report MoAIWD (DAES)
	Customer satisfaction with ADMARC	National Agricultural Policy (2016)	Annual Report of ADMARC; ADMARC Customer Satisfaction Survey
	Profitability of ADMARC	National Agricultural Policy (2016)	Annual Report of ADMARC
	Agriculture Market Information System (AMIS), Agriculture Production Estimates (APES), Tobacco Estimates; Agricultural Commodities Exchange (ACE), Malawi Vulnerability Assessment Committee (MVAC), FEWSNET, Auction Holdings Commodity Exchange (AHCX)	Various - Identified by National Consultation participants as being currently collected	Various
	Market Information Portal - crop volumes, input demands, volumes by location; seed estimates (production, hectorage, type, carry-over seed)	NEW - Identified by National Consultation participants as being useful for collection	TBC
Farmers have access to affordable and flexible loan packages to develop their agricultural enterprises	Public and private expenditure on agricultural insurance premiums	National Agricultural Policy (2016)	MoAIWD – DAPS; MoFEP&D; RBM, Commercial Banks, DODMA
Increase in productivity and profitability due to high adoption rates and sustainable use of technologies demanded by the farmer and market	Agricultural technology adoption index	National Agricultural Policy (2016)	MoAIWD (DAES, DAPS, DARS), others TBC
	Average far, yields of maize, rice, tobacco, legumes, sunflower, sorghum, millet, cassava, Irish potatoes, and sweet	National Agricultural Policy (2016)	MoAIWD (DARS), academic and research institutions

Sustainable and self-perpetuating interventions driven by grassroots adoption and demand	potatoes	Adoption studies, Agriculture Production Estimates (APES), others depending on technology released	Various - Identified by National Consultation participants as being currently collected	Various
		Profitability of specific technologies, cost-benefit analyses, contribution of technologies or varieties	NEW - Identified by National Consultation participants as being useful for collection	TBC
		Agricultural technology adoption index	National Agricultural Policy (2016)	MoAIWD (DAES, DAPS, DARS), others TBC
		Released Technology Database	Various - Identified by National Consultation participants as being currently collected	Various
		Tracking and monitoring technologies	NEW - Identified by National Consultation participants as being useful for collection	TBC

7 Reflections

Feedback was sought from participants during the Theory of Change workshop – focusing on questions, concerns and expectations regarding the Science Agenda. This feedback was centred on implementation of the Science Agenda, alignment with existing policies and priorities, and ensuring funding and sustainability of the Science Agenda in Malawi.

With regard to implementation, participants were keen to learn further about the rollout process – including the partners, structures needed, and how all sectors of the economy will be engaged in the process. Linked to this, the importance of a multi-sectorial approach was highlighted: engaging a wide variety of stakeholders (particularly the private sector), enabling interaction between these groups, and not relying too heavily on government support and intervention. One participant was interested in learning about what other innovations will be scaled-up – in particular, whether FARA is interested in supporting other ‘*research for utilisation*’ beyond biofortification.

Participants also highlighted the importance of ensuring that the Science Agenda is aligned and harmonised with existing country interventions, plans, visions, and frameworks. In particular, it should not be duplicating existing activities in Malawi. More widely, one participant questioned how implementation of the Science Agenda would align with the regional components – particularly around accelerating inter-country technology promotion.

Finally, participants raised a number of concerns around funding and sustainability. This was seen to be a particular challenge and focused on understanding how the Science Agenda will be funded – for implementation in Malawi, and across the continent – and how its sustainability can be assured. Several participants also highlighted that human resource and infrastructure capacity in Malawi is also inadequate in some areas, potentially impacting on implementation of the Science Agenda. In addition, one participant highlighted the importance of equitable Intellectual Property regulation to ensure scientists and researchers are compensated appropriately.

8 Conclusions and next steps

It was clearly communicated in Malawi - as well as in all other National Consultations - that the Science Agenda must be aligned with national policies, processes, frameworks and activities. Malawi is undertaking important and extensive work across the agricultural sector - including leveraging science, technology, and innovation - and the Science Agenda should support, enable, and catalyse this work. It should not distract from existing efforts or provide a parallel agenda, and should also seek to avoid duplication. Instead, the Science Agenda should ensure a holistic approach to tackling national and continental challenges. The process of developing a Theory of Change for Malawi is the first step in enabling this.

In addition, a detailed context analysis - of what's happening in Malawi: What's working, and what's not - is needed to identify where the Science Agenda can add the most value. While this has been done at a high level as part of the National Consultation in Malawi and development of the Theory of Change, there are still areas where a much greater level of detail is crucial for successful implementation.

Building on the above, further detail is needed on what data is (and is not) already being collected, and which areas, crops, or technologies are the priority focus of the country. Much of these will require mapping at the lower levels of both the Theory of Change for the country as well as the related Measurement Frameworks.

Linked to this, the Science Agenda is not a project. It aims to build coordination and synergies across the public, private, and third sectors to leverage science, technology, and innovation for agricultural development. Ensuring the right stakeholders are actually inputting into the process, and engaged in its design and delivery is critical. The National Consultation in Malawi benefitted from extensive participation from a range of experts, however representatives were missing from several sectors - notably farmers. Similarly, input from the CAADP Focal Point for Malawi could also prove valuable.

More widely, across the Tier 1 countries the extent to which processes have been put into place that clarify how the Science Agenda will be rolled out has been varied. In some, but not all, National Consultations, country teams were formed. Having clear champions and ensuring stakeholders understand the next steps is crucial as is having designated people accountable for driving and measuring the performance of the implementation of the Science Agenda in Malawi. This is particularly important with regard to financing the Science Agenda. For FARA, this also demands proper alignment of the tools, activities, and approaches linked to the Science Agenda - including data management, foresight work, situational assessments, and the wider investment strategy.

With regard to next steps, the Theory of Change process has provided a significant opportunity to explore the relevance, value add, and direction of the Science Agenda in Malawi. Moving forward, ownership of this process within Malawi is critical to the success of the Science Agenda. The Theory of Change and Measurement Framework set out in this report need to therefore be validated by stakeholders in Malawi - and regularly reviewed - to ensure that the Science Agenda plays a valuable role in Malawi.

9 Annex

9.1 Outcome Maps

Research and development challenge: Inadequate research manpower and equipment to execute research for different thematic areas

What does success look like?

- Having the minimum desired number of qualified personnel in specific research areas.
- Doubling the number of scientists in different research fields by recruiting and training new staff-mainly MSC and PhD
- Have adequate facilities and equipment to research

Who needs to be involved to make this happen and what are they doing?

- Academic institutions(LUANAR)
- DAES
- Department of animal health and livestock development
- Human resource directors
- CGAIR
- Ministry of finance
- DCAFS(Donor Committee On Agriculture And Food Security)

What does this look like now?

- Only 40%-70% of required vacant positions of research scientists are filled

What are the constraints (internal & external)?

- Shortage of man power to be trained within the system
- Lack of authority to recruit

What role does the Science Agenda play in achieving this success?

- Funding to help in recruitment
- Having a Capacity development plan
- Collaboration in research between countries implementing the science agenda

Research and development challenge: Inadequate coordination and collaboration between stakeholders in research

What does success look like?

- One planning meeting for all stakeholders to enhance coordination
- Having a good M&E system
- Having common indicators of measuring progress and success

Who needs to be involved to make this happen and what are they doing?

- All research organisations(LUANAR,DARS, DAES, CGIAR, National Commission for Science and Technology, DAHLD etc)

What does this look like now?

- There pockets of collaboration that need to be brought together

What are the constraints (internal & external)?

- Leadership problems-who leads the collaboration of all the stakeholders
- Limited funding

What role does the Science Agenda play in achieving this success?

- Supporting ASWAP in institutionalising the coordination of stakeholder within the science agenda framework.

Research and development challenge: Inadequate post-harvest technologies and agro-processing

What does success look like?

- For all key commodities they should be reduction of post harvest losses, value addition and agro-processing
- Consistency supply of commodities on the market not seasonal
- Regularity of supply after harvest through storage

Who needs to be involved to make this happen and what are they doing?

- Private sector
- Research institutions
- Donor community

What does this look like now?

- Limited value addition takes place and for limited crops
- Limited warehouse facilities
- High post-harvest losses
- Inadequate agro-processing techniques

What are the constraints (internal & external)?

- Inadequate financing and lack of structured markets
- Limited technology for agro-processing
- High cost of capital

What role does the Science Agenda play in achieving this success?

- Up scaled business incubation model in Malawi
- Support innovation platforms and market linkages
- Technologies for value addition should be provided

Roll-out and delivery challenge: Lack of harmonization of agricultural messages

What does success look like?

- A comprehensively updated and readily available guide to agricultural production.
- Complete electronic copies of guide to agricultural production focusing on:
 1. Crop production
 2. Livestock production

Who needs to be involved to make this happen and what are they doing?

- DAES-To provide leadership in extension delivery
- Farmer organizations (FUM, NASFAM)-To compliment DAES
- DARS-Generate technologies

What does this look like now?

- Limited knowledge among extension officers
- Limited research dissemination forums
- Low participation in research dissemination forums

What are the constraints (internal & external)?

- Inadequate financing
- Donor priorities
- Government priorities
- Inadequate capacities at District Councils due to leadership challenges and limited financing

What role does the Science Agenda play in achieving this success?

- Proper coordination through development of multi-stakeholder platforms
- Decentralizing and strengthening of M&E
- Facilitating updating of curriculum
- Support MAFAAS to expand accreditation and harmonization of curricula.

Roll-out and delivery challenge: Limited capacity of farmer organisations

What does success look like?

- Farmer organizations being able to recruit and retain extension staff, have a code of ethics, governance processes and structures.

Who needs to be involved to make this happen and what are they doing?

- National Associations-Holding AGMs every year
- Ministry of Industry, Trade and Tourism-Regulate operations of cooperatives

What does this look like now?

- Farmer organizations have governance deficiencies
- Inability of farmer organizations to generate funds to meet their operational costs

What are the constraints (internal & external)?

- Inadequate funds
- Founder syndrome
- Poor mentorship schemes within organizations

What role does the Science Agenda play in achieving this success?

- Engage retired experts as Technical Advisors
- Support farmer organizations to develop a business orientation i.e. do farming as a business
- Support organizations to have proper feedback mechanisms for purposes of refining research agenda and populating knowledge management systems.

Roll-out and delivery challenge: Limited farmer access to affordable financial services

What does success look like?

- Farmers have access to affordable and flexible loan packages for agricultural enterprises.

Who needs to be involved to make this happen and what are they doing?

- CAS-To provide a negotiating platform
- Financial institutions-To customize loan packages
- Commodity exchanges-To establish structured markets

What does this look like now?

- Exploitative and predatory loan schemes
- Stereotyping of farmers as perpetual loan defaulters

What are the constraints (internal & external)?

- Lack of credit guarantees
- Unaffordable insurance
- Fragmented effort by donor community to finance agribusinesses
- Financial illiteracy

What role does the Science Agenda play in achieving this success?

- Facilitate evidence-based research in agricultural financial services.
- Introduce financing models for provision of agricultural credit.
- Support entrepreneurship among farmers.

Adoption and usage challenge: Effective market driven demands for technology

What does success look like? <ul style="list-style-type: none"> Reduced the gap of ignorance Enhanced information portal Structured trade and commodity finance e.g. forward contracts, futures markets Effective demand for good and services Commercially- oriented smallholder farmers utilizing research outputs to support their farming enterprises 	
Who needs to be involved to make this happen and what are they doing? <ul style="list-style-type: none"> Research institutions e.g. DARS, Universities, CGIARS – generates new knowledge Farmer organisations – capacity building and linkage to farmers MCCI and MITC– trade and investment promotion and supportMalawi government (Agriculture, Trade, Finance) – Business friendly regulatory and policy framework 	
What does this look like now? <ul style="list-style-type: none"> Inadequate research finance/ underfunded research Inadequate information infrastructure Unstructured and unreliable markets Uncoordinated interventions 	What are the constraints (internal & external)? <ul style="list-style-type: none"> Antagonistic market reward mechanism No cost recovery mechanism to sustain research Lack of consolidated information portal Lack of financial literacy
What role does the Science Agenda play in achieving this success? <ul style="list-style-type: none"> Creating sustainable technological interventions Create consolidated information portal Decision support tool 	

Adoption and usage challenge: Low adoption and unsustainable use of technologies

What does success look like? <ul style="list-style-type: none"> Mutual uptake of technologies Appreciation and wide adoption of technologies that respond to good balance of market and farmer needs Increased productivity and profitability at all levels 	
Who needs to be involved to make this happen and what are they doing? <ul style="list-style-type: none"> Research institutions e.g. DARS, Universities, CGIARS – generates new knowledge Farmer organisations – capacity building and linkage to farmers MCCI and MITC, Commodity Exchange– trade and investment promotion and support Malawi government (Agriculture, Trade, Finance, NCST) – Business friendly regulatory and policy framework 	
What does this look like now? <ul style="list-style-type: none"> Incoherent technologies Low adoption rates 	What are the constraints (internal & external)? <ul style="list-style-type: none"> Inadequate, sustainable finance for the technologies Affordability of technologies
What role does the Science Agenda play in achieving this success? <ul style="list-style-type: none"> Creating new knowledge for wealth creation Coordination and scaling up promising technologies 	

Adoption and usage challenge: Unsustainability of interventions

What does success look like?

- Sustainable and self-perpetuating interventions
- Adoption at grassroots level

Who needs to be involved to make this happen and what are they doing?

- Research institutions e.g. DARS, Universities, CGIARS – generates new knowledge
- Farmer organisations – capacity building and linkage to farmers
- MCCI and MITC, Commodity Exchange– trade and investment promotion and support
- Malawi government (Agriculture, Trade, Finance, NCST) – Business friendly regulatory and policy framework

What does this look like now?

- Interventions are driven by projects and subsidies
- Limited adoption
- Political interference
- Inadequate funding

What are the constraints (internal & external)?

- Political interference
- Inadequate funding

What role does the Science Agenda play in achieving this success?

- Create sustainable and self-perpetuating interventions through generation of new knowledge/ innovations

9.2 Participant list

#	Full Name	Institution	Type
1	A. CHALE	LIFUWU	Other
2	A. MTEMANG'OMBE	KASINTHULA	Other
3	ALFRED KAMBWIRI	CISANET	Public Sector
4	BAITSI PODISI	CCARDESA	Research
5	BETTY CHINYAMUNYAMU	MASFAM	Farmers Association
6	CANDIDA NAKHUMWA	FUM	Research
7	CHARLES GOVATI	ARL	Public Sector
8	CHARLE MASANGANO	LUANAR	Extension
9	FREDERICK MSISKA	CONSULTANT	Public Sector
10	G. PHIRI	DARS	Research
11	INNOCENT MACHILA	LIFUWU	Research
12	JOAN MTINGIZA	CISAWET	Public Sector
13	JONATHAN CHIKANKHENI	KEZINTHULA	Research
14	KONDWANI MAKOKO	DARS	Research
15	K. K. E. KAONGA	CHITEDZE	Research
16	LAWRENT PUNGULANI	CHITEDZE	Research
17	LEWIS GOVATI	UNIV. OF MALAWI	Education
18	LEONARD CHIMWAZA	AICC	Farmers Association
19	KETULO SALIPILA	MAKOKA	Research
20	M. LADDA	DARS	Research
21	MACKSON BANDA	DARS	Farmers Association
22	MAVUTO CHARLES	DARS	Research
23	McLOYD BANDA	MBAWA	Research
24	MORUT MARTIN ISYAGI	CASS	Research
25	PAUL DEMO	CGIAR	CG
26	R. CHILOMBO	MAKOKA	Other
27	THOKO CHITSULO	DARS	Other
28	T. NYIRENDA	MBAWA	Other
29	THOMSON CHILANGA	BVUMBWE	Research
30	WILKSON MAKUMBA	DARS	Research
31	WISEMAN A. KANYIKA	BAKA	Farmers Association
32	YOHANE GONTHI	AICC	Other
33	S. MTAYAMANJA	BVUMBWE	Other
34	G. M. MUGHOGHO	BAKA	Other
35	D. CHILIMA	AHL	Public Sector
36	CALUM HANDFORTH	FIRETAIL	Research
37	E. P. NKHOMA	APPSA	Other
38	DOCTOR GONDWE	CHITALA	Farmers Association
39	FRAZER MATAYA	NASFAM	Farmers Association
40	ENOCK MAEREKA	CIAT, MALAWI	Research

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47	R. K. BANDA	CHITALA	Other
48	ROBERT NAZITWERE	AHL	Public Sector
49	SANGWANI GOME MAKOKO	AICC	Research
50	S. CHISI	STAM	Public Sector
51	MARION SANUKA	LUANAR-NRC	Extension
52	SNODEN MBALFANI	FUM	Public Sector
53	PEARSON SOKO	CROPS	Research
54	T. STRONG	OPPORTUNITY BANKING	Public Sector
55	MAULANA	LUNYANGWA	Research
56	BANGA	LUNYANGWA	Other
57	DAVID KAMANJIRA	DARS	Research
58	HILDA KABULI	Other	Research
59	I. ABULLAH	DARS	Other
60	JOYCE KALIWO	Other	Extension