WorldFish

Monitoring, Evaluation and Learning (MEL) Plan

Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Africa (FASA) project 2022-2027

About WorldFish
WorldFish is a non-profit research and innovation institution that creates, advances and translates scientific research on aquatic food systems into scalable solutions with transformational impact on human well-being and the environment. Our research data, evidence and insights shape better practices, policies and investment decisions for sustainable development in low- and middle-income countries.

We have a global presence across 20 countries in Asia, Africa and the Pacific with 460 staff of 30 nationalities deployed where the greatest sustainable development challenges can be addressed through holistic aquatic food systems solutions.

Our research and innovation work spans climate change, food security and nutrition, sustainable fisheries and aquaculture, the blue economy and ocean governance, One Health, genetics and AgriTech, and it integrates evidence and perspectives on gender, youth and social inclusion. Our approach empowers people for change over the long term: research excellence and engagement with national and international partners are at the heart of our efforts to set new agendas, build capacities and support better decision-making on the critical issues of our times.

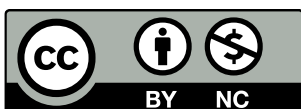WorldFish is part of One CGIAR, the world's largest agricultural innovation network.

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List of acronyms

DQA   Data Quality Assessment

FASA   Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Africa

MEL   Monitoring, Evaluation and Learning

SSA   Sub-Saharan Africa

SSL   Secure Socket Layer

TOC   Theory of Change

1. Introduction

The "Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Africa (FASA)" project is a 5-year project funded by NORAD and implemented by WorldFish. The project is focused in three Sub-Saharan African (SSA) countries, where the aquaculture sector is expanding and demand for fish is increasing. The growth of the aquaculture sector has led to dependence on importing ingredients for fish feed supply and reliance on informal, small-scale feed millers that provide inconsistent quality. The reliance on imports and inconsistent quality food can be attributed to limited knowledge of in-country ingredients and potential processing techniques for improvement.

This project follows the broad framework of increasing significance of aquaculture to sustainable, equitable development in SSA, the urgent need of smallholder fish farmers for local ingredients and fish feeds that are both affordable and high quality, the importance of understanding and adapting to potentially higher essential nutrient requirements of genetically improved tilapia and African catfish, the need for greater local capacity to develop and use high-quality feeds using local ingredients, and the need to prioritize socio-economic and environmental considerations alongside technical considerations. This project, using a gender and socially inclusive lens, seeks to address the lack of sufficient quality fish feed ingredients and need for training and communication for improved, sustainable growth in the fisheries and aquaculture sectors.

1.1 Project Summary

The FASA project prioritizes work in Nigerian, Zambian, and Kenyan regions that have high need and the potential for partnerships. The project has the primary goal of developing low-cost, highly nutritious fish feeds based on novel ingredients and enable 5,000 smallholder fish farmers in 3 African countries to test and adopt these ingredients and feeds, leading to increased income, improved food security, and reduce waste and pollution. Building from a preliminary ingredients assessment in 2017-2018, the project aims to address the need for sustainable, equitable development of aquaculture in SSA, as well as the need for high-quality and local ingredients and fish feeds.

The project seeks to address sustainability through the enhancement of local, sustainable ingredients and fish feeds through a circular economy approach. By recycling waste rather than discarding it, and removing ingredients from fish feeds that can be used in other contexts, this project has the ability to address improvements in human nutrition and food security without damage to the environment. Working with partner organizations, the project will research the nutrition requirements of improve strains of tilapia and African catfish. Based on feedback from lab analysis and stakeholder input, experimental fish feeds will be created for piloting. The knowledge obtained through this process will be synthesized into knowledge products and disseminated. It is expected that at least 6,000 end-users will benefit from the knowledge products and research created.

1.2 Purpose of MEL Plan

For the FASA to achieve project goals and outcomes, it is necessary to have a Monitoring, Evaluation and Learning (MEL) plan to ensure effective implementation and performance measurement. This document serves as a framework that will be used for monitoring, evaluation, and learning throughout the life of the project. The project activities, outputs, and

outcomes are linked through the results framework, and show how the individual project activities cumulate to end goals. Each activity, output, and outcome has defined indicators and data sources. By organizing each activity with its intended output and overarching goal, this framework will aid in tracking progress during the project and show whether the intended outcomes of the project have been achieved as the project ends. The primary purposes of this plan are the following:

- To provide a detailed explanation of how the project will be monitored to ensure intended results are being achieved

- The guide project implementation so that objectives and targets are clear for those responsible and the progress and success made towards achieving goals is transparent

- To define the project data sources that will be used to verify results

- To outline any informational products or written documentation that the project will produce and disseminate

2. Project Results Framework

The "Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)" Project is geared toward the Results Framework.

The FASA project seeks to develop low-cost, highly nutritious fish feeds based on novel ingredients and enable 5,000 smallholder fish farmers in 3 African countries to test and adopt these ingredients and feeds, leading to increased income, improved food security, and reduced waste and pollution.

The Project directly contributes to the achievement of this goal through three main intervention pathways. The 3 main expected outcomes are:

- Enhanced capacity of at least two stakeholder groups in each of the 3 target countries to integrate best practices toward a more sustainable feed sector, and to adopt new knowledge on nutrient requirements of multiple improved strains of tilapia and African catfish

- Quality of at least 15 local ingredients has been improved through various processing techniques and the ingredients are used by stakeholders in the 3 target countries, including local millers and farmers, to produce 9 novels, cost-efficient feed formulations and to improve aquaculture productivity and resilience.

- 5,000 farmers directly or indirectly linked to the project access, test, and use novel fish feeds and feed solutions using the knowledge and innovations developed by the project, with the support of a range of strategic scaling partners and other stakeholders

The synergistic activities of the three outcomes will contribute to enhancing and expanding local, sustainable ingredients and their resulting fish feed through a circular economy approach contributing to short, medium, and long-term improvements in human nutrition and food security without damaging the environment.

Figure 1. FASA Results Framework

Primary project goal: To develop low-cost, highly nutritious fish feeds based on novel ingredients and enable 5,000 smallholder fish farmers in 3 African countries to test and adopt these ingredients and feeds, leading to increased income, improved food security, and reduced waste and pollution.

Outcome 1: Enhanced capacity of at least two stakeholder groups in each of the 3 target countries to integrate best practices toward a more sustainable feed sector, and toadopt new knowledge on nutrient requirements of multiple improved strains of tilapia and African catfish

Outcome 2: Quality of at least 15 local ingredients has been improved through various processing techniques and the ingredients are used by stakeholders in the 3 target countries, including local millers and farmers, to produce 9 novel, cost-efficient feed formulations, to improve aquaculture productivity and resilience.

Outcome 3: 5,000 farmers directly or indirectly linked to the project access, test, and use novel fish feeds and feed solutions using the knowledge and innovations developed by the project, with support of a range of strategic scaling partners and other stakeholders.

Output 1.1: New knowledge on type, price, and seasonality of local ingredients used in animal (fish)feeds produced in 3 focus countries and made available within

Output 2.1: New data and knowledge on local ingredients generated, used in the formulation of novel fish feeds, and made widely available

Output 3.1: Integrated knowledge for enabling the scaling environment (including exploring barriers and bottlenecks to scaling), and strategies for scaling up the use of novel feeds and feed management approaches in the 3 target countries

Output 1.2: Viable opportunities and pathways for women and youth more integrated into and benefits from the fish feed sectors identified in 3 focus countries and made widely available, with a focus on feeds

Output 2.2: Databases and digital solutions developed and used by farmers for formulating and adapting new local feeds on a "real-time" basis

Output 3.2: Strategic partnerships for scaling the use of the project's innovations and knowledge built and operational with a range of partners in the focus countries

Output 1.3: Strategies and opportunities to increase environmental sustainability and climate resilience in the fish feed landscape in 3 focus countries identified and made widely available, with a focus on feeds derived from (novel) local ingredients

Output 2.3: Knowledge and capacity improved of millers, farmers, and other stakeholders to use novel ingredients to create the most affordable, highest quality fish feeds that take into account contextspecific circumstances and needs

Output 3.2: Strategic partnerships for scaling the use of the project's innovations and knowledge built and operational with a range of partners in the focus countries

Output 1.4: New knowledge on market trends and com mercial viability of feeds derived from (novel)local ingredients produced in 3 focus countries and made widely available

Output 1.5: New knowledge and data on nutrient requirements of improved strains of tilapia and African catfish produced, validated, and made widely available
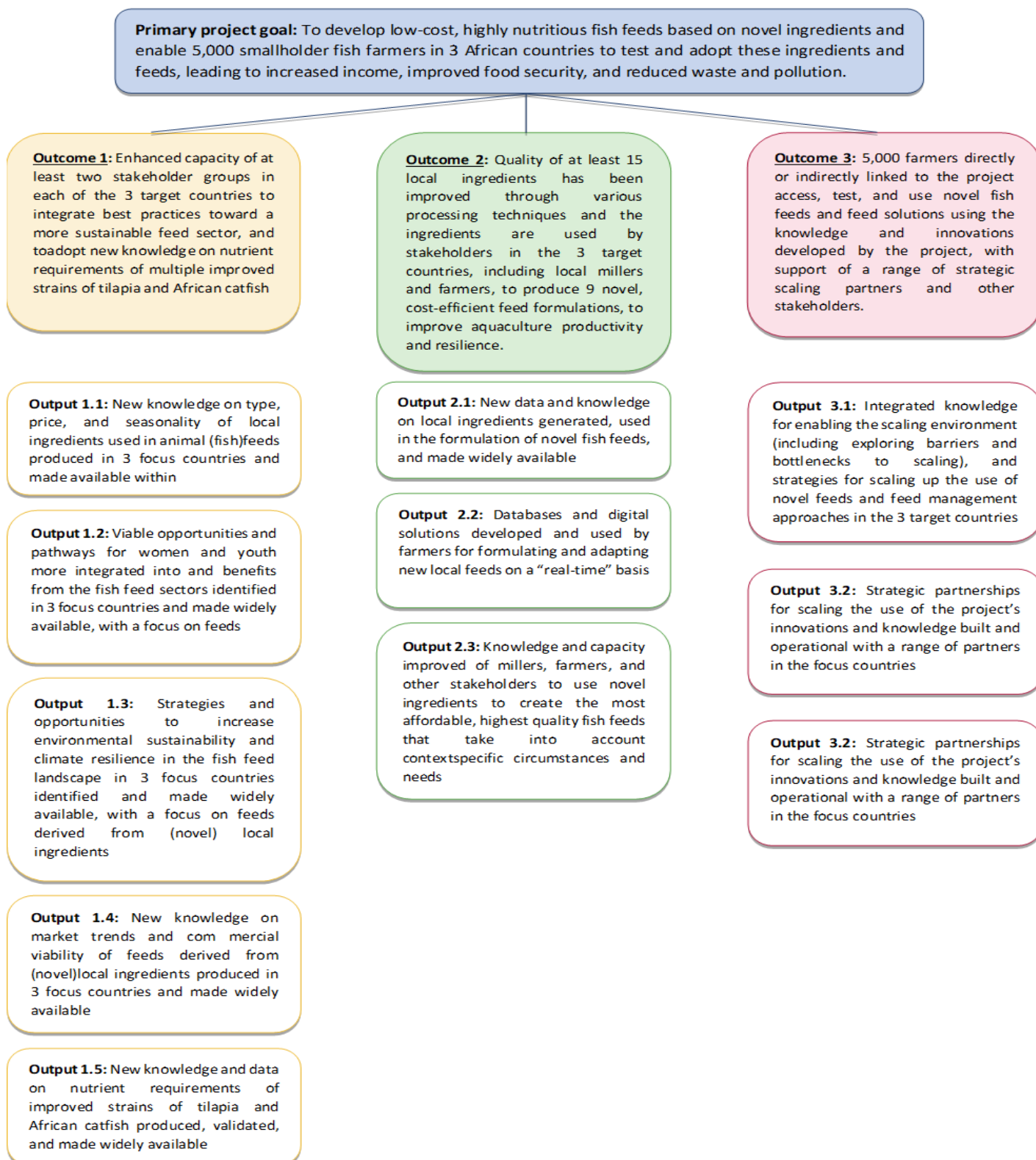
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Table 1. Indicators tracking table

Level	Expected Result	Indicator	Baseline	Project Target and Timeline	Target Y1	Target Y2	Target Y3	Target Y4	Target Y5	Source and Means of Verification
Primary Project Goal	To develop low-cost, highly nutritious fish feeds based on novel ingredients and enable 5,000 smallholder fish farmers in 3 African countries to test and adopt these ingredients and feeds, leading to increased income, improved food security, and reduced waste and pollution.	*Number of smallholder fish farmers in the 3 countries that have tested and adopted ingredients and feeds*	0	*5,000*	-	-	-	*500*	*4500*	*Monitoring data; technical reports; evaluation studies;*
Outcome 1	Enhanced capacity of at least two stakeholder groups in each of the 3 target countries to integrate best practices toward a more sustainable feed sector, and to adopt new knowledge on nutrient requirements of multiple improved strains of tilapia and African catfish	*Number of stakeholder groups improved their capacity in sustainable feed because of research studies* *Number of stakeholder groups adopted and applied new knowledge on nutrients for improved strains*	N/A	*6 (2 per country)* *(80%) 5*	-	-	-	*1*	*1*	*Monitoring data; technical; partners' reports; capacity development reports/evaluation; evaluation studies;*
Output 1.1	New knowledge on type, price, and seasonality of local ingredients used in animal (fish) feeds produced in 3 focus countries and made available within and outside the focus countries	*Number of in-depth scoping studies completed*	0	3 (1 per country) in Year 1 (months 1-9)	3	-	-	-	-	-3 reports to donor -Published WF working paper for external audiences
Output 1.2	Viable opportunities and pathways for women and youth to be more integrated into and benefit from the fish feed sectors identified in 3 focus countries and made widely available, with a focus on feeds derived from (novel) local ingredients	*Number of gender and social assessments completed*		3 (1 per country) in Year 1 (months 1-6)	3	-	-	-	-	Assessment reports

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Output 1.3	Strategies and opportunities to increase environmental sustainability and climate resilience in the fish feed landscape in 3 focus countries identified and made widely available, with a focus on feeds derived from (novel) local ingredients	*Number of climate and environmental assessments completed*		3 (1 per country) in Year 1 (months 1-6)	3	-	-	-	-	Assessment reports
Output 1.4	New knowledge on market trends and commercial viability of feeds derived from (novel) local ingredients produced in 3 focus countries and made widely available	*Number of market assessments completed*		3 (1 per country) in Year 1 (months 1-6)	3	-	-	-	-	Assessment reports
Output 1.5	New knowledge and data on nutrient requirements of improved strains of tilapia and African catfish produced, validated, and made widely available	*Number of experiments completed*		20 by Year 5 (months 6-51): 12 tilapia experiments (4 per country) and 8 catfish experiments (4 each in Nigeria and Kenya)	-	-	-	-	20	-Better Management Practices guidelines (BMPs) -Updated data are provided to the National Research Council of the USA -New WF database -Research report to donor
Outcome 2	Quality of at least 15 local ingredients has been improved through various processing techniques and the ingredients are used by stakeholders in the 3 target countries, including local millers and farmers, to produce 9 novel, cost-efficient feed formulations, to improve aquaculture productivity and resilience.	At least 80% of feed ingredients improved their quality as a result of better processing Number of stakeholders who adopted improved quality ingredients to produce cost-efficient fish feed		12 (80%) 5					12 5	Monitoring data; technical; partners' reports; capacity development reports/evaluation; evaluation studies;
Output 2.1	New data and knowledge on local ingredients generated, used in the formulation of novel fish feeds, and made widely available	*Number of analyses and experiments completed on nutritional qualities and limitations of ingredients*		3 sets of lab analyses (1 set per country) and 6 digestibility experiments by Year 3 (months 6-36)			3 6	-	-	-Research report to donor -Peer reviewed WF publication

Output	Description	Indicator		Target	Y1	Y2	Y3	Y4	Y5	Means of verification
		Number of stakeholder consultations/workshops to discuss results of ingredient selection		3 by Year 3 (months 24-30) 1 workshop per country			3 1	- -	- -	-Workshop reports
		Number of ingredients processed and improved through various methods, and number of fish feeds formulated		15 local ingredients by Year 3 (months 18-36) 3 sets of experiments with 5 local ingredients per country 9 experimental fish feeds by Year 3 (months 18-36) (3 per country)			15 3 9	- - -	- - -	-Research reports and publications -2 PhD theses and defences
		Number of on-farm pilots completed to validate formulated fish feeds		6 on-farm pilots by Year 5 (months 30-54) 2 per country						-Research reports and publications -BMPs -2 PhD theses and defences
		Number of capacity development workshops completed		3 by Year 5 (first quarter) 1 workshop per country						-Workshop reports
Output 2.2	Databases and digital solutions developed and used by farmers for formulating and adapting new local feeds on a "real-time" basis	*Open access database with feed formulation tool developed*		1 by Year 5 (months 42-54)	-	-	-	-	1	-Web link to database -Mobile version of database -Integration of database into existing mobile apps widely used by farmers (including social media apps such as WhatsApp, e.g., a WhatsApp bot)

			Baseline	Target	Y1	Y2	Y3	Y4	Y5	Means of verification
Output 2.3	Knowledge and capacity improved of millers, farmers, and other stakeholders to use novel ingredients to create the most affordable, highest quality fish feeds that take into account contextspecific circumstances and needs	*Printed manuals/booklets developed* *Number of trainings/workshops completed by millers, farmers, and other stakeholders*		1 set of manuals/booklets developed by Year 5 (months 42-54) 12 training/workshops in Year 5 (months 48-60) 4 per country (2 online and 2 in-person)						-Printed manuals/booklets -Training reports -BMPs
Outcome 3	5,000 farmers directly or indirectly linked to the project access, test, and use novel fish feeds and feed solutions using the knowledge and innovations developed by the project, with support of a range of strategic scaling partners and other stakeholders	*Number of farmers' access to fish feed developed as a result of increased knowledge and innovation by the project*	0	5,000 (same as Outcome 1&2)	-	-	-	500	4500	Monitoring data; technical; partners' reports; capacity development reports/evaluation; evaluation studies;
Output 3.1	Integrated knowledge for enabling the scaling environment (including exploring barriers and bottlenecks to scaling), and strategies for scaling up the use of novel feeds and feed management approaches in the 3 target countries co-developed with stakeholders and used to guide selection of country scaling strategies	*Number of scaling assessments completed and strategies developed* *Number of stakeholder consultations/workshops completed to validate scaling assessments and srategies*		12 (3 by end of Year 1, 3 by end of Year 2, 3 by end of Year 3, 3 by end of Year 4) 6 by Year 4 (3 in Q2 of Year 3 and 3 in Q2 of Year 4) 2 workshops per country	3	3	3 3	3 3	- -	-Scaling assessment reports -Scaling strategies -Workshop reports

Output		Indicator		Target						Means of Verification
Output 3.2	Strategic partnerships for scaling the use of the project's innovations and knowledge built and operational with a range of partners in the focus countries	*Number of demonstration sites/model farms developed and farmer field days hosted*		6 model farms developed by year 4 (2 per country) 12 farmer field days hosted (2 per country in years 4 and 5)				6 6	- 6	-Field day reports -Model farm briefs and manuals
		Number of farmers who visit demonstration sites/model farms and attend farmer field days		3,000 farmers visit demonstration sites or attend farmer field days by year 5 (1,000 per country)					3,0000	-Field day reports -Model farm visitation reports -Project reports
		Number of farmers who test novel feeds on their farms		1,500 farmers test novel feeds on individual or group farms by year 5 (500 per country)					1,500	-Farmer surveys and interviews -Stakeholder interviews and site visit reports -MEL studies
		Number of cooperatives promoting, testing, and using novel feeds		15 farmer cooperatives promote and test novel feeds by year 5 (5 per country)					15	-Cooperative surveys and interviews -Site visit reports -MEL studies
		Number of new feed services/feed businesses established by farmers, young people, cooperatives, and other stakeholders.		12 new feed services or businesses established by year 5 (4 per country)					12	-KII interviews -Case studies on new businesses

		Indicator		Target						Value	Means of Verification
		Number of new millers that change or improve their products based on knowledge and innovations developed by the project		15 millers include novel feeds or ingredients into their product offerings to farmers by year 5 (5 per country)						15	-KII interviews -Market surveys -Briefs on millers using project's Outputs
		Number of NGOs, private sector partners, or extension service providers that incorporate the project's knowledge and innovations into their offerings / services to farmers (e.g financial products for farmers who adopt new feeds)		9 NGOs or private entities or extension service providers include knowledge or solutions about novel feeds or ingredients into their offerings or services to farmers by year 5 (3 per country)						9	-KII interviews -Beneficiary surveys -MEL assessments and studies -Case studies on expanded product offerings to farmers
Output 3.3	Strategic capacity development and public awareness campaigns delivered in order to widely disseminate knowledge, innovations, and tools developed by the project	*Number of workshops to disseminate knowledge* *Number of conference presentations* *Number of YouTube videos* *Number of BMPs* *Number of factsheets* *Number of benefits stories published*		By Year 5 (months 51-60): -10 online workshops -3 YouTube videos -1 set of BMPs -1 online factsheet -1 printed factsheet -1 benefits story							-Sets of workshop materials, videos, and reports -YouTube videos -BMPs -Factsheet -Project report

		Number of radio programmes aired		-1 radio programme produced and aired -1 TV programme produced and aired						-Web link to benefits story -Web links to radio and TV programmes and programme airings
		Number of TV programmes aired								
		Number of end-users reached through digital and in-person outreach		-6,000 end-users reached across 3 project countries through outreach programme						-Outreach reports from volunteers, community centres, etc.
		Number of policy briefs published and launched		-1 policy brief in Year 5 (months 48-60)						-Policy brief and launch workshop report

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2.1 Theory of Change

Many developing countries lack sufficient quality fish feed ingredients and depend on more expensive imported resources for commercial feeds, which increases production costs. The Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Africa (FASA) project aims to address the urgent need of small-scale farmers for affordable and high-quality local ingredients to produce fish feed. To address the Results Framework, the project's Theory of Change (TOC) will achieve the goal of developing low-cost, highly nutritious fish feeds based on novel ingredients and enable 5,000 smallholder fish farmers in 3 African countries to test and adopt these ingredients and feeds, leading to increased income, improved food security, and reduced waste and pollution.

The intervention will be supported by in-depth scoping studies on available local ingredients that can be harnessed for the formulation of sufficiently nutritious but low-cost fish feeds. WorldFish will work with the Swedish University of Agricultural Sciences (SLU), the International Centre of Insect Physiology and Ecology (ICIPE), Aller Aqua Africa, and the West and Central African Council for Agricultural Research (CORAF) to examine the nutrient requirements of various improved strains of tilapia and African catfish. Local ingredients will be selected and improved, and experimental fish feeds will be formulated.

All knowledge generated will be available on an online open access database. Printed manuals/booklets will be developed and disseminated. At the higher level for outcomes, the project will generate data and knowledge on market, gender, and other social factors that may influence the adoption and scaling of novel feeds, as well as investigate climate change adaptation potential.

Figure 2. TOC and Impact Pathway
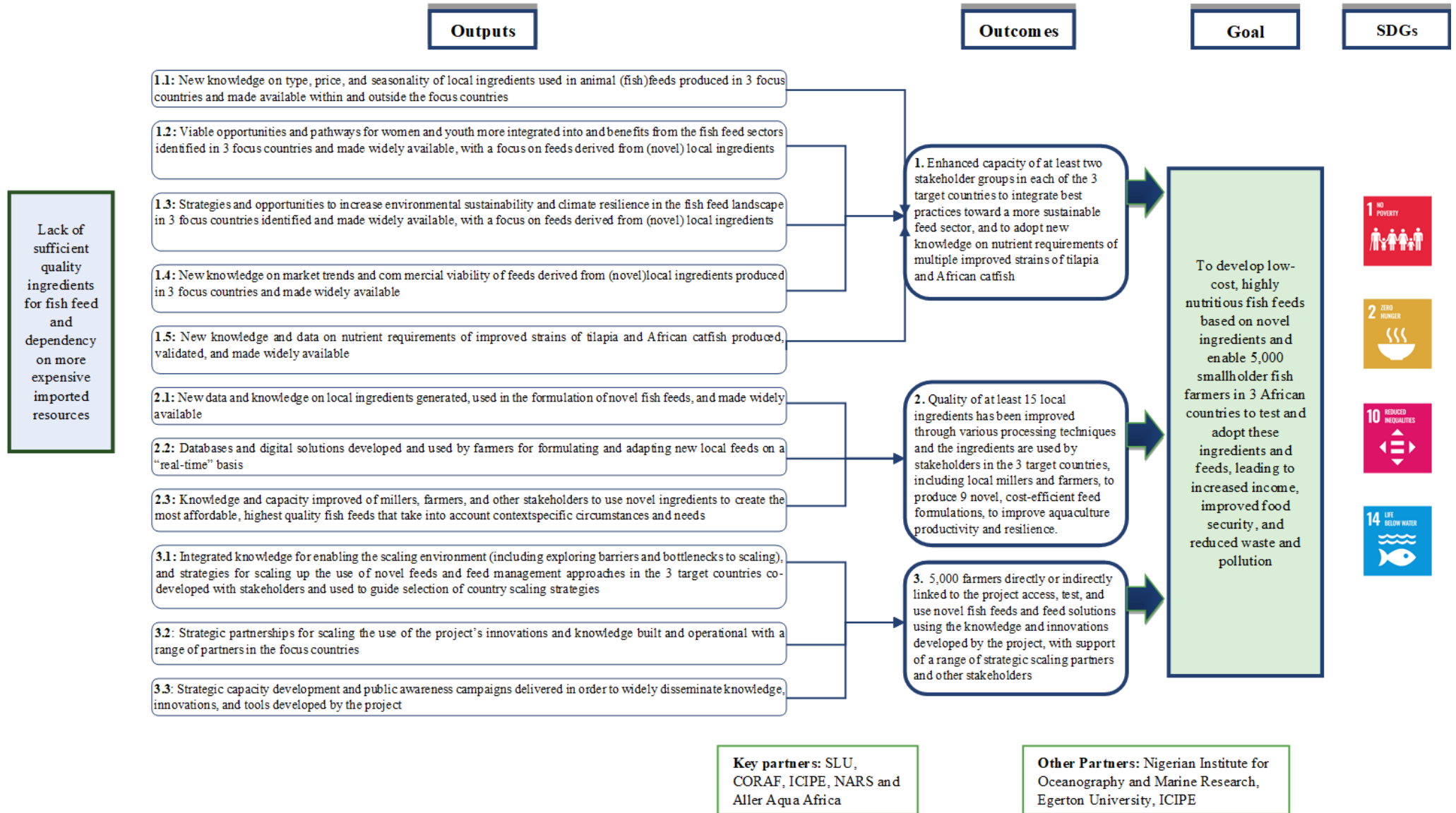
2.2 Project Alignment

The outputs and outcomes of the FASA project are closely aligned with One CGIAR, WorldFish, NORAD and SDGs frameworks.

FASA project aligns with One CGIAR's mission, contributing to achieving its goals. The One CGIAR *2030 Research and Innovation Strategy* aims to significantly transform the world's food, land and water systems. The One CGIAR's intervention is organised into three action areas: (1) Systems Transformation; (2) Resilient Agri-Food Systems; and (3) Genetic Innovation. The work of the One CGIAR seeks to achieve multiple benefits and transformative change across five SDG-focused Impact Areas: (i) nutrition, health and food security; (ii) poverty reduction, livelihoods and employment; (iii) gender equality, youth and social inclusion; (iv) climate adaptation and mitigation; and (v) environmental health and biodiversity.

Within the WorldFish framework, the project is in line with the "2030 WorldFish Research and Innovation Strategy: Aquatic Foods for Healthy People and Planet". It is an opportunity to advance in all the 3 impact areas of the strategy: climate resilience and environmental sustainability, social and economic inclusion, and nutrition and public health.

The project is aligned to address Norad's international development priority areas. Norad recognises the importance of aquaculture as underpinning economic development, advancing food security and human nutrition, and achieving multiple sustainable development goals by 2030. "Food, People and the Environment: The Government's Action Plan on Sustainable Food Systems in the Context of Norwegian Foreign and Development Policy 2019-2023" places significant emphasis on sustainable food production and describes Norway's intention to "improve nutrition, enhance job and value creation, and promote capacity building."

The project is also relevant and aligned with the priorities of the other partners: the Swedish University of Agricultural Sciences (SLU), the International Centre of Insect Physiology and Ecology (ICIPE), Aller Aqua Africa, Small and medium-scale feed millers and smallholder farmers, the West and Central African Council for Agricultural Research (CORAF), NARS, SCALING Partners.

3. Monitoring and Evaluation Plan

The purpose of the M&E plan is to ensure the effective progress of the project following the stated outputs, outcomes and the main goal and within an agreed timescale. The project M&E plan includes indicators to track the project's overall progress and provide measurable means of verifying whether or not the outputs and outcomes are achieved. Indicators will be collected on a routine (frequently collected, measured, and assessed throughout the project) or periodic (measured annually or at the end of the project) basis.

3.1 Activity and output monitoring

Project team will routinely collect data as part of project activities to monitor the progress of activities and results, ensuring that the activities planned in the annual work plans are implemented as planned and that the associated results are achieved. Throughout the project period, project results and activities will be mapped in the MEL system together with the MEL responsible and the MEL team.

It will be used the MEL platform, the OneCGIAR-developed web-based knowledge sharing and monitoring, evaluation and learning tool. The MEL platform, utilized by all WorldFish projects, facilitates the tracking of indicators to assess the project's overall progress and engagement with stakeholders to understand why targets are or are not being met. In addition, the MEL platform will host the entire MEL strategy, indicators, and impact pathway. Key data outputs related to the outlined indicators, project summary documents and deliverables will be regularly uploaded onto the MEL platform.

3.2 Outcome monitoring

The outcomes contribute to achieve the project objectives. In the monitoring phase they will be tracked over time by using mainly performance indicators. The Indicator Matrix contains in details a list of indicators per objective, baseline values, data sources, collection methods, and reporting frequency.

Outcome 1	Enhanced capacity of at least two stakeholder groups in each of the 3 target countries to integrate best practices toward a more sustainable feed sector, and to adopt new knowledge on nutrient requirements of multiple improved strains of tilapia and African catfish
Indicator 1(a)	Number of stakeholder groups improved their capacity in sustainable feed as a result of research studies
Indicator 1(b)	Percentage of stakeholder groups adopted and applied new knowledge on nutrients for improved strains
Outcome 2	Quality of at least 15 local ingredients has been improved through various processing techniques and the ingredients are used by stakeholders in the 3 target countries, including local millers and farmers, to produce 9 novel, cost-efficient feed formulations, to improve aquaculture productivity and resilience.
Indicator 2(a)	At least 80% of selected feed ingredients improved their quality as a result of better processing
Indicator 2(b)	Number of stakeholders who adopted improved quality ingredients to produce cost-efficient fish feed
Outcome 3	5,000 farmers directly or indirectly linked to the project access, test, and use novel fish feeds and feed solutions using the knowledge and innovations developed by the project, with support of a range of strategic scaling partners and other stakeholders
Indicator 3(a)	Number of farmers' access to fish feed developed as a result of increased knowledge and innovation by the project

3.3 Evaluation and Impact Assessment

The project evaluation will involve, I) a baseline II) mid-term evaluation, III) end term evaluation IV) and annual assessments in year 1, 3, 4, 5.

I) **Baseline evaluation.** A baseline characterisation among farmers and feed millers will be conducted during the first 4 months of the second year. The baseline will collect socio-economic indicators such current production practices, food security and poverty levels which allow us to verify if change has occurred due to the intervention.

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II) **Mid-term evaluation.** The midterm evaluation will be conducted in 2024. The midterm evaluation aims to obtain midterm values on the progress made towards achieving the goal. The purpose is to monitor and evaluate the course of the project's actions**.**

III) **End-term evaluation.** The end-term evaluation will be conducted at the end of the project, in 2026. An external review focusing on the results achieved by the Project shall be submitted to Norad 12 months before the end of the Support period.

IV) **Annual assessments**. Contributing to understanding the impact of the project activities, in addition to, baseline, midterm and end-term evaluations, annual assessments to understand the positive and negative (intended and unintended) socio-economic impacts of the intervention will be conducted in year 1, 3, 4 and 5. In year 1, a contextualised systems-based theory of change (ToC) will be developed with the participation of all key project stakeholders. The system-based ToC seek to assess the ex-ante systemic-wide effects for the introduction of novel ingredients in the formulation of fish feeds in Nigeria, Kenya, and Zambia. The outcome will be systemic-based theory change maps that reveal the intended (and unintended) consequences of the intervention at both the value-chain level & farming system level and will establish the impact assessment system boundary. In year 3, the impact assessment will assess the quality and impact of capacity building activities on the use of locally produced feeds among feed millers and farmers. In year 4, the project will assess the socio-economic impact of farmers access/use of novel fish feeds and feed solutions. In year 5, the project will characterize and assess the impact of established innovation scaling partnership structures on the access/use of locally produced fish feeds.

Based on the assessments conducted annually, the evaluations will produce five reports addressing a holistic assessment of the intervention detailing (intended and unintended) socio-economic impacts of the selected key focus areas. In addition, the study will produce one midterm term and one end term reports detailing the key milestones and lessons learnt, including recommendations for future interventions and policy.

3.4 Indicators Matrix

The Indicator Matrix serves as a directory for all the indicators that will be monitored by the project. Most of these indicators will be reported monthly, quarterly and annually.

Table 2. Indicator Definitions

Outcome Indicator	1 (a) Number of stakeholder groups improved their capacity in sustainable feed as a result of research studies
Description	
Definition	Sum of the stakeholder groups that improved their capacity in sustainable feed as a rsult of research studies
Unit of Measure	Number (of stakeholders)
Method of Calculation	Summation of count (of stakeholder)
Baseline	
Target	6
Disaggregation	Geographic location (country)

Data collection and Analysis	
Data source	
Data collection method	
Frequency	
Responsible	
Reporting	

Outcome Indicator	1 (b) 80% of stakeholder groups adopted and applied new knowledge on nutrients for improved strains
Description	
Definition	The percentage (80%) of the stakeholder groups who adopted and applied new knowledge on nutrients for improved strains
Unit of Measure	Percentage (of stakeholders)
Method of Calculation	Calculation of 80/100*number (of stakeholders)
Baseline	
Target	5
Disaggregation	Geographic location (country)

Output Indicator	1.1 Number of in-depth scoping studies completed
Description	
Definition	Sum of the completed in-depth scoping studies
Unit of Measure	Number (of studies)
Method of Calculation	Summation of count (of completed studies)
Baseline	
Target	3 (1 per country) in Year 1 (months 1-9)
Disaggregation	Geographic location (country)

Output Indicator	1.2 Number of gender and social assessments completed
Description	
Definition	Sum of the completed gender and social assessments
Unit of Measure	Number (of assessment)
Method of Calculation	Summation of count (of completed assessments)
Baseline	
Target	3 (1 per country) in Year 1 (months 1-6)
Disaggregation	Geographic location (country)

Output Indicator	1.3 Number of climate and environmental assessments completed
Description	
Definition	Sum of the completed climate and environmental assessments
Unit of Measure	Number (of assessment)
Method of Calculation	Summation of count (of completed assessments)
Baseline	
Target	3 (1 per country) in Year 1 (months 1-9)
Disaggregation	Geographic location (country)

Output Indicator	1.4 Number of market assessments completed
Description	
Definition	Sum of the completed market assessments
Unit of Measure	Number (of assessment)
Method of Calculation	Summation of count (of completed assessments)

Baseline	
Target	3 (1 per country) in Year 1 (months 1-6)
Disaggregation	Geographic location (country)

Output Indicator	1.5 Number of experiments completed
Description	
Definition	Sum of the completed experiments
Unit of Measure	Number (of experiment completed)
Method of Calculation	Summation of count (of completed experiments)
Baseline	
Target	20 by Year 5 (months 6-51): 12 tilapia experiments (4 per country) and 8 catfish experiments (4 each in Nigeria and Kenya)
Disaggregation	Geographic location (country)

Outcome Indicator	2 (a) At least 80% of selected feed ingredients improved their quality as a result of better processing
Description	
Definition	The percentage (80%) of feed ingredients improved their quality as a result of better processing
Unit of Measure	Percentage (of feed ingredients)
Method of Calculation	Calculation of 80/100*number (of feed ingredients)
Baseline	
Target	12
Disaggregation	Geographic location (country)

Outcome Indicator	2 (b) Number of stakeholders who adopted improved quality ingredients to produce cost-efficient fish feed
Description	
Definition	Sum of stakeholders who adopted improved quality ingredients to produce cost-efficient fish feed
Unit of Measure	Number (of stakeholder)
Method of Calculation	Summation of count (of stakeholder)
Baseline	
Target	5000
Disaggregation	Geographic location (country)

Output Indicator	2.1 Number of analyses and experiments completed on nutritional qualities and limitations of ingredients
Description	
Definition	Sum of the completed analyses and experiments on nutritional qualities and limitations of ingredients
Unit of Measure	Number (of analyses and experiment completed)
Method of Calculation	Summation of count (of completed analyses and experiments)
Baseline	
Target	3 sets of lab analyses (1 set per country) 6 digestibility experiments by Year 3 (months 6-36)
Disaggregation	Geographic location (country)

Output Indicator	2.1 Number of stakeholder consultations/workshops to discuss results of ingredient selection
Description	
Definition	Sum of the stakeholder consultation/workshops on ingredients selection results
Unit of Measure	Number (of stakeholder consultation/workshop)
Method of Calculation	Summation of count (of stakeholder consultation/workshop)

Baseline	
Target	3 by Year 3 (months 24-30) 1 workshop per country
Disaggregation	Geographic location (country)

Output Indicator	2.1 Number of ingredients processed and improved through various methods, and number of fish feeds formulated
Description	
Definition	Sum of the fish feed ingredients processed and improved
Unit of Measure	Number (of fish feed ingredients processed and improved)
Method of Calculation	Summation of count (of fish feed ingredients processed and improved)
Baseline	
Target	15 local ingredients by Year 3 (months 18-36) 3 sets of experiments with 5 local ingredients per country 9 experimental fish feeds formulated by Year 3 (months 18-36) (3 per country)
Disaggregation	Geographic location (country)

Output Indicator	2.1 Number of on-farm pilots completed to validate formulated fish feeds
Description	
Definition	Sum of completed on-farm pilots to validate formulated fish feeds
Unit of Measure	Number (of completed on-farm pilots)
Method of Calculation	Summation of count (of completed on-farm pilots)
Baseline	
Target	6 on-farm pilots by Year 5 (months 30-54) 2 per country
Disaggregation	Geographic location (country)

Output Indicator	2.1 Number of capacity development workshops completed
Description	
Definition	Sum of completed CapDev workshops
Unit of Measure	Number (of completed CapDev workshops)
Method of Calculation	Summation of count (of completed CapDev workshops)
Baseline	
Target	3 by Year 5 (first quarter) 1 workshop per country
Disaggregation	Geographic location (country)

Output Indicator	2.2 Open access database with feed formulation tool developed
Description	
Definition	Open access database
Unit of Measure	Number (of open access database)
Method of Calculation	Summation of count (of open access database)
Baseline	
Target	1 by Year 5 (months 42-54)
Disaggregation	Geographic location (country)

Output Indicator	2.3 Printed manuals/booklets developed
Description	
Definition	Printed manuals/booklets developed
Unit of Measure	Number (of printed manuals/booklets)
Method of Calculation	Summation of count (of printed manuals/booklets)

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Baseline	
Target	1 set of manuals/booklets developed by Year 5 (months 42-54)
Disaggregation	Geographic location (country)

Output Indicator	2.3 Number of trainings/workshops completed by millers, farmers, and other stakeholders
Description	
Definition	Sum of completed trainings/workshops by millers, farmers, and other stakeholders
Unit of Measure	Number (of training/workshops)
Method of Calculation	Summation of count (of training/workshops)
Baseline	
Target	12 training/workshops in Year 5 (months 48-60) 4 per country (2 online and 2 in-person)
Disaggregation	Geographic location (country)

Outcome Indicator	3 Number of farmers' access to fish feed developed as a result of increased knowledge and innovation by the project
Description	
Definition	Sum of farmers' access to fish feed developed as a result of increased knowledge and innovation by the project
Unit of Measure	Number (of farmer)
Method of Calculation	Summation of count (of farmer)
Baseline	
Target	
Disaggregation	Geographic location (country)

Output Indicator	3.1 Number of scaling assessments completed and strategies developed
Description	
Definition	Sum of completed scaling assessments and strategies developed
Unit of Measure	Number (of scaling assessments and strategies)
Method of Calculation	Summation of count (of scaling assessments and strategies)
Baseline	
Target	12 (3 by end of Year 1, 3 by end of Year 2, 3 by end of Year 3, 3 by end of Year 4)
Disaggregation	Geographic location (country)
Data collection and Analysis	

Output Indicator	3.1 Number of stakeholder consultations/workshops completed to validate scaling assessments and srategies
Description	
Definition	Sum of completed stakeholder consultations/workshops
Unit of Measure	Number (of consultation/workshop)
Method of Calculation	Summation of count (of consultation/workshop)
Baseline	
Target	6 by Year 4 (3 in Q2 of Year 3 and 3 in Q2 of Year 4) 2 workshops per country
Disaggregation	Geographic location (country)
Data collection and Analysis	

Output Indicator	3.2 Number of demonstration sites / model farms developed and farmer field days hosted
Descritpion	
Definition	Sum of demonstration sites / model farms developed
Unit of Measure	Number (of demonstration sites/model farms)

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Method of Calculation	Summation of count (of demonstration sites/model farms)
Baseline	
Target	6 model farms developed by year 4 (2 per country) 12 farmer field days hosted (2 per country in years 4 and 5)
Disaggregation	Geographic location (country)

Output Indicator	3.2 Number of farmers who visit demonstration sites / model farms and attend farmer field days
Description	
Definition	Sum of farmers who visit demonstration sites / model farms and attend farmer field days
Unit of Measure	Number (of farmers)
Method of Calculation	Summation of count (of farmers)
Baseline	
Target	3,000 farmers visit demonstration sites or attend farmer field days by year 5 (1,000 per country)
Disaggregation	Geographic location (country)

Output Indicator	3.2 Number of farmers who test novel feeds on their farms
Description	
Definition	Sum of farmers who who test novel feeds on their farms
Unit of Measure	Number (of farmers)
Method of Calculation	Summation of count (of farmers)
Baseline	
Target	1,500 farmers test novel feeds on individual or group farms by year 5 (500 per country)
Disaggregation	Geographic location (country)

Output Indicator	3.2 Number of cooperatives promoting, testing, and using novel feeds
Description	
Definition	Sum of cooperatives promoting, testing, and using novel feeds
Unit of Measure	Number (of cooperatives)
Method of Calculation	Summation of count (of cooperative)
Baseline	
Target	15 farmer cooperatives promote and test novel feeds by year 5 (5 per country)
Disaggregation	Geographic location (country)

Output Indicator	3.2 Number of new feed services / feed businesses established by farmers, young people, cooperatives, and other stakeholders.
Description	
Definition	Sum of new feed services / feed businesses established by farmers, young people, cooperatives, and other stakeholders
Unit of Measure	Number (of new feed services/feed business)
Method of Calculation	Summation of count (of new feed services/feed business)
Baseline	
Target	12 new feed services or businesses established by year 5 (4 per country)
Disaggregation	Geographic location (country)

Output Indicator	3.2 Number of new millers that change or improve their products based on knowledge and innovations developed by the project
Description	
Definition	Sum of new millers that change or improve their products based on knowledge and innovations developed by the project

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Unit of Measure	Number (of new millers)
Method of Calculation	Summation of count (of new millers)
Baseline	
Target	15 millers include novel feeds or ingredients into their product offerings to farmers by year 5 (5 per country)
Disaggregation	Geographic location (country)

Output Indicator	3.2 Number of NGOs, private sector partners, or extension service providers that incorporate the project's knowledge and innovations into their offerings / services to farmers (e.g. financial products for farmers who adopt new feeds)
Description	
Definition	Sum of NGOs, private sector partners, or extension service providers that incorporate the project's knowledge and innovations into their offerings / services to farmers
Unit of Measure	Number (of NGOs, private sector partners, or extension service providers)
Method of Calculation	Summation of count (of NGOs, private sector partners, or extension service providers)
Baseline	
Target	9 NGOs or private entities or extension service providers include knowledge or solutions about novel feeds or ingredients into their offerings or services to farmers by year 5 (3 per country)
Disaggregation	Geographic location (country)

Output Indicator	3.3 Number of workshops to disseminate knowledge
Description	
Definition	Sum of workshops to disseminate knowledge
Unit of Measure	Number (of workshop)
Method of Calculation	Summation of count (of workshop)
Baseline	
Target	By Year 5 (months 51-60): 10 online workshops
Disaggregation	Geographic location (country)

Output Indicator	3.3 Number of conference presentations
Description	
Definition	Sum of conference presentations
Unit of Measure	Number (of conference presentation)
Method of Calculation	Summation of count (of conference presentation)
Baseline	
Target	3
Disaggregation	Geographic location (country)

Output Indicator	3.3 Number of YouTube videos
Description	
Definition	Sum of YouTube videos
Unit of Measure	Number (of YouTube video)
Method of Calculation	Summation of count (of YouTube video)
Baseline	
Target	-3 YouTube videos
Disaggregation	Geographic location (country)

Output Indicator	3.3 Number of BMPs
Description	

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Definition	Sum of BMPs
Unit of Measure	Number (of BMPs)
Method of Calculation	Summation of count (of BMPs)
Baseline	
Target	-1 set of BMPs
Disaggregation	Geographic location (country)

Output Indicator	3.3 Number of factsheets
Description	
Definition	Sum of factsheets
Unit of Measure	Number (of factsheets)
Method of Calculation	Summation of count (of factsheets)
Baseline	
Target	1 online factsheet
Disaggregation	Geographic location (country)

Output Indicator	3.3 Number of benefits stories published
Description	
Definition	Sum of benefits stories published
Unit of Measure	Number (of benefits stories published)
Method of Calculation	Summation of count (of benefits stories published)
Baseline	
Target	1 benefits story
Disaggregation	Geographic location (country)

Output Indicator	3.3 Number of radio programmes aired
Description	
Definition	Sum of radio programmes aired
Unit of Measure	Number (of radio programmes aired)
Method of Calculation	Summation of count (of radio programmes aired)
Baseline	
Target	1
Disaggregation	Geographic location (country)

Output Indicator	3.3 Number of TV programmes aired
Description	
Definition	Sum of TV programmes aired
Unit of Measure	Number (of TV programmes aired)
Method of Calculation	Summation of count (of TV programmes aired)
Baseline	
Target	-1 TV programme produced and aired
Disaggregation	Geographic location (country)

Output Indicator	3.3 Number of end-users reached through digital and in-person outreach
Description	
Definition	Sum of end-users reached through digital and in-person outreach
Unit of Measure	Number (of end-users)
Method of Calculation	Summation of count (of end-users)
Baseline	

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Target	-6,000 end-users reached across 3 project countries through outreach programme
Disaggregation	Geographic location (country)

Output Indicator	3.3 Number of policy briefs published and launched
Description	
Definition	Sum of policy briefs published and launched
Unit of Measure	Number (of policy briefs
Method of Calculation	Summation of count (of policy briefs)
Baseline	
Target	1 policy brief in Year 5 (months 48-60)
Disaggregation	Geographic location (country)

3.5 Reporting

This section describes different types of reports that the project requires to produce at different time intervals for both internal and external results communication and accountability purposes. Section 3.4.1 addresses internal reporting requirements while section 3.4.2 addresses external (donor) reporting requirements.

3.4.1 Internal Reporting

All planned project deliverables will be configured in MEL platform to facilitate reporting by the project team. This will make it easier to report on the planned deliverables assigned to the respective project team. There will also be the option to report unplanned deliverables. Research-related deliverables will go through internal controls to ensure that they meet the required standards (i.e., compliance with science quality standards, ensuring proper metadata fields, proper licenses applied etc.). Once this is done, each deliverable will be pushed on DSpace (Publications) and Dataverse (data). It is recommended that project staff make deliverables Open Access, however, where there is reason to restrict access, staff will have the option to save deliverables internally and fix an embargo period if needed. The internal reporting process will include:

.
1) Quarterly progress reporting: This will be achieved through progress reports complemented by a recording of output-level indicator values in the MEL Platform. The MEL team will coordinate with country focal points and the project manager to collect and/or validate the data. The data shall cover: (1) a summary of all project activities, (2) progress over the previous three months showing targets and achievements, (3) highlighting significant key issues and challenges identified, and (4) lessons learned and recommended solutions to overcome the challenges. A quartertly meeting with the project team (including parteners) is recommended to generate learning and adaptive management. The indicator values on the status of output-level results will be recorded in MEL following the pre-recorded indicators.

2) Annual reporting: The MEL team in coordination with the focal points will collate and analyse the data collected trhopught the year at output and outcome level, as per results framework and in alignment with donor reporting requirement. The data will contribute to the drafting of the annual report.

3) Final monitoring, evaluation, and learning report: A final monitoring, evaluation and learning report will be submitted to reflect on (1) operational experiences, (2) results from

routine monitoring, and (3) results from periodic evaluations, taking full consideration of the project goal.

3.4.2 External Reporting (Donor)

WorldFish shall submit technical and financial reports to NORAD regarding the expenditure of the Project Funds and progress in achieving the outputs and outcomes for which the funding has been made, according to the Reporting Schedule set in the project agreement and following the reporting format provided by the NORAD. In order for the technical report to be deemed satisfactory, WorldFish must demonstrate achievement or meaningful progress towards the project outputs as set out in the project proposal. WorldFish will submit other reports at other times as the NORAD may reasonably request.

1. **Annual progress Report:** It will be submitted annually to assess project progress and cover technical and financial aspects of the project. Covering the period from January to December, the annual report shall be submitted to Norad by 15 April each year. For 2022 the reporting period shall be from the start of the support period to 31 December 2022. Each year an annual review meeting with Norad will be held in September before the annual report is produced. The report will be submitted and recorded on the MEL platfrom.

2. **Project Final Report:** At the end of the project, it is required a project completion report. The final report for the Support Period shall be submitted to Norad no later than 4 months after the end of the Support Period.

3. **Financial Report:** the financial report covering the period from January to December shall be submitted to Norad by 15 April each year.

4. **Audit report:** the report covering the annual financial statements of the project shall be submitted to Norad by 1 June each year.

The completed donor reports will be uploaded to the MEL Platform under the 'Donor Reports' section.

Table 3. Reporting workplan

	Proposed timeline (2022 – 2026)																			
	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Quarterly progress summary	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Annual progress donor report				■				■				■				■				■
Financial donor Report				■				■				■				■				■
Final monitoring, evaluation, and learning report																			■	
Final project donor report																				■

4. Roles and Responsibilities

The monitoring and evaluation of this project will involve personnel with different determined roles and responsibilities. At field level, there will be coordinators and staff for each of the countries involved in the project. They will be linked with partners that will provide support with development and implementation and collaboration with local research scientists. The field level coordinators and staff will also have direct communication with the project leader. They will also be linked with the Monitoring and Evaluation team at WorldFish headquarters in Penang, Malaysia. This team involves a Monitoring and Evaluation specialist, a data specialist, and a data and knowledge management team. Their work will involve data quality checks, internal monitoring, performance tracking, and knowledge sharing. The HQ staff will also provide support in utilizing digital tools to track and monitor performance of the project. A visual representation of the team can be found below.

Figure 3. MEL team organagram
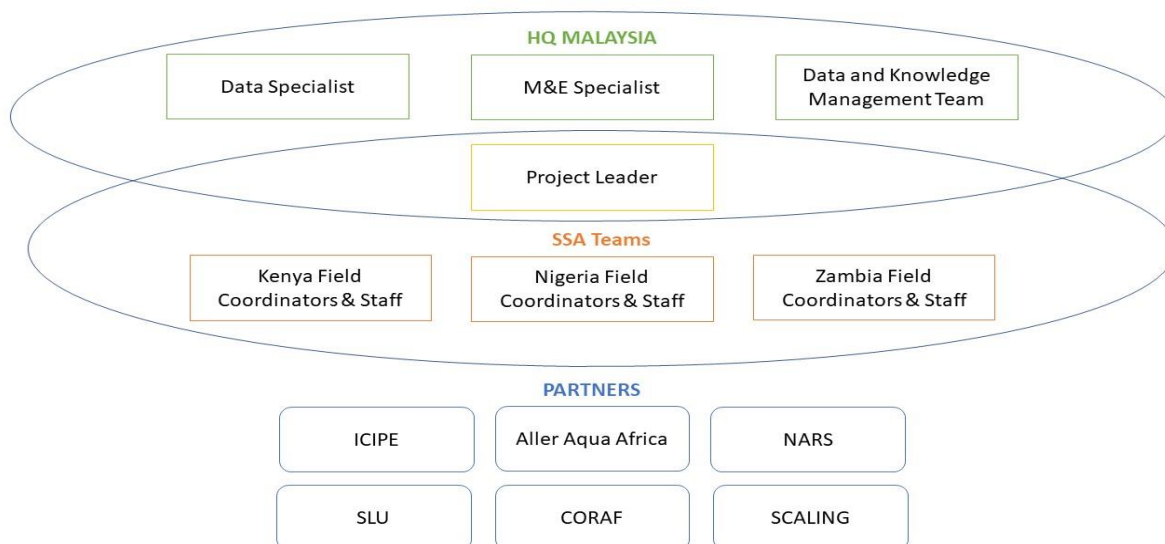
5. Data Management

To comply with the WorldFish Research Data and Open Access Policy, a Data Management Plan (DMP) (see Annex 1) will be created and share with the RDM team. Upon the submission of DMP, RDM Team will evaluate and check to see that all requirements stated in both WorldFish and NORAD data policies are comply.

All project data will be organized in a project data management folder as follow:

Table 4. Project data management

Folder name	Description
0. Disclaimer	WorldFish data disclaimer on usage of the data (This will be automatically be uploaded by admin)
1. Method documentation	Documentation relating to the methods that will be/were used in data collection
2. Questionnaires	Tools that were developed for data collection in the project

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3. Data collection tools	This can either be the forms that were developed for data entry of the field data e.g. CSPro data entry templates or xls files (field data collections using phones or tablets) if the project used ODK or any other mobile data collection method
4. Handbooks, Guides and Manuals	Handbooks, Guides and Manuals associated with data collection
5. Unpublished reports	Any unpublished reports relating to the project
6. Raw and verified data	The following should be uploaded here: • csv, stata, spss, R files for the raw data collected. • Cleaned and verified data should also be put here. • Calculated indicators can be also be put in this folder (the indicators should be accompanied by their variable descriptions)
7. Codebook	Descriptions of variables for the data collected.
8. Scripts	Scripts for calculating indicators should be put here with accompanying indicator report

Screenshot of the data folder is as picture below.

Figure 4. Data folder

5.1 Data Flow

A flow chart of the data as managed at WorldFish, can be observed on Figure 5.

Figure 5. Data flow chart
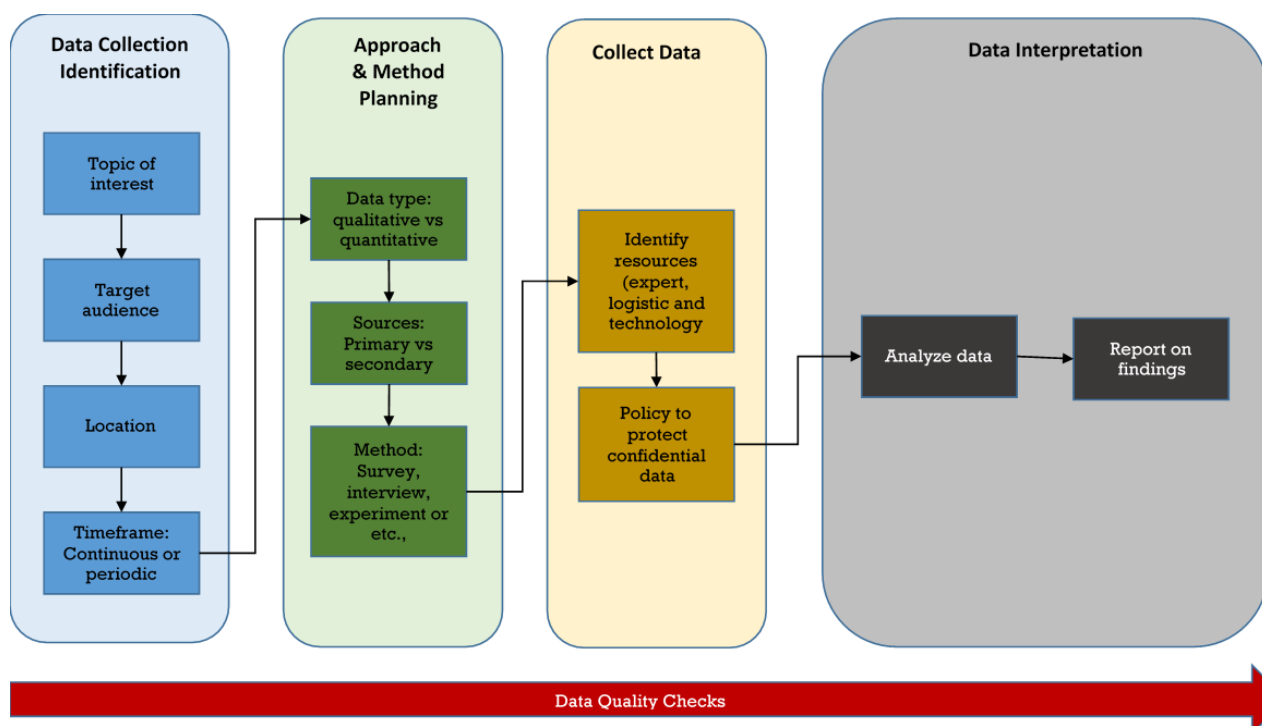
Data and Knowledge Management will be overseen by a Data Management and Open Access Officer (herein called Data Officer). The Data Officer will ensure that the data generated by the project is of a quality that meets Norad and CGIAR requirements, and that it can be relied upon for scientific writing.

5.2 Data Collection

To this end, the project will utilise mobile data collection technologies because of the scope for timely data quality checks, data traceability, and quick turnaround time, among others. WorldFish support digitalization, thus a digital approach is preferred. It is recommended to use a separate digital devices for this data collection process. Whenever necessary, a personal digital device will be use along with the administered guideline shared by the RDM Team.

Templates for output data collection will be designed and the project staff responsible for collecting the data will be trained. The MEL Specialist will routinely collate the data, record them in the MEL Platform, and utilise the same for routine technical progress reports required by Norad. Ad hoc templates and tracking methods will be put in to ensure key information is collected and reported properly.

Appropriate formats for organizing and storing collected data will be developed. Collected data will be stored mainly in soft copy and it will be primarily saved at the organization's cloud system and MEL platform. In
the process of data sharing, strict data protection and sharing policies will be follo wed to protect sensitive information and copyrights.

5.3 Data Storage

Knowledge and information generated by this project will be archived in WorldFish's Open

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repositories (DSpace, MELSpace and Dataverse) that enable discoverability of the products, allowing seamless knowledge sharing. All of the raw data store in the digital collection server i.e. Kobo Toolbox, Survey CTO or ODK Cloud will be transferred to RDM shared folder once finish with data collection process.

Dataset store in the Dataverse will be kept secure thanks to varieties of security enforce code. Dataverse has security measures in place to protect against the loss, misuse and alteration of the information under their control. In order to access data on dataverse, any user needs to have API keys (credentials). Without them, no data stored will be able to be shared or retrievce. The API is developed in a way that one can only query and retrieve data that they need. User actions (edit, delete and update) are limited with regard to the user's permission level. The communication between MEL and Dataverse is secure as it is under a Secure Socket Layer (SSL) that ensures that any traffic exchange between the two is encrypted.

5.4 Data Quality

Data Quality Assessment (DQA) will be implemented in three stages of data life cycle. These identified stages are during data collection, data entry and data analyzing.

Data collection
Actions required in this stage include:
- calibration of instruments to check the precision, bias and/or scale of measurement
- taking multiple measurements, observations or samples
- checking the truth of the record with an expert
- using standardized methods and protocols for capturing observations, alongside recording forms with clear instructions
- computer-assisted interview software to: standardize interviews, verify response consistency, route and customize questions so that only appropriate questions are asked, confirm responses against previous answers where appropriate and detect inadmissible responses

Digitisation and data entry
When data are digitized, transcribed, entered in a database or spreadsheet, or coded, quality can be ensured by standardised and consistent procedures for data entry with clear instructions. This may include:
- setting up validation rules or input masks in data entry software
- using controlled vocabularies, code lists and choice lists to minimize manual data entry
- detailed labeling of variable and record names to avoid confusion
- designing a purpose-built database structure to organize data and data files
- accompanying notes and documentation about the data

Data Analysing
Data checking is when data are edited, cleaned, verified, cross-checked and validated. Checking typically involves both automated and manual procedures, for example:
- double-checking coding of observations or responses and out-of-range values
- checking data completeness
- adding variable and value labels where appropriate

- verifying random samples of the digital data against the original data
- double entry of data
- statistical analyses such as frequencies, means, ranges or clustering to detect errors and anomalous values
- correcting errors made during transcription

5.5 Data analysis, use and dissemination

Data will be analyzed according to specific quantitative and qualitative techniques. The project will use visualization software to conduct analysis and produce visualizations to enhance data use. Visualizations include maps showing variations within project sites to compare performance. These analyses will highlight areas for further project intervention. The project generates analyses and graphical presentations of the relevant indicators vs targets. Other analyses include all indicators disaggregated by gender and age, coverage based on catchment populations, site comparisons, and aggregation of site data for input.

Data will be used to provide information on the success of inputs in producing outputs, and the success of outputs in achieving impact and sustainability. This will enable decisions to improve future project actions.

Researchers are required to ensure that all of the research data are freely accessible through the publisher's website or WorldFish repository on WorldFish Dataverse in accordance with the WorldFish Research Data and Open Access Policy. These data may include raw and verified data, codebook, questionnaires, software code, algorithm's scripts, data collection tools, method documentation, databases, handbooks, guides and manuals, geospatial coordinates, reports and articles or any other relevant material. In order to provide information about the content and the context of the research, each dataset must include a complete Data Dictionary. The Data Dictionary must include the following two elements:
- DataDictionary_Metadataform: the file provides background explanatory information about the dataset (see Annex 2).
- DataDictionary_ElementDescription: the file provides explanation for each variable/column and any code used inside the dataset.

The project will adopt the 'Creative Commons – Attribution – Non- Commercial – License' (CC BY-NC) or 'Creative Commons – Attribution License' (CC BY AL) for the copyrighted materials produced in this project. This will allow the copying and redistribution of material while acknowledging the project, WorldFish, and Norad.

6. Learning and Adaptive Management

6.1   Learning

A well-thought implementation plan ensures timely and judicious execution of a project. While executing, there are different levels and layers that a project needs to take care of from inputs to processes, to outputs, to outcomes, to impacts. Each level involves a certain level of ambiguity and complexity while achieving results. Nevertheless, at each level, there are loops that feed data and information into the subsequent loops. This data can be used for learning. Learning is a term that takes many shapes at different levels. However, the crux of learning is to make sure that the evidence and data collected guide the project team into a better decision that results in the achievement of targets and goals. The literature defines

"*Learning is the intentional process of generating, capturing, sharing, and analyzing information and knowledge from a wide range of sources to inform decisions and adapt programs to be more effective*".

The Learning agenda for FASA is embedded in the activities carried out for the project implementation. The routine collected data and evidence will serve to inform management in taking better decisions and adapting as and when required. Learning opportunities at different levels of project implementation are framed and linked to adaptive management.

The project team will document, share, and make use of lessons learned for continuous project improvement. The project criteria for identifying lessons learned will be as follows:

a. Lessons that are relevant/related to the **project thematic areas**;
b. Lessons that demonstrate a **clear cause-effect relationship between project actions and results realized**;
c. Lessons whose recommendations have a bearing on **project relevance, effectiveness, efficiency, sustainability, and impact**.

6.2   Adaptive Management

The evidence and data generated through Learning are utilized for effective and better decision-making. This improved decision-making process, following defined steps, is known as adaptive management. Adaptive management is "*an intentional approach to making decisions and adjustments in response to new information and changes in context*". For adapting, many aspects need attention and focus on what was learned and how it impacted management's ability to decisions making. The global COVID-19 pandemic proved that the context matters a lot and it changes so rapidly. Learning allows collecting data and evidence on all the changes happening in the context of a project. This evidence then helps the project team to utilize it for better and improved decision-making. The following sub-sections briefly outline what aspects and levels the FASA project team will focus on learning and adaptive management.

Learning and adaptive management will be based on (1) activities-based lessons learned, which capture more periodic activities happening annually during the implementation of the project, and (2) research-based learning which is more of a periodic, reflective process that focuses around revisiting the ToC.

6.2.1   Activities-based Lessons Learned

6.2.1.1   Review/Assessment/Scoping Studies

The project will conduct a range of review/assessment/scoping studies in the first half of the implementation. These studies will generate a lot of evidence and data. Initially, this will be an opportunity for the project team to constitute mechanisms that helps project team members to feed this into a learning loop. The initial learning loop can be a single loop to avoid complications. The evidence generated from the studies will help not only to analyze the current situation but identify gaps those needs to be filled throughout project implementation. Keeping data stored and archived in a manner that the data is easy and

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readily available would be ensured to build a log for data. The MEL Specialist along with the Project Manager will ensure that all publications and products generated by the project should be available in the data repository of WorldFish.

6.2.1.2   Staff Meeting and Project Review Workshop Pause-and-Reflect sessions:

The Project Manager will ensure that pause-and-reflect sessions are incorporated in regular staff meetings, as well as during the Annual Project Review Workshop. These sessions will focus on three questions:

a. What went right, why, and things that worked that can be continued/repeated
b. What went wrong, why, and things that didn't work that should be avoided/discontinued
c. What needs to be improved

Through discussion and brainstorming during these meetings, the meeting chair will seek to determine whether any of the discussed experiences are worth documenting as a lesson learned. The chair or a volunteer from the meeting shall fill out the Lessons Learned template and submit it to MEL staff, who will review all submitted activities-based lessons learned documents and provide guidance and feedback to project staff within 14 days. Completed Lessons Learned Report Templates will be uploaded onto the MEL Platform by project MEL staff. The MEL Specialist will review the submitted lesson learned and provide feedback to the project MEL staff and/or approve the lesson learned. The MEL Specialist will approve each lesson learned either internally or in public sharing.

6.2.1.3   Annual Project Meeting and Outcome Monitoring Studies

The FASA project team will convene for an in-person annual meeting. In the annual meeting, the FASA project team will meet the donor. This meeting is an opportunity for the project team and the donor to discuss the available evidence that helps the project team to take corrective measures and ensure the activities are on track and as planned. In these meetings, corrective measures might be taken or discussed if there needs a different direction and requirement for a change in the scope of the project based on the evolving context. The MEL Specialist will share the evidence gathered on learning with the project team and donor. The collective wisdom should be reflected by both parties to make prudent decisions based on data and evidence.

6.2.1.4   Strategic Collaborations – stakeholders and partners workshops

The FASA will carry out project implementation with partners and stakeholders. Partners in the intervention countries are well placed to generate the evidence required for learning. However, they will need clear guidance from the project team. These partners include various organizations and academic entities that operate in three African countries. There are plans for annual stakeholders and partners workshops in three countries. These workshops will provide an opportunity for the project team to build strategic collaborations with stakeholders and capture the learning that occurred in the previous year of implementation. This will be a time where the evidence generated from the pause and reflect meetings should be discussed, validated, and affirmed.

6.2.2 Research-Based Lessons Learning

6.2.2.1 ToC Review and Adaptation

The theory of change (ToC) was developed based on an understanding of how change may happen as a result of the project activities, based upon multiple assumptions, hypotheses, and linkages. However, it is recognized that the understanding of change and the realities of project implementation are not static. Therefore, the project team will routinely test, revise, and adapt the project ToC.

The project team will organize a one-day meeting to review and refine the ToC with project staff and stakeholders at two points: (1) after the first three months of the project and (2) after the first year of project implementation, during the Annual Project Review and Planning Workshop.

For the ToC Review process, the meeting participants will break into groups, making sure that each group includes members with a breadth of expertise and knowledge. The breakout groups will discuss key questions related to (1) the relevance of outcomes in the ToC, and (2) the rationale of the outcomes and causal pathways. For each outcome, groups should document responses to the following questions:

1. **Relevance of outcome:**
   a. Is the outcome still relevant? If yes, maintain; If no, delete and document the irrelevant ones and include any new ones.
   b. Is the outcome still achievable within the ICARDA and partners' technical and operational capability, and the available project resources?
   c. Are the output results critical for achieving the corresponding outcomes?
   d. Are the associated outputs actionable?

2. **Rationale of outcomes and causal pathways:**
   e. Do the assumptions still hold? If yes, no need to review them; If no, revise the assumptions and the associated risk analysis and risk mitigation measures.
   f. Are there shifts in the risks of the 'unchanged' assumptions? If yes, document these and design appropriate risk mitigation actions.
   g. Do we now have better or worse evidence for the assumptions made? If better, document. If worse, how can we seek/generate better evidence?

3. **Final assessment**
   h. Which of these outcomes do you predict will be at risk of insufficient evidence and why?
   i. Which of these outcomes have knowledge gaps (insufficient evidence to support the preconditions, assumptions, linkages, and activities) and therefore should be the basis for a learning action plan?

It is recommended that the initial group of people that conduct ToC analysis does not exceed five. If a review meeting is comprised of more than five people, create breakout groups of equal numbers, with a mix of specializations. The meeting facilitator should spend some time checking on the groups, ensuring that varying viewpoints are considered, and

consensus generated. The meeting facilitator will collate the information from all groups and share the joint ToC analysis responses with the project MEL staff, who will make final ToC revisions in consultation with the MEL Specialist. Changes made in the project ToC will be communicated back to the project staff and donor with clear justifications.

List of figures

List of tables

Monitoring, Evaluation and Learning (MEL) Plan

Annex 1

WorldFish Data Management Plan - Template	
Introduction and Context	
Project Title	Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)
Donor/Funding Agency	The Norwegian Agency for Development Cooperation (NORAD
Grant ID	SAF-21/0004
Project Lead Centre	WorldFish
Participating Centre(s)	
Project Start Date	Friday, 1 July, 2022
Duration of the project	5 years
Principal Investigator; PI Email	Rodrigue Yossa; r.yossa@cgiar.org
Project Data Lead; Email	Data Management and Open Access Officer (Data Officer)
Policies and Guidelines	
Describe your Open Data approach and agreements to implement WorldFish Open Access policy	All of the research data will be deposited and archived in the WorldFish repository on WorldFish Dataverse.
Does the Donor/Funding Agency have an open access and data management policy?	Yes
If, yes, please link it here	Research (norad.no)
Data Generation	
Describe the nature and scope of the data that will be generated under the project.	In 5 years (2022-2027), different datasets will be generated each year based on the activities, outputs and outcomes Data generation: • New knowledge on type, price, and seasonality of local ingredients used in animal (fish) feeds produced in 3 project countries. • Gender and social assessment in 3 project countries • Climate change and environmental assessment in 3 project countries • Market trend assessment of feed derived from local ingredient in 3 project countries • Nutrient requirements in improved strains of tilapia and African catfish • Biochemistry analyses of ingredients samples • Digestibility experiments of ingredients samples

Monitoring, Evaluation and Learning (MEL) Plan

	• Validation of formulated feed fish through on-farm pilots • Scaling assessment in 3 focus countries • Stakeholders and farmers interview for scaling the use of the project's innovations and knowledge
Use of pre-existing/secondary data?	No
If yes, provide link to the datasets	Dataset 1: Dataset 2: Dataset n:
Geographic coverage of the data	Malaysia, Nigeria, Zambia, Kenya, Sweden
Data Collection and Entry	
How will you capture/create data	☒Experiments ☒Interviews ☒Surveys ☒Mobile data collection ☐Other : _____
What support be needed in creating the data collection templates?	• General support in the metadata collection template design • Ensuring that the data generated by the project is of a quality that meets Norad and CGIAR requirements • Training on the data collection, cleaning, and storage in Dataverse
Sensitive Data	
Will the project be collecting sensitive data?	Yes (eg: interview's respondent personal data, GPS data)
How does the project plan to deal with sensitive data?	All of the sensitive data will be anonymized upon data publication
Short Term Storage and Back up	
Where will the data be stored in the short term?	Data storage using digital platform, soft copy, WF shared folder (one drive), SPSS, KoBo toolbox
Who will be responsible for the data storage?	MEL data officer
Where will the data be backed up?	Cloud storage (WorldFish OneDrive) and external hard drive
Open Data	
What repository will the project use to archive and share the data? (Use World Fish's Dataverse by default).	Knowledge and information generated by this project will be archived in WorldFish's Open repositories (DSpace, MELSpace and DataVerse),
Timelines	

Deadline for metadata creation and data public access	Deadline for metadata creation is 12 months after completion of each data collection and data public access upon publication is produced.
Budget	
Describe the anticipated total costs involved with making data widely available (if any):	3000 USD per manuscript; expect 14 manuscripts, total about 42,000 USD
What other additional resources or support will be required for the implementation of this plan?	Not applicable

Annex 2

Metadata fields

*Represents the Required fields

Metadata Fields		
	Description	
Title*	Official/unofficial title of the information product	
Creator*	Author(s) responsible for the information product	
Creator ID	(ORCID ID if applicable)	
Creator Affiliation*	Affiliation of the creator e.g. WorldFish	
Subject*	Domain-specific Subject Categories that are topically relevant to the information product e.g. Social Science, Life Sciences	
Keywords	Subject matter of the research e.g. Fish Single words or short phrases. Use controlled vocabularies e.g. AGROVOC, GACS	
Subject; Vocab	Vocabulary used for each term e.g. "vocab=AGROVOC"	
Description*	Abstract; Description of the information product	
Publisher*	Entity responsible for publication, distribution. E.g. WorldFish	
Contributor*	Person, organization making contributions to the information product e.g. IRRI, FISH CRP	
Contributor Type*	Type of contributor e.g. Project lead center, partner, donor, project	
Date*	**Production date:** Date information product was created in its final from to be published	
	Distribution date: In cases when information product has an embargo, this date indicates when it would be available	
Identifier of related publications*	Reference to the information product e.g. DOI, URL that based on this dataset	
Language	Language of the information product	

Coverage	Geospatial coordinates, country, region	
Coverage X	The X coordinate in geospatial coverage	
Coverage Y	The Y coordinate in geospatial coverage	
Time Period Covered	Time period to which this data refer	**Start :** **End :**
Date of Collection	Contains the date when data were collected and ended	**Start :** **End :**
Kind of Data	Type of data included in the file e.g. survey data, clinical data, experimental data, observation data,	
Software	Information about the software used to generate dataset e.g. ODK/ KoBo, STATA, SPSS (provide version is applicable)	
Rights	Rights/terms of use identifying level of open access. E.g. CC BY 4.0	
Contact*	Point of contact for anyone who has questions about dataset/information product	
Contact email*	Holds email of the contact	