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Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)

Annual Technical Report

April 2023, WorldFish Penang, Malaysia

In partnership with

icipe CORAF SLU Swedish University of Agricultural Sciences ALLER AQUA ZAMBIA Natural Resources Development College

Annual Technical Report

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Section A

Background

Project title: Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)

Project goals: 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.

Project objectives: Developing and increasing access to local, sustainable ingredients and formulating novel fish feeds from Sub-Saharan Africa countries (Zambia, Nigeria, and Kenya), done in a socially and environmentally responsible manner that responds to sustainability, climate change, as well as gender and social inclusion issues.

Project outcomes/output:

The project has 3 main expected outcomes with several outputs:

- **Outcome 1**: Enhanced capacity of at least two stakeholders' groups in the 3 target countries to integrate best practices toward a more sustainable feed sector and improve their capacity and to adopt new knowledge on nutrient requirements of multiple improved strains of tilapia and African catfish.
    - **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.
    - **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 derived from (novel) local ingredients.
    - **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 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.
    - **Output 1.5**: New knowledge and data on nutrient requirements of improved strains of tilapia and African catfish produced, validated, and made widely available.
- **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 at least 27 improved cost-efficient feed formulations to improve aquaculture productivity and resilience.
    - **Output 2.1**: New data and knowledge on local ingredients generated, used in the formulation of novel fish feeds, and made widely available.
    - **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 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 consider context specific circumstances and needs.

- **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 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.
    - **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 3.3**: Strategic capacity development and public awareness campaigns delivered to widely disseminate knowledge, innovations, and tools developed by the project.

Section B

Implementation progress

Project expenditure

Total project budget	Year 2022
Funds received	80,000,000
Expenditure (as of December 2022)	2,066,805
Balance	77,933,195

As of December 2022, a total of NOK 2,066,805 has been spent out of the NOK 80,000,000 budget approved by Norad, leaving a budget balance of NOK 77,933,195 for the for the FASA project. The expenditure were accrued on personnel (NOK 1,273,873), travels (NOK 8362), consultants (NOK 30,732), communications and publications (NOK 1099), training and workshops (NOK 307,229), purchase of equipment (NOK 130,955), specific project-related costs (NOK 29,069), operating costs (NOK 112,400), indirect operating costs (NOK 132,560), and CGIAR consortium costs (NOK 40,526), as presented in the attached annual financial report of the FASA project (Appendix 1).

Physical progress by component/output

Project start-up activities

The project start-up activities for the FASA project planned for the first project year included 1) to conduct internal WF project management start-up meetings, 2) to negotiate, prepare, and sign project agreements with key partners, 3) to conduct general project management start-up meeting (including partners), 4) to develop hiring plan for project, 5) to recruit new staff, 6) to recruit 2 PhD students (Nigeria & Zambia) and 10 MSc students (Kenya), 7) to conduct project start-up workshops (1 global and 1 per project country for a total of 4), 8) to develop detailed project communications plan, project messaging guide, and project templates, and 9) to develop detailed monitoring, evaluation, and learning (MEL) plan.

1. Conduct internal WF project management start-up meeting
   The kick-off meeting of the FASA project took place online on the 5th August 2022 and lasted about two hours. Seventeen WorldFish staff attended this meeting. During the meeting, the overall project description, project results framework, project implementation plan, partners, contractual responsibilities, and project budget and timeline were thoroughly discussed with the participants. At the end of the meeting, responsibilities were given to existing key project staff to start the project implementation, as per the approved implementation plan.

2. Negotiate, prepare, and sign project agreements with key partners
   Following the approval and signing of the FASA project, WorldFish started the conversation with the project partners regarding the subgrant agreement. As of the 31st of December 2022, four subgrant agreements were signed with the project partners, including ALLER AQUA Zambia on 9th October 2022, ICIPE on the 3rd November 2022, SLU on the 5th December 2022, and CORAF on 12th December 2022. These subgrant agreements are presented in the Appendix 2. The negotiation on the subgrant agreement with NRDC and the selected consulting firms, INCLUDOVATE and NAGI ENTERPRISE is ongoing, and the signing will take place in 2023. The scaling partner has not yet been selected by WorldFish, but this will be done in 2023.

3. Conduct general project management start-up meeting (including partners)
   WorldFish conducted a project management start-up meeting for the FASA project on the 13th of July 2022, in a hybrid mode (in person and online). Eighteen people attended this workshop, including seven people from WorldFish, one person from ICIPE, three people from CORAF, one person from Aller Aqua Zambia, two people from SLU, three people from NRDC Zambia and an invited gender expert. During the workshop, the overall project description, project results framework, project implementation plan, partners, contractual responsibilities, and project budget and timeline were thoroughly discussed with the participants. At the end of the meeting, WorldFish committed to start engaging with each partner, for the negotiation and signing of the sub-grant agreement and the effective start of the FASA project. The minutes of the workshop are presented in the Appendix 3.

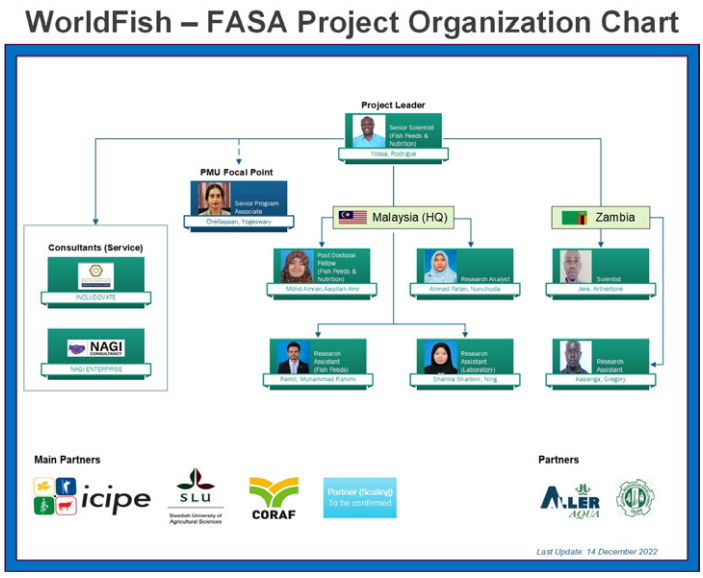
4. Develop hiring plan for project
   The Human Resource Department of WorldFish developed a hiring plan for seven new positions, including five new staff positions and two consultant positions; the former included the Scientist (Fish Feeds and Nutrition) and Research Assistant positions in Zambia, and the Postdoctoral/Scientist and two research assistant positions in Malaysia, while the latter included the gender and climate change consulting firms to support the FASA project in Zambia, Kenya, and Nigeria. The hiring plan of the FASA project was aligned with the Human Resources policies of WorldFish and the OneCGIAR. The details on the hiring plan, including the positions, location, hiring type, job descriptions, duration of the contract and target hiring dates and recruitment timeline are presented in the Appendix 4.

5. Recruit new staff
   WorldFish hired four new staff in 2022 to complete the existing three technical staff assigned to the FASA project. The new staff included Dr. Arthertone Jere (Scientist) and Mr. Gregory Kasanga (Research Assistant) in Zambia, Dr. Aaqillah Amr Mohd Amran (Postdoctoral Fellow) and Mr. Muhammad Rahimi Ramli (Research Assistant) in Malaysia. A fifth staff, Ms. Ning Shahira (Research Assistant) accepted WorldFish's offer but was only available to join WorldFish in February 2023.

   The two consulting firms contracted by WorldFish to implement the gender and the climate change activities of the FASA project included INCLUDOVATE and NAGI ENTERPRISE, respectively.

   The hiring of the staff and Consultants for the FASA project was aligned with the Human Resources plan of WorldFish and the OneCGIAR.

   The organogram of the FASA project as of the 31st of December 2022 was as follows:



   The details on the implementation of the hiring, information on the new staff hired and the effective date of starting the new positions in 2022 are presented in the Appendix 4.

6. Recruit 2 PhD students (Nigeria & Zambia) and 10 MSc students (Kenya)
   Discussions on the candidate profile, job description and timeline for hiring the PhD students were discussed between WorldFish, SLU and ICIPE in 2022, and the recruitment of the two PhD students and ten MSc students will take place in 2023, as per the Project Implementation plan.

7. Conduct project start-up workshops (1 global and 1 per project country for a total of 4)
   The global project start-up meeting for the FASA project took place on the 13th of July 2022, as discussed above. Following this global workshop, the Zambia country start-up workshop took place on the 20th of December 2022 in a hybrid format (in person in WorldFish Zambia Office and online).

   Fifty-nine people attended this workshop, including the project partners, representatives from the Government Departments and agencies, the private sector, and the civil society. During the workshop, the overall project description, results framework, implementation plan, partners, and timeline in Zambia were thoroughly discussed with the participants. At the end of the meeting, WorldFish committed to start engaging with local partners an effective implementation of the FASA project in Zambia. The minutes of the workshop are presented in the Appendix 5.

8. Develop detailed project communications plan, project messaging guide, and project templates
   In 2022, the WorldFish Communication Team started the production of the project communication plan and the messaging guide, but these documents will only be completed in 2023. However, the Microsoft PPT and scientific report templates of the FASA project were developed and shared with the project partners. Moreover, the FASA project roll-up banner was produced and printed, and one roll-up banner was sent to each of the project countries in Africa.

9. Develop detailed monitoring, evaluation, and learning (MEL) plan
   The monitoring, evaluation, learning and impact assessment team of WorldFish produced the monitoring, evaluation, and learning (MEL) plan, using the project description, result framework and implementation plan. This 40-page MEL plan has been published, is available online (https://hdl.handle.net/20.500.12348/5308) and can be cited as follows: Cullhaj M., Ceccarelli. V., Burcham L. Ali A. S., Ghazali S., Manyise T., Yossa R., Dam Lam R., 2022. Monitoring, Evaluation and Learning (MEL) Plan Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Africa (FASA) project 2022-2027. Penang, Malaysia: WorldFish. The MEL plan for the FASA project includes, among other topics, the project results framework, monitoring and evaluation plan, internal reporting, external reporting (donor), roles and responsibilities, data management, and the learning and adaptive management. The detailed MEL plan for FASA Project is presented in the Appendix 6.

Cross-cutting/regular activities

The cross-cutting/regular activities of the FASA project planned for the first project year included 1) procurement and transfer of project materials, 2) annual project meetings (rotating countries), 3) monthly internal WorldFish meetings, and 4) regular project phone calls/online meetings.

1. Procurement and transfer of project materials
   As of the 31st December 2022, the Procurement Team of WorldFish purchased five laptops (two for WorldFish Zambia and three for WorldFish Malaysia), two tablets (one for WorldFish Zambia and one for WorldFish Malaysia), two oxy-thermometers (one for WorldFish Zambia and one for WorldFish Malaysia), two weighing scales (one for WorldFish Zambia and one for WorldFish Malaysia) and two GPS (one for WorldFish Zambia and one for WorldFish Malaysia), as per the procurement plan of the FASA project. The procurement process used was aligned with the procurement policies of WorldFish and the OneCGIAR.

2. Annual project meetings (rotating countries)
   The first annual workshop of the FASA project took place from the 28th to 29th of November 2022 at WorldFish HQ, Penang, Malaysia, followed by a site visit to Fisheries Research Institute Malaysia, Pulau Sayak and Jitra Aquaculture Extension Centre in Kedah on the 30th of November 2022. The first two days

of the workshop was conducted both in-person and virtually (hybrid) to accommodate the participants who could not attend in person. The purpose of the 2022 Annual workshop was to bring together project partners to meet in person, discuss the overall project goal and the specific project activities in each country, and conduct the 2023 annual planning for the FASA project. Thirty participants and twenty-five participants attended the first and second day of the workshop, respectively. The participants were representatives from the West and Central Africa Council for Agricultural Research and Development (CORAF), International Centre of Insect Physiology and Ecology (ICIPE), Swedish University of Agricultural Sciences (SLU), Aller Aqua Zambia Limited, INCLUDOVATE (Consultant for Gender and Social Inclusion), NAGI Enterprise (Consultant for Climate Change and Environmental Assessment), WorldFish Zambia office and WorldFish Headquarters Malaysia.

The details on the agenda, presentation, discussions, and deliberations are presented in the workshop report, which is in the Appendix 7, and can be cited as follows: "WorldFish. 2023. Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA). Annual Workshop Report: WorldFish. Workshop Report".

3. Monthly internal WorldFish meetings
   Since the inception of the FASA project, WorldFish conducted monthly internal project meetings, to monitor the project implementation. One of the outcomes of these monthly meetings is the request for the adjustments in the implementation plan, which were all approved by Norad in 2022.

4. Regular project phone calls/online meetings.
   WorldFish maintains a close communication with the project partners and potential beneficiaries of the project. For instance, WorldFish Project Leader meets virtually with SLU, CORAF and ICIPE on a quarterly basis, and the Project Leader communicates on a weekly basis with the Focal points of the FASA project in those partner institutions.

Communications activities (in addition to project start-up and outcome 4)

The Communications activities of the FASA project planned for the first project year included 1) develop and release project launch press release, 2) develop project webpage and update regularly, 3) fish-for-thought events (themed lectures and talks), 4) produce 4 blog posts per year, 5) produce 2 social media updates per month, 6) produce 2 case/success stories per year, 7) produce 1 photo story per year, and 8) publish and circulate project newsletters.

1. Develop and release project launch press release
   The press release announcing the approval of the FASA project by Norad was published by WorldFish Communication Team in July 2022 and can be found at : https://www.worldfishcenter.org/press-release/press-release-worldfish-partners-norad-develop-low-cost-and-highly-nutritious-aquatic. This press release was then share on many social media platforms, including LinkedIn, Twitter, and Facebook.

2. Develop project webpage and update regularly
   The structure of the webpage of the FASA project was developed by WorldFish Communication Team 2022 and can be found at : https://www.worldfishcenter.org/project/development-and-scaling-sustainable-feeds-resilient-aquatic-food-systems-sub-saharan-africa. This webpage will be finalized in 2023.

3. Fish-for-thought events (themed lectures and talks)
   The first session of the Fish-for-thought events for the FASA project will take place in 2023, as per the implementation plan.

4. Produce 4 blog posts per year
   The first blog post of the FASA project was published in 2022 and can be found at: https://www.worldfishcenter.org/blog/developing-sustainable-aquatic-feeds-resilient-aquatic-food-systems-sub-saharan-africa. The other blog posts will be published by June 2023.

5. Produce 2 social media updates per month
   The social media updates were achieved each month in 2022, as per the implementation plan, including:

   (i) Featured in 3 Twitter promotional blasts:
   https://twitter.com/WorldFishCenter/status/1552568334847287298?s=20&t=gTUz8HZ-dIBcDNlOmAQ5zg
   https://twitter.com/WorldFishCenter/status/1550390601186770951?s=20&t=gTUz8HZ-dIBcDNlOmAQ5zg
   https://twitter.com/WorldFishCenter/status/1577573105974878208?s=20&t=gTUz8HZ-dIBcDNlOmAQ5zg

   (ii) Featured in 3 Facebook promotional blasts:
   https://www.facebook.com/worldfishcenter/posts/pfbid0Ty2bipi87sehn1fBgnJY5E5jgFmDvKSKp9MgkCS15thsfpnAFwJhW4tqimFVw637l
   https://www.facebook.com/worldfishcenter/photos/a.111238691762/10160311852161763/
   https://www.facebook.com/worldfishcenter/photos/a.111238691762/10160302424716763/

   (iii) Featured in 3 LinkedIn promotional blasts:
   https://www.linkedin.com/feed/update/urn:li:activity:6983365273806397440
   https://www.linkedin.com/feed/update/urn:li:activity:6958360515265929216
   https://www.linkedin.com/feed/update/urn:li:activity:6956186179998285824

   (iv) Featured in 2 WorldFish promotional newsletters (not part of requirement but was done as it was a good project to showcase for Earth Day & Quarterly Dive – July to Sept):
   https://mailchi.mp/cgiar/international-campaign-2022-earth-overshoot-day-1194767
   https://mailchi.mp/cgiar/quarterly-dive-q32022

6. Produce 2 case/success stories per year
   Two case/success stories will be published by June 2023, as per the implementation plan.

7. Produce 1 photo story per year
   One photo story will be published by March 2023, as per the implementation plan.

8. Publish and circulate project newsletters.
   Newsletters will be published by June 2023, as per the implementation plan.

Outcome 1: Enhanced capacity of at least two stakeholders' groups in the 3 target countries to integrate best practices toward a more sustainable feed sector and improve their capacity and to adopt new knowledge on nutrient requirements of multiple improved strains of tilapia and African catfish.

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.

WorldFish

The hiring of the Scientist and Research Assistant based at WorldFish Zambia office was completed in mid-November, and as of the 31st of December 2022, the two staff had conducted literature review on the type, price, and seasonality of local ingredients used in animal (fish) feeds and drafted the research protocol for the ingredient and feeds scoping study in Zambia.

ICIPE

ICIPE signed the subgrant agreement with WorldFish on the 3rd of November 2022. As of the 31st of December 2022, ICIPE had not yet mobilized the human resources (Postdoctoral Fellow and MSc students) who would conduct the ingredient and feeds scoping study in Kenya. However, ICIPE took the initiative to conduct a pre-scoping assessment titled "Baseline report on fish farming in Busia, Siaya & Kakamega Counties" The following is the summary of the report of this unplanned, yet important, pre-scoping assessment in Kenya:

Executive summary

The aim of the baseline survey was to assess the current knowledge, status, and attitudes of the aquaculture farmers towards aquaculture feeding and utilization of insect proteins in feeding of fish in Busia, Siaya, and Kakamega counties. The survey was conducted from 14th – 18th of November 2022 in all the target counties using specific tools that were designed ahead of the survey. The main tool was an online Open Data Kit (ODK) platform that was fed with questionnaire and transferred to android phones for enumerators (field officers and representatives of the beneficiary groups). The questionnaires were pre-tested before the actual data collection was done. Training of the enumerators was done before the survey to familiarize them to the questionnaire contents and administration and to the online platform for data collection. Over 220 respondents were surveyed in the three target Counties. The results showed that Tilapia (93.2%) was the most popular species farmed followed by catfish (12.2%). Most farmers (70.7%) harvested their fish once yearly. Majority of fish farmers obtain their feed supply from other farmers (15.2%), private companies (10.8%) and only 5.8% produce their own fish feeds. Most of the farmers use compounded feeds (65.5%) to feed their fish while only 5.8% of the farmers reported to use insects to feed fish. Majority of the farmers (more than 50%) generally have good attitudes towards the utilization of insects and their products in fish feeds. The farmers also showed high levels of awareness regarding the use of insect fed fish. Over 50% of farmers indicated that they either agree or strongly agree to use the use of insect proteins to feed their fish. However, the farmers indicated that facilitating factors such as availability, information, and reliability were key factors influencing their willingness to utilize insect proteins in feeding their fish. These results indicate the potential of insect proteins to improve the nutrition of fish in the project target areas. The farmers were willing to embrace the technologies and project will strive to implement various technologies, innovations, and management practices (TIMPs).

Source of fish farming inputs

There are many inputs required for successful smallholder fish farming. However, this study considered only the source of fingerlings, feed, and technical/advisory services. The suppliers of the various fish farming inputs included the government, private companies, other farmers, and self-production. The results of the study show that the government is the highest supplier of fingerlings (25.6%) to the farmers followed closely by the private companies (22.9%) and other farmers (22.4%). Only 0.4% of the fish farmers in the three counties of Busia, Kakamega and Siaya produced their own fingerlings. The study found that most of the farmers sourced fish feeds from other farmers (15.2%) followed by the private companies (10.8%). The farmers indicated the government as the source of feed at only 3.6%. However, a good number of the farmers also produced their own feed for their fish (5.8%) and a combination of self-production, private company and other farmers was indicated to be a source of feed at 6.3%. During the study, the quality of the feed supplied by the various sources was not ascertained but this always as a bearing on the production of the fish. The quality also likely to have a big range as it was witnessed that the farmers use various kinds of feeds to feed their fish. Some farmers who source their feed from private companies are likely to have better quality feeds for their fish since these feeds are complete feeds formulated to meet the nutrient requirements of the fish. Some home-made feeds for the fish are either single ingredients used on feed formulation such as maize bran or household food left-overs; these may not be balanced to meet the nutrient requirements of the fish for optimal growth and production.

The government was the single most important source of technical/advisory services for the farmers (34.1%). The farmers also identified a combination of a combination of government and private sector as a substantial (12.0%) source of extension services. Other combination sources of technical or advisory services were the government and other farmers (1.7%) and government, private companies, and other farmers at 3.9%.

Type of fish feed frequently provided to fish

The quality and quantity of fish feeds used to feed the fish determine the aquaculture production to a large extent. The cost of aquaculture production also influenced by feeding by over 70%. This study therefore sought to find out the kind of feeds used by the farmers in the three counties of Busia, Kakamega, and Siaya. The study found that most of the farmers use purchased feeds (85%) to feed their fish, while only 1% used home-made feeds. However, 12% of the farmers use a combination of both purchased and home-made

feeds to feed their fish. The study found that in the last production cycle, most farmers used complete compounded feeds (65.5%) and dry supplements (63.2%) and only 10.3% used wet supplements to feed their fish. Among the energy sources, maize bran (9.9%), maize germ (7.6%), wheat bran (7.6%) and wheat pollard (1.3%) were the most used by the farmers to feed their fish. Protein quantity and quality is critical in the growth of fish and therefore the source of protein for the fish is important. The protein fraction in the fish feeds is also the most expensive. These issues give protein sources in fish feeds prominence from both nutritional and economical standpoints. The results of the baseline study found that the fish farmers in the three counties use a variety of protein sources to feed their fish. The most used protein source is the freshwater shrimp (commonly referred to as "Ochonga") at 45.3%. The other protein sources include fishmeal (17.9%), dry poultry waste (9.4%), Sardines (Omena) (6.7%), insects/earthworms (5.8%), legume residues (5.4%), sunflower cake (4.4%), blood meal (5.4%), soybean meal (3.1%). Cotton seed cake (2.7%) and sesame seed meal (1.3%). These results indicate that the farmers are mostly using animal-based protein sources to feed the fish compared to the plant-based proteins. The animal-based protein sources are usually of better quality i.e., better balanced for the essential amino acids, compared to the plant-based protein sources. However, their utilization depends on the availability of other nutrients such as energy, essential fatty acids, minerals, and vitamins. Interestingly, while 5.8% of the farmers reported to have used insects to feed their fish, more farmers i.e. 17.5% are aware of insect-based feed for fish. The farmers indicated that the sources of this information about insect-based fish feed are the research institutions, government, media (TV, radio, and newspapers), private extension providers and farmer groups. This information is important as it provides a good platform for deployment and dissemination of the current TIMPs being validated about insect production and subsequent use in formulation of diets for feeding of fish in the project areas.

Attitudes towards utilization of insects in fish feeds

The survey sought to find out the general attitudes of the farmers towards the use of insects in fish feeds. A Likert scale was used to measure the farmers' general feelings and opinions on the use of insects in fish feeds. The general questions were lumped together but generally were of two groups i.e. one group comprised of questions that portray insects use positively (e.g. insects lower the feed price and production cost in fish farming) and another group of questions that portray insects use negatively (e.g. insects lower consumer acceptance of fish products).

The farmers in the three counties of Busia, Kakamega, and Busia had generally positive attitudes towards the use of insects in fish feeds. Majority of the farmers (51.1%) either agreed or strongly agreed that insects allow to produce enough food for the world with 33.6% of the farmers neither agreeing nor disagreeing. The farmers also agreed (38.1%) or strongly agreed (21.5%) that insects help to lower dependence on the traditional or foreign protein sources i.e. they could be a local solution to protein inadequacies. The farmers agreed (52.5%) and strongly agreed (14.8%) that insects help to add value to organic wastes. This implies that the farmers appreciate the many roles insects play in the ecosystem. For instance, besides the protein biomass produced from organic wastes, the insects also help to process the organic wastes and turn it into high quality biofertilizer. Perhaps this is the reason why the farmers strongly agreed (20.6%) and agreed (47.5%) that insects help to lower the feed price and overall production cost in fish farming. On the contrary, the farmers either disagreed or strongly disagreed with negative attitudes concerning the use of insects in fish feeds. The farmers disagreed (48.9%) and strongly disagreed (18.8%) that insects are disgusting, dirty, and dangerous for fish farming. This implies that the farmers can easily embrace the use of insects in fish feeds and for feeding fish. The farmers also generally disagree with the notion that the use of insects in feeding fish will cause allergic reactions towards humans consuming the fish products as well as that the use of insects does not lower the consumer acceptable of the fish products from fish fed insects or insect-based feeds. The farmers also don't believe that the use of insects will introduce micro-organisms and contaminants in the feed for fish. However, the results of this survey clearly demonstrate that the farmers are ready to embrace insects usage in feeding fish and that the products of the fish fed on the insects or insect-based feeds are generally accepted.

Factors influencing the utilization of insect-based feeds.

The farmers indicated that for them to use insects in fish feeds, availability is important. The production of the insects is therefore important. The project must therefore have to start with insect production to make the insect biomass available to the farmers. This is likely to open up more value chains where for instance entrepreneurs can produce the insect biomass and sell to the fish farmers or even to the feed suppliers. Clear, reliable, and precise information is also critical in influencing the utilization of the insects for fish feed. The farmers either strongly agreed or agreed that making clear, reliable, and precise information available to them will positively influence them to adopt the insect production and use in fish feeds technology.

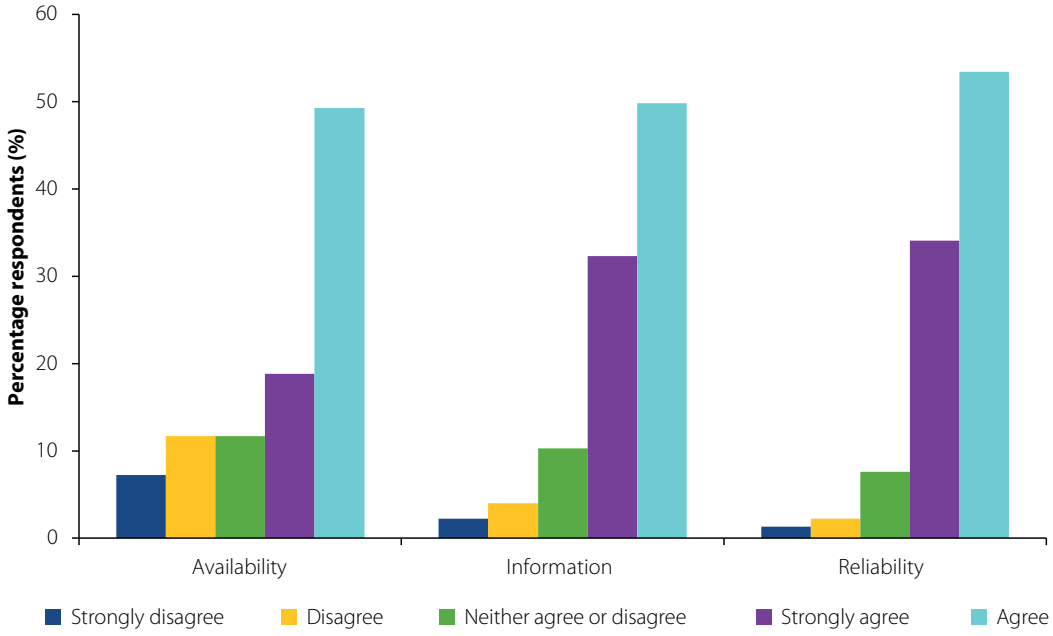


Figure 1. Factors influencing the utilization of insect-based feeds.

Busia Fish Farmer Group

The County Director of Fisheries (CDF) inducted the team on the general outline of the county fisheries and aquaculture infrastructure and the projects currently on-going. The team was given a brief overview of the existing fish farming groups and suggested those that could be of interest to the project. The County fisheries director, Mr. Tim Odede envisions to change how things are done and seeks to revamp the fisheries and aquaculture infrastructure in Busia County. The team was briefed about fish farm models that promotes aggregated ponds and activities in packs (aquaparks) e.g Bukani Aquapark. Busia County seeks to develop cloud-based application to monitor cages and linking this into one platform. The CDF encouraged the team to see what has been done thus far on the ground and supplement existing gaps. An upcoming on-line aquaculture marketing system (AQUAMIS) to boost marketing of fish and fish products in the county was also elaborated. With regards to fish nutrition, the CDF indicated that is a big challenge to the enhanced aquaculture production in the county. However, there is a fish feed plant in Nasewa that does production and distribution. The feed plant is owned by community group with management backstopping from the county fisheries office. Regarding fingerling production, there is a government facility in charge of seed production as well as other group owned facilities. The county director encouraged the project team to compliment the works of the county including fish marketing, value addition, and post-harvest loss reduction. Some of the challenges highlighted by the coordinator in the aquaculture sector within the county included.

Difficulty in accessing quality fingerlings by fish farmers within the funded groups occasioned by lack of a stable hatchery within the county.

The lack of quality broodstock to boost fingerling production. He asserted that if the project could facilitate the provision of quality broodstock, this could boost aquaculture within the county.

Difficulty in accessing quality fish feeds by many aquaculture projects and fish farmers within the county. This he said is occasioned by the fact that most farmers buy food from outside the county. This makes the feed expensive thus raising the cost of production.

It was therefore agreed that this project will work with the Nasewa Feeds Group to implement all the TIMPs in Busia County. The group has 54 members in total (42 males and 12 females).

Siaya County Fish Farmer Group

Prior to the survey, the team paid a courtesy call at the Siaya County Fisheries offices. The CDF, Siaya County and Deputy CDF welcomed the team and expressed their gratitude. Overview on the current status of aquaculture activities in the county were discussed and exposed the huge aquaculture potential in the county. The project team indicated that the initiative would benefit fish farmers in Siaya County and beyond through increased fish productions. During the meeting, the team briefed the County Director of Fisheries on the project's main objectives and purpose of the project and the baseline survey. The director also briefed the team on the status of aquaculture within the county as well as the possible area of collaboration. He agreed that there was need for collaboration in the sector in order to boost fish production within the county. After the meeting, the team, guided by the fisheries officer visited several fish farmers within the county to access the situation of the facilities as well as possible areas of collaboration. After observations and discussions, it was agreed that this project will work with Orieco Youth Group to implement all the TIMPs in Siaya County. The group experiences challenges in accessing fish seeds and feeds. The feeds are very expensive and therefore most cases the members feed fish on local materials e.g. *Caradina nilotica*. The group has 28 active members in total.

Kakamega Fish Farming Group

The team met with the CDF and Fisheries Office. The team were briefed in the status of fish production in Kakamega. The fisheries officers indicated that there are many farmers and groups involved in fish farming in Kakamega County. They have taken fish farming seriously despite the various challenges the farmers and groups are facing such lack of quality seeds and feeds. They also indicated that the county government was establishing a fish feed manufacturing plant to supply quality feeds to the farmers. The fisheries indicated that they were ready to work to the fish value chain project teams to implement the various TIMPs in Kakamega County. After a short visit to the county and sub-county fisheries offices to brief the officers on the purpose of the visit, the team visited several fish farming groups under the guidance of various sub-county fisheries officers.

After consultation and touring the groups, it was agreed that the project will work with Vision Youth group in located in Lurambi sub-county, South Butsotso ward, Eshisiru village. The group's membership is 15 with 10 men and 5 ladies. They are involved in activities such as table banking; horticulture; pond construction; fish farming (2 fishponds); agroforestry and poultry rearing. The major challenges are lack of fingerlings, brooders, and feeds. They have a hatchery that require broodstock for efficient production of seeds. The project team recommended this group for broodstock supply so that they can be able to produce mass fingerlings to supply to other fish farmers in the region.

SLU:

Not applicable

CORAF:

CORAF signed the subgrant agreement with WorldFish on 12th December 2022. CORAF did not have enough time in 2022 to mobilize resources and start the scoping study by the 31st of December 2022. CORAF will start and complete this study by June 2023.

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 derived from (novel) local ingredients.

As of the 31st of December 2023, INCLUDOVATE was selected as the consulting firm that will conduct this activity, but the signing of the contract with WorldFish was pending. Therefore, INCLUDOVATE will complete this activity by June 2023 (still Year 1).

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.

As of the 31st December 2023, NAGI ENTERPRISE was selected as the consulting firm that will conduct this activity, but the signing of the contract with WorldFish was pending. Therefore, NAGI ENTERPRISE will complete this activity by June 2023 (still Year 1).

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.

WorldFish initially invited the International Livestock Research Institute (ILRI) to implement the scaling work in the FASA project, but ILRI decided to focus on terrestrial animal where they already have an extensive scaling experience. WorldFish is still looking for a Partner who will take over the responsibility to achieve the scaling work in the FASA project.

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

WorldFish:
The only activity planned in this output to start in 2022 was the renovation of the wet lab at the Natural Resources Development College (NRDC) in Zambia by transforming it from a flow-through to a Recirculating Aquaculture System (RAS). WorldFish team in Zambia paid the first visit in the framework of the FASA project to NRDC on the 27th of December 2022 to understand the current status of the wet laboratory. The visit was also to initiate the discussion around upgrading of the wet laboratory from a flow-through to recirculating system for the nutrition experiments at NRDC. The visit started with a short introductory meeting with Dr. Alice Tembo, who is the principal of the NRDC. This meeting was followed by the visit to the laboratory. The current status of the wet laboratory is presented in the Figure 2. Briefly, the wet laboratory needs a thorough renovation prior to the upgrade, as many items of the flow-through system are missing, and the wet laboratory has not been in operation for more than a year.

Figure 2. Current state of the NRDC wet laboratory.

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 at least 27 improved cost-efficient feed formulations to improve aquaculture productivity and resilience.

Not applicable for 2022. The output and activities of the overall Outcome 2 were not meant to be achieve during the year 2022, as per the implementation plan of the FASA project. In fact, all these outputs are dependent on a prior completion of the ingredients and feed scoping studies in Zambia, Kenya, and Nigeria (Output 1.1).

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.

Not applicable for 2022. The output and activities of the overall Outcome 3 were not meant to be achieve during the year 2022, as per the implementation plan of the FASA project.

Project Implementation Constraints (issues related to staff, partnerships, political, funding etc)

WorldFish:

a. Signing of the subgrant agreements with partners and consultants
   The negotiations with the project partners took longer than anticipated, and the subgrant agreements were only signed with ICIPE, SLU, and CORAF in 2022. Moreover, the negotiations with NRDC and the selected consulting firms are still on-going, and contract will be signed with them in 2023.

b. Identifying the scaling partner
   WorldFish initially invited the International Livestock Research Institute (ILRI) to implement the scaling work in the FASA project, but ILRI decided to focus on terrestrial animal where they already have an extensive scaling experience. WorldFish is still looking for a Partner who will take over the responsibility to achieve the scaling work in the FASA project.

c. Adjustments to the project budget
   Since the inception of the FASA project, WorldFish conducted monthly internal project meetings, to monitor the project implementation. One of the outcomes of these monthly meetings is the request for the adjustments in the implementation plan, which were all approved by Norad in 2022:
   i. Local consultant - Scientist (Nigeria): to move the fund from consultant to personnel. Use this fund to hire a local full-time Scientist/Postdoc at WorldFish, who will be based in Penang, Malaysia, and support the other scientists in Nigeria, Zambia, Kenya, and Malaysia. WorldFish will hire this Scientist/Postdoc following WorldFish's HR procedures.
   ii. Research facility renovation and rentals: WorldFish will keep the amount of NOK 215,520 in WorldFish's Specific project-related cost and use that amount to transform the research facility at NRDC from flow-through to a recirculating aquaculture system, by installing a biofilter, sump, sand filter, trickling filter, swirl separator, pumps, and new pipes.
   iii. International consultant - Scaling Specialist & Scaling activities: To combine these two activities into one and assign them to a single scaling partner, which will be involved in the project over the entire 5 years. WorldFish will engage the scaling partner following WorldFish's HR and procurement procedures.
   iv. Gender Research Leader, Local consultant - Gender Scientist (Nigeria), Local consultant - Gender Scientist (Kenya) & Local consultant - Gender Scientist (Zambia): Considering that WorldFish, within the new CGIAR configuration, does not currently have a Gender Research Leader, we would like to combine the work initially planned for the WorldFish's Gender lead and the work of the local gender Consultants into one single work package and assign them to a single Gender consulting firm or group, which will be involved in the project over the entire 5 years. WorldFish will engage that Consulting firm or group, following WorldFish's HR and procurement procedures.

v. Global Lead, Climate and Environmental Sustainability, Local consultant - Climate Scientist (Nigeria), Local consultant - Climate Scientist (Zambia) & Local consultant - Climate Scientist (Kenya): Considering that WorldFish, within the new CGIAR configuration, does not currently have a Global Lead-Climate and Environmental Sustainability, we would like to combine the work initially planned for the WorldFish's Climate and Environmental Sustainability Lead and the work of the local climate change Consultants into one single work package and assign them to a single Consulting firm or group, which will be involved in the project over the entire 5 years. WorldFish will engage that consulting firm or group, following WorldFish's HR and procurement procedures.

ICIPE
No major challenges observed yet.

SLU
No challenge observed.

CORAF
Currently, there is a delay in: (i) the first disbursement of fund and (ii) CORAF subcontracting ARCN.

Innovative approaches/achievements if any (in case there are innovative approaches or products developed, you do not need to have something reported under the section if there is none, if there is, then provide highlights, which should be in bullet points new technology, new tools, etc)

None.

Priorities for the coming Year (if applicable)

WorldFish
- Conduct an ingredients and feeds scoping study,
- Conduct two nutrient requirement experiments with tilapia in Zambia,
- Conduct two digestibility experiments in Malaysia, using ten ingredients obtained from the project countries.

ICIPE
- Recruit new staff (Postdoc & Technical staff) as well as 10 MSc students.
- Conduct 1 scoping studies on type, price, and seasonality of local ingredients used in animal (fish) feed.
- Investigate nutrient requirements in improved strains of tilapia and African catfish which includes (Design research protocols).
- Research report preparation and publication and addition of results to WF's Better Management Practices guidelines (BMPs).

SLU
- Organization of the FASA start-up workshop.
- Recruitment of 2 PhDs (Zambia and Nigeria)
- Biochemical analyses of the feed ingredients once delivered by the WorldFish, Penang.

CORAF
Not applicable

International Public Goods (list of publications, in press, submitted or in preparation, authors, title and year, title of thesis can be included)

Not applicable.

Nutrition and Health (Project contribution to nutrition and health SLO if applicable)

Not applicable.

Gender Issues

Not applicable.

Partnerships

WorldFish
Actions are ongoing to identify a new scaling partner for the FASA project.

ICIPE
New partnerships and complementary collaboration between the FASA project supported by Norad and other insect-based feed projects funded by Rockefeller Foundation, IKEA Foundation, Australian Centre for International Agricultural Research and Europe Union has been established in Kenya.

SLU
Not applicable.

CORAF
Not applicable.

Conclusions

WorldFish
All outcomes and outputs are progressing well, and the scoping of ingredients is underway. With a proper planning and consistent communication with each partner of the project, the objective of the project could be achieved.

ICIPE
FASA project activities are going on smoothly and the implementation plan in Kenya has been discussed and shared with all the key stakeholders along the fish value chain.

SLU
Not applicable.

CORAF
CORAF is currently working on the organization of the national launching of the project in Nigeria on a virtual mode. CORAF will associate a request of fund to the current technical and financial reports to start activities on the ground.

Appendixes (this could include detailed research outputs under the various components.)

Appendix 1: The 2022 annual financial report of the FASA project.

WorldFish

FINANCIAL REPORT
FOR THE PERIOD 01/07/2022 to 31/12/2022
IN NOK

Contract/Project Processing No.	SAF-21/0004
Project Code	AG10578
Project Title	Development And Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)
Project Duration	01/07/2022 - 30/06/2027
Project Leader	Yossa, Rodrigue
Donor	Norwegian Agency for Development Cooperation (NORAD)
Total Grant	NOK 80,000,000

BUDGET LINE ITEMS	TOTAL BUDGET	EXPENSES			BUDGET BALANCE
		PERIOD REPORTING 1st Jul 2022 - 31st Dec 2022	PERIOD REPORTING 1st Jul 2022 - 31st Dec 2022	TOTAL CUMULATIVE EXPENDITURES 1st Jul 2022 - 31st Dec 2022	
	NOK	USD	NOK	NOK	NOK
1. Personnel Costs	28,875,957	129,142	1,273,873	1,273,873	27,602,084
2. Travel	4,027,918	848	8,362	8,362	4,019,556
3. Consultants	7,007,992	3,116	30,732	30,732	6,977,260
4. Communications and Publications	2,245,000	111	1,099	1,099	2,243,901
5. Training & Workshops	2,117,933	31,146	307,229	307,229	1,810,705
6. Purchase of equipment	131,394	13,276	130,955	130,955	439
7. Specific project-related costs	6,438,994	2,947	29,069	29,069	6,409,924
8. Operating costs	2,604,291	11,395	112,400	112,400	2,491,890
9. Partners	19,850,869	-	-	-	19,850,869
10. Indirect operating costs (7%)	5,131,024	13,439	132,560	132,560	4,998,464
11. CGIAR consortium costs (2%)	1,568,627	4,108	40,526	40,526	1,528,102
Total Budget / Expenditure	80,000,000	209,527	2,066,805	2,066,805	77,933,195

Certified by:
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Simon Carter
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Carter, Simon
Global Financial Controller
Date : 4 April 2023

Approved by:
DocuSigned by:
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Yossa, Rodrigue
Project Leader
Date : 4 April 2023

WorldFish

STATEMENT OF FUNDS STATUS
for the period from 01 July 2022 to 31 December 2022
In NOK

Contract/Project Processing No.	SAF-21/0004
Project Code	AG10578
Project Title	Development And Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)
Project Duration	01/07/2022 - 30/06/2027
Project Leader	Yossa, Rodrigue
Donor	Norwegian Agency for Development Cooperation (NORAD)
Total Grant	NOK 80,000,000

Amount Invoiced			Amount Received		
Date	NOK		Date	NOK	USD
8 Jul 2022	6,501,585.00		27 Jul 2022	6,501,585.00	659,114.25
1 Dec 2022	3,517,328.00		13 Dec 2022	3,517,328.00	351,679.11
Total	**10,018,913.00**			**10,018,913.00**	**1,010,793.36**

Fund Disbursements	NOK	USD
1 Jul 2022 - 31 Dec 2022	2,066,805.19	209,527.48
Total Fund Disbursements	**2,066,805.19**	**209,527.48**
Fund Balance as of 31 Dec 2022	**7,952,107.81**	**801,265.88**

Certified by:
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Simon Carter
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Carter, Simon
Global Financial Controller
Date : 4 April 2023

Approved by:
DocuSigned by:
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Yossa, Rodrigue
Project Leader
Date : 4 April 2023

Appendix 2: Subgrant agreements signed between WorldFish and ALLER AQUA Zambia, ICIPE, SLU, and CORAF for the implementation of the FASA project.

MEMORANDUM OF AGREEMENT

Between

Aller Aqua Zambia Ltd.

And

International Center for Living Aquatic Resources Management (ICLARM)
also known as
WorldFish
Penang, Malaysia

This MEMORANDUM OF AGREEMENT (**MOA**) is made on 1 October 2022 between:

(1) International Centre for Living Aquatic Resource Management (ICLARM), also known as and hereinafter referred to as "WorldFish", and

(2) Aller Aqua Zambia Ltd., hereinafter referred to as "Aller Aqua Zambia Ltd." or the "Partner"

WorldFish and Aller Aqua Zambia Ltd. are hereinafter collectively referred to as the "Parties" and may be individually referred to as the "Party".

PREAMBLE

WorldFish is managing the project titled "Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)", the goal of which is 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 FASA project will be implemented in mainly in Nigeria, Zambia and Kenya, with additional research activities to be completed in Malaysia and Sweden.

Aller Aqua organization produces fish feed for freshwater and saltwater aquaculture. Aller Aqua mission is to develop and produce fish feed and in partnership with fish farmers to optimize the production of fish in harmony with nature to the benefit of human health and quality of life. In the FASA project, Aller Aqua will provide the perspective of the commercial aqua-feed industry on project activities in Africa in general and Zambia in particular.

This MOA is supplementary to any Memorandum of Understanding (**MOU**) that may exist between the Parties and Articles I to III of the MOU also apply to this MOA.

ARTICLE I – OBJECTIVES

The purpose of this MOA is to achieve the following objectives:

- Enhancing food security and the economic wellbeing of fish producers, through the development of innovations that enable parties to provide nutritious and environmentally friendly feed options.
- Improve partnerships between both parties, with a focus on supporting the growth of the aquaculture sector in Africa.

ARTICLE II – TERMS OF REFERENCE

Under the direction of the Project Leader, Aller Aqua Zambia Ltd. will provide the following deliverables/services:

No	Deliverables/ Services	Due Dates
1.	Participating in key surveys during the project's implementation	29 April 2027
2.	Sharing of the feed industry perspective during the project's implementation	29 April 2027
3.	Participating in the annual project meeting	29 April 2027

WHEREAS, WorldFish responsibilities shall be the following:

Acknowledgment of Aller Aqua Zambia Ltd's contribution in any communication related to the work performed collaboratively.

ARTICLE III – DURATION

This agreement will commence on the date of signature by the Parties, and will continue until 29 April 2027, unless mutually extended by the Parties in writing.

ARTICLE IV – CONTRACTUAL ARRANGEMENT

Aller Aqua Zambia Ltd. will provide in-kind contribution in accordance with the tasks, lists of items and the timetables set forth in the Project Plan in order to enable the Parties to meet the work schedule for the Project.

Aller Aqua Zambia Ltd. will not receive any funds as part of this project, but a Representative of Aller Aqua Zambia will be invited to attend the annual project meetings, all actual costs covered by WorldFish. The cost will include airfare, perdiem, lodging, local transportation, and visa application, fees up to a maximum of NOK135,831/- during the five years of the project.

ARTICLE V – INDEMNITY AND LIABILITY

Neither Party will assume responsibility for any liability arising from or incidental to the other party's work in connection with the project. Both Parties will arrange for their own group medical, life, AD&D and professional liability insurance and shall be responsible for any damage, loss, suit, claim and demand whatsoever that may arise from and related to this project. Both Parties shall indemnify and keep indemnified at all times the other Party against such damage, loss, suit, claim and demand arising in connection to the project. This indemnity shall continue even after the termination of this agreement or after the completion of the project.

ARTICLE VI – POLICIES, PROCEDURES AND GUIDELINES

The Partner is required to comply with WorldFish's code of conduct, ethics policy, child protection policy, anti-harassment, discrimination and bullying policy, anti-fraud and anti-corruption policy, and any other organisational policies relating to workplace behaviors and processes. WorldFish may terminate the appointment with immediate effect in the event that the partner is in breach of any of the provisions of this letter or if the conduct brings themselves or WorldFish into disrepute.

ARTICLE VII – INTELLECTUAL PROPERTY

"Intellectual property" means information, ideas, inventions, new fish varieties, innovations, art work, designs, literary text and any other matter or thing whatsoever that adds a creation of human intervention that may be capable of legal protection or the subject of legal rights.

Intellectual property created in the course of this contract is subject to the CGIAR Policy on the Management of Intellectual Assets.

1. Resulting Intellectual Property Rights
All intellectual property rights arising from the partnership shall be jointly owned by both Parties. As such, it shall remain publicly accessible and shall be available to the partners of WorldFish and the Partner and to end-users.

Results of the collaborative research will be jointly published in the public interest as mutually agreed upon.

2. Background Intellectual Property
Either Party may choose to introduce intellectual property that it owns to the other, in the interest of this MOA. It would thereby grant the other Party a license to use and sublicense the background intellectual property being introduced, wherever this is required to meet the objectives of this MOA. Such license shall be granted in writing.

3. Intellectual Property Rights Protection
Partners who believe that intellectual property rights protection should be sought by WorldFish in relation to aspects of the collaborative work must discuss this with their WorldFish counterpart. As a general rule, such IP protection shall not be sought unless it is necessary for the further improvement of the intellectual property or to enhance the scale or scope of impact on target beneficiaries, in furtherance of the CGIAR Vision as defined in the CGIAR IA Principles.

4. Publication
Wherever possible, publications should be in Open Access Journals or made available through Open Access Repositories. Similarly, data sets and other outputs of research should be publicly available in line with the obligation of WorldFish to comply with the CGIAR Open Access and Data Management Policy.

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ARTICLE VIII – CONFIDENTIAL INFORMATION

Each Party shall hold in confidence all documents disclosed to it by the other Party containing the other Party's trade secrets and proprietary, secret, confidential and/or other information not generally available to the public (Confidential Information). Confidential Information shall only be disclosed to persons assigned by the Parties who are directly involved in the collaboration.

ARTICLE IX – SEVERABILITY

If any provision in this MOA shall be invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions shall not in any way be affected or impaired thereby.

ARTICLE X – TIME

Every effort should be made to ensure that the time-frame laid out herein in Article II is adhered to. Gross disregard of this shall be ground for termination of this Agreement under Article XII.

ARTICLE XI – AMENDMENTS AND MODIFICATIONS

This MOA may not be assigned, amended or modified unless mutually agreed upon in writing by the Parties, and the changes shall then form part of this MOA.

ARTICLE XII – TERMINATION

Either party may terminate this MOA by giving 30 days notice in writing to the other party stating the reasons for such termination. During this notice period, the Parties shall make reasonable efforts to resolve the reasons for termination stated in the termination notice. Unless the Party giving the termination notice rescinds such notice, this MOA shall be terminated upon the expiry of the notice period and neither Party shall have any further obligation hereunder, except for such rights and obligations under the following Articles, which will survive termination: Article V – Indemnity and Liability; Article VII – Intellectual Property; Article VIII – Confidential Information; and Article XIII – Dispute Resolution. The affected Party is eligible to claim for payment due and payable until and before the date of the termination. The Parties are obliged to submit to each other all reports, data and manuscripts that are relevant to this MOA before the termination of the MOA.

ARTICLE XIII – DISPUTE RESOLUTION

Before recourse to legal action, all attempts must be made to settle the dispute amicably by negotiations between the Parties.

Should amicable negotiations fail, all disputes shall be finally settled under the Rules of Arbitration of the International Chamber of Commerce by one or more arbitrators appointed in accordance with

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said Rules. The seat of arbitration shall be Lusaka, the governing law of the contract and the arbitration clause shall be Zambian Law and the language of arbitration shall be English.

ARTICLE XIV – FORCE MAJEURE

If either Party is temporarily unable by reasons of force majeure to meet any of its obligations under this MOA, and if such Party gives the other Party written notice of the event within thirty (30) days of its occurrence, such obligations of the Party as it is unable to perform by reason of the event shall be suspended for as long as the inability continues. If necessary the MOA can be cancelled, if Force Majeure prevents performance for an extended period. Neither Party shall be liable to the other Party for any event referred to below or delays arising from such event. The term "Force Majeure" as used herein shall mean Acts of God, strikes, lockouts or other industrial disturbances, acts of public enemy, wars, blockades, insurrection, riots, epidemics, lightening, floods, washouts, civil disturbances, explosions and other similar events not within the control of either Party and which, by the exercise of due diligence, neither Party is able to overcome.

Signed

DocuSigned by: Simon Carter 1EAF465595E547D...
Simon Carter
Global Financial Controller
Corporate Functions

WorldFish Headquarters (Malaysia)
Jalan Batu Maung, Batu Maung,
11960 Bayan Lepas,
Penang, Malaysia.

Date: Oct 6, 2022 | 5:01 PM SGT

DocuSigned by: C8EBF5D73B124A2...
Pieter Visagie
Managing Director

Aller Aqua Zambia Ltd.
1 New Heights Road,
Kamimbi Siavonga District,
Zambia.

Date: Oct 9, 2022 | 10:11 PM SGT

Witnessed by:-

DocuSigned by: A7D13B54251944F...
Dr. Rodrigue Yossa
Senior Scientist (Fish Feeds & Nutrition)
Aquatic Food Biosciences
WorldFish

DocuSigned by: DAE55FE513584EE...
Mbita Mwenya
Finance Director
Aller Aqua Zambia Ltd.

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WorldFish

SUB-GRANT AGREEMENT

Between the International Center for Living Aquatic Resources Management (ICLARM) also known as WorldFish, headquartered in Penang, Malaysia, and

West and Central African Council for Agricultural Research and Development (CORAF) headquartered in Dakar, Senegal, referred to as the "Sub-grantee" in this Agreement.

This Agreement includes this Signature Page and all Annexes attached to this agreement. In the event of any conflict between the contents of Annexes and the terms stated in the Signature Page, the terms in the Signature Page shall prevail.

This Agreement is issued to the Sub-grantee on the expressed condition that project activities and funds will be carried-out and administered in accordance with the terms and conditions as hereby set forth in this agreement and all its attachments.

Agreement Period	Start Date: 25 November 2022	End Date: 30 April 2027	
Duration	Total of 53 months		
Agreement Amount (currency and amount)	NOK4,250,492/-	Four Million Two Hundred Fifty Thousand and Four Hundred Ninety-Two Norwegian Krone	
Cash or In kind contribution (if none insert N/A)	N/A		
Project Title	Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)		
WorldFish Contact Person:	Senior Scientist, Project Leader	Rodrigue Yossa	r.yossa@cgiar.org
Sub-grantee Contact Person	Programmes Manager Focal Point, Agriculture, Food and Nutrition Security PID	Lamien Niéyidouba	n.lamien@coraf.org

Attachments:
Annex 1: WorldFish Standard Terms and Conditions
Annex 2: Project Description
Annex 3: Reporting Templates
Annex 4: General Conditions Applicable to Grants from The Norwegian Agency for Development Cooperation
Annex 5: CGIAR and WorldFish Policies and Procedures
Annex 6: Project Description, Result Framework, and Implementation Plan

Signed by Authorized Signatories:

For WorldFish

DocuSigned by: Simon Carter 1EAF465595E547D...
Name : Simon Carter
Title : Global Financial Controller
Corporate Functions
Date : Dec 9, 2022 | 6:15 PM SGT

For CORAF

DocuSigned by: ATenkouano 5715AAF334324FE...
Name : Abdou Tenkouano
Title : Executive Director
Date : Dec 12, 2022 | 6:29 PM SGT

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ANNEX 1: WORLDFISH STANDARD TERMS AND CONDITIONS

WorldFish and the Sub-grantee are hereinafter collectively referred to as the "Parties" and may be individually referred to as the "Party".

ARTICLE I – PERIOD OF AGREEMENT

This Agreement shall be effective for the period specified in the Signature Page. All expenditures made with funds provided under this agreement shall be for allowable project expenditures and actual costs incurred during the period of this agreement.

ARTICLE II – AMOUNT AND PAYMENT

WorldFish, subject to funds received from the donors and successful completion of activities and deliverables by the Sub-grantee, will pay the Sub-grantee up to the amount specified in the Signature Page. WorldFish shall not be liable for reimbursing the Sub-grantee for any costs in excess of what is specifically and explicitly agreed to in this Agreement. No other fees, reimbursements, allowances or benefits will be paid under this agreement other than those specified in this Agreement.

Expenditures must be incurred within the eligibility period and in connection with the project and necessary for its implementation. Expenditures must be for activities that are carried out within the agreement period. They must also be identifiable and verifiable; reasonable, justified and comply with the principle of sound financial management; and comply with national rules (of applicable tax and social legislation).

In case of partial performance of the deliverables set out herein, WorldFish has the discretion to pay a partial sum corresponding to the work completed or to withhold payment for inadequate performance.

The details of this total Agreement Amount, payment schedule and budgetary restrictions are set forth in Annex 2.

Funds will be made available within 60 working days of receipt AND acceptance of deliverables. No funds will be released until technical and financial reports are received and accepted by WorldFish.

Unless otherwise agreed in writing, WorldFish funds will be paid in the currency of Agreement amount and in accordance with the detailed banking instructions provided by the Sub-grantee as part of the Work Plan and Budget in Annex 2.

WorldFish reserves the right to withhold final payment until after the final technical and financial reports are received and accepted by WorldFish.

WorldFish will not be responsible for any losses incurred by the Sub-grantee due to currency fluctuations, standard and additional bank charges arising from incomplete or inaccurate banking details being submitted, or any taxes, duties or fees that may be due. The sole responsibility shall be with the Sub-grantee.

WorldFish reserves the right to withhold payment for any of the following:

- Sub-grantee's failure to make satisfactory progress towards the project objectives set forth in Annex 2.
- Sub-grantee's default of or otherwise inability to adhere to the conditions or provisions of this agreement
- Sub-grantee's inability to submit reliable and/or timely reports or other deliverables as described in this agreement.

Any balance of funds held by the Sub-grantee at the completion or sooner termination of the project shall be returned to WorldFish within 30 days irrespective of a formal demand from WorldFish. Funds must be returned to WorldFish in the currency of the agreement unless a different arrangement is agreed and clearly written in this agreement.

ARTICLE III – INDEMNITY AND LIABILITY

WorldFish will not assume responsibility for any liability arising from or incidental to the Sub-grantee's work specified in the Agreement. The Sub-grantee will arrange for group medical, life, AD&D and professional liability insurance for themselves and their personnel and shall be responsible for any damage, loss, suit, claim and demand whatsoever that may arise from and be related to this project. The Sub-grantee shall indemnify and keep indemnified at all times WorldFish against such damage, loss, suit, claim and demand. This indemnity shall continue even after the termination

of this agreement or after the completion of the project for a period of 5 years.

ARTICLE IV – POLICIES, PROCEDURES AND GUIDELINES

The Sub-grantee shall strictly adhere to the guidelines and provisions listed in Annex 4 and Annex 5.

The Sub-grantee is required to comply with WorldFish's code of conduct, ethics policy, child protection policy, anti-harassment, discrimination and bullying policy, anti-fraud and anti-corruption policy, and any other organizational policies relating to workplace behaviors and processes. WorldFish may terminate the appointment with immediate effect in the event that the Sub-grantee is in breach of any of the provisions of this letter or if the conduct brings themselves or WorldFish into disrepute.

CGIAR Policy and Principles on the Management of Intellectual Assets: All intellectual assets produced or acquired shall be managed in ways that maximize their global accessibility and/or ensure they lead to the broadest possible impact on target beneficiaries in furtherance of the CGIAR vision. WorldFish implement this principle through Article V below.

CGIAR Open Access & Data Management Policy: Open Access is defined by WorldFish as the ownership, preservation, exploitation and publication of research data collected by Sub-grantees and others which should be managed in a way that increases the visibility, accessibility and impact of the research. WorldFish implements this Policy through its Open Access/Open Data Implementation Plan which will be adopted on approval by the WorldFish Board of Trustees.

WorldFish Policy on Ethics of Research Involving People: WorldFish staff are held accountable towards people (communities, groups, individuals) involved in or affected by our research, and expects our Sub-grantees to adhere to the same high ethical standards.

WorldFish Anti-Fraud and Anti-Corruption Policy: WorldFish will not accept any level of bribery, corruption, money laundering and all types of fraud, whether actual or attempted and will treat any such matter with the utmost of seriousness. This is whether it is committed by trustees, staff, contractors, consultants or Sub-grantees.

WorldFish Child Protection Policy: WorldFish is committed to creating and maintaining positive environments that protect children from all forms of exploitation and abuse. Sub-grantees shall not engage in any form of child exploitation or engage with anyone who poses an unacceptable risk to children, shall work towards reducing the risks to children that may be associated with WorldFish programs, and will report any concern or suspicion of exploitation and abuse of children and abide to WorldFish Child Protection Policy

ARTICLE V – INTELLECTUAL PROPERTY (IP)

"Intellectual property" or "IP" means information, ideas, inventions, innovations, art work, designs, literary text and any other matter or thing whatsoever that adds a creation of human intervention that may be capable of legal protection or the subject of legal rights.

Intellectual property created in the course of this agreement is subject to the CGIAR Policy and Principles on the Management of Intellectual Assets as described in Article IV.

1. Resulting Intellectual Property Rights
All intellectual property rights arising from Sub-granting must be treated in the following manner:

a) If all or a substantive majority of the cost of the collaborative project as described in the Work Plan and budget is borne by WorldFish, then WorldFish reserves the right to own all intellectual property rights resulting from the project but WorldFish grants the Sub-grantee a non-exclusive, worldwide, royalty-free, irrevocable license to use, publish and sublicense the resulting intellectual property for other than commercial reasons.

b) If the Sub-grantee bears all or a substantive majority of the cost, then the Sub-grantee reserves the right to own all resulting intellectual property rights and grants to WorldFish a non-exclusive, worldwide, royalty-free, irrevocable license to use, publish and sublicense the resulting intellectual property

c) If WorldFish and the Sub-grantee contribute approximately equally to the costs then the resulting intellectual property rights shall be jointly owned by both Parties. As such, they shall

remain publicly accessible and shall be available to the Sub-grantees of WorldFish and the Sub-grantee and to end-users.

2. Background Intellectual Property
Either Party may choose to introduce intellectual property that it owns to the other, for the purpose of this Agreement. It would thereby grant the other Party a non-exclusive, royalty free license to use and sublicense the background intellectual property being introduced, wherever this is required to meet the objectives of this Agreement.

3. Intellectual Property Rights Protection
Sub-grantees who believe that intellectual property rights protection should be sought by WorldFish in relation to aspects of the collaborative work must discuss this with their WorldFish counterpart. As a general rule, such IP protection shall not be sought unless it is necessary for the further improvement of the intellectual property or to enhance the scale or scope of impact on target beneficiaries, in furtherance of the CGIAR Vision as defined in the CGIAR IA Principles.

4. Publication
Wherever possible, publications should be in Open Access Journals or made available through Open Access Repositories. Similarly, data sets and other outputs of research should be publicly available in line with the obligation of WorldFish to comply with the CGIAR Open Access and Data Management Policy (and the WorldFish Open Access/Open Data Implementation Plan when approved by the WorldFish Board of Trustees. The technical and scientific articles published by CORAF as the result of this agreement must be coauthored by WF Project Leader.

ARTICLE VI – CONFIDENTIAL INFORMATION

Each Party shall hold in confidence all documents disclosed to it by the other Party containing the other Party's trade secrets and proprietary, secret, confidential and/or other information not generally available to the public (Confidential Information). Confidential information shall only be disclosed to persons assigned by the Parties who are directly involved in the collaboration. Any obligation of confidentiality hereunder shall not apply to information that:

I. is or becomes public knowledge through no fault of the receiving party, or
II. was known prior to this Agreement by the receiving party, or
III. properly and lawfully becomes available to the receiving party from another source without any obligation of secrecy, or
IV. is independently developed without benefit of disclosure from the receiving party, or
V. is required to be disclosed through process of law.

ARTICLE VII – PROHIBITION AGAINST TERRORIST FINANCING AND DISCRIMINATION

The Sub-grantee certifies that it has not provided and will not provide material support or resources to any individual or entity that it knows, or has reason to know, is an individual or entity that advocates, plans, sponsors, engages in or has engaged in terrorist activity.

The Sub-grantee agrees to undertake all reasonable efforts to ensure that none of the funds shall be used to provide support to individuals or entities associated with terrorism, as included in the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). This provision must be included in any subcontracts or sub-agreements entered into under this Agreement.

Funds received from WorldFish shall not be used for payments for which corrupt, fraudulent, collusive, obstructive or coercive practices were engaged in, nor for drug trafficking.

The Sub-grantee will not discriminate against persons with disabilities, and will make every effort to respect the principles of the UN Convention on the Rights of Persons with Disabilities.

ARTICLE VIII – SEVERABILITY

If any provision in this Agreement shall be invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions shall not in any way be affected or impaired thereby.

ARTICLE IX – TIME

Every effort should be made to ensure that the time-frame laid out in the Work Plan and Budget at Annex 2 is adhered to. Failure to meet the time-frame set forth in Table 3 and Table 4 of Annex 2 shall be grounds for termination by WorldFish as provided in Article XI.

ARTICLE X – AMENDMENTS AND MODIFICATIONS

This Agreement may not be assigned, amended or modified unless mutually agreed upon in writing by designated signatories of the Parties, and the changes shall then form part of this Agreement.

ARTICLE XI – TERMINATION

Either Party may terminate this Agreement by giving 30 days' notice in writing to the other Party stating the reason(s) for such termination. During this notice period, the Parties shall make reasonable efforts to resolve the reasons for termination stated in the termination notice. Unless the Party giving the termination notice rescinds such notice, this Agreement shall be terminated upon the expiry of the notice period and neither Party shall have any further obligation hereunder, except for such rights and obligations under the following Articles, which will survive termination: Article III – Indemnity and Liability; Article V – Intellectual Property; Article VI – Confidential Information; and Article XII – Dispute Resolution. The affected Party is eligible to claim for payment due and payable until and before the date of the termination. The Parties are obliged to submit to each other all reports, data and manuscripts that are relevant to this Agreement before the termination of the Agreement.

ARTICLE XII – DISPUTE RESOLUTION

Before recourse to legal action, all attempts must be made to settle the dispute amicably by negotiations between the Parties.

Should amicable negotiations fail, all disputes shall be finally settled under the Rules of Arbitration of the International Chamber of Commerce by one or more arbitrators appointed in accordance with said Rules. The seat of the arbitration shall be Malaysia, the governing law of the contract and the arbitration clause shall be Malaysian Law and the language of arbitration shall be English.

ARTICLE XIII – FINANCIAL RECORDS, MONITORING AND AUDIT

The Sub-grantee shall maintain books, records, documents and other evidence in accordance with their respective usual accounting procedures to sufficiently substantiate financial data relating to this Agreement. The Sub-grantee shall establish and maintain a reliable accounting system that enables the production of financial reports.

WorldFish and its authorized representatives shall have the right to audit, examine and make copies of or extracts from all the financial and related records (in whatever form they may be kept, whether written, electronic, or other) relating to or pertaining to this agreement. Such records shall include, but are not be limited to, accounting records; sub-agreement files (including proposals of successful and unsuccessful bidders, bid recaps, etc.); all paid vouchers; other reimbursements supported by invoices; ledgers; cancelled checks; deposit slips; journals; payroll documents; timesheets; and correspondence. The Sub-grantee shall, at all times during the term of the agreement and for a period of 7 years after the completion of this agreement, maintain such records, together with such supporting or underlying documents and materials. The Sub-grantee may at any time be requested by WorldFish, whether during or after completion of the agreement, and at the Sub-grantee's own expense, to make such records available for inspection and audit. Costs of any audits conducted by WorldFish will be borne by WorldFish.

WorldFish reserves the right to request separate audited financial statements or reports, which should be paid for using project funds provided by WorldFish.

If an audit identifies any costs that are not in compliance with the donor requirements and considers those costs as ineligible, those costs shall be borne by the Sub-grantee and as applicable, costs shall be reimbursed to WorldFish.

ARTICLE XIV - REPORTING

WorldFish requires the Sub-grantee to submit both interim and final reports. Details of reporting requirements are set forth in Annex 2.

Sub-grantee shall maintain adequate records that clearly support the charges and expenditures incurred under this project. If requested by WorldFish, Sub-grantee may be required to send the supporting documentation to support claims made on the Financial Report. WorldFish may, at its discretion, request modification of any invoice or report when unallowable expenditures are incurred or charged to the project, amend the schedule for reporting requirements, and/or require additional supporting documentation from the Sub-grantee as necessary.

ARTICLE XV – FORCE MAJEURE

If either Party is temporarily unable by reasons of force majeure to meet any of its obligations under this Agreement, and if such Party gives the other Party written notice of the event within thirty (30) days after its occurrence, such obligations of the Party as it is unable to perform by reason of the event shall be suspended for as long as the inability continues. If necessary the Agreement can be cancelled, if Force Majeure prevents performance for an extended period. Neither Party shall be liable to the other Party arising from any event referred to below or delays arising from such event. The term "Force Majeure" as used herein shall mean Acts of God, strikes, lockouts or other industrial disturbances, acts of public enemy, wars, blockades, insurrection, riots, epidemics, lightening, floods, washouts, civil disturbances, explosions and other similar events not within the control of either Party and which, by the exercise of due diligence, neither Party is able to overcome.

ARTICLE XVI - REPRESENTATIONS AND WARRANTIES

The Parties shall be independent parties and nothing herein shall be construed or implied to mean the establishment or existence of a partnership or joint venture between the parties, nor shall any party herein be construed to be employees, agents, or principals of the other party.

By signing this Agreement, all parties certify that the terms of conditions defined in this Agreement are accepted; that the Parties are proper business entities permitted to do business; and that the individuals signing are competent parties authorized to enter into this Agreement on behalf of their respective agencies.

ANNEX 2: PROJECT DESCRIPTION

I. Project Overview

WorldFish is managing the project titled "Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)", which goal is 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 FASA project will be implemented in will be implemented mainly in Nigeria, Zambia, and Kenya, with additional research activities to be completed in Malaysia and Sweden. Full-time postdoctoral researchers and scientists hired by CORAF through this agreement will be co-supervised by WF Project Leader.

II. Expected Outputs and Required Activities to be Performed by Sub-grantee

Table 1: Expected Outputs and Required Activities to be Performed by Sub-grantee

Outputs	Activities
Output 1: Participation in annual project meetings and planning a Start-up workshop	Detail activities: Participate in annual project meetings and conduct a project start-up workshop at CORAF (Nigeria) in the year of 2022
Output 2: 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	Detail activities: Conduct 1 scoping assessment, which includes (i) Conducting a literature review of relevant research documents and protocol; (ii) Design scoping studies for Nigeria; (iii) Data collection (including sample ingredients) and analysis; and (iv) Report preparation and publication.
Output 3: New knowledge and data on nutrient requirements of improved strains of tilapia and African catfish produced, validated, and made widely available	Detail activities: Investigate nutrient requirements in improved strains of tilapia and African catfish which includes (i) Design research protocols; (ii) Secure animal ethics approval; (iii) Conduct 12 tilapia experiments and 8 catfish experiments in project countries; (iv) Analyse data and samples; and (v) Research report preparation and publication and addition of results to WF's Better Management Practices guidelines (BMPs).

Outputs	Activities
Output 4: New data and knowledge on local ingredients generated, used in the formulation of novel fish feeds, and made widely available	Detail activities: Stakeholder consultations (1 online workshop per country) to discuss results of activity 2.1.1 and potential benefits, risks, challenges, and hazards to the use of local ingredients which includes (i) Organise and facilitate 1 online stakeholder workshop per country; and (ii) Reports preparation and dissemination. Detail activities: Validate 9 formulated fish feeds through 6 on-farm pilots (2 per country which include (i) Design and validate research protocols; (ii) Conduct validation experiments on-farm; (iii) Analyse the data and produce reports; and (iv) Hold workshops to share and discuss results (1 workshop per country).
Output 5: 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 context-specific circumstances and needs	Detail activities: Hold consultation workshops to develop the printed booklets/manuals for ingredients and fish feeds, which includes (i) Organise and facilitate 2 workshops per country (1 online and 1 in-person); and (ii) Reports preparation and dissemination. Detail activities: Hold workshops to train feed millers and fish farmers on ingredients, feeds, practices, databases, booklets/manuals which includes (i) Organise and facilitate 4 training workshops per country (2 online and 2 in-person); and (ii) Reports preparation and dissemination.
Output 6: 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.	Detail activities: Stakeholder consultations to co-develop scaling strategies which includes (i) Organise and facilitate 2 stakeholder workshops per country (total of 6); and (ii) Report preparation and dissemination.

Outputs	Activities
Output 7: Disseminate knowledge through workshops, conferences, and mass media	Detail activities: Design and conduct context-specific outreach (based on assessments in output 1.5 of the Implementation Plan (Annex C)) to target end-users (farmers and millers) to support scale-up; and Develop scaling potential outside of project by identifying additional scaling opportunities. Support to the gender, climate change, scaling, MEL, Communication, Project Leadership and other stakeholders involved in project during the implementation of their activities in Nigeria, including guidance in the project areas in Nigeria, invitation letters for visa application, hotel reservations, venue booking for workshops, etc.

For exact description of the Expected Outputs and Required Activities to be performed: Kindly refer to the Project Description, Result Framework and Implementation Plan approved by the donor, Norad (Annex 6A,6B and 6C).

III. Outcomes or Results Expected (include Work Plan or Activity Implementation Plan) if needed

- Outcomes or results expected 1: Deliver and participate in the project start-up activities.
- Outcomes or results expected 2 and 3: Enhanced capacity of at least two stakeholder groups in Nigeria 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.
- Outcomes or results expected 4: Quality of at least 5 local ingredients has been improved through various processing techniques and the ingredients that are used by stakeholders in Nigeria, including local millers and farmers, to produce 9 novel, cost-efficient feed formulations, to improve aquaculture productivity and resilience.
- Outcomes or results expected 5: Databases and digital solutions developed and used by farmers for formulating and adapting new local feeds on a "real-time" basis.
- Outcomes or results expected 6: 2,000 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.
- Outcomes or results expected 7: 10 online workshops to disseminate knowledge; Number of conference presentations; 3 YouTube videos; 1 BMPs; 1 online and printed factsheets; 1 benefits story published; 1 radio programme aired; 1 TV programme aired; 6000 end-users reached through digital and in-person outreach; and 1 policy briefs published and launched. Support provided to other project stakeholders during the implementation of their activities in Nigeria.

Activity Implementation Plan:

Activity Implementation Plan: Please refer to Annex 6C

IV. Budget, Reporting and Payment Schedule

1) BUDGET in NOK

Table 2: BUDGET in NOK

Budget Item/ Year	Year 1 (NOK)	Year 2 (NOK)	Year 3 (NOK)	Year 4 (NOK)	Year 5 (NOK)	Total (NOK)
Personnel Cost	348,543	348,543	348,543	348,543	348,543	**1,742,713**
Travel	45,113	45,113	76,543	45,113	45,113	**256,996**
Specific project-related costs	391,678	344,811	381,517	607,661	254,110	**1,979,777**
Operating Costs	2,182	2,182	2,182	2,182	2,182	**10,911**
Purchase of equipment	57,691	-	-	-	-	**57,691**
Indirect operating costs (5%)	42,260	37,032	40,439	50,175	32,497	**202,404**
Total (NOK)	**887,468**	**777,681**	**849,224**	**1,053,674**	**682,445**	**4,250,492**

The following modifications to the budget require written approval from WorldFish:

- To change the required funding amounts necessary to fulfill the stated project objectives.
- To change or temporarily replace key project staff.
- To reallocate between budget lines items an amount greater than 10% percent of the main budget line.
- To add a line item to the budget.
- To sub-grant or subcontract any portion of this budget to a third party.

2) PAYMENT SCHEDULE

WorldFish, subject to funds received from the donors and in accordance with payment terms as per table below, will pay the partner a total of not more than **NOK4,250,492** towards the expected outputs / deliverables as per Annex 2. Fund Transfers may be executed in **Norwegian Krone (NOK)**. .

With the exception of the first payment of **NOK88,747 upon acceptance of the Year 1 Work Plan and Budget,** subsequent releases of funds (cost reimbursement) to the Sub-grantee are subject to the following conditions:

1. Technical and financial reports that are due are received and accepted by WorldFish, whichever is the later (please refer to Table 3 - Schedule for Submission of Technical Reports and Table 4 – Schedule for Submission of Financial Reports).
2. Sub-grantee's approved expenditure reports cover at least 75% of the previous cash transfers from WorldFish.
3. Sufficient supporting evidence must be provided with the financial reports to support the expenditure.

Payment should be made to the below account number:-

Bank Account Holder Name : CORAF/WECARD-SECONV
Bank Name : SOCIETE GENERALE SENEGAL
Bank Account Currency : XOF
SWIFT Code : SGSNSNDAXXX
Branch Address : ROUME PARTICULIERS 19 AV LS SENGHOR
Bank Account Number : 01029 022802058274 25

WorldFish shall not be responsible for any losses incurred by the Sub-grantee due to currency fluctuations and/or delays, standard and additional bank charges arising from incomplete or inaccurate banking details submitted. The sole responsibility shall be the Sub-grantee directly.

3) REPORTS

a. Financial Reporting

Sub-grantee shall submit the following reports to WorldFish according to the Table 4 (Schedule for Submission of Financial Report) below:

Financial reporting template is provided for in Annex 3 (MS Excel file). Reports shall be submitted in the currency set out in the Signature Page, i.e., in NOK. The Sub-grantee shall submit proof by the bank of the amount that has been credited in the currency of account for the funds disbursed by WorldFish.

Financial reports shall include at a minimum the following information:

a. Budget versus actual expenses, with current reporting period data and grant to date data.
b. Detailed list of expenses that include description, transaction date, amount, expense category, exchange rates used to convert to reporting currency.
c. Cost Share or matching progress report for period. (if necessary)
d. WorldFish needs access to all supporting documentation from the sub-grantee to support the transaction list.
e. Fund balance status – cash received from WorldFish versus expenditures reported to WorldFish

b. Technical Reports

Sub-grantee shall submit the following reports to WorldFish according to the Table 3 (Schedule for Submission of Technical Report) below:

Technical reporting template is provided for in Annex 3 (MS Word file)

c. Other Reports

WorldFish may, at its discretion, require other necessary reports (supporting documents) from Sub-grantee.

d. Reporting Format

Sub-grantee shall submit semi-annual and annual technical reports not later than one month after the reporting period.

Sub-grantee shall submit semi-annual financial report in NOK covering January to June not later than one month after reporting period and annual financial report in NOK covering January to November (actual spending) and for the month of December (estimation).

Sub-grantee shall submit a final financial statement in NOK and a final technical report not later than 4 weeks after completion of the project.

Table 3: Schedule for Submission of Technical Report

No	Reporting Period	Type of Report	Due Date
1.	October 2022 – December 2022	• FASA_Annual Technical Report 2022Q4	30 January 2023
2.	January 2023 – June 2023	• FASA_Mid-Year Technical Report 2023Q1-Q2	30 July 2023
3.	January 2023 – December 2023	• FASA_Annual Technical Report 2023Q1-Q4	30 January 2024
4.	January 2024 – June 2024	• FASA_Mid-Year Technical Report 2024Q1-Q2	30 July 2024
5.	January 2024 – December 2024	• FASA_Annual Technical Report 2024Q1-Q4	30 January 2025
6.	January 2025 – June 2025	• FASA_Mid-Year Technical Report 2025Q1-Q2	30 July 2025
7.	January 2025 - December 2025	• FASA_Annual Technical Report 2025Q1-Q4	30 January 2026
8.	January 2026 – June 2026	• FASA_Mid-Year Technical Report 2026Q1-Q2	30 July 2026
9.	January 2026 – December 2026	• FASA_Annual Technical Report 2026Q1-Q4	30 January 2027
10.	January 2027 – April 2027	• FASA_Mid-Year Technical Report 2027Q1-Q2	30 May 2027
11.	October 2022 – April 2027	• FASA_Final Technical Report 2022-2027	30 May 2027

Table 4: Schedule for Submission of Financial Report

No	Reporting Period	Type of Report	Due Date
1.	October 2022 – December 2022	• FASA_Annual Financial Report 2022Q4	30 December 2022
2.	January 2023 – June 2023	• FASA_Mid-Year Financial Report 2023Q1-Q2	30 July 2023
3.	January 2023 – December 2023	• FASA_Annual Financial Report 2023Q1-Q4	30 December 2023
5.	January 2024 – June 2024	• FASA_Mid-Year Financial Report 2024Q1-Q2	30 July 2024
6.	January 2024 – December 2024	• FASA_Annual Financial Report 2024Q1-Q4	30 December 2024
8.	January 2025 – June 2025	• FASA_Mid-Year Financial Report 2025Q1-Q2	30 July 2025
8.	January 2025 – December 2025	• FASA_Annual Financial Report 2025Q1-Q4	30 December 2025
9.	January 2026 – June 2026	• FASA_Mid-Year Financial Report 2026Q1-Q2	30 July 2026
10.	January 2026 – December 2026	• FASA_Annual Financial Report 2026Q1-Q4	30 December 2026
11.	January 2027 – April 2027	• FASA_Mid-Year Financial Report 2027Q1-Q2	30 May 2027
12.	October 2022 – April 2027	• FASA_Final Financial Report 2022-2027	30 May 2027

ANNEX 3: REPORTING TEMPLATE

Financial & Technical reporting template-Please see Annex 3a and 3b for details.

Financial Reporting Template: Annex 3a (attached)

Technical Reporting Template: Annex 3b (attached)

ANNEX 4: PART II: GENERAL CONDITIONS APPLICABLE TO GRANTS FROM THE NORWEGIAN AGENCY FOR DEVELOPMENT COOPERATION (ATTACHED).

ANNEX 5: CGIAR AND WORLDFISH POLICIES AND PROCEDURES

In addition to the Policies and Procedures listed in Annex 1 Article IV, the Sub-Grantee shall adhere to the attached WorldFish Procurement Policy for all procurement-related activities (attached).

ANNEX 6: PROJECT DESCRIPTION (ANNEX A), RESULT FRAMEWORK (ANNEX B), AND IMPLEMENTATION PLAN (ANNEX C)

SUB-GRANT AGREEMENT

Between the International Center for Living Aquatic Resources Management (ICLARM) also known as WorldFish, headquartered in Penang, Malaysia, and

International Centre of Insect Physiology and Ecology (ICIPE), headquartered in Nairobi, Kenya, referred to as the "Sub-grantee" in this Agreement.

This Agreement includes this Signature Page and all Annexes attached to this agreement. In the event of any conflict between the contents of Annexes and the terms stated in the Signature Page, the terms in the Signature Page shall prevail.

This Agreement is issued to the Sub-grantee on the expressed condition that project activities and funds will be carried-out and administered in accordance with the terms and conditions as hereby set forth in this agreement and all its attachments.

Agreement Period	Start Date: 1 November 2022	End Date: 30 May 2027	
Duration	Total of 54 months		
Agreement Amount (currency and amount)	NOK8,169,749	Eight Million One Hundred Sixty-Nine Thousand Seven Hundred Forty-Nine Norwegian Krone	
Cash or In kind contribution (if none insert N/A)	N/A		
Project Title	Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)		
WorldFish Contact Person	Senior Scientist, Project Leader	Rodrigue Yossa	r.yossa@cgiar.org
Sub-grantee Contact Person	Senior Scientist, Head of Insects for Food, Feed and Other Uses (INSEFF) Program	Chrysantus Mbi Tanga	ctanga@icipe.org

Attachments:
Annex 1: WorldFish Standard Terms and Conditions
Annex 2: Project Description
Annex 3: Reporting Templates
Annex 4: General Conditions Applicable to Grants from The Norwegian Agency for Development Cooperation
Annex 5: CGIAR and WorldFish Policies and Procedures
Annex 6: Project Description, Result Framework, and Implementation Plan

Signed by Authorized Signatories:

For WorldFish

DocuSigned by: Simon Carter 1EAF465596E547D...

Name : Simon Carter
Title : Global Financial Controller Corporate Functions
Date : Nov 3, 2022 | 5:33 PM SGT

For ICIPE

DocuSigned by: Dr. Segenet Kelemu, PhD 0732AAD79655421...

Name : Segenet Kelemu, PhD
Title : Director General & CEO
Date : Nov 3, 2022 | 8:47 PM SGT

ANNEX 1: WORLDFISH STANDARD TERMS AND CONDITIONS

WorldFish and the Sub-grantee are hereinafter collectively referred to as the "Parties" and may be individually referred to as the "Party".

ARTICLE I – PERIOD OF AGREEMENT

This Agreement shall be effective for the period specified in the Signature Page. All expenditures made with funds provided under this agreement shall be for allowable project expenditures and actual costs incurred during the period of this agreement.

ARTICLE II – AMOUNT AND PAYMENT

WorldFish, subject to funds received from the donors and successful completion of activities and deliverables by the Sub-grantee, will pay the Sub-grantee up to the amount specified in the Signature Page. WorldFish shall not be liable for reimbursing the Sub-grantee for any costs in excess of what is specifically and explicitly agreed to in this Agreement. No other fees, reimbursements, allowances or benefits will be paid under this agreement other than those specified in this Agreement.

Expenditures must be incurred within the eligibility period and in connection with the project and necessary for its implementation. Expenditures must be for activities that are carried out within the agreement period. They must also be identifiable and verifiable; reasonable, justified and comply with the principle of sound financial management; and comply with national rules (of applicable tax and social legislation).

In case of partial performance of the deliverables set out herein, WorldFish has the discretion to pay a partial sum corresponding to the work completed or to withhold payment for inadequate performance.

The details of this total Agreement Amount, payment schedule and budgetary restrictions are set forth in Annex 2.

Funds will be made available within 60 working days of receipt AND acceptance of deliverables. No funds will be released until technical and financial reports are received and accepted by WorldFish.

Unless otherwise agreed in writing, WorldFish funds will be paid in the currency of Agreement amount and in accordance with the detailed banking instructions provided by the Sub-grantee as part of the Work Plan and Budget in Annex 2.

WorldFish reserves the right to withhold final payment until after the final technical and financial reports are received and accepted by WorldFish.

WorldFish will not be responsible for any losses incurred by the Sub-grantee due to currency fluctuations, standard and additional bank charges arising from incomplete or inaccurate banking details being submitted, or any taxes, duties or fees that may be due. The sole responsibility shall be with the Sub-grantee.

WorldFish reserves the right to withhold payment for any of the following:

- Sub-grantee's failure to make satisfactory progress towards the project objectives set forth in Annex 2.
- Sub-grantee's default of or otherwise inability to adhere to the conditions or provisions of this agreement
- Sub-grantee's inability to submit reliable and/or timely reports or other deliverables as described in this agreement.

Any balance of funds held by the Sub-grantee at the completion or sooner termination of the project shall be returned to WorldFish within 30 days irrespective of a formal demand from WorldFish. Funds must be returned to WorldFish in the currency of the agreement unless a different arrangement is agreed and clearly written in this agreement.

ARTICLE III – INDEMNITY AND LIABILITY

WorldFish will not assume responsibility for any liability arising from or incidental to the Sub-grantee's work specified in the Agreement. The Sub-grantee will arrange for group medical, life, AD&D and professional liability insurance for themselves and their personnel and shall be responsible for any damage, loss, suit, claim and demand whatsoever that may arise from and be related to this project. The Sub-grantee shall indemnify and keep indemnified at all times WorldFish against such damage, loss, suit, claim and demand. This indemnity shall continue even after the termination

of this agreement or after the completion of the project for a period of 5 years.

ARTICLE IV – POLICIES, PROCEDURES AND GUIDELINES

The Sub-grantee shall strictly adhere to the guidelines and provisions listed in Annex 4 and Annex 5.

The Sub-grantee is required to comply with WorldFish's code of conduct, ethics policy, child protection policy, anti-harassment, discrimination and bullying policy, anti-fraud and anti-corruption policy, and any other organizational policies relating to workplace behaviors and processes. WorldFish may terminate the appointment with immediate effect in the event that the Sub-grantee is in breach of any of the provisions of this letter or if the conduct brings themselves or WorldFish into disrepute.

CGIAR Policy and Principles on the Management of Intellectual Assets: All intellectual assets produced or acquired shall be managed in ways that maximize their global accessibility and/or ensure they lead to the broadest possible impact on target beneficiaries in furtherance of the CGIAR vision. WorldFish implement this principle through Article V below.

CGIAR Open Access & Data Management Policy: Open Access is defined by WorldFish as the ownership, preservation, exploitation and publication of research data collected by Sub-grantees and others which should be managed in a way that increases the visibility, accessibility and impact of the research. WorldFish implements this Policy through its Open Access/Open Data Implementation Plan, which will be adopted on approval by the WorldFish Board of Trustees.

WorldFish Policy on Ethics of Research Involving People: WorldFish staff are held accountable towards people (communities, groups, individuals) involved in or affected by our research, and expects our Sub-grantees to adhere to the same high ethical standards.

WorldFish Anti-Fraud and Anti-Corruption Policy: WorldFish will not accept any level of bribery, corruption, money laundering and all types of fraud, whether actual or attempted and will treat any such matter with the utmost of seriousness. This is whether it is committed by trustees, staff, contractors, consultants or Sub-grantees.

WorldFish Child Protection Policy: WorldFish is committed to creating and maintaining positive environments that protect children from all forms of exploitation and abuse. Sub-grantees shall not engage in any form of child exploitation or engage with anyone who poses an unacceptable risk to children, shall work towards reducing the risks to children that may be associated with WorldFish programs, and will report any concern or suspicion of exploitation and abuse of children and abide to WorldFish Child Protection Policy

ARTICLE V – INTELLECTUAL PROPERTY (IP)

"Intellectual property" or "IP" means information, ideas, inventions, innovations, artwork, designs, literary text and any other matter or thing whatsoever that adds a creation of human intervention that may be capable of legal protection or the subject of legal rights.

Intellectual property created in the course of this agreement is subject to the CGIAR Policy and Principles on the Management of Intellectual Assets as described in Article IV.

1. Resulting Intellectual Property Rights
All intellectual property rights arising from Sub-granting must be treated in the following manner:

a) If all or a substantive majority of the cost of the collaborative project as described in the Work Plan and budget is borne by WorldFish, then WorldFish reserves the right to own all intellectual property rights resulting from the project but WorldFish grants the Sub-grantee a non-exclusive, worldwide, royalty-free, irrevocable license to use, publish and sublicense the resulting intellectual property for other than commercial reasons.

b) If the Sub-grantee bears all or a substantive majority of the cost, then the Sub-grantee reserves the right to own all resulting intellectual property rights and grants to WorldFish a non-exclusive, worldwide, royalty-free, irrevocable license to use, publish and sublicense the resulting intellectual property

c) If WorldFish and the Sub-grantee contribute approximately equally to the costs then the resulting intellectual property rights shall be jointly owned by both Parties. As such, they shall

remain publicly accessible and shall be available to the Sub-grantees of WorldFish and the Sub-grantee and to end-users.

2. Background Intellectual Property
Either Party may choose to introduce intellectual property that it owns to the other, for the purpose of this Agreement. It would thereby grant the other Party a non-exclusive, royalty free license to use and sublicense the background intellectual property being introduced, wherever this is required to meet the objectives of this Agreement.

3. Intellectual Property Rights Protection
Sub-grantees who believe that intellectual property rights protection should be sought by WorldFish in relation to aspects of the collaborative work must discuss this with their WorldFish counterpart. As a general rule, such IP protection shall not be sought unless it is necessary for the further improvement of the intellectual property or to enhance the scale or scope of impact on target beneficiaries, in furtherance of the CGIAR Vision as defined in the CGIAR IA Principles.

4. Publication
Wherever possible, publications should be in Open Access Journals or made available through Open Access Repositories. Similarly, data sets and other outputs of research should be publicly available in line with the obligation of WorldFish to comply with the CGIAR Open Access and Data Management Policy (and the WorldFish Open Access/Open Data Implementation Plan when approved by the WorldFish Board of Trustees. The technical and scientific articles published by ICIPE as the result of this agreement must be coauthored by WF Project Leader.

ARTICLE VI – CONFIDENTIAL INFORMATION

Each Party shall hold in confidence all documents disclosed to it by the other Party containing the other Party's trade secrets and proprietary, secret, confidential and/or other information not generally available to the public (Confidential Information). Confidential information shall only be disclosed to persons assigned by the Parties who are directly involved in the collaboration. Any obligation of confidentiality hereunder shall not apply to information that:

I. is or becomes public knowledge through no fault of the receiving party, or

II. was known prior to this Agreement by the receiving party, or

III. properly and lawfully becomes available to the receiving party from another source without any obligation of secrecy, or

IV. is independently developed without benefit of disclosure from the receiving party, or

V. is required to be disclosed through process of law.

ARTICLE VII – PROHIBITION AGAINST TERRORIST FINANCING AND DISCRIMINATION

The Sub-grantee certifies that it has not provided and will not provide material support or resources to any individual or entity that it knows, or has reason to know, is an individual or entity that advocates, plans, sponsors, engages in or has engaged in terrorist activity.

The Sub-grantee agrees to undertake all reasonable efforts to ensure that none of the funds shall be used to provide support to individuals or entities associated with terrorism, as included in the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). This provision must be included in any subcontracts or sub-agreements entered into under this Agreement.

Funds received from WorldFish shall not be used for payments for which corrupt, fraudulent, collusive, obstructive or coercive practices were engaged in, nor for drug trafficking.

The Sub-grantee will not discriminate against persons with disabilities, and will make every effort to respect the principles of the UN Convention on the Rights of Persons with Disabilities.

ARTICLE VIII – SEVERABILITY

If any provision in this Agreement shall be invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions shall not in any way be affected or impaired thereby.

ARTICLE IX – TIME

Every effort should be made to ensure that the time-frame laid out in the Work Plan and Budget at Annex

2 is adhered to. Failure to meet the time-frame set forth in Table 3 of Annex 2 shall be grounds for termination by WorldFish as provided in Article XI.

ARTICLE X – AMENDMENTS AND MODIFICATIONS

This Agreement may not be assigned, amended or modified unless mutually agreed upon in writing by designated signatories of the Parties, and the changes shall then form part of this Agreement.

ARTICLE XI – TERMINATION

Either Party may terminate this Agreement by giving 30 days' notice in writing to the other Party stating the reason(s) for such termination. During this notice period, the Parties shall make reasonable efforts to resolve the reasons for termination stated in the termination notice. Unless the Party giving the termination notice rescinds such notice, this Agreement shall be terminated upon the expiry of the notice period and neither Party shall have any further obligation hereunder, except for such rights and obligations under the following Articles, which will survive termination: Article III – Indemnity and Liability; Article V – Intellectual Property; Article VI – Confidential Information; and Article XII – Dispute Resolution. The affected Party is eligible to claim for payment due and payable until and before the date of the termination. The Parties are obliged to submit to each other all reports, data and manuscripts that are relevant to this Agreement before the termination of the Agreement.

ARTICLE XII – DISPUTE RESOLUTION

Before recourse to legal action, all attempts must be made to settle the dispute amicably by negotiations between the Parties.

Should amicable negotiations fail, all disputes shall be finally settled under the Rules of Arbitration of the International Chamber of Commerce by one or more arbitrators appointed in accordance with said Rules. The seat of the arbitration shall be Malaysia, the governing law of the contract and the arbitration clause shall be Malaysian Law and the language of arbitration shall be English.

ARTICLE XIII – FINANCIAL RECORDS, MONITORING AND AUDIT

The Sub-grantee shall maintain books, records, documents and other evidence in accordance with their respective usual accounting procedures to sufficiently substantiate financial data relating to this Agreement. The Sub-grantee shall establish and maintain a reliable accounting system that enables the production of financial reports.

WorldFish and its authorized representatives shall have the right to audit, examine and make copies of or extracts from all the financial and related records (in whatever form they may be kept, whether written, electronic, or other) relating to or pertaining to this agreement. Such records shall include, but are not be limited to, accounting records; sub-agreement files (including proposals of successful and unsuccessful bidders, bid recaps, etc.); all paid vouchers; other reimbursements supported by invoices; ledgers; cancelled checks; deposit slips; journals; payroll documents; timesheets; and correspondence. The Sub-grantee shall, at all times during the term of the agreement and for a period of 7 years after the completion of this agreement, maintain such records, together with such supporting or underlying documents and materials. The Sub-grantee may at any time be requested by WorldFish, whether during or after completion of the agreement, and at the Sub-grantee's own expense, to make such records available for inspection and audit. Costs of any audits conducted by WorldFish will be borne by WorldFish.

WorldFish reserves the right to request separate audited financial statements or reports, which should be paid for using project funds provided by WorldFish.

If an audit identifies any costs that are not in compliance with the donor requirements and considers those costs as ineligible, those costs shall be borne by the Sub-grantee and as applicable, costs shall be reimbursed to WorldFish.

ARTICLE XIV - REPORTING

WorldFish requires the Sub-grantee to submit both interim and final reports. Details of reporting requirements are set forth in Annex 2.

Sub-grantee shall maintain adequate records that clearly support the charges and expenditures

incurred under this project. If requested by WorldFish, Sub-grantee may be required to send the supporting documentation to support claims made on the Financial Report. WorldFish may, at its discretion, request modification of any invoice or report when unallowable expenditures are incurred or charged to the project, amend the schedule for reporting requirements, and/or require additional supporting documentation from the Sub-grantee as necessary.

ARTICLE XV – FORCE MAJEURE

If either Party is temporarily unable by reasons of force majeure to meet any of its obligations under this Agreement, and if such Party gives the other Party written notice of the event within thirty (30) days after its occurrence, such obligations of the Party as it is unable to perform by reason of the event shall be suspended for as long as the inability continues. If necessary the Agreement can be cancelled, if Force Majeure prevents performance for an extended period. Neither Party shall be liable to the other Party arising from any event referred to below or delays arising from such event. The term "Force Majeure" as used herein shall mean Acts of God, strikes, lockouts or other industrial disturbances, acts of public enemy, wars, blockades, insurrection, riots, epidemics, lightening, floods, washouts, civil disturbances, explosions and other similar events not within the control of either Party and which, by the exercise of due diligence, neither Party is able to overcome.

ARTICLE XVI - REPRESENTATIONS AND WARRANTIES

The Parties shall be independent parties and nothing herein shall be construed or implied to mean the establishment or existence of a partnership or joint venture between the parties, nor shall any party herein be construed to be employees, agents, or principals of the other party.

By signing this Agreement, all parties certify that the terms of conditions defined in this Agreement are accepted; that the Parties are proper business entities permitted to do business; and that the individuals signing are competent parties authorized to enter into this Agreement on behalf of their respective agencies.

ARTICLE XVII – SPECIAL PROVISIONS

ICIPE shall notify WorldFish and provide all the relevant supporting details in the event that the exchange rate fluctuations negatively affect its ability to fulfil its obligations/ deliverables under this agreement. WorldFish and ICIPE shall evaluate the notice and shall mutually agree on amendments, variations or modifications to this agreement subject to obtaining prior approval from the prime donor.

ANNEX 2: PROJECT DESCRIPTION

I. Project Overview

WorldFish is managing the project titled "Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)", which goal is 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 FASA project will be implemented mainly in Nigeria, Zambia, and Kenya, with additional research activities to be completed in Malaysia and Sweden. Full-time postdoctoral researchers and scientists hired by ICIPE through this agreement will be co-supervised by WF Project Leader.

II. Expected Outputs and Required Activities to be Performed by Sub-grantee

Outputs	Activities
Output 1: Participation in annual project meetings and planning a Start-up workshop	Detail activities: Participate in annual project meetings and conduct a project start-up workshop at ICIPE (Kenya) in the year of 2022
Output 2: 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	Detail activities: Conduct 1 scoping assessment, which includes (i) Conducting a literature review of relevant research documents and protocol; (ii) Design scoping studies for Kenya; (iii) Data collection (including sample ingredients) and analysis; and (iv) Report preparation and publication.
Output 3: New knowledge and data on nutrient requirements of improved strains of tilapia and African catfish produced, validated, and made widely available	Detail activities: Investigate nutrient requirements in improved strains of tilapia and African catfish which includes (i) Design research protocols; (ii) Secure animal ethics approval; (iii) Conduct 12 tilapia experiments and 8 catfish experiments in project countries; (iv) Analyse data and samples; and (v) Research report preparation and publication and addition of results to WF's Better Management Practices guidelines (BMPs).
Output 4: New data and knowledge on local ingredients generated, used in the formulation of novel fish feeds, and made widely available	Detail activities: Stakeholder consultations (1 online workshop per country) to discuss results of activity 2.1.1 and potential benefits, risks, challenges, and hazards to the use of local ingredients which includes (i) Organise and facilitate 1 online stakeholder workshop per country; and (ii) Reports preparation and dissemination. Detail activities: Validate 9 formulated fish feeds through 6 on-farm pilots (2 per country which include (i) Design and validate research protocols; (ii) Conduct validation experiments on-farm; (iii) Analyse the data and produce reports; and (iv) Hold workshops to share and discuss results (1 workshop per country).

Outputs	Activities
Output 5: 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 context-specific circumstances and needs	Detail activities: Hold consultation workshops to develop the printed booklets/manuals for ingredients and fish feeds, which includes (i) Organise and facilitate 2 workshops per country (1 online and 1 in-person); and (ii) Reports preparation and dissemination. Detail activities: Hold workshops to train feed millers and fish farmers on ingredients, feeds, practices, databases, booklets/manuals which includes (i) Organise and facilitate 4 training workshops per country (2 online and 2 in-person); and (ii) Reports preparation and dissemination.
Output 6: 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.	Detail activities: Stakeholder consultations to co-develop scaling strategies which includes (i) Organise and facilitate 2 stakeholder workshops per country (total of 6); and (ii) Report preparation and dissemination
Output 7: Support is offered to other project stakeholders working in Kenya	Detail activities: Support to the gender, climate change, scaling, MEL, Communication, Project Leadership and other stakeholders involved in project that are not based in Kenya are supported by ICIPE during the implementation of their activities in Kenya, including guidance in the project areas in Kenya, invitation letters for visa application, hotel reservations, venue booking for workshops, etc.

For exact description of the Expected Outputs and Required Activities to be performed: Kindly refer to the Project Description, Result Framework and Implementation Plan approved by the donor, Norad (Annex 6A,6B and 6C).

III. Outcomes or Results Expected (include Work Plan or Activity Implementation Plan) if needed

- Outcomes or results expected 1: Deliver and participate in the project start-up activities.
- Outcomes or results expected 2 and 3: Enhanced capacity of at least two stakeholder groups in Kenya 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.
- Outcomes or results expected 4: Quality of at least 5 local ingredients has been improved through various processing techniques and the ingredients that are used by stakeholders in Kenya, including local millers and farmers, to produce 9 novel, cost-efficient feed formulations, to improve aquaculture productivity and resilience.
- Outcomes or results expected 5: Databases and digital solutions developed and used by farmers for formulating and adapting new local feeds on a "real-time" basis.
- Outcomes or results expected 6: 2,000 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.
- Outcome 7: All the other project stakeholders working in Kenya have received local support and guidance during the implementation of their activities in Kenya.

Activity Implementation Plan:

Activity Implementation Plan: Please refer to Annex 6C

IV. Budget, Reporting and Payment Schedule

1) BUDGET in NOK

Budget Item/ Year	Year 1 (NOK)	Year 2 (NOK)	Year 3 (NOK)	Year 4 (NOK)	Year 5 (NOK)	Total (NOK)
Personnel Cost	816,174	1,002,815	1,002,815	816,174	751,087	**4,389,065**
Travel	-	6,960	38,390	6,960	6,960	**59,268**
Specific project-related costs	626,186	997,754	633,494	524,486	192,333	**2,974,254**
Purchase of equipment	121,948	4,041	2,694	2,245	2,694	**133,622**
Subcontractors & Collaborators	75,234	86,285	50,115	6,006	6,864	**224,504**
Indirect operating costs (5%)	81,977	104,893	86,375	67,794	47,997	**389,036**
Total (NOK)	**1,721,520**	**2,202,747**	**1,813,882**	**1,423,665**	**1,007,935**	**8,169,749**

The following modifications to the budget require written approval from WorldFish:

- To change the required funding amounts necessary to fulfill the stated project objectives.
- To change or temporarily replace key project staff.
- To reallocate between budget lines items an amount greater than 10% percent of the main budget line.
- To add a line item to the budget.
- To sub-grant or subcontract any portion of this budget to a third party.

2) PAYMENT SCHEDULE

WorldFish, subject to funds received from the donors and accordance with payment terms as per table below, will pay the partner a total of not more than **NOK8,169,749** towards the expected outputs / deliverables as per Annex 2. Fund Transfers may be executed in **Norwegian Krone (NOK)**. .

With the exception of the first payment of **NOK172,152 upon acceptance of the Year 1 Work Plan and Budget,** subsequent releases of funds (cost reimbursement) to the Sub-grantee are subject to the following conditions:

1. Technical and financial reports that are due are received and accepted by WorldFish, whichever is the later (please refer to Table 3 - Schedule for Submission of Technical Reports and Table 4 – Schedule for Submission of Financial Reports).
2. Sub-grantee's approved expenditure reports cover at least 75% of the previous cash transfers from WorldFish.
3. Sufficient supporting evidence must be provided with the financial reports to support the expenditure.

Payment should be made to the account number below:-

Bank Account Holder Name	**: International Centre of Insect Physiology & Ecology (ICIPE)**
Bank Name	**: Standard Chartered Bank Kenya Limited**
Bank Account Currency	**: US Dollar (USD)**
SWIFT Code	**: SCBLKENXXXX**
Branch Address	**: P.O Box 40310 – 00100, Nairobi, Kenya**
Bank Account Number	**: 8704074020600**

WorldFish shall not be responsible for any losses incurred by the Sub-grantee due to currency fluctuations and/or delays, standard and additional bank charges arising from incomplete or inaccurate banking details submitted. The sole responsibility shall be the Sub-grantee directly.

3) REPORTS

a. Financial Reporting

Sub-grantee shall submit the following reports to WorldFish according to the Table 3 (Schedule for Submission of Technical and Financial Reports) below:

Financial reporting template is provided for in Annex 3 (MS Excel file). Reports shall be submitted in the currency set out in the Signature Page, i.e., in NOK. The Sub-grantee shall submit proof by the bank of the amount that has been credited in the currency of account for the funds disbursed by WorldFish.

Financial reports shall include at a minimum the following information:

a. Budget versus actual expenses, with current reporting period data and grant to date data.
b. Detailed list of expenses that include description, transaction date, amount, expense category, exchange rates used to convert to reporting currency.
c. Cost Share or matching progress report for period. (if necessary)
d. WorldFish needs access to all supporting documentation from the sub-grantee to support the transaction list.
e. Fund balance status – cash received from WorldFish versus expenditures reported to WorldFish

b. Technical Reports

Sub-grantee shall submit the following reports to WorldFish according to the Table 3 (Schedule for Submission of Technical and Financial Reports) below:

Technical reporting template is provided for in Annex 3 (MS Word file)

c. Other Reports

WorldFish may, at its discretion, require other necessary reports (supporting documents) from Sub-grantee.

d. Reporting Format

Sub-grantee shall submit semi-annual and annual technical reports not later than one month after the reporting period.

Sub-grantee shall submit semi-annual financial report in NOK covering January to June not later than one month after reporting period and annual financial report in NOK covering January to November (actual spending) and for the month of December (estimation).

Sub-grantee shall submit a final financial statement in NOK and a final technical report not later than 4 weeks after completion of the project.

Table 3: Schedule for Submission of Technical Report

No	Reporting Period	Type of Report	Due Date
1.	October 2022 – December 2022	• FASA_Annual Technical Report 2022Q4	30 January 2023
2.	January 2023 – June 2023	• FASA_Mid-Year Technical Report 2023Q1-Q2	30 July 2023
3.	January 2023 – December 2023	• FASA_Annual Technical Report 2023Q1-Q4	30 January 2024
4.	January 2024 – June 2024	• FASA_Mid-Year Technical Report 2024Q1-Q2	30 July 2024
5.	January 2024 – December 2024	• FASA_Annual Technical Report 2024Q1-Q4	30 January 2025
6.	January 2025 – June 2025	• FASA_Mid-Year Technical Report 2025Q1-Q2	30 July 2025
7.	January 2025 - December 2025	• FASA_Annual Technical Report 2025Q1-Q4	30 January 2026
8.	January 2026 – June 2026	• FASA_Mid-Year Technical Report 2026Q1-Q2	30 July 2026
9.	January 2026 – December 2026	• FASA_Annual Technical Report 2026Q1-Q4	30 January 2027
10.	January 2027 – April 2027	• FASA_Mid-Year Technical Report 2027Q1-Q2	30 May 2027
11.	October 2022 – April 2027	• FASA_Final Technical Report 2022-2027	30 May 2027

Table 4: Schedule for Submission of Financial Report

No	Reporting Period	Type of Report	Due Date
1.	October 2022 – December 2022	• FASA_Annual Financial Report 2022Q4	30 December 2022
2.	January 2023 – June 2023	• FASA_Mid-Year Financial Report 2023Q1-Q2	30 July 2023
3.	January 2023 – December 2023	• FASA_Annual Financial Report 2023Q1-Q4	30 December 2023
5.	January 2024 – June 2024	• FASA_Mid-Year Financial Report 2024Q1-Q2	30 July 2024
6.	January 2024 – December 2024	• FASA_Annual Financial Report 2024Q1-Q4	30 December 2024
8.	January 2025 – June 2025	• FASA_Mid-Year Financial Report 2025Q1-Q2	30 July 2025
8.	January 2025 – December 2025	• FASA_Annual Financial Report 2025Q1-Q4	30 December 2025
9.	January 2026 – June 2026	• FASA_Mid-Year Financial Report 2026Q1-Q2	30 July 2026
10.	January 2026 – December 2026	• FASA_Annual Financial Report 2026Q1-Q4	30 December 2026
11.	January 2027 – April 2027	• FASA_Mid-Year Financial Report 2027Q1-Q2	30 May 2027
12.	October 2022 – April 2027	• FASA_Final Financial Report 2022-2027	30 May 2027

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ANNEX 3: REPORTING TEMPLATE

Financial & Technical reporting template-Please see Annex 3a and 3b for details.

Financial Reporting Template: Annex 3a (attached)
Technical Reporting Template: Annex 3b (attached)

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ANNEX 4: Part II: General Conditions Applicable to Grants from The Norwegian Agency for Development Cooperation (attached).

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ANNEX 5: CGIAR AND WORLDFISH POLICIES AND PROCEDURES

In addition to the Policies and Procedures listed in Annex 1 Article IV, the Sub-Grantee shall adhere to the attached WorldFish Procurement Policy for all procurement-related activities (attached).

ANNEX 6: Project Description (Annex A), Result Framework (Annex B), and Implementation Plan (Annex C)

WorldFish

SUB-GRANT AGREEMENT

Between the International Center for Living Aquatic Resources Management (ICLARM) also known as WorldFish, headquartered in Penang, Malaysia, and

Swedish University of Agricultural Sciences (SLU) headquartered in Uppsala, Sweden, referred to as the "Sub-grantee" in this Agreement.

This Agreement includes this Signature Page and all Annexes attached to this agreement. In the event of any conflict between the contents of Annexes and the terms stated in the Signature Page, the terms in the Signature Page shall prevail.

This Agreement is issued to the Sub-grantee on the expressed condition that project activities and funds will be carried-out and administered in accordance with the terms and conditions as hereby set forth in this agreement and all its attachments.

Agreement Period	Start Date: 25 November 2022	End Date: 30 April 2027	
Duration	Total of 53 months		
Agreement Amount (currency and amount)	NOK4,197,829/-	Four Million One Hundred Ninety-Seven Thousand and Eight Hundred Twenty Nine Norwegian Krone	
Cash or In kind contribution (if none insert N/A)	N/A		
Project Title	Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)		
WorldFish Contact Person:	Senior Scientist, Project Leader	Rodrigue Yossa	r.yossa@cgiar.org
Sub-grantee Contact Person	Associate Professor, Group Leader: Aquaculture Nutraceuticals Research Group (ANARG)	Kartik Baruah	kartik.baruah@slu.se

Attachments:
Annex 1: WorldFish Standard Terms and Conditions
Annex 2: Project Description
Annex 3: Reporting Templates
Annex 4: General Conditions Applicable to Grants from The Norwegian Agency for Development Cooperation
Annex 5: CGIAR and WorldFish Policies and Procedures
Annex 6: Project Description, Result Framework, and Implementation Plan

Signed by Authorized Signatories:

For WorldFish

DocuSigned by: Simon Carter 1EAF465595E547D...

Name : Simon Carter
Title : Global Financial Controller Corporate Functions
Date : Dec 5, 2022 | 5:32 PM SGT

For SLU

DocuSigned by: Dr. Ewa Wredle CFD2623ED8548B...

Name : Ewa Wredle
Title : Head of Department of Animal Nutrition and Management
Date : dec 5, 2022 | 9:27 PM SGT

ANNEX 1: WORLDFISH STANDARD TERMS AND CONDITIONS

WorldFish and the Sub-grantee are hereinafter collectively referred to as the "Parties" and may be individually referred to as the "Party".

ARTICLE I – PERIOD OF AGREEMENT

This Agreement shall be effective for the period specified in the Signature Page. All expenditures made with funds provided under this agreement shall be for allowable project expenditures and actual costs incurred during the period of this agreement.

ARTICLE II – AMOUNT AND PAYMENT

WorldFish, subject to funds received from the donors and successful completion of activities and deliverables by the Sub-grantee, will pay the Sub-grantee up to the amount specified in the Signature Page. WorldFish shall not be liable for reimbursing the Sub-grantee for any costs in excess of what is specifically and explicitly agreed to in this Agreement. No other fees, reimbursements, allowances or benefits will be paid under this agreement other than those specified in this Agreement.

Expenditures must be incurred within the eligibility period and in connection with the project and necessary for its implementation. Expenditures must be for activities that are carried out within the agreement period. They must also be identifiable and verifiable; reasonable, justified and comply with the principle of sound financial management; and comply with national rules (of applicable tax and social legislation).

In case of partial performance of the deliverables set out herein, WorldFish has the discretion to pay a partial sum corresponding to the work completed or to withhold payment for inadequate performance.

The details of this total Agreement Amount, payment schedule and budgetary restrictions are set forth in Annex 2.

Funds will be made available within 60 working days of receipt AND acceptance of deliverables. No funds will be released until technical and financial reports are received and accepted by WorldFish.

Unless otherwise agreed in writing, WorldFish funds will be paid in the currency of Agreement amount and in accordance with the detailed banking instructions provided by the Sub-grantee as part of the Work Plan and Budget in Annex 2.

WorldFish reserves the right to withhold final payment until after the final technical and financial reports are received and accepted by WorldFish.

WorldFish will not be responsible for any losses incurred by the Sub-grantee due to currency fluctuations, standard and additional bank charges arising from incomplete or inaccurate banking details being submitted, or any taxes, duties or fees that may be due. The sole responsibility shall be with the Sub-grantee.

WorldFish reserves the right to withhold payment for any of the following:

- Sub-grantee's failure to make satisfactory progress towards the project objectives set forth in Annex 2.
- Sub-grantee's default of or otherwise inability to adhere to the conditions or provisions of this agreement
- Sub-grantee's inability to submit reliable and/or timely reports or other deliverables as described in this agreement.

Any balance of funds held by the Sub-grantee at the completion or sooner termination of the project shall be returned to WorldFish within 30 days irrespective of a formal demand from WorldFish. Funds must be returned to WorldFish in the currency of the agreement unless a different arrangement is agreed and clearly written in this agreement.

ARTICLE III – INDEMNITY AND LIABILITY

No Party shall be responsible to any other Party for any indirect or consequential loss or similar damage such as, but not limited to, loss of profit, loss of revenue or loss of contracts, provided such damage was not caused by a wilful act, wilful misconduct, gross negligence or by a breach of confidentiality.

For any remaining contractual liability, a Party's aggregate liability towards the other Party shall be limited to once the Party's share of the total costs of the Project provided such damage was not caused by a wilful act, wilful misconduct or gross negligence.

WorldFish will not assume responsibility for any liability arising from or incidental to the Sub-grantee's work specified in the Agreement.

ARTICLE IV – POLICIES, PROCEDURES AND GUIDELINES

The Sub-grantee shall strictly adhere to the guidelines and provisions listed in Annex 4 and Annex 5.

The Sub-grantee is required to comply with WorldFish's code of conduct, ethics policy, child protection policy, anti-harassment, discrimination and bullying policy, anti-fraud and anti-corruption policy, and any other organizational policies relating to workplace behaviors and processes. WorldFish may terminate the appointment with immediate effect in the event that the Sub-grantee is in breach of any of the provisions of this letter or if the conduct brings themselves or WorldFish into disrepute.

CGIAR Policy and Principles on the Management of Intellectual Assets: All intellectual assets produced or acquired shall be managed in ways that maximize their global accessibility and/or ensure they lead to the broadest possible impact on target beneficiaries in furtherance of the CGIAR vision. WorldFish implement this principle through Article V below.

CGIAR Open Access & Data Management Policy: Open Access is defined by WorldFish as the ownership, preservation, exploitation and publication of research data collected by Sub-grantees and others which should be managed in a way that increases the visibility, accessibility and impact of the research. WorldFish implements this Policy through its Open Access/Open Data Implementation Plan which will be adopted on approval by the WorldFish Board of Trustees.

WorldFish Policy on Ethics of Research Involving People: WorldFish staff are held accountable towards people (communities, groups, individuals) involved in or affected by our research, and expects our Sub-grantees to adhere to the same high ethical standards.

WorldFish Anti-Fraud and Anti-Corruption Policy: WorldFish will not accept any level of bribery, corruption, money laundering and all types of fraud, whether actual or attempted and will treat any such matter with the utmost of seriousness. This is whether it is committed by trustees, staff, contractors, consultants or Sub-grantees.

WorldFish Child Protection Policy: WorldFish is committed to creating and maintaining positive environments that protect children from all forms of exploitation and abuse. Sub-grantees shall not engage in any form of child exploitation or engage with anyone who poses an unacceptable risk to children, shall work towards reducing the risks to children that may be associated with WorldFish programs, and will report any concern or suspicion of exploitation and abuse of children and abide to WorldFish Child Protection Policy

ARTICLE V – INTELLECTUAL PROPERTY (IP)

"Intellectual property" or "IP" means information, ideas, inventions, innovations, art work, designs, literary text and any other matter or thing whatsoever that adds a creation of human intervention that may be capable of legal protection or the subject of legal rights.

Intellectual property created in the course of this agreement is subject to the CGIAR Policy and Principles on the Management of Intellectual Assets as described in Article IV.

1. Resulting Intellectual Property Rights
All intellectual property rights arising from Sub-granting must be treated in the following manner:

a) If all or a substantive majority of the cost of the collaborative project as described in the Work Plan and budget is borne by WorldFish, then WorldFish reserves the right to own all intellectual property rights resulting from the project but WorldFish grants the Sub-grantee a non-exclusive, worldwide, royalty-free, irrevocable license to use, publish and sublicense the resulting intellectual property for other than commercial reasons.

b) If the Sub-grantee bears all or a substantive majority of the cost, then the Sub-grantee reserves the right to own all resulting intellectual property rights and grants to WorldFish a non-exclusive, worldwide, royalty-free, irrevocable license to use, publish and sublicense the resulting intellectual property

c) If WorldFish and the Sub-grantee contribute approximately equally to the costs then the resulting intellectual property rights shall be

jointly owned by both Parties. As such, they shall remain publicly accessible and shall be available to the Sub-grantees of WorldFish and the Sub-grantee and to end-users.

2. Background Intellectual Property
Either Party may choose to introduce intellectual property that it owns to the other, for the purpose of this Agreement. It would thereby grant the other Party a non-exclusive, royalty free license to use and sublicense the background intellectual property being introduced, wherever this is required to meet the objectives of this Agreement.

3. Intellectual Property Rights Protection
Sub-grantees who believe that intellectual property rights protection should be sought by WorldFish in relation to aspects of the collaborative work must discuss this with their WorldFish counterpart. As a general rule, such IP protection shall not be sought unless it is necessary for the further improvement of the intellectual property or to enhance the scale or scope of impact on target beneficiaries, in furtherance of the CGIAR Vision as defined in the CGIAR IA Principles.

4. Publication
Wherever possible, publications should be in Open Access Journals or made available through Open Access Repositories. Similarly, data sets and other outputs of research should be publicly available in line with the obligation of WorldFish to comply with the CGIAR Open Access and Data Management Policy (and the WorldFish Open Access/Open Data Implementation Plan when approved by the WorldFish Board of Trustees. The technical and scientific articles published by SLU as the result of this agreement must be coauthored by WF Project Leader.

ARTICLE VI – CONFIDENTIAL INFORMATION

Each Party shall hold in confidence all documents disclosed to it by the other Party containing the other Party's trade secrets and proprietary, secret, confidential and/or other information not generally available to the public (Confidential Information). Confidential information shall only be disclosed to persons assigned by the Parties who are directly involved in the collaboration. Any obligation of confidentiality hereunder shall not apply to information that:

I. is or becomes public knowledge through no fault of the receiving party, or

II. was known prior to this Agreement by the receiving party, or

III. properly and lawfully becomes available to the receiving party from another source without any obligation of secrecy, or

IV. is independently developed without benefit of disclosure from the receiving party, or

V. is required to be disclosed through process of law.

ARTICLE VII – PROHIBITION AGAINST TERRORIST FINANCING AND DISCRIMINATION

The Sub-grantee certifies that it has not provided and will not provide material support or resources to any individual or entity that it knows, or has reason to know, is an individual or entity that advocates, plans, sponsors, engages in or has engaged in terrorist activity.

The Sub-grantee agrees to undertake all reasonable efforts to ensure that none of the funds shall be used to provide support to individuals or entities associated with terrorism, as included in the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). This provision must be included in any subcontracts or sub-agreements entered into under this Agreement.

Funds received from WorldFish shall not be used for payments for which corrupt, fraudulent, collusive, obstructive or coercive practices were engaged in, nor for drug trafficking.

The Sub-grantee will not discriminate against persons with disabilities, and will make every effort to respect the principles of the UN Convention on the Rights of Persons with Disabilities.

ARTICLE VIII – SEVERABILITY

If any provision in this Agreement shall be invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions shall not in any way be affected or impaired thereby.

ARTICLE IX – TIME

Every effort should be made to ensure that the time-frame laid out in the Work Plan and Budget at Annex 2 is adhered to. Failure to meet the time-frame set forth in Table 3 and Table 4 of Annex 2 shall be grounds for termination by WorldFish as provided in Article XI.

ARTICLE X – AMENDMENTS AND MODIFICATIONS

This Agreement may not be assigned, amended or modified unless mutually agreed upon in writing by designated signatories of the Parties, and the changes shall then form part of this Agreement.

ARTICLE XI – TERMINATION

Either Party may terminate this Agreement by giving 30 days' notice in writing to the other Party stating the reason(s) for such termination. During this notice period, the Parties shall make reasonable efforts to resolve the reasons for termination stated in the termination notice. Unless the Party giving the termination notice rescinds such notice, this Agreement shall be terminated upon the expiry of the notice period and neither Party shall have any further obligation hereunder, except for such rights and obligations under the following Articles, which will survive termination: Article III – Indemnity and Liability; Article V – Intellectual Property; Article VI – Confidential Information; and Article XII – Dispute Resolution. The affected Party is eligible to claim for payment due and payable until and before the date of the termination. The Parties are obliged to submit to each other all reports, data and manuscripts that are relevant to this Agreement before the termination of the Agreement.

ARTICLE XII – DISPUTE RESOLUTION

Before recourse to legal action, all attempts must be made to settle the dispute amicably by negotiations between the Parties.

Should amicable negotiations fail, all disputes shall be finally settled under the Rules of Arbitration of the International Chamber of Commerce by one or more arbitrators appointed in accordance with said Rules. The seat of the arbitration shall be Malaysia, the UNIDROIT Principles of International Commercial Contracts (2016) are incorporated in this Agreement to the extent that they are not inconsistent with the other terms of the Agreement. The Agreement and the Principles shall be supplemented when necessary by Malaysian law.The language of arbitration shall be English.

ARTICLE XIII – FINANCIAL RECORDS, MONITORING AND AUDIT

The Sub-grantee shall maintain books, records, documents and other evidence in accordance with their respective usual accounting procedures to sufficiently substantiate financial data relating to this Agreement. The Sub-grantee shall establish and maintain a reliable accounting system that enables the production of financial reports.

WorldFish and its authorized representatives shall have the right to audit, examine and make copies of or extracts from all the financial and related records (in whatever form they may be kept, whether written, electronic, or other) relating to or pertaining to this agreement. Such records shall include, but are not be limited to, accounting records; sub-agreement files (including proposals of successful and unsuccessful bidders, bid recaps, etc.); all paid vouchers; other reimbursements supported by invoices; ledgers; cancelled checks; deposit slips; journals; payroll documents; timesheets; and correspondence. The Sub-grantee shall, at all times during the term of the agreement and for a period of 7 years after the completion of this agreement, maintain such records, together with such supporting or underlying documents and materials. The Sub-grantee may at any time be requested by WorldFish, whether during or after completion of the agreement, and at the Sub-grantee's own expense, to make such records available for inspection and audit. Costs of any audits conducted by WorldFish will be borne by WorldFish.

WorldFish reserves the right to request separate audited financial statements or reports, which should be paid for using project funds provided by WorldFish.

If an audit identifies any costs that are not in compliance with the donor requirements and considers those costs as ineligible, those costs shall be borne by the Sub-grantee and as applicable, costs shall be reimbursed to WorldFish.

ARTICLE XIV - REPORTING

WorldFish requires the Sub-grantee to submit both interim and final reports. Details of reporting requirements are set forth in Annex 2.

Sub-grantee shall maintain adequate records that clearly support the charges and expenditures incurred under this project. If requested by WorldFish, Sub-grantee may be required to send the supporting documentation to support claims made on the Financial Report. WorldFish may, at its discretion, request modification of any invoice or report when unallowable expenditures are incurred or charged to the project, amend the schedule for reporting requirements, and/or require additional supporting documentation from the Sub-grantee as necessary.

ARTICLE XV – FORCE MAJEURE

If either Party is temporarily unable by reasons of force majeure to meet any of its obligations under this Agreement, and if such Party gives the other Party written notice of the event within thirty (30) days after its occurrence, such obligations of the Party as it is unable to perform by reason of the event shall be suspended for as long as the inability continues. If necessary the Agreement can be cancelled, if Force Majeure prevents performance for an extended period. Neither Party shall be liable to the other Party arising from any event referred to below or delays arising from such event. The term "Force Majeure" as used herein shall mean Acts of God, strikes, lockouts or other industrial disturbances, acts of public enemy, wars, blockades, insurrection, riots, epidemics, lightening, floods, washouts, civil disturbances, explosions and other similar events not within the control of either Party and which, by the exercise of due diligence, neither Party is able to overcome.

ARTICLE XVI - REPRESENTATIONS AND WARRANTIES

The Parties shall be independent parties and nothing herein shall be construed or implied to mean the establishment or existence of a partnership or joint venture between the parties, nor shall any party herein be construed to be employees, agents, or principals of the other party.

By signing this Agreement, all parties certify that the terms of conditions defined in this Agreement are accepted; that the Parties are proper business entities permitted to do business; and that the individuals signing are competent parties authorized to enter into this Agreement on behalf of their respective agencies.

ARTICLE XVI – SPECIAL PROVISIONS

SLU shall notify WorldFish and provide all the relevant supporting details in the event that the exchange rate fluctuations negatively affect the ability to fulfil its obligations/ deliverables under this agreement. WorldFish shall evaluate the notice and may at its discretion propose amendments, variations or modifications to this agreement upon prior approval from the prime donor.

ANNEX 2: PROJECT DESCRIPTION

I. Project Overview

WorldFish is managing the project titled "Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)", which goal is 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 FASA project will be implemented mainly in Nigeria, Zambia, and Kenya, with additional research activities to be completed in Malaysia and Sweden. Two full-time PhD students and a researcher hired by SLU through this agreement will be co-supervised by the WorldFish Project Leader.

II. Expected Outputs and Required Activities to be Performed by Sub-grantee

Table 1: Expected Outputs and Required Activities to be Performed by Sub-grantee

Outputs	Activities
Output 1: Participation in annual project meetings and planning a Start-up workshop	Detail activities: Participate in annual project meetings and conduct a project start-up workshop at SLU (Sweden) by Q12023. Recruit 2 Ph.D. students (Nigeria & Zambia).
Output 2: New data and knowledge on local ingredients generated, used in the formulation of novel fish feeds, and made widely available	Detail activities: Conduct experiments to prioritise 15 ingredients: Conduct biochemistry analyses of ingredients samples collected for output 1.1 *(please refer to the Annex 6C: Implementation Plan)*. Produce ingredients and co-formulate fish feeds: Develop and use processing techniques to improve the quality of the 15 local ingredients as needed (e.g., fermentation, soaking, drying, detoxification, etc.); Quality check the improved ingredients; and Formulate fish feeds using software. Validate 9 formulated fish feeds through 6 on-farm pilots (2 per country): Design and validate research protocols; Conduct validation experiments on-farm; Analyse the data and produce reports; Hold workshops to share and discuss results (1 workshop per country); and Finalise the two Ph.D.theses and ensure the graduation of the two PhD students. Provide scientific support to other research teams involved in the FASA project.
Output 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 context-specific circumstances and needs	Detail activities: Hold workshops to train raw material processors and providers, feed millers and fish farmers on ingredients, feeds, practices, databases, booklets/manuals: Facilitate 4 training workshops per country (2 online and 2 in-person); and Reports preparation and dissemination.

For exact description of the Expected Outputs and Required Activities to be performed: Kindly refer to the Project Description, Result Framework and Implementation Plan approved by the donor, Norad (Annex 6A,6B and 6C).

III. Outcomes or Results Expected (include Work Plan or Activity Implementation Plan) if needed

- Outcomes or results expected 1: Participate in the project annual meetings
- Outcomes or results expected 2 and 3: 3 sets of lab analyses and experiments completed on nutritional qualities and limitations of ingredients; Nutritional characteristics of 5 local ingredients per Country improved through processing and validated in the lab; 9 experimental fish feeds formulated using the improved local ingredients and 6 on-farm pilots completed to validate formulated fish feeds; 2 PhD students graduated; and 3 of capacity development and 1 workshop completed.

Activity Implementation Plan:

Activity Implementation Plan: Please refer to Annex 6C

IV. Budget, Reporting and Payment Schedule

1) BUDGET in NOK

Table 2: BUDGET in NOK

Budget Item/ Year	Year 1 (NOK)	Year 2 (NOK)	Year 3 (NOK)	Year 4 (NOK)	Year 5 (NOK)	Total (NOK)
Personnel Cost	22,549	267,595	272,992	95,709	48,815	**707,660**
Travel	-	44,900	44,900	44,900	44,900	**179,600**
Specific project-related costs	-	110,454	193,968	193,968	110,454	**608,844**
Operating costs	-	796,526	1,103,642	470,552	100,576	**2,471,296**
Purchase of equipment	30,532	-	-	-	-	**30,532**
Indirect operating costs (5%)	2,654	60,974	80,775	40,256	15,237	**199,897**
Total (NOK)	**55,735**	**1,280,449**	**1,696,277**	**845,385**	**319,983**	**4,197,829**

The following modifications to the budget require written approval from WorldFish:

- To change the required funding amounts necessary to fulfill the stated project objectives.
- To change or temporarily replace key project staff.
- To reallocate between budget lines items an amount greater than 10% percent of the main budget line.
- To add a line item to the budget.
- To sub-grant or subcontract any portion of this budget to a third party.

2) PAYMENT SCHEDULE

WorldFish, subject to funds received from the donors and accordance with payment terms as per table below, will pay the partner a total of not more than **NOK4,197,829/-** towards the expected outputs / deliverables as per Annex 2. Fund Transfers may be executed in **Norwegian Krone (NOK)**. .

With the exception of the first payment of **NOK55,735 upon acceptance of the Year 1 Work Plan and Budget,** subsequent releases of funds (cost reimbursement) to the Sub-grantee are subject to the following conditions:

1. Technical and financial reports that are due are received and accepted by WorldFish, whichever is the later (please refer to Table 3 - Schedule for Submission of Technical and Table 4- Schedule for Submission of Financial Reports).
2. Sub-grantee's approved expenditure reports cover at least 75% of the previous cash transfers from WorldFish.
3. Sufficient supporting evidence must be provided with the financial reports to support the expenditure.

Payment should be made to the below account number:-

Bank Account Holder Name : Sveriges Lantbruksuniversitet
Bank Name : Danske Bank
Bank Account Currency : SEK
SWIFT Code : DABASESX
Branch Address : Norrmalmstorg 1, 111 46 Stockholm, Sweden
Bank Account Number : 1281-01-19090

WorldFish shall not be responsible for any losses incurred by the Sub-grantee due to currency fluctuations and/or delays, standard and additional bank charges arising from incomplete or inaccurate banking details submitted. The sole responsibility shall be the Sub-grantee directly.

3) REPORTS

a. Financial Reporting

Sub-grantee shall submit the following reports to WorldFish according to the Table 4 (Schedule for Submission of Financial Report) below:

Financial reporting template is provided for in Annex 3 (MS Excel file). Reports shall be submitted in the currency set out in the Signature Page, i.e., in NOK. The Sub-grantee shall submit proof by the bank of the amount that has been credited in the currency of account for the funds disbursed by WorldFish.

Financial reports shall include at a minimum the following information:

a. Budget versus actual expenses, with current reporting period data and grant to date data.
b. Detailed list of expenses that include description, transaction date, amount, expense category, exchange rates used to convert to reporting currency.
c. Cost Share or matching progress report for period. (if necessary)
d. WorldFish needs access to all supporting documentation from the sub-grantee to support the transaction list.
e. Fund balance status – cash received from WorldFish versus expenditures reported to WorldFish

b. Technical Reports

Sub-grantee shall submit the following reports to WorldFish according to the Table 3 (Schedule for Submission of Technical Report) below:

Technical reporting template is provided for in Annex 3 (MS Word file)

c. Other Reports

WorldFish may, at its discretion, require other necessary reports (supporting documents) from Sub-grantee.

d. Reporting Format

Sub-grantee shall submit semi-annual and annual technical reports not later than one month after the reporting period.

Sub-grantee shall submit semi-annual financial report in NOK covering January to June not later than one month after reporting period and annual financial report in NOK covering January to November (actual spending) and for the month of December (estimation).

Sub-grantee shall submit a final financial statement in NOK and a final technical report not later than 4 weeks after completion of the project.

Table 3: Schedule for Submission of Technical Report

No	Reporting Period	Type of Report	Due Date
1.	October 2022 – December 2022	• FASA_Annual Technical Report 2022Q4	30 January 2023
2.	January 2023 – June 2023	• FASA_Mid-Year Technical Report 2023Q1-Q2	30 July 2023
3.	January 2023 – December 2023	• FASA_Annual Technical Report 2023Q1-Q4	30 January 2024
4.	January 2024 – June 2024	• FASA_Mid-Year Technical Report 2024Q1-Q2	30 July 2024
5.	January 2024 – December 2024	• FASA_Annual Technical Report 2024Q1-Q4	30 January 2025
6.	January 2025 – June 2025	• FASA_Mid-Year Technical Report 2025Q1-Q2	30 July 2025
7.	January 2025 - December 2025	• FASA_Annual Technical Report 2025Q1-Q4	30 January 2026
8.	January 2026 – June 2026	• FASA_Mid-Year Technical Report 2026Q1-Q2	30 July 2026
9.	January 2026 – December 2026	• FASA_Annual Technical Report 2026Q1-Q4	30 January 2027
10.	January 2027 – April 2027	• FASA_Mid-Year Technical Report 2027Q1-Q2	30 May 2027
11.	October 2022 – April 2027	• FASA_Final Technical Report 2022-2027	30 May 2027

Table 4: Schedule for Submission of Financial Report

No	Reporting Period	Type of Report	Due Date
1.	October 2022 – December 2022	• FASA_Annual Financial Report 2022Q4	30 December 2022
2.	January 2023 – June 2023	• FASA_Mid-Year Financial Report 2023Q1-Q2	30 July 2023
3.	January 2023 – December 2023	• FASA_Annual Financial Report 2023Q1-Q4	30 December 2023
5.	January 2024 – June 2024	• FASA_Mid-Year Financial Report 2024Q1-Q2	30 July 2024
6.	January 2024 – December 2024	• FASA_Annual Financial Report 2024Q1-Q4	30 December 2024
8.	January 2025 – June 2025	• FASA_Mid-Year Financial Report 2025Q1-Q2	30 July 2025
8.	January 2025 – December 2025	• FASA_Annual Financial Report 2025Q1-Q4	30 December 2025
9.	January 2026 – June 2026	• FASA_Mid-Year Financial Report 2026Q1-Q2	30 July 2026
10.	January 2026 – December 2026	• FASA_Annual Financial Report 2026Q1-Q4	30 December 2026
11.	January 2027 – April 2027	• FASA_Mid-Year Financial Report 2027Q1-Q2	30 May 2027
12.	October 2022 – April 2027	• FASA_Final Financial Report 2022-2027	30 May 2027

ANNEX 3: REPORTING TEMPLATE

Financial & Technical reporting template-Please see Annex 3a and 3b for details.

Financial Reporting Template: Annex 3a (attached)

Technical Reporting Template: Annex 3b (attached)

ANNEX 4: PART II: GENERAL CONDITIONS APPLICABLE TO GRANTS FROM THE NORWEGIAN AGENCY FOR DEVELOPMENT COOPERATION (ATTACHED).

ANNEX 5: CGIAR AND WORLDFISH POLICIES AND PROCEDURES

In addition to the Policies and Procedures listed in Annex 1 Article IV, the Sub-Grantee shall adhere to the attached WorldFish Procurement Policy for all procurement-related activities (attached).

ANNEX 6: PROJECT DESCRIPTION (ANNEX A), RESULT FRAMEWORK (ANNEX B), AND IMPLEMENTATION PLAN (ANNEX C)

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ANNEX 3A: REPORTING TEMPLATE

FINANCIAL REPORT
for the period from XXXXX to XXXXX
In <CURRENCY>

Contract/Project Processing No.	
Project Code	
Project Title	
Project Duration	
Project Leader	
Donor	
Total Grant	

BUDGET LINE ITEMS	TOTAL BUDGET	TOTAL EXPENDITURES			BUDGET BALANCE
		PREVIOUS REPORTING XXX - XXX	CURRENT PERIOD XXX - XXX	TOTAL CUMULATIVE EXPENDITURES	
	<CURRENCY>	<CURRENCY>	<CURRENCY>	<CURRENCY>	<CURRENCY>
A. Personnel Costs				-	-
B. Consultancy				-	-
C. Supplies & Operations				-	-
D. Equipment				-	-
E. Training / Workshop				-	-
F. Travel				-	-
G. Publication				-	-
H. Other Expenses				-	-
I. Institutional Overhead				-	-
J. Consortium Costs				-	-
Total budget for this project	-	-	-	-	-

We certify to the best of our knowledge and belief that this report is true in all respects and that disbursements have been made for the purpose and conditions of the sub-grant agreement. All documentation authenticating these expenditures has been retained by the sub-grantee and available for purposes of WorldFish review and external audit.

Certified by: **Approved by:**

Date : **Date :**

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ANNEX 3A: REPORTING TEMPLATE

Request for Funds

Attention To: **Finance Unit**
WorldFish
11960 Batu Maung, Penang, Malaysia

Request Number: _____

Type of Request:
- ☐ Advance
- ☐ Reimbursement
- ☐ Direct Payment

Project Reference number and Project Title: _____

Amount:

Please pay (currency) _____ (amount) _____ (in words) _____

Purpose of Request:

- ☐ This payment is related to the agreed work plan and budget for the period from _____ to _____
- ☐ This payment is in accordance with Article _____of the sub-grant agreement
- ☐ This payment is a reimbursement for expenses incurred for this project (*refer to fund status report*)

Please make payment to the bank account indicated in the sub-grant agreement.

Certification:

I hereby certify and agree as follows:

- ☐ The funds being requested are required (used) exclusively for the purposes of the Project
- ☐ The attached financial reports provide detailed information on the utilisation of the immediately preceding advance and confirms that the funds received have been exclusively used in accordance with the sub-grant agreement. All documentation authenticating these expenditures has been retained in accordance with Annex 1 Article XIIII attached to the sub-grant agreement (1)

Sub-grantee Name: _____

Authorized Signature: _____

Name: _____

Title: _____

(1) does not apply for first payment request

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ANNEX 3A: REPORTING TEMPLATE

STATEMENT OF FUNDS STATUS
for the period from XXXXX to XXXXX
In <CURRENCY>

Project Code	
Project Code	
Project Title	
Project Duration	
Project Leader	
Donor	
Total Grant	

	USD	<CURRENCY>
Fund Receipts		
	0.00	**0.00**
Fund Disbursements		
	0.00	**0.00**
Fund Balance as of		**0.00**
		0.00
Fund Balances		**0.00**

Certified by: **Approved by:**

Date : **Date :**

ANNEX 3A: REPORTING TEMPLATE

Sample Transaction List

No.	Date	Journal/ Reference	Expenditure categories	Supplier / Payee	Description/Purpose of Payment	Amount in local currency	Currency rate	Amount in <CURRENCY>

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ANNEX 3A: REPORTING TEMPLATE

Financial Statement - Inventory list of Equipment and Materials of the contract

Sub-grantee:

Financial statement for the period from : **to:**

Project Processing No.: **Contract No.:**

Equipment and Material

Reference number	Date of receipt	Amount in local currency	Exchange rate	Inventory	Expenditure in <CURRENCY>
1	2	3	4	5	6
				Total	0.00

Date and signature of Sub-grantee

ANNEX 3B: REPORTING TEMPLATE

PROJECT PROGRESS REPORT

The progress report will comprise of two sections and should not exceed 20 pages

SECTION A

This is an extract of the project design document. Ideally, Schedule 1 of the Grant agreement and should be summarised to the extent possible.

I. BACKGROUND

Project Title:

Project goals:

Project objectives:

Project Components/Output:

SECTION B:

II. IMPLEMENATION PROGRESS:

A. Project expenditure

Total project Budget	Year
Funds Received	
Expenditure	
Balance	

Brief comments on expenditure

B. Physical progress by component/output

Component 1:

Component 2:

Component 3:

Component 4:

Component 5:

ANNEX 3B: REPORTING TEMPLATE

C. Project Implementation Constraints (*issues related to staff, partnerships, political, funding etc*)

D. Innovative approaches/achievements if any (*in case there are innovative approaches or products developed, you do not need to have something reported under the section if there is none, If there is, then provide highlights, which should be in bullet points new technology, new tools, etc)*

E. Priorities for the coming Year (if applicable)

III. International Public Goods (*list of publications, in press, submitted or in preparation, authors, title and year, title of thesis can be included*)

IV. Nutrition and Health (*Project contribution to nutrition and health SLO if applicable)*

V. Gender Issues

VI. Partnerships

VII. Conclusions

Annexes (*this could include detailed research outputs under the various components.)*

PART II: GENERAL CONDITIONS APPLICCABLE TO GRANTS FROM THE NORWEGIAN AGENCY FOR DEVELOPMENT COOPERATION

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1 WORK PLAN AND BUDGET

1.1 Any updated work plan to be submitted in accordance with the Specific Conditions shall be directly related to the results framework.

1.2 Any updated budget to be submitted in accordance with the Specific Conditions shall be based on the approved budget in Annex A and include estimated income to the Project from all sources as well as planned expenditures for the upcoming reporting period. The estimated financial need of the Project in the upcoming reporting period shall be clearly stated.

2 PROGRESS REPORT

2.1 Any progress reports to be submitted in accordance with the Specific Conditions shall describe the results achieved by the Project during the reporting period. The report shall be set up in a way that allows direct comparison with the latest approved Application, work plan and budget, and shall be signed by an authorised representative of the Grant Recipient.

2.2 The progress reports shall, as a minimum, include:

a) an account of the results achieved so far by the Project, using the format, indicators and targets of the approved results framework. The overview must:
   - show delivered main outputs compared to planned Outputs;
   - show the Project's progress towards achieving the Outcome;
   - if possible, describe the likelihood of the Impact being achieved.
b) an account and assessment of deviations from the latest approved Application and/or work plan;
c) a brief update on the risk management of the Project, including:
   - any new risk factors;
   - how materialized risks have been handled in the reporting period;
   - the effectiveness of mitigating measures;
   - how risks will be handled going forward.

   The update shall include both risks affecting Project achievements and the risks for negative consequences from the Project on its surroundings. Potential negative effects on the cross-cutting issues as referred to in the Specific Conditions article 3 shall always be accounted for.
d) a brief account of work undertaken to prevent instances of corruption and sexual exploitation, sexual abuse and sexual harassment (SEAH) from occurring in the future and, if received any allegations during the reporting period, how these were handled and any actions taken.

3 FINANCIAL REPORT

3.1 Any financial report to be submitted in accordance with the Specific Conditions shall comprise financial statements with a comparison to the latest approved budget for the reporting period, as well as an identification of any deviations from the budget as per clause 3.3 below. The financial report shall be certified by the financial controller (or equivalent) as well as an authorised representative of the Grant Recipient.

3.2 The financial statements shall be set up in a way that allows for direct comparison with the latest approved budget, using the same currency and budget line items. They shall, as a minimum, include:

a) income from all sources, including bank interest. Norad's contribution shall be specified;
b) expenses charged/capitalised in the relevant reporting period;
c) expenses charged/capitalised from start-up of the Project to the end of the reporting period;
d) unused funds as per the reporting date. Norad's share shall be specified;

e) overhead/indirect costs to be covered by the Grant in accordance with article 4 of the Specific Conditions;
f) balance sheet, when required in accordance with the accounting principles applied;
g) explanatory notes including a description of the accounting principles used and any other explanatory material necessary for transparent financial reporting of the Project.

3.3 Deviations from the approved budget shall be highlighted with information about both nominal amounts and percentage of each deviation. The Grant Recipient shall include a written explanation of any deviations amounting to more than 10% and NOK 15 000 from a budget line.

4 FINAL REPORT

4.1 The final report to be submitted in accordance with the Specific Conditions shall describe the results achieved by the Project during the Support Period. The report shall be set up in a way that allows for a direct comparison with the Application and shall be signed by an authorised representative of the Grant Recipient.

4.2 The final report shall, as a minimum, include:

a) the items listed for the progress reports described in article 2 of the General Conditions, covering the entire Support Period;
b) an assessment of the Project's effect on society (Impact);
c) a description of the main lessons learned from the Project;
d) an assessment of how efficiently Project resources have been turned into outputs
e) an assessment of the sustainability of the achieved results by the Project.

5 AUDIT

5.1 If an audit of the Project's financial statements is required pursuant to the Specific Conditions article 6, the audit shall be carried out by an independent chartered/certified or state-authorised public accountant (auditor).

5.2 Norad reserves the right to approve the auditor and may require that the auditor shall be replaced if Norad finds that the auditor has not performed satisfactorily or if there is any doubt as to the auditor's independence or professional standards.

5.3 The auditor shall form an opinion on whether the Project's financial statements fairly reflect the financial position of the Project and whether they are prepared, in all material respects, in accordance with the applicable financial reporting framework and the requirements of article 3 of the General Conditions.

5.4 The auditor shall report in accordance with the applicable audit standards, as agreed in the Specific Conditions.

5.5 The audit report shall include:

a) the Project name and agreement number;
b) the Project period subject of the audit;
c) reference to the financial reporting framework applied;
d) the auditing standards applied;
e) a statement that the auditor has obtained reasonable assurance about whether the financial statements as a whole are free from material misstatement;
f) the auditor's opinion.

5.6 If any findings have been reported in the Project's management letter, the Grant Recipient shall prepare a response including an action plan to be submitted to Norad together with the management letter.

5.7 The costs of the audit of the Project's financial statements shall be included in the Project's budget.

5.8 The audit requirements stated in this Agreement are applicable for the total Grant, including any part of the Grant that has been transferred to a cooperating partner.

5.9 The auditor of the Project's consolidated financial statement is responsible for the direction, supervision and performance of the audit of any part of the Grant that has been transferred to a cooperating partner. The auditor shall assure itself that those performing the audit for cooperating partners have the appropriate qualifications, that the audit is in compliance with professional standards, and that the audit report is appropriate under the circumstances. ISA 600 establishes standards and provide guidelines when using the work of other auditors.

5.10 The auditor of the Project's consolidated financial statement shall express an opinion on whether the statement is prepared, in all material respects, in accordance with the applicable financial reporting framework and the requirements of article 3. To this end, the auditor shall obtain sufficient appropriate audit evidence regarding the financial statements of the cooperating partner and the consolidation process.

6 CONTROL MEASURES

6.1 Representatives of Norad and the Norwegian Auditor General may at all times carry out independent reviews, audits, field visits or evaluations or other control measures related to the Project. The objective of such control measures may be i.a to verify that the Grant has been used in accordance with the Agreement or to evaluate the achievement of results.

6.2 The Grant Recipient shall facilitate such control measures by providing all information and documentation necessary to carry out the relevant initiative, as well as ensuring unrestricted access to any premises, records, goods and documents requested.

6.3 The representatives of Norad and the Norwegian Auditor General shall also have access to the Grant Recipient's auditor and the auditor's assessments of all information pertaining to the Grant Recipient and the Project. The Grant Recipient shall release the auditor from any confidentiality obligations in order to facilitate such access.

6.4 The rights and obligations of this article 6 shall remain in force for 5 years following expiry or termination of the Agreement, whichever occurs later.

7 FINANCIAL MANAGEMENT

7.1 The Grant Recipient shall keep accurate accounts of the Project's income and expenditure using an appropriate accounting- and double-entry book-keeping system[1].

1 A double-entry bookkeeping a system is system of bookkeeping where every entry to an account requires a corresponding and opposite entry to a different account.

7.2 The accounts shall be kept up to date at least on a monthly basis. Bank reconciliations[2] and cash reconciliations[3] shall be completed at least every month, and shall be documented by the Grant Recipient.

7.3 Accounts and expenditures relating to the Project must be easily identifiable and verifiable, either by using separate accounts for the Project or by ensuring that Project expenditure can be easily identified and traced within the general accounting- and bookkeeping systems. Insufficient documentation may render the expenditure ineligible. The accounts must provide details of bank interest accrued on the Grant.

7.4 The Grant Recipient shall keep the Project's accounting records for at least 5 years from the time of Norad's approval of the final report for the Project. This shall include i.a. vouchers, receipts, contracts and bank statements.

8 EXCHANGE RATE FLUCTUATIONS

8.1 If the Grant is converted into another currency, the exchange shall be made through a national or commercial bank unless otherwise approved by Norad. Exchange rates must be stated to four decimal places.

8.2 If exchange rate fluctuations decrease the value of the Grant to such an extent that this will have consequences for the implementation of the Project, the Grant Recipient shall inform Norad as soon as possible.

8.3 If exchange rate fluctuations increase the value of the Grant, the surplus shall be treated as disbursed Grant funds and used for Project purposes. This means that net surplus from conversion into foreign currency shall be subtracted from future disbursements or repaid as unused funds at the end of the Support Period, unless otherwise agreed between the Parties.

9 EQUIPMENT, CONSUMABLES AND INTELLECTUAL PROPERTY RIGHTS

9.1 The right of ownership to equipment, consumables and intellectual property rights procured or developed by use of the Grant shall vest in the Grant Recipient or its cooperating partner, unless otherwise stated in the Application. All matters associated with such equipment, consumables and intellectual property rights are the exclusive responsibility of the Grant Recipient. However, significant use of such equipment, consumables and intellectual property rights for purposes outside the Project shall be subject to the Norad's prior approval.

9.2 Intellectual property rights financed in whole or in part from the Grant shall, in the spirit of securing such rights as a common global good, be managed in a way that maximizes their public accessibility and allows the broadest possible use. Material produced as a result of this Grant shall, as far as possible and appropriate, be placed in the public domain for non-commercial use.

2 Bank reconciliation is a process of verifying whether the sum found in the bank statements at the end of the period correspond with transactions recorded in the accounting system. This is usually done in conjunction with closure of the accounting records.
3 Cash reconciliation is a process of verifying whether the cash at hand at the end of the period corresponds with the amount of cash in the beginning of the period and the registrations of withdrawals and deposits in the period. This is usually done in conjunction with closure of the accounting records.

9.3 Norad shall have a non-exclusive and royalty-free license to use all intellectual property rights procured or developed by the use of the Grant. Norad may assign this right to any individual or organisation at its own discretion.

9.4 Transfer of ownership of such equipment, consumables or intellectual property rights during the Support Period shall be made at market terms. Ownership may not be transferred to an employee of the Grant Recipient or its cooperating partner, or to anyone related or connected to an employee, if such relation could lead to a conflict of interest as described in article 17 of the General Conditions.

9.5 Before a transfer is decided, the Grant Recipient shall assess whether it may have an impact on the Project and, where appropriate, consult with Norad. Any income from a transfer shall accrue to the Project, and shall be reported in the financial statement of the Project.

9.6 The Grant Recipient shall prepare a record of transfer of ownership for any equipment, consumables and intellectual property rights. The record shall comprise information about the object of transfer, the original purchase price paid by the Grant Recipient, price offers received, the final sales price and the name of the purchaser. The record shall be submitted to Norad along with the first progress report due after the sale.

9.7 If the activities of the Project do not continue after the end of the Support Period or after termination of the Agreement, the Grant Recipient shall inform Norad about the remaining equipment and goods that have been purchased by use of the Grant. The Norad may require that such assets be sold. Such sale shall be completed in accordance with the procedures described above. Income from the sale shall be repaid to Norad.

10 REAL PROPERTY

10.1 The Grant may not be used to purchase or construct real property (land or buildings) unless explicitly approved by Norad. Where Norad has approved a purchase or construction of real property such approval must be formalised in the Specific Conditions or in a separate agreement document.

10.2 The Grant Recipient and Norad shall in such agreement decide on the details concerning the ownership and the status of the real property after the end of the Support Period and/or the end of the Project.

10.3 Norad may in such an agreement require i.a. that the real property shall be sold after the end of the Support Period and that the proceeds from the sale shall be repaid to Norad. Norad may also reserve the right to establish security interests in any real property purchased by use of the Grant.

11 TRANSFER OF THE GRANT TO A COOPERATING PARTNER

11.1 Transfer of all or part of the Grant including assets to a cooperating partner must be documented through a written sub-grant agreement. The sub-grant agreement shall specify that the cooperating partner is required to comply with the provisions of this Agreement which is relevant to the sub-grant agreement and to cooperate with the Grant Recipient to ensure that the Grant Recipient is able to fulfil its overall obligations under the Agreement.

11.2 The sub-grant agreement shall include provisions for results and financial reporting, audit, procurement and measures to prevent financial irregularities. Furthermore, the sub-grant agreement shall explicitly state that:

a) both the Grant Recipient, Norad and the Norwegian Auditor General shall have access to undertake such control measures related to the cooperating partner's use of the Grant as described in article 6 of the General Conditions,
b) the Grant Recipient shall be entitled to claim repayment from the cooperating partner in the same instances and to the same extent that Norad is entitled to claim repayment from the Grant Recipient, and that Norad has the right to claim repayment directly from the cooperating partner to the same extent as the Grant Recipient,
c) the cooperating partner shall accept the choice of law and settlement of disputes provisions in article 25 of the General Conditions for any dispute arising between the cooperating partner and Norad.

11.3 The Grant Recipient shall assure itself that the cooperating partner has the necessary competence and internal procedures to meet the requirements of the Agreement that are relevant for the sub-grant agreement and shall follow-up the cooperating partner's compliance with such requirements throughout the Support Period.

11.4 The Grant Recipient must obtain and assess management letters issued to all cooperating partners. Any significant findings and a response including an action plan to be submitted to Norad.

11.5 The Grant may not be transferred to a cooperating partner who has previously been charged or sentenced for any criminal activity unless explicitly approved by Norad.

11.6 The Grant Recipient shall remain fully responsible towards Norad for any part of the Grant including assets that has been transferred to a cooperating partner.

12 CHANGES OR CIRCUMSTANCES AFFECTING THE PROJECT OR THE GRANT RECIPIENT

12.1 The Grant Recipient shall immediately inform Norad of circumstances likely to hamper, delay or otherwise significantly affect the successful implementation of the Project. The same applies to significant changes to, or circumstances materially affecting, the Grant Recipient's organisation. Norad may suspend disbursement of the Grant until the implications for the Project has been assessed.

13 EXTENSION OF THE SUPPORT PERIOD

13.1 The Grant Recipient may request an extension of the Support Period if this is necessary to complete all planned activities. The request must state the reasons for the delay and supporting documentation must be enclosed. Norad shall approve or decline the request in writing.

14 TRANSPARENCY

14.1 Norad may make this Agreement and other Project documentation, such as but not limited to, the Application and agreed reports available to the public to promote transparency of the use of public funds.

14.2 The Grant Recipient shall make the Project documentation, including the Application and all agreed reports, available to anyone upon request. Requests for disclosure may only be denied if such disclosure is prohibited by confidentiality obligations and/or if it may be detrimental to the Grant Recipient's legitimate interests.

15 FINANCIAL IRREGULARITIES

15.1 The Grant Recipient is required to practise zero tolerance against corruption and other financial irregularities within and related to the Project. The zero-tolerance policy applies to all staff members, consultants and other non-staff personnel and to cooperating partners and where relevant beneficiaries of the Grant.

15.2 "Financial irregularities" refers to all kinds of:

a) corruption, including bribery, nepotism and illegal gratuities;
b) misappropriation of cash, inventory and all other kinds of assets;
c) financial and non-financial fraudulent statements;
d) all other use of Project funds which is not in accordance with the Agreement.

15.3 In order to fulfil the zero-tolerance requirement, the Grant Recipient shall:

a) organise its operations and internal control systems in a way that financial irregularities are prevented and detected;
b) do its utmost to prevent and stop financial irregularities within and related to the Project;
c) require that all staff involved in, and any consultants, suppliers and contractors financed under the Project refrain from financial irregularities.

15.4 The Grant Recipient shall inform Norad immediately of any indication of financial irregularities in or related to the Project. The Grant Recipient shall provide Norad with an account of all the known facts and an assessment of how the matter should be followed up, including whether criminal prosecution or other sanctions are considered appropriate.

15.5 The matter will be handled by Norad in accordance with Norad's guidelines for handling suspicion of financial irregularities. The Grant Recipient shall cooperate fully with Norad's investigation and follow-up. If requested by Norad, the Grant Recipient shall, provided there is sufficient basis for taking legal steps, report the suspicions to the police, commence civil proceedings for recovery of damages or apply other appropriate sanctions against persons or entities suspected of financial irregularities. However, in cases where the Grant Recipient is concerned that due process of law may be unavailable, the matter shall instead be included in the account and assessment referred to in clause 15.4 for discussion of a mutually acceptable course of action.

16 SEXUAL EXPLOITATION, ABUSE AND HARASSMENT

16.1 Norad has zero tolerance for inaction against sexual exploitation, abuse and harassment (SEAH). The Grant Recipient shall have a victim/survivor-centred approach to SEAH issues and do its utmost to prevent, detect and respond to SEAH within and related to the Project. This obligation applies to all staff members, consultants and other non-staff personnel, cooperating partners and any third parties involved in activities funded by the Grant.

16.2 The following definitions apply:

a) Sexual exploitation: Any actual or attempted abuse of a position of vulnerability, differential power, or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another.
b) Sexual abuse: The actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions.
c) Sexual harassment: Any form of unwanted sexual attention that has the purpose or effect of being offensive, frightening, hostile, degrading, humiliating or troublesome.

16.3 The Grant Recipient shall:

a) Adhere to the IASC-Minimum Operation Standards on "Protection from sexual exploitation and abuse by own personnel" and/or the SEA elements of the Core Humanitarian Standard on Quality and Accountability,
b) have ethical guidelines that include policies on prevention and response to SEAH,
c) organise its operations and internal control systems in a way that SEAH is prevented, detected and responded to,
d) take swift action on suspicions or complaints of SEAH to stop harm occurring, investigate and report to relevant authorities (for criminal matters), after considering the rights, needs and wishes of the survivor/victim.

16.4 The Grant Recipient shall inform Norad immediately of any indications of SEAH credible enough to warrant an investigation within or related to the Project as well as indications of SEAH not directly linked to the Project but of significant impact on the partnership with Norad.

16.5 The Grant Recipient shall provide Norad with a report of the relevant facts and an assessment of how the matter will be followed up, including whether the organisation will improve internal systems to prevent, detect and respond to SEAH, and whether criminal prosecution or other sanctions are considered appropriate, considering the rights, needs and wishes of the survivor/victim. The reporting will be made without compromising the safety, security, privacy, and due process rights of any concerned person. The report will be handled by Norad in accordance with Norad's guidelines for handling notifications of sexual abuse, sexual exploitation, and sexual harassment by grant recipients.

16.6 Upon request from Norad, the Grant Recipient shall grant the Norad access to all relevant information and documentation related to the Grant Recipients adherence with this article.

17 CONFLICT OF INTEREST

17.1 The Grant Recipient shall take all necessary precautions to avoid any conflicts of interest in all matters related to the Project.

17.2 Conflict of interest refers to any situation where the impartial and objective exercise of the functions of anyone acting on behalf of the Grant Recipient is, or may be, compromised for reasons involving family, personal life, political or national affinity, economic interest or any other connection or shared interest with another person.

17.3 If a conflict of interest occurs, the Grant Recipient shall, without delay, take all necessary measures to resolve the conflict, e.g. by replacing the person in question or by obtaining independent verification of the terms of the proposed decision or transaction.

17.4 If the conflict of interest cannot be resolved and/or if it relates to a decision or transaction of special significance to the Project, the decision or transaction may not be concluded without the prior, written approval of Norad.

18 BREACH OF THE AGREEMENT

18.1 If the Grant Recipient fails to fulfil its obligations under this Agreement and/or if there is suspicion of financial irregularities, Norad may suspend disbursement of all or part of the Grant.

18.2 In the event of material breach of the Agreement, Norad may terminate the Agreement with immediate effect, and/or claim repayment of all or parts of the Grant. A repayment claim may

also include interest and any other financial gain obtained by the Grant Recipient as a result of the financial irregularity.

18.3 Material breach of the Agreement shall include, without limitation, the following situations:

a) all or part of the Grant has not been used in accordance with the Agreement and/or approved work plans and budget,
b) the Grant Recipient has made false or incomplete statements to obtain the Grant,
c) the use of the Grant has not been satisfactorily accounted for,
d) the Grant Recipient has, after having been granted an extended deadline, failed to provide the agreed reports, or has knowingly provided reports that do not reflect reality,
e) the Grant Recipient has failed to to take preventive measures against sexual exploitation, sexual abuse, or sexual harassment, to detect or respond to indications thereof, or to take corrective action when sexual exploitation, sexual abuse or sexual harassment has occurred, in accordance with article 16 of the General Conditions,
f) financial irregularities, grave professional misconduct, or illegal activity of any form have taken place within the Grant Recipient or its cooperating partners,
g) the Grant Recipient has failed to inform Norad of indication of financial irregularities within the Project in accordance with article 15 of the General Conditions,
h) the Grant Recipient has changed legal personality without prior notification to Norad,
i) the Grant Recipient is bankrupt, being wound up or is having its affairs administered by the courts, or is subject to any analogous or corresponding procedure provided for under national legislation.

18.4 The Grant Recipient shall inform Norad immediately of any circumstances that may indicate or lead to a breach of Agreement, and shall provide Norad with any information or documentation it may reasonably require in order to determine if a breach of the Agreement has occurred.

18.5 Norad may also suspend disbursements or terminate the Agreement with immediate effect if a material breach of another agreement between Norad and the Grant Recipient has been established.

19 TERMINATION OF THE AGREEMENT

19.1 Each of the Parties may terminate the Agreement upon a written notice.

19.2 The Support Period shall end three months after the date of the notice of termination. During these three months, the Grant Recipient may only use the Grant to cover commitments that have been established before the date of the notice of termination. Any funds that remain unused at the end of the Support Period shall be repaid to Norad.

19.3 If the Project cannot continue without the Grant, the Grant Recipient shall use these three months to discontinue or scale down the Project promptly and in an orderly and financially sound manner.

19.4 The Grant Recipient shall submit a final report to Norad within three months of the end of the Support Period. The final report shall meet the requirements set out in article 4 of the General Conditions and shall also include a financial report and audit report covering the period from the previous financial report until the end of the Support Period.

19.5 The Agreement will be considered terminated when the final report has been approved by Norad and any remaining funds have been repaid.

20 WAIVER AND IMMUNITIES

20.1 Nothing in the Agreement or any document related to the Agreement shall imply a waiver, express or implied, by Norad, the Government of Norway or any of its officials of any privileges or immunity enjoyed by them or their acceptance of the jurisdiction of the courts of any country over disputes arising thereof. This article 20 will not prevent arbitration or court proceedings in the legal venue of the Grant Recipient pursuant to article 25 of the General Conditions.

21 LIABILITY

21.1 Norad shall not under any circumstances or for any reason be held liable for damage, injury or loss of income sustained by the Grant Recipient or its agencies, staff or property as a direct or indirect consequence of the Project or services provided thereunder. Norad will not accept any claim for compensation or increases in payment in connection with such damage, injury or loss of income.

21.2 The Grant Recipient shall assume sole liability towards third parties, including liability for damage, injury or loss of income of any kind sustained by them as a direct or indirect consequence of the Project. The Grant Recipient shall indemnify Norad against any claim or action from the Grant Recipient's staff or third parties in relation to the Project.

22 ASSIGNMENT

22.1 The Agreement and/or the Grant may not be assigned to a third party without the prior written consent of Norad. This shall not, however, prevent transfer of parts of the Grant to a cooperating partner in accordance with article 11 of the General Conditions.

23 RECOGNITION AND PUBLICATION

23.1 The Grant Recipient shall acknowledge Norad's support to the Project in all publications and other materials issued in relation to the Project. Norad's logotype will be provided by Norad upon request. All use of Norad's logotype must be approved by Norad.

24 ENTRY INTO FORCE, DURATION AND AMENDMENT

24.1 The Agreement shall enter into force at the date of the last signature and shall remain in force until all obligations arising from it have been fulfilled, or until it is terminated in accordance with the provisions of the General Conditions. Whether the obligations of the Agreement shall be considered fulfilled, will be determined through consultations between the Parties and confirmed by Norad in a completion letter.

24.2 The Agreement may be amended. Any such amendment must be agreed upon in writing between the Parties and shall become an integral part of the Agreement.

24.3 Termination or expiry of the Agreement shall not release the Parties from any liability arising from any act or omission that has taken place prior to such termination or expiry.

25 CHOICE OF LAW AND SETTLEMENT OF DISPUTES

25.1 The Agreement shall be governed and construed in accordance with Norwegian law.

25.2 If any dispute arises relating to the implementation or interpretation of the Agreement, the Parties shall seek to reach an amicable solution.

25.3 Any dispute arising out of or in connection with the Agreement that cannot be solved amicably, shall exclusively be settled before the Norwegian courts of law with Oslo District Court as legal venue.

25.4 Norad may, at its own sole discretion and as an alternative to the legal venue mentioned above, choose to settle the dispute by

a) the courts in the legal venue of the Grant Recipient, or
b) arbitration in accordance with the Arbitration Rules of the Arbitration Institute of the Stockholm Chamber of Commerce. The arbitral tribunal shall be composed of three arbitrators. If the disputed amount is below an amount corresponding to NOK 10 000 000 the arbitral tribunal shall, however, be composed of a sole arbitrator. The seat of arbitration shall be Stockholm, Sweden, and the language to be used in the arbitral proceedings shall be English. The Parties agree that neither the arbitral proceedings nor the award shall be subject to any confidentiality.

25.5 The Parties agree that no other courts of law, than as set out in this article 25, shall have jurisdiction over disputes arising out of or in connection with this Agreement.

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Procurement: Policy 1 – General Requirements

PROCUREMENT POLICY & PROCEDURES

Document Summary & Version Control

Document Summary	
Policy Title:	Procurement Policy & Procedures
Policy Owner:	Global Procurement Lead
Policy Sponsor:	Executive Director-Corporate Services
Responsible Office:	HQ Procurement Office
Effective date:	2014
Last updated:	01 July 2021
To be reviewed:	30 June 2024

Version Control Tracking			
Issue Date	**Summary of Changes**	**Distribution**	**Version Number**
2014	Procurement Policy & Procedures	All WorldFish Personnel in HQ, Country and Project Offices	1.0
01 July 2021	Revise the existing Procurement Policy & Procedures	All WorldFish Personnel in HQ, Country and Project Offices	2.0

1 PURPOSE

WorldFish (WF) procurement processes are designed to provide the appropriate controls needed to conduct its business with suppliers of goods and services and other third parties in a cost effective, controlled and transparent manner.

2 SCOPE

2.1 This Policy applies to all WF Headquarters, Country and Project Offices, who are directly or indirectly involved in the procurement of goods and services for or on behalf of WF. Any exception not covered in the policy will be dealt on a case by case basis by the Global Procurement Lead, e.g. when requirements are expressed by a respective Donor.

2.2 Employees involved in any procurement activity must take full responsibility to understand and comply with the procurement processes, including any ethical requirements.

2.3 Unless otherwise expressly stated herein, the Procurement department is the single point of contact for all procurement activities at WF. Only the Procurement department or delegated staff are authorized to purchase on behalf of WF.

2.4 Procurement Planning is essential for the effective and timely solicitation of bids, award of purchase orders or contracts, and delivery of the goods or services required. Requestors should submit their annual/half yearly/quarterly procurement plans by 15 January every year or at the start of a Project.

3 POLICY STATEMENT

All procurement of goods and services and the employees of WF will be governed and shall conform to the procurement policies and procedures, donor requirements and/or host country laws when engaging in procurement activities.

4 POLICY DETAILS

4.1 Overview

a) Regional and Project Offices may have localized procurement manuals that have more restrictive procedures, processes and/or thresholds, with appropriate approval. These localizations should not contradict WorldFish Procurement Policies including not exceeding any set forth thresholds.

b) Due to the nature of certain purchases, procurement policies and procedures do not apply to payroll, utilities, utility-related services, insurance, sub-grants, local periodical subscriptions and items controlled by government pricing. Other services such as air tickets are managed through long term supplier contracts where procurement process may apply once in identifying the supplier and in each renewal of the contract

4.2 Finance and Controls

a) **Payments.** The standard payment terms given to the supplier by WF is 30 days. Any exceptions should be discussed with the Finance department. All invoice relating to goods and service will be delivered directly to Finance department for registering Invoice and effecting payment.

b) **Annual Evaluation of Purchases.** On an annual basis Risk and Compliance department should test, on a sample basis, all categories of purchases and suppliers for validity, accuracy and completeness. The findings should be presented to the Global Procurement Lead. The Risk and Compliance department can request the assistance of the Procurement department in performing their review.

c) **Contracts Management.** All contracts or other forms of legal commitment entered into on behalf of the WF should be reviewed and approved by the Legal department. The Procurement department will keep the original copy of the contract. A photocopy of the contract will be given to the requesting unit for reference purposes and for contract implementation and administration.

d) **Framework or Long-Term Contracts**. It is a long-term agreement established between the WF and one or more selected suppliers on a call-off basis for the supply of a determined or undetermined quantity of a certain item at an unfixed or fixed price for a specified period of time. It is suitable to satisfy recurring requirements thus reducing administrative costs and repetitive acquisition and is able to reduce procurement lead time. Requestors are encouraged to work with the Procurement department to identify such opportunities where a long-term agreement is possible.

e) **Records Management.** It applies to the retention and storage of documents created by WF as part of its procurement activities as well as documentation submitted by suppliers. Both electronic and hard copy documentation shall be safely and securely stored with access being restricted to authorized personnel. This ensures that commercial confidentiality is protected, and that documentation is available in the event that it needs to be accessed at a later date. Procurement files should be kept for a minimum of 7 years for audit trail purposes and may differ based on Donor requirements and other circumstances.

f) **HQ Procurement Technical Approval** is required for all country offices procurement with PR value exceeding $ 25,000. It ensures that all relevant procurement procedures have been followed and respected. Country Offices must send a copy of the full procurement file (including the documents listed below:

- Approved PR
- Full RFP or tender document package
- Minutes of opening ceremony
- Signed technical & commercial supplier bids
- Comparative bid analysis
- Procurement Committee minutes on the award recommendation
- Draft of the contract (if applicable)

NB: If the above documents are issued in the local language, translations into English are required and must be sent together with copies of the original documents.

5 PROCEDURES

5.1 Regional and Country Offices that have localized their procurement policies and procedures have to obtain the Global Procurement Lead approval on processes and thresholds.

5.2 The procurement policies and procedures are linked to the OCS workflows. Changes in the policies or the approvals, will require changes to the OCS workflows

5.3 The procurement policies will be revised as per the policy development framework every three (3) years, however if there are changes in the circumstances such as serious economic changes (e.g. economic recession, sever currency fluctuation…etc.) or changes in applicable laws (e.g. sales tax, VAT…etc.) which may require change in thresholds or certain policies, the policy owner will submit a policy proposal to include the required changes for management decision.

6 RESPONSIBILITIES

All personnel engaged in procurement activities must fully comply with all the procurement policies and procedures. The procurement of goods and services for or on behalf of WF shall be conducted in a manner that is based on the principles set out below.

6.1 Value for money (VFM)
VFM represents the combination of cost, quality and sustainability that best meets the requirements of WF. The principle implies that successful offers will not always be those that are offered at the lowest price, but rather those that represent the lowest overall cost to WF and the best return on investment.

6.2 Competition
Procurement shall be carried out on a competitive basis to the maximum practical extent based on threshold.

6.3 Impartiality, Transparency & Accountability
In ensuring impartiality, potential suppliers of goods and/or services shall be accorded equitable treatment and their offers shall be evaluated based on their legal, technical and financial abilities. Employees shall be accountable for their acts with respect to procurement based on the lines of accountability established in the Procurement Policy & Procedures.

6.4 Splitting Purchases or attempting to by-pass, procurement processes is prohibited. "Splitting" means dividing the total cost of a single or a multiple Purchase into two or more smaller transactions, with the intention of, or resulting in, avoiding the application of the procurement processes.

6.5 Code of Conduct
WF employees' conduct must be characterized by integrity, respect and loyalty to WF interests and must not in any way harm or compromise WF reputation. Fraud and/or collusion in any form is strictly prohibited. Fraud is defined as any action aimed at obtaining an unauthorized benefit, such as money, goods, services or other personal or commercial advantages, regardless of whether such advantage benefits the employee(s) concerned, WF or a third party.

6.6 Conflict of Interest
A conflict of interest refers to a situation where a conflict arises for an individual between two competing interests. This refers to a reasonably perceived, potential or actual conflict of interest. Conflicts of interest can involve financial or non-financial interests of the staff member and the interests of a business partner or associate, family member, friend or person in a close personal relationship with the staff member. If such situation arises, then the staff member should complete and sign a conflict of interest declaration form in accordance with the Risk and Compliance policy.

6.7 Prohibition on Gifts.
Suppliers should be informed that during the tender process they should not provide gifts or entertainment to WF employees or their families who are involved in the tender process. Please refer to Personnel Policy Manual (5.6).

7 PROCESS MAP OR FLOWCHART

Not applicable

8 DEFINITIONS AND ACRONYMS

8.1 Goods are defined as tangible item with a value that is greater than the petty cash value and for which it will be procured following the procurement policy.

8.2 Services are defined as activities that are performed by individuals or companies for WorldFish and the value exceed the petty cash limit.

8.3 Consultants are defined as a contractual arrangement between WorldFish and an individual consultant or company in which the consultant performs a particular set of tasks and provide output over a defined period of time; usually a relatively short duration. For more information on consultants, please refer to the consultancy policy.

8.4 OCS refers to One Corporate System which is WorldFish Enterprise Resource Planning (ERP) system using Agresso Software.

9 REFERENCES AND ASSOCIATED POLICIES

- This policy supersedes Procurement Procedures and Guidelines – Oct. 2014
- OCS Training Materials and Workflows

Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)

Proposal by WorldFish and partners

Contents

Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)

Current situation and Research/Evidence

Aquaculture is essential for advancing sustainable development and ending hunger. Its contributions to development include income, employment generation, people's food and nutrition security, family well-being, socio-economic growth, and poverty alleviation (Belton et al., 2014; Ottinger et al., 2016; FAO, 2018; Mangeni and Mhlanga, 2019; Razafindrabe et al., 2019; Nasr-Allah et al., 2020). Fish and other aquatic foods provide income for more than 800 million people globally and provide 3.3 billion with 20% of their animal protein intake. Global aquaculture is the fastest growing food-producing sector in the world and is projected to increase by as much as 50% by the year 2030 (Falch, 2014). The sustainable, equitable production and use of aquatic foods will play a key role in achieving 13 of the 17 SDGs by that year, including SDG 1 (no poverty), SDG 2 (zero hunger), and SDG 10 (reduced inequalities).

Like any other terrestrial farming activity, aquaculture relies on the provision and supply of nutrients. Many developing countries lack sufficient quality fish feed ingredients and depend on more expensive imported resources for commercial feeds which increases the costs of production. Studies have shown that feed costs are one of the main challenges facing aquaculture in low-income countries (Hajra et al., 2013; Aanyu and Ondhoro, 2016; Singh et al., 2018) with feeds currently representing 40-70% of the variable production costs. The expected growth in aquaculture in the coming years will be accompanied by an increased demand for quality, affordable fish feeds, particularly by smallholder fish farmers seeking to improve their productivity.

Currently available conventional fish feeds have a high environmental cost (described in detail in the sustainability section on page 4) and are often inaccessible to many smallholder fish farmers because of their prohibitive prices and other constraints to access and use. This is particularly true for women and youth in the sector, who often have less income, fewer assets, and face greater barriers to accessing inputs. The scarcity, unsustainability, and high environmental and economic costs of feeds are recognised as main constraints for the expansion of smallholder production throughout Sub-Saharan Africa (Adeleke, Robertson-Andersson, Moodley, & Taylor, 2020; Brummett, Lazard, & Moehl, 2008; Kaminski et al., 2019). To overcome these constraints, there is a need to develop the production of feeds using local, sustainable ingredients (Hasan & New, 2013), as well as local capacity to test and develop new feed solutions using the latest knowledge. However, many local feed millers and smallholder fish farmers have limited capacity to access, assess, and improve local ingredients, formulate balanced diets, and produce and use quality feeds. Moreover, little is known on the type, seasonality, quality, and nutritional values of the local ingredients available in rural markets across Africa.

In addition, multiple African countries promote the use of genetically improved tilapia and catfish species or implement genetic improvements on these fish species. For example, in Ghana, the government is promoting improved strains of tilapia (including the Akosombo strain generation 10 and the GIFT strain generation 2 of Nile tilapia) (Trong, 2021). A growing body of evidence indicates that these genetic

improvements (growth, condition, and well-being) may increase the nutrient requirements of the fish (Frontiers, 2021). A recent study demonstrated that the methionine requirement level of genetically improved farm tilapia (GIFT) increased by 60% compared to non-GIFT strains (Yossa et al., under review). Essential nutrients such as methionine are limited in many local plant-based ingredients. Therefore, there is a need to develop further processing techniques to improve the quality of the local ingredients and use them to formulate balanced diets. As well, it is important to re-evaluate a range of nutrient requirements in these improved fish strains in Africa to update existing data/knowledge and enable correct diet formulations. The institutional and human capacity needed to conduct applied aquaculture experiments to estimate the nutrient requirements of improved strains is not yet available in many regions of Africa.

Sub-Saharan Africa (SSA)

Twenty-two percent of all human dietary protein in SSA countries is supplied by fish (FAO, 2016). The aquaculture sector is expanding and is expected to grow across the region by as much as 55% by 2030 (Falch, 2014), and development of the aquaculture industry has been prioritized within the national agriculture development plans of more than 20 African countries, including the focus countries of this proposal. Until recently, most smallholder fish farmers engaged chiefly in the production of on-farm feed. For example, in 2005, approximately 70% of aquafeed in Nigeria was farm-made (Fagbenro and Adebayo, 2005) and in Kenya, prior to the availability of compounded feeds, most smallholder fish farmers used locally available feed stuffs such as corn meal or rice bran to feed their fish or fish were reared in ponds with manure with or without supplemental feeds (Liti, 2006). However, while many smallholder fish farmers in SSA still use on-farm feeds, the upsurge in aquaculture growth over the past decade has led to the emergence of informal small-scale feed millers and formal large-scale aquafeed manufacturers (Hecht, 2007). The 3 SSA countries proposed by WorldFish for this project—Nigeria, Zambia, and Kenya—depend on imports in addition to domestic production for their supply of quality feed ingredients. In Zambia, for instance, almost all micro-ingredients in feeds, such as fishmeal, premixes, and vitamins, are imported (Genschick et al., 2017; Kaminski et al., 2018). This reliance on imported ingredients is coupled with inconsistent quality of farm-made feeds in SSA related to limited knowledge of 1) in-country ingredients available; 2) the potential processing techniques to improve local ingredients; 3) the formulation of local balanced diets; and 4) the use of digital tools to access information on local ingredients.

Nigeria

Nigeria is the largest aquaculture producer in SSA. By 2012, the aquaculture sector in Nigeria had grown 500% (FAO, 2012) due to the need to narrow the gap between production and demand for fish in the country. African catfish is the dominant fish species, followed by tilapia (Hasan and New, 2013). Smallholder fish farmers make up 70% of the fish farmers in the country and approximately 70% of aquafeed is imported annually (Udo and Umanah, 2017). There are many local feed factories across Nigeria and some farmers do produce feeds on-farm, but the quality of farm-made feeds is inconsistent; it depends on the method of formulation, ingredient quality (content of protein, lipids, minerals, vitamins, fibers, energy, and digestibility of nutrients), manufacturing processes, and storage methods (Udo and Umanah, 2017). Many smallholder farmers in Nigeria do not feed their fish or rely on NGOs for fish feed, but recent investments by large feed companies have increased local production of commercial feeds. Given its high levels of aquaculture production, projected increase in domestic demand for fish (from 1.56 million tonnes in 2021 to 1.75 million tonnes by 2025) (Akinsorotan, 2019), large number of smallholder

fish farmers, significant importing of fish feeds, the presence and interest of key actors such as Aller Aqua Africa, and WorldFish's history and capacity in the country, Nigeria is an ideal country to participate in the proposed project.

Zambia

Fish makes up over 50% of Zambian animal protein intake, and national demand is increasing. According to Kaminski et al. (2017), the overall aquaculture production yield in Zambia almost doubled between 2004-2014, but there is still a 70,000t/year gap between demand and local supply (from both the stagnating capture fisheries and the growing aquaculture sector). Major constraints to increasing productivity include low availability of quality fingerlings and quality, affordable feeds, inadequate extension services, and a lack of technical knowledge and business management skills among small farmers (European Commission, 2018). Employee bases at larger fish farms are male- dominated and while youth work as general workers on larger farms, it appears their participation in rural fish farming is limited (European Commission, 2018). The aquafeed sector in the country has seen tremendous improvements over the past few years as new feed mills have emerged and established mills have started to develop lines for aquafeed manufacturing (Genschick et al., 2017). However, though these large-scale feed companies sometimes sell to small-scale farms, currently most of their feeds go to large tilapia cage farms because smallholder farms purchase less and are often sparsely distributed throughout remote areas. WorldFish's programmes are beginning to link smallholder farmers to large feed millers like Aller Aqua Africa, but many rural smallholder farmers in Zambia still exclusively fertilize their ponds with animal manure or farm-made feed. Fish feed ingredients in Zambia include local animal and plant proteins (such as groundnut cake) and energy sources (such as maize bran). Novel feed ingredients, such as algae, insect meal, microbial biomass, etc., could be at the forefront of future research in Zambia. Given its rapidly growing aquaculture and aquafeed sectors, its demand/supply gap and constraints to increasing productivity, its abundance of potential novel feed ingredients, the presence and interest of key actors such as Aller Aqua Africa, and WorldFish's history and capacity in the country, Zambia is also an ideal country to participate in the proposed project.

Kenya

Kenya is the fourth largest producer of freshwater fish in Africa (Chia, 2020) with Nile tilapia accounting for 75% of aquaculture production, followed by African catfish at 18% (Opiyo, 2018). The aquaculture sector employs about 20,000 people in the country, but multiple factors prevent it from realising its full potential, including few extension services, lack of quality and affordable feeds, and lack of market information (Kenya Marine and Fisheries Research Institute (KMFRI), 2017). The domestic demand for fish in Kenya is 500,000 tonnes annually and, according to Nyandat and Owiti (2013), the country has far greater capacity for fish farming, with 1.14+ million hectares potentially available to enable a production capacity of 11+ million tonnes per year. More than 90% of Kenyan farmers practice semi-intensive fish farming while the intensive system is practiced by only 3% due to the high cost of electricity and non-availability of inexpensive quality feeds (Opiyo, 2018). Kenya's agriculture and fisheries sectors produce most of the raw materials needed for locally made fish feeds, but there are few large-scale feed mills in the country (KMFRI, 2017). Currently, most fish feeds produced by small-scale feed millers and fish farmers are not considered to be of adequate quality by the KMFRI. There is a significant need for training and communication around local ingredients and feeds, appropriate feed formulation techniques and processing technologies, and access to up-to-date market information (Munguti, 2021). Given its high

overall production levels and the large percentages of tilapia and African catfish, significant domestic demand and considerable potential for increased production, the presence and interest of key actors such as Aller Aqua Africa, and the potential benefits of miller/farmer training related to aquafeeds, Kenya is a third ideal country to participate in the proposed project.

Cross-cutting issues

To implement programmes that reflect its vision of an inclusive world of healthy, well-nourished people and a sustainable blue planet, WorldFish designs projects that are not only technically sound, but that place programming and research within the broader framework of sustainability, the realities of climate change, and gender and social inclusion. The process of developing and increasing access to local, sustainable ingredients and formulating novel fish feeds must be done in a socially and environmentally responsible manner that responds to the issues described below.

Sustainability

Prioritising a circular economy approach that does not place added pressure on small fish populations and that avoids waste and pollution will be critical to this project's success. The farming of carnivorous fish has put undue pressure on world fishmeal supplies by using up to 5 times more fish protein than that which is produced (Naylor, 2000). Moreover, in SSA, agricultural by-products (cassava peel, blood from livestock, etc.) are often indiscriminately disposed of and can become an environmental challenge, primarily from microbes that are harmful to humans. This waste is sometimes channeled into lakes, rivers, and streams, where it can be detrimental to aquatic organisms. Converting agricultural by-products into valuable feed resources can help create wealth from waste. This project's 3 focus countries produce large quantities of poultry and other livestock, but conversion of the resultant waste into ingredients is currently underexploited. Additionally, there is competition to use feed resources (agricultural by-products, protein sources, etc.) for food, feed, and fuel throughout SSA, but currently little data available on the consumption for each category. While data on crop production per country is widely available, data on the production of fish feed ingredients and their nutrition composition is limited.

Climate change

Sustainable development is closely linked to climate change effects and responses (IPCC 2018); it is not possible to achieve sustainability without responding to the effects of global warming and other environmental realities. The projected impact of climate change on aquaculture (rising temperatures, diseases and harmful algal blooms, changes in rainfall and in sea surface salinity patterns, uncertain external inputs supplies, and increasing severe climatic events) is expected to reduce the availability and increase the cost of inputs, including fish feed ingredients (Maulu et al, 2021). Smallholder fish farmers, especially those in developing countries, are particularly vulnerable to climate change because of their geographical locations and economic status. Most climate change predictions indicate that the lower adaptive capacity and preparedness of these small-scale producers will mean they will be among the most affected as climate changes increase (IPCC, 2014; Bueno and Soto, 2017; Barange et al., 2018). Therefore, environmentally friendly and cost-effective technologies and production practices such as sustainable fish feeds are critical to mitigating the effects of climate change within the aquaculture sector (VGREEN, 2012; Barange, 2018). The Paris Agreement, the UN Agenda 2030, and other international agreements emphasize poverty eradication and food security as key drivers for enhancing the climate change resilience of individuals and communities (Barange, 2018). This proposed project's innovations—local,

sustainable fish feeds—will increase economic security as well as food security among developing communities while reducing food loss and waste and building climate resilience.

Gender and social inclusion

One quarter of fish farmers and feed millers across Africa are women. According to Norad's "Fish for Development" policy brief (2019), even though women play an integral role in fish processing and commerce in developing countries, they are often marginalised. WorldFish's recent report, "Affordable, Local Ingredients for Fish Feeds in Low-income Contexts: A Social and Gender Risk and Opportunity Analysis" (in review) flagged that alternative fish feeds development may compound gender inequalities if gender is not explicitly addressed in the development. In particular, it identified 4 key areas shaping equity in relation to developing locally sourced fish feed ingredients: access to and control of aquaculture assets and resources; gendered division of labour; allocation of benefits; and gender and social norms in aquaculture value chains. New opportunities for fish feeds in fish-intensive countries may disadvantage or exclude women, youth, and other marginalised groups if these drivers are not taken into consideration. Conversely, if effective gender analysis and strategies are implemented, the innovation may reduce gender gaps and contribute to social and gender equity in the value chains.

Project Context

The proposed project builds on a preliminary ingredients assessment conducted by WorldFish and Wageningen University & Research in 2017-2018 (Agboola, Yossa, & Verreth, 2019). This preliminary assessment was completed in 3 Asian countries (Malaysia, Bangladesh, and Myanmar) and 3 African countries (Nigeria, Zambia, and Egypt). The researchers identified and studied a wide variety of inexpensive, sustainable, largely underused ingredients with year-round availability (groundnut cake, maize, sunflower, poultry feathers, brewery waste, etc.). The study report provides basic information on the possible use of these local ingredients, which otherwise might become pollutants in rural areas, and concludes that information on nutritional composition and digestibility of ingredients produced in the countries is scarce (and where it exists it is non-exhaustive and disjointed). Therefore, the study recommends that holistic nutritional analyses of novel ingredients (such as insects, algae, worms, and single-cell proteins) be conducted and that substantial efforts be dedicated to improving the use of these ingredients in the feeds for various fish species. This inventory of local feed ingredients in the 6 countries is considered to be WorldFish's first step in developing research on fish feeds and nutrition within the sustainable aquaculture component of its CGIAR (Consultative Group for International Agriculture Research) Research Programme (CRP) on Fish Agri-Food Systems (FISH).

The next step is this proposed project, "Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)." WorldFish has designed this project within the broad framework described above: the 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 prioritise socio-economic and environmental considerations alongside technical considerations. To fully contribute to goals for inclusive, equitable, and sustainable agri-food systems in SSA, sustainable feeds and feeding practices must be (1) tailored to the needs of women and men farmers and other value chain actors; (2)

accessible and affordable for poor and marginalised groups, including women and youth; and (3) strengthen the circular economy without competing with food for direct human consumption. Improving the social, economic, and environmental sustainability of fish feeds and feeding practices will enhance aquaculture's contribution to poverty reduction and food and nutrition security.

Theory of Change

As discussed earlier, many developing countries lack sufficient quality fish feed ingredients and depend on more expensive imported resources for commercial feeds which increases the costs of production. Studies have shown that feed costs are one of the main challenges facing aquaculture in low-income countries (Hajra et al. 2013; Aanyu and Ondhoro 2016; Singh et al. 2018) with feeds currently representing 40-70% of the variable production costs. The proposed project will conduct in-depth scoping studies on available local ingredients that can be harnessed for the formulation of sufficiently nutritious but low-cost fish feeds. In addition, 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.

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. Lab analyses and digestibility experiments of multiple samples of local ingredients and existing fish feeds will be conducted, the resultant data presented to stakeholders, and feedback obtained. Based on the feedback, local ingredients will be selected and improved, and experimental fish feeds will be formulated. The experimental feeds will be validated through on-farm pilots and workshops. Doctor of Philosophy (PhD) and master's students will be involved in the formulation and validation of novel fish feeds to enhance fish feeds expertise that meets international standards, is relevant to the needs of African smallholder farmers, and can eventually be sustained from local resources.

All knowledge generated will be available on an online open access database. Printed manuals/booklets will be developed and disseminated. Knowledge will further be disseminated through policy briefs, training workshops, and mass media. It is envisioned that the disseminated knowledge will reach at least 6,000 end-users across the 3 project countries of which as many as 5,000 will adopt the use of these low-cost, highly nutritious fish feeds. WorldFish and its partners will explore barriers and bottlenecks for scaling and co-develop strategies for scale-up. Various organisations (such as farmer, development, etc.) will actively contribute to understanding scale-up needs and will be part of a strategic scale-up partnership. The use of feeds based on novel ingredients is expected to increase the productivity, profitability, and incomes from aquaculture; reduce income inequalities by uplifting incomes of smallholders; and reduce waste that would otherwise be generated from unexploited poultry and other livestock waste. Novel feeds thus reduce nutrient pollution in water bodies, lead to the creation of sustainable food systems for the production of highly nutritious food, and contribute to poverty reduction.

Project Description

The proposed project will take place over a 5-year period in 3 African countries. WorldFish prioritises working in regions that have high need and the potential for partnerships. In Nigeria, WorldFish plans to focus on Oyo State and Lagos State (where the Nigerian Institute for Oceanography and Marine Research is located); in Zambia, the focus will be on the Northern Provinces; and in Kenya, WorldFish will work in Nairobi as well as Nakuru (where Egerton University is located). (These areas are contingent on further discussions with partners and are subject to change after assessments). WorldFish has completed

numerous other projects and has offices and project delivery capacity in Nigeria and Zambia as well as a strong partner (ICIPE) in Kenya.

This project has the following primary 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. WorldFish estimates that 30% of total fish farmers will be women and 40% will be youth.

The project has **3 main expected outcomes:**

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

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.

Project outputs and key activities

The outputs and key activities described below have all been developed through a sustainability and gender and socially inclusive lens. The enhancement and expansion of local, sustainable ingredients and their resulting fish feeds through a circular economy approach—recycling waste as fish feed instead of discarding it and not using products that could be human food or fuel—has the potential to contribute to short, medium, and long-term improvements in human nutrition and food security without damaging the environment. Identifying and mitigating any gender-related risk factors and ensuring the balanced and active participation of women, youth, and other marginalised groups in project activities is critical to creating feeds that are responsive to diverse client needs and an inclusive project that benefits and provides opportunities for all.

The first 5 outputs and their respective activities fit under outcome 1 of the project. Except for the fifth output studying nutrient requirements of improved strains of tilapia and African catfish, these assessments and studies will all take place in the first 9 months of the project. While many technical and socio-economic studies have been conducted on fish feeds in the project countries, little information exists on local ingredients that could be used sustainably in fish feeds and most of the completed ingredient studies and surveys have failed to include social, economic, gender and youth, and climate change and seasonality considerations. These assessments will provide WorldFish and its partners with the knowledge and data needed to ensure the project progresses with a context-specific understanding of key factors such as market realities and gender considerations. The 3 outputs and their multiple activities that fall under outcome 2 will take place in the middle and later months of the project and willl enable WorldFish and its partners to identify and test local ingredients, create novel feeds, and increase the capacity of millers and farmers. The outputs and activities of outcome 3 will take place throughout

the project (with many in the second half) and will facilitate knowledge dissemination, strategic scaling partnerships, and scale-up.

All training materials developed for this project will be translated into local languages as needed.

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

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

This output's activity aims to develop and conduct 3 scoping studies (1 per project country) during the first 9 months of the project to increase knowledge and data on the type, price, and seasonality of local ingredients used in animal (fish) feeds in the region. Where possible, country-specific studies will be built on the previous high-level global ingredient scoping conducted by WorldFish and Wageningen University & Research described above. These scoping studies will be more in-depth and will entail a particularly deep focus on seasonality in each project country. At least 10 local fish feeds per country will also be examined. This output will be foundational for delivering the project's next steps and is the basis for the investigation into local ingredients and the eventual selection of 15 ingredients for improvement and use in the formulation of novel feeds. The sub-activities to be completed to conduct these studies include literature reviews, study design, meetings with partners, data collection and analysis, and report preparation and publication.

Research scientists from SLU, CORAF, ICIPE, and Aller Aqua Africa (all PhD holders) will provide feedback on proposed research protocols and scientific methods relevant to their expertise. For example, ICIPE will focus on protocols that are insect-related because of its experience with insect-based feeds.

Additionally, multiple partners will be included as survey participants/interviewees. National Agricultural Research Services (NARS) agencies of project countries (for example, the Nigerian Institute for Oceanography and Marine Research and the Kenya Marine and Fisheries Research Institute/the Central Laboratory for Aquaculture Research) will participate in the survey along with Aller Aqua Africa. Local cooperatives and groups of feed millers and fish farmers and local NGOs will also be interviewed. All will provide information on local ingredients in response to questionnaires that will be adapted to target specific partners in each country appropriately.

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 derived from (novel) local ingredients

This output's activity aims to develop and conduct mixed methods gender and social assessments in the 3 project countries using a context-sensitive approach and compiling sex-disaggregated data. These assessments will be completed in the first 6 months of the project and will identify opportunities for the project to advance gender and social inclusion goals of Norad, WorldFish, and other key stakeholders within the novel feeds landscape. Because the needs, risks, and opportunities associated with the use of novel ingredients are gendered and socially differentiated, a shift to using local ingredients in fish feeds and the development of related businesses may have uneven reach or benefits, placing some social

groups, especially women and youth, at risk. These assessments will enable WorldFish to identify such risks and to ensure that women, youth, and other marginalised groups are prioritised throughout implementation and ensured the same access to project opportunities as non-marginalised groups. The subactivities to be completed to conduct these studies include literature reviews, study design, meetings with partners, data collection and analysis, and report preparation and publication.

WorldFish's gender team and associates will design and conduct these assessments in each country. Local cooperatives and groups of women, youth, fish farmers, and feed millers will participate in the assessments as interviewees (FGDs, household interviews, etc.).

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

This output's activity aims to develop and conduct climate change and environmental assessments in each of the 3 countries to identify opportunities for the project to benefit the environment within the novel feeds landscape. WorldFish will employ life cycle assessment (LCA) method to assess and quantify the benefits (or disbenefits) of new fish feeds in enhancing sustainable management of natural resources and their contribution to reducing greenhouse gas emissions. Such assessment of novel ingredients and their production processes will be a key design feature in identifying both cost-effective and environmentally sustainable products. The subactivities to be completed to conduct these studies include literature reviews, study design, meetings with partners, data collection and analysis, and report preparation and publication.

WorldFish's climate team and associates will design and conduct 1 assessment in each country. NARS, national meteorological services, local NGOs, and local cooperatives and groups of women, youth, fish farmers, and feed millers will participate in the assessments as interviewees (FGDs, household interviews, etc.).

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

This output's activity aims to develop and conduct market assessments to analyse potential economic factors (including volatility of prices throughout the year) related to creating feed formulations for feed millers and smallholder fish farmers and to provide background data for assessing the commercial viability of ingredients and feeds. These assessments will enrich project knowledge of the economic realities faced by women and men millers and farmers, including youth, and will be critical to understanding their perspectives. One assessment in each country will be completed in the first 6 months of the project. These surveys will also provide background data for assessing the commercial viability of some of the feeds that will be developed using novel ingredients. The subactivities to be completed to conduct these studies include literature reviews, study design, meetings with partners, data collection and analysis, and report preparation and publication.

WorldFish will design and conduct 1 assessment in each country. NARS, local NGOs, and local cooperatives and groups of women, youth, fish farmers, and feed millers will participate in the assessments as interviewees (FGDs, household interviews, etc.).

Output 1.5: New knowledge and data on nutrient requirements of improved strains of tilapia and African catfish produced, validated, and made widely available

This output's activity aims to investigate essential nutrient requirements in improved strains of tilapia and African catfish. As described in the "current situation & research/evidence" section above, while many African countries are introducing genetically improved fish, little data is available on the amino acids, fatty acids, vitamins, and minerals requirements of these improved tilapia and catfish. However, growing evidence points to increased needs. In order for the aquaculture community generally as well as feed millers and fish farmers in particular to better understand the nutrient needs of these new strains of fish (and the economic and business implications of those needs), this project will investigate the amino acids, fatty acids, vitamins, and minerals requirements for different strains of improved tilapia in each project country and different strains of improved African catfish in 2 countries (Nigeria and Kenya).

As shown in the table below, 4 experiments on tilapia will be conducted in each country, for a total of 12 tilapia experiments, and 4 experiments will be conducted on African catfish in 2 of the 3 project countries, for a total of 8 catfish experiments.

	Zambia	Nigeria	Kenya	Totals
Tilapia experiments	4	4	4	12
Catfish experiments	0	4	4	8
Totals	**4**	**8**	**8**	**20**

This research will be conducted in a controlled environment (tanks/aquaria). Steps/subactivities to complete these experiments will include designing the research protocol, securing animal ethics approval, running the experiment, analysing data and samples, writing the research reports, and publishing peer-reviewed manuscripts. The resulting data from the 20 experiments will be provided to the National Research Council of the United States of America, which is widely used, and will be included in a new WorldFish database available to stakeholders across Africa and beyond as well as in WorldFish Better Management Practices guidelines (BMPs).

WorldFish will collaborate with multiple partners to develop and implement these experiments. Local research scientists in each project country (WorldFish, ICIPE, and CORAF) and the research scientists of the partners (NARS, ICIPE, CORAF) will contribute to the design of research protocols and implement the research. Aller Aqua Africa's research team will also provide feedback on the proposed protocols as will SLU.

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 at least 27 improved cost-efficient feed formulations to improve aquaculture productivity and resilience.

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

This output's activities aim to identify nutritional qualities and limitations of local ingredients to prioritise 15 local ingredients to be selected for improvement (activity 2.1.1); hold stakeholder consultations with feed millers and fish farmers to discuss the results of the analyses and to assess other potential benefits, risks, challenges, and hazards related to the use of the analysed feeds and local ingredients in the short, medium, and long run (activity 2.1.2); produce improved local ingredients (fermentation, soaking, etc.) and co-formulate experimental fish feeds with feed milllers in 3 countries (activity 2.1.3); and validate formulated novel fish feeds through on-farm pilots and workshops to learn if the fish grow bigger, faster, and healthier when consuming these feeds made with novel ingredients (activity 2.1.4).

Activity 2.1.1: Conduct experiments to prioritise 15 ingredients
For this activity, the project will conduct lab analyses and digestibility experiments of multiple samples from the local ingredients collected in output 1.1 and from existing fish feeds. The parameters analysed will include proximate composition, anti-nutritional factors, and apparent digestibility coefficients (ADCs) of the nutrients contained in the ingredients. The results will demonstrate some of the most important nutritional qualities and limitations of these ingredients and will help WorldFish and its partners (along with stakeholder consultations in activity 2.1.2) to determine which 15 local sustainable ingredients should be selected for improvement. Criteria for sustainability include availability of the ingredients, affordability, nutritional value, associated constraints (presence of anti-nutritional factors), feed-food competition, and environmental impact, among others. Local ingredients such as groundnut cake, algal meals, and insect meals made from black soldier fly larvae will be considered. These analyses and knowledge will inform the formulation of novel fish feeds and will be made public.

For this activity, SLU will complete the biochemistry analysis (proximate composition and antinutritional factors) while WorldFish will complete the digestibility experiments at its model lab in Penang, Malaysia. A database with the results will be developed and used in the stakeholder consultations in activity 2.1.2.

Activity 2.1.2: Stakeholder consultations
For this activity, the project will hold stakeholder consultations with feed millers and fish farmers (1 online workshop per country, each 2 days in length, gender balanced and including youth) to discuss the results of the lab analyses and ADCs and to assess other potential benefits, risks, challenges, and hazards related to the large-scale use of local ingredients in the short, medium, and long run in SSA. These workshops will take place after the first year and will start as soon as data from the lab analyses and ADCs become available. These consultations will be critical to understanding the perspectives of feed millers and fish farmers and will help WorldFish and its partners to determine which 15 local, sustainable ingredients should be selected for improvement.

WorldFish will facilitate the stakeholder workshops. Cooperatives and groups of fish farmers and feed millers as well as NARS, ICIPE, CORAF, SLU, and Aller Aqua Africa will participate in the workshop discussions.

Activity 2.1.3: Produce ingredients and co-formulate fish feeds
For this activity, the project will select 15 local, sustainable ingredients (5 per country) for the formulation of novel fish feeds based on the scoping studies in output 1.1 and subsequent lab analyses (and preliminary digestibility research), and consultations with feed millers and fish farmers in activities 2.1.1 and 2.1.2. The selection of these ingredients will take place in the second year of the project and will be crucial to project success. Key subactivities will include the synthesis of the findings generated so far to enable prioritisation of the most relevant local ingredients for feed millers to include in formulating novel fish feeds. This will be done within the framework of a circular economy (which aims to use local

agricultural by-products to reduce waste and pollution) while also accounting for gender and social inclusion issues as understood/learned through the assessments conducted in output 1.2. Selected new ingredients will include alternative local protein sources (insect meals—dried insects ground into meal), microbial proteins, algal proteins, etc.) and local energy sources (brans, grain by-products, etc.).

Once the 15 ingredients are selected, the project will conduct further research and develop processing techniques to improve their quality as needed (e.g., through fermentation, soaking, drying, detoxification, etc.) to use them to formulate balanced fish feeds. Three sets of experiments with 5 local ingredients per country will be conducted for the research. After the needed improvements and after ensuring the quality of the ingredients, software will be used to formulate the feeds and a total of 9 experimental feeds will be produced by feed millers (3 per country).

WorldFish will discuss the results of the lab analyses (and ADCs) and the stakeholder consultations (activities 2.1.1 and 2.1.2) and will consult with project partners to support the process of selecting 15 local ingredients. WorldFish will consult with SLU, ICIPE (with a focus on insect-based ingredients), CORAF, Aller Aqua Africa, NARS, local cooperatives and groups of fish farmers, feed millers, women, and youth, NARS, and local NGOs. These consultations will be carried out through an online workshop for each project country. For the subsequent research, WorldFish and SLU will develop the research design. Two 2 PhD students in Nigeria and Zambia and 10 Masters students in Kenya will conduct the research and be supervised by SLU (Nigeria and Zambia), ICIPE (Kenya), and WorldFish. (Each student will be recruited from a project country and will be a national of one of the project countries). SLU and ICIPE will work with the students to design the correct processing for each ingredient and the use the software to formulate the 9 experimental feeds. Research scientists from CORAF and Aller Aqua Africa will provide feedback on the research design as will local cooperatives and groups of feed millers.

Activity 2.1.4: On-farm validation pilots of the novel fish feeds
For this activity, the project aims to validate the 9 formulated fish feeds through on-farm piloting to learn if the fish grow bigger, faster, and healthier (growth, condition, and well-being) when consuming these feeds made with novel ingredients. The activities will involve comparing 3 formulas of feeds for each on-farm pilot through a farmer-scientist research partnership. (As feasible, the pilots will draw on best practices from Farmer Field Schools to optimise results as well as capacity development and empowerment outcomes for farmers.) There will be a total of 6 on-farm experiments (2 per country). The research will be conducted directly in farmers' ponds (12 ponds per experiment for a total of 24 ponds per country).

Key subactivities will include working with women and men farmers, including youth, to validate the feeds with a research protocol, conducting the experiments, analysing data, producing reports, and holding inclusive workshops (1 per country) with diverse and representative farmers, feed millers, NARS, and other stakeholders to share the results and discuss their relevance to individual contexts and potential for adoption. Validating the formulated feeds and the resulting workshops will be key to understanding the willingness of feed millers and smallholder fish farmers to use the novel ingredients to formulate their own feeds.

WorldFish, SLU, ICIPE will develop the research design and co-supervise the students who will conduct the research. Research scientists from CORAF and Aller Aqua Africa will provide feedback on the research design. Cooperatives and groups of fish farmers will provide their farms for the research and actively participate by following research protocols, including feeding and caring for the fish, providing feedback as the pilots progress, and participating in workshops.

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

This output's activity aims to develop an open access database for feed ingredients for tilapia and African catfish feeds (using the local novel ingredients and based on the databases developed in activities of outputs 1.5 and 2.1) with a feed formulation application/tool (FeedCalculator) which will be made available to the public in Africa and will enhance the capacity of feed millers and farmers to grow and sell tilapia and African catfish. A mobile version of the database will also be developed, and the database will be integrated into existing mobile apps widely used by farmers (including social media apps such as WhatsApp, e.g., a WhatsApp bot). Feed millers and fish farmers with access to the internet will be able to use these tools to develop fish feeds that include the novel local ingredients, formulating these feeds on a "real-time" basis. The database and app will enable fish farmers and feed millers to develop and adapt feeds as needed daily, using factors such as most recent market prices of the ingredients. Farmers and millers will be able to use the novel ingredients to create the most affordable, highest quality fish feeds that take into account individual circumstances and needs.

The company Single Spark will establish in its FeedCalculator Application (tool) a module containing the 15 ingredients developed by the project. Single Spark will include a least-cost formulation programme in the software. Smallholder fish farmers and small and medium feed millers (including women, youth, and other marginalised groups) and Aller Aqua Africa as well as ICIPE, CORAF, and the PhD and master's students will provide feedback on the database its use in an online workshop (1 per country) before the tool is finalised. This activity and its subactivities will take place in the fourth and fifth years of the project.

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 context-specific circumstances and needs

This output's activities aim to develop printed manuals/booklets which will be made available to the public in SSA for fish farmers and feed millers to facilitate formulation of sustainable tilapia and African catfish feeds using novel ingredients and to hold training workshops on novel ingredients, sustainable feeds, and feed formulation practices, and on the use of the open access database and printed manuals/booklets.

The project will develop printed manual/booklets for farmers and millers with no internet access (and for those who prefer printed material for other reasons) that will enhance their capacity to develop and use the right nutrition solutions for growing tilapia and African catfish. These printed manuals/booklets will include basic information on the local ingredients. As well, for each country, the project will insert a unique set of 9 fish feeds (3 formulas for each of 3 live-stages of fish—starter, grower, and finisher) in the booklet based on the novel ingredients (a total of 27 unique feeds). This will enable farmers and millers to develop/select the most cost-effective and nutritious locally available feed option.

Additionally, the project will organise 4 trainings/workshops for each project country (2 online and 2 in-person) to train fish farmers and feed millers on novel ingredients, sustainable feeds and feed formulation practices, and on the use of the open access database and printed manuals/booklets. Trainings will be tailored to results of gender and social scoping and will use gender and socially inclusive facilitation strategies. Pictorial-based blended learning and role-based learning approaches will be used where appropriate in the in-person workshops. Twelve training/workshops (4 per country) will target 300 people

(with a minimum in each training of 5 millers, 5 NARS, and 30% women). WorldFish will make the trainings available on YouTube in English, French, and several local languages as needed. Moreover, digital announcements of workshops and their benefits will be made via radio, WhatsApp, and social media. These workshops will take place in the last year of the project.

WorldFish will develop this manuals/booklet with support from the PhD and master's students, Aller Aqua Africa, ICIPE, and CORAF and after facilitating 3 in-person workshops (1 for each project country) and 1 online workshop. Best practices for gender and socially inclusive communications will be followed, including nongender-reinforcing language and visuals. These manuals will also include significant graphics/drawings to make it reader-friendly and will avoid excessive technical information and language. Aller Aqua Africa and cooperatives and groups of fish farmers, feed millers, women, and youth will participate as trainees in each of the 12 workshops. ICIPE, CORAF, and NARS will support the organisation and implementation of the trainings and NARS extension services will attend as trainees, providing capacity development for them. WorldFish will provide all participants with relevant BMPs to distribute and to use to train others.

<u>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.</u>

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

This output's activities aim to provide WorldFish and its partners with critical information and knowledge on potential opportunities and barriers to project scale-up and to develop and implement a participatory scaling process. Annual scaling assessments in each country will examine enabling and constraining factors (including barriers and bottlenecks) for scaling up the use of novel ingredients, feeds, and tools for farmers and millers that will be developed as part of the project. These will be multi-stakeholder, participatory assessments focusing on small and medium scale feed millers because of their important role in producing fish feeds for farmers. They will assess if new products (sustainable ingredients, novel fish feeds) and tools (databases, modules, etc.) can be accepted and adopted and why, before scale-up begins. The assessments will provide information on the possible opportunities and barriers to the scaling of the ingredients, feeds, and nutrient requirement tools and will include gender and social scoping regarding digital needs and capabilities to ensure marginalised groups, women, and youth have access to the developed tools.

Additionally, WorldFish will hold stakeholder consultations (2 workshops per country) to discuss the new data on the nutrient requirements of improved tilapia and African catfish, generate feedback on the data's acceptance and potential for adoption, and codevelop strategies for scale-up of the use of this new knowledge. Stakeholders will share their perspectives and experiences, actively contributing to understand scaling as a dynamic process that involves a wide range of different stakeholders, pathways, tools, and methodologies. There will be a total of 6 workshops that will take place in the third and fourth years of the project.

Experts within WorldFish (for gender considerations, climate change, and markets) will work with a scaling specialist (to be recruited for this project) who will lead these assessments and stakeholder workshops. The workshops will be held in project partners' offices (or rented facilities) in each country. Local and national government officials, cooperatives and groups of fish farmers, feed millers, women, and youth, Aller Aqua Africa, ICIPE, NARS, CORAF, SLU will all participate in the workshops along with development, farmer, policy, and finance organizations.

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

This output's activities aim to codevelop and formalise strategic partnerships and innovation platforms with local stakeholders in the 3 countries, with a view to catalyzing multiple scaling activities on multiple fronts, based on the recommendations of the scaling assessments. These strategic scaling partnerships will scale the project's knowledge and innovations through a variety of channels, such as: (i) setting up demonstration sites and model farms where farmers can gain first-hand experience and see the impacts of using the novel feeds; (ii) hosting farmer field days in order to attract new groups of farmers to learn about novel feeds and gain a strong interest in testing the feeds; (iii) working with selected farmer cooperatives to incentivize their testing and use of the novel feeds; (iv) supporting the establishment of new services or businesses by farmers and young people, focused on developing and offering feed solutions using the projects innovations; (v) working with NGOs, the private sector, and extension service providers to expand or improve their product offerings to fish farmers based on the project's innovations; (vi) catalyzing additional investment into novel feeds through the private sector or financial institutions; and (vii) supporting public and private extension service providers to update their advisory and support services using the project's knowledge and innovations.

The project's scaling expert will work with the selected scaling partners in each country to identify the best set of approaches per country, and WorldFish and other project partners will collaboratively advise and support these scaling partners to identify exciting ways of scaling the project's innovations to as many farmers as possible. From a preliminary screening process, PIND Nigeria, Musika Initiative Zambia, and Farm Africa Kenya have been pre-selected as potential strong partners for supporting scaling in each of the three countries. All three entities have experience working with aquaculture farmers, and have strong presence and capacity on the ground.

Output 3.3: Strategic capacity development and public awareness campaigns delivered in order to widely disseminate knowledge, innovations, and tools developed by the project

This output aims to develop and deliver training materials, workshops, conferences, and media campaigns to disseminate knowledge of local, sustainable ingredients and fish feeds across sub-Saharan countries. This will include the presentation of results of the overall project to the public across the African continent through workshops, factsheets (online and printed), BMPs, and project reports. WorldFish will organise and host 10 dissemination and capacity building workshops. All workshop videos will be made available on YouTube. Additionally, WorldFish will produce a "benefits story," a short video that summarizes the diverse benefits to millers and farmers of using local, sustainable ingredients for their fish feeds. As well, WorldFish will produce television and radio programmes documenting results to be aired as widely as possible in select countries. WorldFish's communications team will contribute to knowledge dissemination with the development of position papers, videos and animation, infographics/posters, blogs, social media posts, project newsletters, case/success stories, and fish-for-thought events. Regional

bodies such as AfDB (African Development Bank), SADC (Southern African Development Community), ECOWAS (Economic Community of West African States), EAC (East African Community), and environmental agencies will be included in all dissemination of materials and will be invited to attend online workshops in order to promote additional regional scaling.

Moreover, based on stakeholder consultations in output 3.1, WorldFish will work with on-ground partners to design and conduct significant outreach to end-users (farmers and millers) to support scale-up. This outreach will be designed based on the context(s) in each country and the results of the annual assessments in output 3.1, but could include the use of community volunteers, technicians in the field, community health and other centres, cell phone contacts, etc. CORAF has a significant on-ground presence in 23 countries in West and Central Africa and will be a key partner for initiating scaling. CORAF will promote the adoption of sustainable feed technologies throughout the region. Additionally, CORAF will support the design and implementation of outreach activities targeting end-users. Cooperatives and groups of fish farmers, feed millers, women, and youth will also participate in all outreach activities (as end-users). The workshops, media campaigns and radio/TV programmes will draw on best practices for gender and socially inclusive communications, including CGIAR research into inclusive virtual extension.

Finally, the project will develop and publish a policy brief in the final year, to support the advancement of novel ingredients use in the focus countries and across Africa. Key subactivities will also include the hosting of an online workshop to launch the brief. All stakeholders will be invited to this workshop to review and provide feedback on the first version of the policy brief which will be revised as appropriate before final publication.

WorldFish will develop and publish the policy brief with contributions from all partners involved in the project. WorldFish will host the online workshop.

Covid-19

According to the United Nations, Covid-19 is having a devastating impact on progress toward achieving the 17 SDGs and, though the virus impacts everyone worldwide, the poorest and most vulnerable are most affected by the pandemic (Yongyi, 2020). The virus is exacerbating health, nutrition, and economic disparities and negatively affecting the ability of countries such as Nigeria, Zambia, and Kenya and their partners to work toward decreasing those disparities. Research and development projects continue to be impacted by major travel and movement restrictions. As demonstrated in the attached risk matrix, WorldFish's proposed project could be impacted in several ways. There could be delays to the overall project implementation due to national and international travel restrictions and operational restrictions. Additionally, there could be delays in hiring in-country project staff and in communications and outreach activities depending on the ongoing status of the virus in each country. To manage these risks, WorldFish will ensure it regularly updates its knowledge base of country-specific restrictions and rates of infection (and infection "hot spot" areas), consults regularly with country and operational partners, and maintains capacity to have online interviews and training sessions where restrictions prevent gatherings. WorldFish has developed Business Continuity Plans (BCPs) for most countries of operations, including guidelines for project delivery in the event of major disruptions due to covid-19 or other similar constraints. These BCPs are evolving documents, and will guide the adaption of project activities in the event of expected or unforeseen disruption as a result of covid-19. WorldFish and partners will adhere to all country-specific standard operating procedures and safety guidelines/mandates regarding Covid-19 management. While the pandemic presents challenges to project planning and operations, it also offers WorldFish and partners the opportunity to help build Covid-19 resilience in the 3 focus countries as project results include

thousands of people (and their families) with stable livelihoods and improved economic circumstances.

Relevance of the Project for Norwegian and Partner Priorities

Relevance of the project for Norwegian priorities

The Norwegian government recognises the importance of aquaculture to achieving multiple sustainable development goals by 2030. According to "White Paper 22" (Report to the Storing), the anticipated growth of aquaculture in coming years has the potential to "make a significant contribution to global food security." (Norwegian Ministry of Foreign Affairs, 2017) Norwegian development priorities reflect this recognition. Norad's "Fish for Development Policy" (FfD) (2019) commits to expanding Norway's support of aquaculture so that "Norwegian competence and expertise can be of greater benefit to developing countries." It states, "In order to promote food security and/or nutritional goals and to end poverty, FfD will support partner countries in their efforts to ensure sustainable fisheries and aquaculture and to increase the sustainable production of fish and seafood." Norad clearly views aquaculture as underpinning economic development and advancing food security and human nutrition. FfD also emphasizes the need for research and prioritises research cooperation with fisheries and aquaculture, naming WorldFish specifically as a partner. Among the topics emphasized for research and higher education, is "nutrition and feed," which is at the heart of WorldFish's proposed project.

"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" through "efforts towards small-scale farmers and fishermen, with a particular focus on the least developed countries and sub-Saharan Africa." WorldFish's proposed project directly addresses these needs in the parts of the world and with the people who Norway prioritises. As well, the Action Plan prioritises partnerships with research organisations to ensure food producers have access to knowledge and that small-scale food producers can access existing and new relevant technology. The WorldFish project responds to this priority through an emphasis on access to knowledge and the development of new tools and technologies. Moreover, the proposed project's focus on gender and social inclusion aligns ideally with FfD's commitment to gender equality and women's rights. Alignment extends to the importance of addressing climate and environment in formulating programme activities. The importance Norway places on sustainability—economic, social, and environmental—and ending hunger aligns precisely with WorldFish's vision and mission, its 2030 strategy, and its plans to contribute to the relevant SDGs through this project.

WorldFish explored Skretting as a potential Norwegian partner for this project and, though a formal partnership will not be developed, the project and its data and analysis are of interest to the company. Additionally, WorldFish approached a Norwegian University as a potential academic partner but the university is unable to take on PhD students so a partnership was developed with SLU instead.

Relevance of the project for WorldFish priorities

WorldFish's 2030 strategy, "Aquatic Foods for Healthy People and Planet: 2030 Research and Innovation Strategy," focuses on 3 impact areas: climate resilience and environmental sustainability, social and economic inclusion, and nutrition and public health. This proposed project is relevant to all 3 impact areas. The project is part of the current CGIAR FISH CRP whose goal is to achieve sustainable increases in the gender and socially inclusive production and equitable distribution of nutritious fish to improve the

livelihoods and nutrition of poor households in priority geographies. Moving forward, the project will become part of the One CGIAR impact areas—1) Nutrition, Health, and Food Security; 2) Poverty Reduction, Livelihoods, and Jobs; 3) Gender Equality, Youth, and Social Inclusion; 4) Climate Adaptation and Mitigation; and 5) Environmental Health and Biodiversity—which also align ideally with project objectives.

WorldFish views this project as an opportunity to advance its mission to end hunger and advance sustainable development by 2030 through science and innovation to transform food, land, and water systems with aquatic foods for healthier people and planet. Project outputs and activities have been designed with a deliberate focus on understanding and responding to context-specific realities affecting livelihoods and nutrition, sustainability, gender and social inclusion, and the environment. The collaborations proposed in this project are in line with the WorldFish 2030 strategy and the OneCGIAR vision, which aims to strengthen the synergy between the CGIAR centres and between OneCGIAR and other organisations operating in food systems in order to achieve greater impact in people's lives.

Relevance of the project for the partners' priorities

SLU: The proposed project fully aligns with SLU's mission to conduct education, research, and environmental monitoring and assessment in collaboration with society at large and to focus on the interaction between humans, animals, and ecosystems and the responsible use of natural resources. SLU's PhD students conducting field work, its co-supervision of those students, its laboratory analyses, and its contributions to research protocols will provide the University with significant research, learning, and practicum opportunities in line with its mandate.

ICIPE: The proposed project is in full alignment with ICIPE's goal to use insect science for sustainable development and to ensure food security and improve the overall health of communities in Africa. This project will enhance ICIPE's data and knowledge on insect-based local ingredients and fish feeds in the 3 project countries, and it aligns ideally with ICIPE's plans for scale-up in multiple African countries and its continuing focus on women and youth.

Aller Aqua Africa: The proposed project is relevant to Aller Aqua Africa's priorities of continuously developing existing and new feed types and evaluating raw materials for fish nutrition. As well, Aller Aqua uses a circular economy approach and sources many ingredients locally in Zambia and other African countries (also in line with this project's priorities).

Small and medium-scale feed millers and smallholder farmers: Cooperatives and groups of women and men feed millers and smallholder farmers form the core of this proposed project. The project's goal, outcomes, outputs, and activities are ideally aligned with the priorities of millers and farmers to produce and use economically viable, sustainable, and high-quality feeds that lead to increased fish farm productivity.

CORAF: CORAF's mission to address food and nutrition insecurity, chronic poverty, and youth unemployment fully aligns with this proposed project. One of CORAF's key functionalities and interests is scaling technologies and innovations, and this project will enable it to play a crucial scaling role among its 23 member nations in West and Central Africa. In addition, CORAF's Aquaculture Centre in Nigeria has developed several tilapia and African catfish feeds using local ingredients and is very interested in developing them further within the framework of this project.

NARS: NARS agencies identified by WorldFish as partners in each of the project countries are mandated to conduct scientific research focusing on aquaculture. This proposed project is relevant to that mandate and will enable NARS partners to work toward increasing sustainable aquaculture productivity in their respective countries. Additionally, this project aligns with the overall country strategies (of the 3 focus countries) on increasing production of aquatic foods.

SCALING Partners: Potential scaling partners (e.g. PIND Nigeria, Musika Initiative Zambia, and Farm Africa Kenya) have been selected due to their ongoing or recent work to deploy solutions to small and medium-scale farmers working in African aquaculture. These institutions and other scaling partners that will be identified as the project evolves are committed to growing the aquaculture sector in Africa, and will play key roles in scaling the project's knowledge and innovations beyond the lifespan of the project.

Human Resources Planning

This proposed project will have complex human resources needs due to its multi-year timeframe, multi-country geographic range, and diverse range of partners. Proper planning for human resources requirements will be critical to its success. WorldFish's headquarters team in Penang will work closely with country HR teams and partners to put together a hiring timetable to meet project needs of each country throughout the 5 years. The project leader will be Rodrigue Yossa, PhD (WorldFish FP1-2 Cluster Feed sub-theme Leader, Scientist—Fish Feeds and Nutrition). Dr. Yossa will be supported by 3 local research scientists (1 per project country, either WorldFish or partner staff). Additional key project roles will include a MEL specialist, a communications specialist, a project management assistant, and a scaling specialist. As discussed earlier, WorldFish will scale up this initiative through traditional means, but the scaling specialist will also identify additional opportunities to widen and enhance the project's impact.

Project Management

The overall management and organisation responsibilities of this proposed project will belong to WorldFish, and WorldFish will be accountable to Norad for all project deliverables and expenditures. WorldFish will collaborate closely with partners, including SLU and the PhD students, Aller Aqua Africa, ICIPE and the master's students, CORAF, NARS, feed millers and fish farmers, throughout the 5-year timeframe to ensure the timely completion of project activities and fulfillment of project obligations. WorldFish will lead the implementation of multiple cross-cutting project management activities designed to ensure project cohesion and forward progress. These activities will include internal and general (partners included) project start-up meetings, WorldFish internal monthly meetings, annual project meetings (rotating countries), regular project phone calls/online meetings, regular MEL check-in/data updates on the MEL platform, the development of annual project donor reports, and the activities discussed in the monitoring, evaluation, and learning section below. This comprehensive project management structure will be managed and monitored by the WorldFish Project Management Unit (PMU).

Monitoring, Evaluation, and Learning Plan

The project monitoring, evaluation, and learning (MEL) team will be comprised of the WF MEL lead, a MEL manager, and a MEL specialist who will dedicate 11% of their time to the project for the first 4 years and 16.5% for the final year. The MEL function of the project will assess, in a systematic and objective way, how well project results are being achieved throughout the project, identifying those achievements and introducing corrective measures as required. WorldFish uses an impact-focused results-based

management (RBM) system to improve performance, learning, and accountability; track progress; and provide quality information for adaptive project management. Under the supervision of the MEL lead, the MEL specialist will be responsible for finalising the design of the project's RBM system. A CGIAR-developed web-based knowledge sharing and MEL platform will be used. The MEL platform facilitates the tracking of indicators to assess the project's overall progress and engagement with stakeholders to develop an understanding of why targets are or are not being met.

The M&E system will be executed through 5 interrelated approaches:

1. **Activity monitoring**: The MEL Specialist will be a member of the project team and will attend regular project management meetings. All the deliverables associated with project activities will be recorded on the web-based knowledge sharing and MEL platform described above (https://mel.cgiar.org). The MEL Specialist will track the implementation of activities and the upload of the associated deliverables to the MEL Platform.
2. **Output monitoring**: The achievement of project outputs will be measured using the indicators stated in the Results Framework. The indicators and the associated targets will be recorded in the MEL platform. 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.
3. **Outcome monitoring**: The MEL Specialist will design and conduct annual outcome monitoring studies in each of the countries and maintain excel-based algebraic models of the impact pathway for simulation of outcome and impact results (projected benefits).
4. **Learning and adaptation**: The MEL function will continuously convene stakeholders to review the project theory of change and enumerate evidence of linkages thereof. Linkages with weak evidence will form the basis for the project learning agenda. Lessons learned throughout the project will be recorded on standard templates, disseminated widely, and utilised to adapt subsequent annual workplans.
5. **Outcome evaluation**: An evaluation study will be conducted only at project end line since most/all baseline output indicator values are either zero or can be established through review of secondary literature or information gathered through scoping studies. To enhance independence and objectivity, the end line evaluation will be led by external consultant(s) recruited by the project in consultation with Norad. The MEL team will lead the development of the terms of reference, select the best service providers, and review the inception report and final evaluation report. The MEL Specialist will also coordinate logistical support required by the evaluation team.

To facilitate systematic implementation of the above 5 approaches, a detailed MEL plan will be developed at the project inception stage.

Data and Knowledge Management

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. 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.

Knowledge and information generated by this project will be archived in WorldFish's Open repositories (DSpace, MELSpace and DataVerse) that enable discoverability of the products, allowing seamless knowledge sharing. 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.

Project Communications

Communications will be a key component of this project, and WorldFish will take a very proactive approach to communicating project outcomes, outputs, products, and events to target audiences in Africa and beyond and to contribute to initiating project scale-up. A project communications specialist will be recruited and a detailed communications planning exercise will take place once the project is underway. Priority project communications products will include position papers (key messages and activities), the packaging and promotion of key research innovations, early planning for priority strategic events and digital campaigns, video abstracts (journal articles and publications), blogs (themed series), and fish-for-thought events (themed lectures and talks).

The detailed communications planning exercise described above will take place at project start-up and will include the development of a project messaging guide and project templates (presentation slides, e-banner/background, and word documents). Throughout project implementation, the communications team will develop important communications products, including a project webpage, a press release about the project launch, a project fact sheet, 4 blog posts per year, and 2 social media updates per month. Additionally, project research products will include journal articles, project briefs, project reports, infographics/posters, case/success stories (2 per year), photo stories (1 per year), project videos and animation, a PPT/video abstract for key journal articles/publications, an op-ed for key highlights, and project newsletters. Finally, the communications team will support project events and campaigns with announcements and planning (concept notes, coordination, and media and communications).

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

Results Framework

APPENDIX A

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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.				
Outputs	**Partners**	**Indicators/Deliverables**	**Targets/Timelines**	**Means of Verification**
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				
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	SLU, ICIPE, Aller Aqua Africa, NARS, CORAF, local cooperatives/groups of feed millers and fish farmers, local NGOs	Number of in-depth scoping studies completed	3 (1 per country) in Year 1 (months 1-9)	-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	Local cooperatives/groups of feed millers and fish farmers, women's and youth groups, local NGOs	Number of gender and social assessments completed	3 (1 per country) in Year 1 (months 1-6)	Assessment reports
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	NARS, national climate / environmental agencies, local cooperatives/groups of feed millers and fish farmers, women's and youth groups, local NGOs	Number of climate and environmental assessments completed	3 (1 per country) in Year 1 (months 1-6)	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	NARS, local cooperatives/groups of feed millers and fish farmers, women's and youth groups, local NGOs	Number of market assessments completed	3 (1 per country) in Year 1 (months 1-6)	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	SLU, ICIPE, Aller Aqua Africa, CORAF	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)	-Better Management Practices guidelines (BMPs) -Updated data are provided to the National Research Council of the USA -New WF database -Research report to donor
Key communications products associated with outcome 1: blog posts, webpage, press release, social media updates, position papers, project newsletters, journal articles, case/success stories, photo stories, infographics/posters, project videos and animation, a video abstract for journals, and promotion of key research innovations				
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.				
Output 2.1: New data and knowledge on local ingredients generated, used in the formulation of novel fish feeds, and made widely available	SLU, 2 PhD students, 10 master's students, ICIPE, CORAF, Aller Aqua Africa, NARS, local cooperatives/groups of fish farmers and feed millers	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)	-Research report to donor -Peer reviewed WF publication

		Number of stakeholder consultations/workshops to discuss results of ingredient selection	3 by Year 3 (months 24-30) 1 workshop per country	-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)	-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	Single Spark, 2 PhD students, 10 master's students, ICIPE, CORAF, local cooperatives/groups of feed millers and fish farmers	Open access database with feed formulation tool developed	1 by Year 5 (months 42-54)	-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)

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 context-specific circumstances and needs	NARS, CORAF, ICIPE, Aller Aqua Africa, local cooperatives/groups of feed millers and fish farmers, women's and youth groups	Printed manuals/booklets developed	1 set of manuals/booklets developed by Year 5 (months 42-54)	-Printed manuals/booklets
		Number of trainings/workshops completed by millers, farmers, and other stakeholders	12 training/workshops in Year 5 (months 48-60) 4 per country (2 online and 2 in-person)	-Training reports -BMPs
Key communications products associated with outcome 2: blog posts, webpage, social media updates, project newsletters, position papers, journal articles, project briefs, case/success stories, photo stories, infographics/posters, project videos and animation, a video abstract for journals, and promotion of key research innovations				
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 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	NARS, CORAF, ICIPE, Aller Aqua Africa, local cooperatives/groups of feed millers and fish farmers, women's and youth groups; research, development, policy and finance organizations	Number of scaling assessments completed and strategies developed	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)	-Scaling assessment reports -Scaling strategies
		Number of stakeholder consultations/workshops completed to validate scaling assessments and srategies	6 by Year 4 (3 in Q2 of Year 3 and 3 in Q2 of Year 4) 2 workshops per country	-Workshop reports
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	Cooperatives/groups of feed millers and fish farmers, women's and youth groups, scaling NGOs, private sector partners, financial institutions, extension service providers, etc	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)	-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)	-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)	-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)	-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)	-KII interviews -Case studies on new businesses
		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)	-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)	-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	SLU, 2 PhD students, 10 master's students, CORAF, NARS, ICIPE, Aller Aqua Africa, local cooperatives/groups of feed millers and fish farmers, women's and youth groups, scaling NGOs, private sector partners, financial institutions, policymakers, regional bodies (AfDB, SADC, ECOWAS, EAC, and environmental agencies)	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 Number of radio programmes aired Number of TV programmes aired	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 -1 radio programme produced and aired -1 TV programme produced and aired -6,000 end-users reached across 3 project countries	-Sets of workshop materials, videos, and reports -YouTube videos -BMPs -Factsheet -Project report -Web link to benefits story -Web links to radio and TV programmes and programme airings -Outreach reports from volunteers, community centres, etc.

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		Number of end-users reached through digital and in-person outreach	through outreach programme	
		Number of policy briefs published and launched	1 policy brief in Year 5 (months 48-60)	Policy brief and launch workshop report
Key communications products associated with outcome 3: blog posts, webpage, social media updates, project newsletters, position papers, journal articles, project briefs, case/success stories, photo stories, infographics/posters, fish-for-thought events, and an op-ed for key highlights				

Appendix B

Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)																					
Outcomes, Outputs, Activities, & Subactivities	**Lead(s)**	**Associates (co-deliverers)**	**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
Project start-up activities																					
Conduct internal WF project management start-up meetings	WF project management unit	WF staff involved in project (as needed for each meeting)																			
Negotiate, prepare, and sign project agreements with key partners	WF project management unit	SLU; ICIPE; CORAF; NARS																			
Conduct general project management start-up meeting (including partners)	WF project management unit	Victor Siamudaala; Sunil Siriwardena; 3 local research scientists (1 per project country - WF, ICIPE, CORAF); SLU; NARS; ICIPE; CORAF																			
Develop hiring plan for project	WF HR team	Victor Siamudaala; Sunil Siriwardena; ICIPE; CORAF																			
Recruit new staff	WF HR team	Victor Siamudaala; Sunil Siriwardena; ICIPE; CORAF																			
Recruit 2 PhD students (Nigeria & Zambia) and 10 master's students (Kenya)	SLU; WF	3 local research scientists (1 per project country - WF, ICIPE, CORAF)																			
Conduct project start-up workshops (1 global and 1 per project country for a total of 4)	3 local research scientists (1 per project country - WF, ICIPE, CORAF)	Victor Siamudaala; Sunil Siriwardena, CORAF; ICIPE; NARS; Aller Aqua Africa; local cooperatives of feed millers and fish farmers																			
Develop detailed project communications plan, project messaging guide, and project templates	WF communications specialist	Florine Lim; WF communications team																			
Develop detailed monitoring, evaluation, and learning (MEL) plan	WF MEL specialist	WF MEL team; Rodolfo Dam Lam																			

Outcomes, Outputs, Activities, & Subactivities	**Lead(s)**	**Associates (co-deliverers)**	**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
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																					
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																					
Activity 1.1.1: 3 scoping assessments (1 per project country)																					
Subactivity 1.1.1.1: Conduct literature review of relevant research documents and protocols	Local research scientists (1 per project country - WF, ICIPE, CORAF)	Victor Siamudaala; Sunil Siriwardena; research scientists (ICIPE, Aller Aqua Africa, CORAF); SLU																			
Subactivity 1.1.1.2: Design scoping studies for each country	Local research scientists (1 per project country - WF, ICIPE, CORAF)	Victor Siamudaala; Sunil Siriwardena; research scientists (ICIPE, Aller Aqua Africa, CORAF); SLU																			
Subactivity 1.1.1.3: Data collection (including sample ingredients) and analysis	Local research scientists (1 per project country - WF, ICIPE, CORAF)	Victor Siamudaala; Sunil Siriwardena; Saadiah Ghazali; research scientists (ICIPE, Aller Aqua Africa, CORAF); SLU																			
Subactivity 1.1.1.4: Report preparation and publication	Local research scientists (1 per project country - WF, ICIPE, CORAF)	Victor Siamudaala; Sunil Siriwardena; research scientists (ICIPE, Aller Aqua Africa, CORAF); SLU																			
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 derived from (novel) local ingredients																					
Activity 1.2.1: 3 gender and social assessments (1 per project country)																					
Subactivity 1.2.1.1: Conduct literature review of relevant policy, research, and country documents	WF gender lead	WF gender team; associates to gender team																			
Subactivity 1.2.1.2: Design gender and social assessment for each country	WF gender lead	WF gender team; Victor Siamudaala; Sunil Siriwardena; associates to gender team																			

Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026
			Year 1 (Q1 Q2 Q3 Q4) · Year 2 (Q1 Q2 Q3 Q4) · Year 3 (Q1 Q2 Q3 Q4) · Year 4 (Q1 Q2 Q3 Q4) · Year 5 (Q1 Q2 Q3 Q4)
Subactivity 1.2.1.3: Data collection and analysis	WF gender lead	WF gender team; Victor Siamudaala; Sunil Siriwardena; associates to gender team; Saadiah Ghazali	
Subactivity 1.2.1.4: Report preparation and publication	WF gender lead	WF gender team; associates to gender team	
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			
Activity 1.3.1: 3 climate change and environmental assessments (1 per project country)			
Subactivity 1.3.1.1: Conduct literature review of relevant policy, research, and country documents	Essam Mohammed	WF climate team; associates to climate team	
Subactivity 1.3.1.2: Design climate change and environmental assessments for each country	Essam Mohammed	WF climate team; Victor Siamudaala; Sunil Siriwardena, national meteorological services; associates to climate team	
Subactivity 1.3.1.3: Data collection and analysis	Essam Mohammed	WF climate team; Victor Siamudaala; Sunil Siriwardena, national meteorological services; associates to climate team; Saadiah Ghazali	
Subativity 1.3.1.4: Report preparation and publication	Essam Mohammed	WF climate team; associates to climate team	
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			
Activity 1.4.1: 3 market assessments (1 per project country)			
Subactivity 1.4.1.1: Conduct literature review of relevant policy, research, and country documents	Scaling specialist	None	
Subactivity 1.4.1.2: Design market assessments for each country	Scaling specialist	Victor Siamudaala; Sunil Siriwardena	

Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026
			Year 1 (Q1 Q2 Q3 Q4) · Year 2 (Q1 Q2 Q3 Q4) · Year 3 (Q1 Q2 Q3 Q4) · Year 4 (Q1 Q2 Q3 Q4) · Year 5 (Q1 Q2 Q3 Q4)
Subactivity 1.4.1.3: Data collection and analysis	Scaling specialist	Victor Siamudaala; Sunil Siriwardena; Saadiah Ghazali	
Subactivity 1.4.1.4: Report preparation and publication	Scaling specialist	Victor Siamudaala; Sunil Siriwardena	
Output 1.5: New knowledge and data on nutrient requirements of improved strains of tilapia and African catfish produced, validated, and made widely available			
Activity 1.5.1: Investigate nutrient requirements in improved strains of tilapia and African catfish			
Subactivity 1.5.1.1: Design research protocols	3 local research scientists (1 per project country - WF, ICIPE, CORAF)	Victor Siamudaala; Sunil Siriwardena; research scientists (ICIPE, Aller Aqua Africa); SLU	
Subactivity 1.5.1.2: (Zambia specific) Renovate wet lab at NRDC Zambia/Recirculating Aquaculture System (RAS)	Local research scientist in Zambia	Rodrigue Yossa; Khairul Rizal Abu Bakar	
Subactivity 1.5.1.3: Secure animal ethics approval	3 local research scientists (1 per project country - WF and/or partner organisations)	Victor Siamudaala; Sunil Siriwardena; research scientists (ICIPE, Aller Aqua Africa); feed technologist expert and fish nutritionist (both professors from academic partner/university)	
Subactivity 1.5.1.4: Conduct 12 tilapia experiments and 8 catfish experiments in project countries	3 local research scientists (1 per project country - WF, ICIPE, CORAF)	Victor Siamudaala; Sunil Siriwardena; research scientists (ICIPE, Aller Aqua Africa); SLU	
Subactivity 1.5.1.5: Analyse data and samples	3 local research scientists (1 per project country - WF, ICIPE, CORAF)	Victor Siamudaala; Sunil Siriwardena; research scientists (ICIPE, Aller Aqua Africa); SLU	
Subactivity 1.5.1.6: Research report preparation and publication and addition of results to WF's Better Management Practices guidelines (BMPs)	3 local research scientists (1 per project country - WF, ICIPE, CORAF)	Victor Siamudaala; Sunil Siriwardena; research scientists (ICIPE, Aller Aqua Africa); SLU	

Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026
			Year 1 Q1 Q2 Q3 Q4 | Year 2 Q1 Q2 Q3 Q4 | Year 3 Q1 Q2 Q3 Q4 | Year 4 Q1 Q2 Q3 Q4 | Year 5 Q1 Q2 Q3 Q4
Subactivity 1.5.1.7: Develop new WF database of essential nutrient requirements in improved strains of tilapia and African catfish	3 local research scientists (1 per project country - WF, ICIPE, CORAF)	Victor Siamudaala; Sunil Siriwardena; Saadiah Ghazail; research scientists (ICIPE, Aller Aqua Africa); SLU	
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.			
Output 2.1: New data and knowledge on local ingredients generated, used in the formulation of novel fish feeds, and made widely available			
Activity 2.1.1: Conduct experiments to prioritise 15 ingredients			
Subactivity 2.1.1.1: Conduct biochemistry analyses of ingredients samples collected for output 1.1	SLU	SLU	
Subactivity 2.1.1.2: Conduct digestibility experiments of ingredients samples collected for output 1.1	Rodrigue Yossa	Nurulhuda Fatan; research assistant; laboratory technician (all in Penang)	
Subactivity 2.1.1.3: Database development and research report preparation and publication	Rodrigue Yossa	Nurulhuda Fatan; Saadiah Ghazali; research assistant; laboratory technician (all in Penang); SLU	
Activity 2.1.2: Stakeholder consultations (1 online workshop per country) to discuss results of activity 2.1.1 and potential benefits, risks, challenges, and hazards to the use of local ingredients			
Subactivity 2.1.2.1: Organise and facilitate 1 online stakeholder workshop per country	Rodrigue Yossa; 3 local research scientists (1 per project country - WF, ICIPE, CORAF)	Victor Siamudaala; Sunil Siriwardena; Nurulhuda Fatan; research scientists (ICIPE, CORAF, Aller Aqua Africa); SLU	
Subactivity 2.1.2.2: Reports preparation and dissemination	Rodrigue Yossa; 3 local research scientists (1 per project country - WF, ICIPE, CORAF)	Research scientists (ICIPE, CORAF, Aller Aqua Africa); SLU	

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Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026
			Year 1 Q1 Q2 Q3 Q4 | Year 2 Q1 Q2 Q3 Q4 | Year 3 Q1 Q2 Q3 Q4 | Year 4 Q1 Q2 Q3 Q4 | Year 5 Q1 Q2 Q3 Q4
Activity 2.1.3: Produce ingredients and co-formulate fish feeds			
Subactivity 2.1.3.1: Synthesize all findings on ingredients generated so far to enable prioritisation	Rodrigue Yossa	3 local research scientists (1 per project country - WF, ICIPE, CORAF)	
Subactivity 2.1.3.2: Discuss all results with internal and external partners (including 1 online workshop per project country) and select 15 ingredients	Rodrigue Yossa	WF gender lead; Essam Mohammed; scoping consultant; research scientists (ICIPE, CORAF, Aller Aqua Africa); SLU	
Subactivity 2.1.3.3: Develop and use processing techniques to improve the quality of the 15 local ingredients as needed (e.g., fermentation, soaking, drying, detoxification, etc.)	SLU	2 PhD students (Nigeria & Zambia); 10 master's students (Kenya); research scientists (ICIPE, Aller Aqua Africa, CORAF); local cooperatives of feed millers	
Subactivity 2.1.3.4: Quality check the improved ingredients	SLU	2 PhD students (Nigeria & Zambia); 10 master's students (Kenya); research scientists (ICIPE, Aller Aqua Africa, CORAF); local cooperatives of feed millers	
Subactivity 2.1.3.5: Formulate fish feeds using software	SLU	2 PhD students (Nigeria & Zambia); 10 master's students (Kenya); research scientists (ICIPE, Aller Aqua Africa, CORAF); local cooperatives of feed millers	
Subactivity 2.1.3.6: Produce 9 experimental fish feeds	Local cooperatives and feed millers	SLU; 2 PhD students (Nigeria & Zambia); 10 master's students (Kenya); research scientists (ICIPE, Aller Aqua Africa, CORAF)	
Activity 2.1.4: Validate 9 formulated fish feeds through 6 on-farm pilots (2 per country)			
Subactivity 2.1.4.1: Design and validate research protocols	3 local research scientists (1 per project country - WF, ICIPE, CORAF)/SLU	2 PhD students (Nigeria & Zambia); 10 master's students (Kenya); local cooperatives of fish farmers and feed millers; research scientists (ICIPE, CORAF, Aller Aqua Africa)	

Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026
			Year 1 Q1 Q2 Q3 Q4 | Year 2 Q1 Q2 Q3 Q4 | Year 3 Q1 Q2 Q3 Q4 | Year 4 Q1 Q2 Q3 Q4 | Year 5 Q1 Q2 Q3 Q4
Subactivity 2.1.4.2: Conduct validation experiments on-farm	3 local research scientists (1 per project country - WF, ICIPE, CORAF)/SLU	2 PhD students (Nigeria & Zambia); 10 master's students (Kenya); local cooperatives of fish farmers and feed millers; research scientists (ICIPE, CORAF, Aller Aqua Africa)	
Subactivity 2.1.4.3: Analyse the data and produce reports	3 local research scientists (1 per project country - WF, ICIPE, CORAF)/SLU	2 PhD students (Nigeria & Zambia); 10 master's students (Kenya); Saadiah Ghazali; local cooperatives of fish farmers and feed millers; research scientists (ICIPE, CORAF, Aller Aqua Africa)	
Subactivity 2.1.4.4: Hold workshops to share and discuss results (1 workshop per country)	3 local research scientists (1 per project country - WF, ICIPE, CORAF)/SLU	2 PhD students (Nigeria & Zambia); 10 master's students (Kenya); local cooperatives of fish farmers and feed millers; research scientists (ICIPE, CORAF, Aller Aqua Africa)	
Subactivity 2.1.4.5: Finalise and defend PhD theses	SLU; WF	2 PhD students (Nigeria & Zambia); 10 master's students (Kenya)	
Output 2.2: Databases and digital solutions developed and used by farmers for formulating and adapting new local feeds on a "real-time" basis			
Activty 2.2.1: Develop an open access database (FeedCalculator) for feed ingredients, fish feeds, and nutrient requirements, including mobile version/apps			

Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026
			Year 1 Q1 Q2 Q3 Q4 | Year 2 Q1 Q2 Q3 Q4 | Year 3 Q1 Q2 Q3 Q4 | Year 4 Q1 Q2 Q3 Q4 | Year 5 Q1 Q2 Q3 Q4
Subactivity 2.2.1.1: Develop database with a feed formulation application/tool (FeedCalculator)	Single Spark	Rodrigue Yossa; 3 local research scientists (1 per project country - WF, ICIPE, CORAF); Saadiah Ghazali; ICIPE; CORAF; Aller Aqua Africa; 2 PhD students (Nigeria & Zambia); 10 master's students (Kenya)	
Subactivity 2.2.1.2: Develop a mobile version of the database and integrate into existing mobile apps widely used by farmers (including social media apps such as WhatsApp)	Single Spark	Rodrigue Yossa; 3 local research scientists (1 per project country - WF, ICIPE, CORAF) ; ICIPE; CORAF; Aller Aqua Africa; 2 PhD students (Nigeria & Zambia); 10 master's students (Kenya)	
Subactivity 2.2.1.3: Hold an online workshop in each project country to obtain feedback from key project partners on initial design	Single Spark	Rodrigue Yossa; 3 local research scientists (1 per project country - WF, ICIPE, CORAF) ; ICIPE; CORAF; Aller Aqua Africa; 2 PhD students (Nigeria & Zambia); 10 master's students (Kenya)	
Subactivity 2.2.1.4: Finalise both tools based on feedback from key project partners	Single Spark	Rodrigue Yossa; 3 local research scientists (1 per project country - WF, ICIPE, CORAF) ; ICIPE; CORAF; Aller Aqua Africa; 2 PhD students (Nigeria & Zambia); 10 master's students (Kenya)	

Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026
			Year 1 Q1 Q2 Q3 Q4 | Year 2 Q1 Q2 Q3 Q4 | Year 3 Q1 Q2 Q3 Q4 | Year 4 Q1 Q2 Q3 Q4 | Year 5 Q1 Q2 Q3 Q4
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 context-specific circumstances and needs			
Activity 2.3.1: Develop printed booklets/manuals for ingredients and fish feeds and make available to the public			
Subactivity 2.3.1.1: Conduct 3 in-person workshops (1 for each project country) and 1 online workshop	Rodrigue Yossa	Nurulhuda Fatan; 3 local research scientists; CORAF; ICIPE; Aller Aqua Africa; 2 PhD students (Nigeria & Zambia); 10 master's students (Kenya)	
Subactivity 2.3.1.2: Develop overall printed booklets/manuals	Rodrigue Yossa/Communications specialist	Nurulhuda Fatan; 3 local research scientists; CORAF; ICIPE; Aller Aqua Africa; 2 PhD students (Nigeria & Zambia); 10 master's students (Kenya)	
Subactivity 2.3.1.3: Develop and insert a unique set of 9 fish feeds per country in the booklet based on the novel ingredients (a total of 27 unique feeds)	Rodrigue Yossa	Nurulhuda Fatan; 3 local research scientists; CORAF; ICIPE; Aller Aqua Africa; 2 PhD students (Nigeria & Zambia); 10 master's students (Kenya)	
Activity 2.3.2: Hold workshops to train feed millers and fish farmers on ingredients, feeds, practices, databases, booklets/manuals			
Subactivity 2.3.2.1: Organise and facilitate 4 training workshops per country (2 online and 2 in-person)	3 local research scientists (1 per project country - WF, ICIPE, CORAF)/SLU	Rodrigue Yossa; Nurulhuda Fatan; Aller Aqua Africa; CORAF; ICIPE; Single Spark; Victor Siamudaala; Sunil Siriwardena; representatives of NARS	
Subactivity 2.3.2.2: Reports preparation and dissemination	3 local research scientists (1 per project country - WF, ICIPE, CORAF)/SLU	Rodrigue Yossa; Nurulhuda Fatan; Aller Aqua Africa; CORAF; ICIPE; Single Spark; Victor Siamudaala; Sunil Siriwardena; representatives of NARS	

Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026
			Year 1 Q1 Q2 Q3 Q4 | Year 2 Q1 Q2 Q3 Q4 | Year 3 Q1 Q2 Q3 Q4 | Year 4 Q1 Q2 Q3 Q4 | Year 5 Q1 Q2 Q3 Q4
Subactivity 2.3.2.3: Digital announcements of the workshops and their benefits via radio, WhatsApp, and social media	WF communications specialist	Florine Lim; WF communications team	
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 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			
Activity 3.1.1: Annual assessments of enabling and constraining factors for scale-up (1 per project country at the end of years 1, 2, 3, 4)			
Subactivity 3.1.1.1: Design scaling assessments for each country (redesign/update for each year as needed)	Scaling specialist	Victor Siamudaala; Sunil Siriwardena; WF gender lead; Essam Mohammed	
Subactivity 3.1.1.2: Data collection and analysis, including online stakeholder workshops (1 workshop per country at the end of year 1 and 1 recap workshop at the end of year 4 for a total of 4)	Scaling specialist	Victor Siamudaala; Sunil Siriwardena; WF gender lead; Essam Mohammed; Saadiah Ghazali	
Subactivity 3.1.1.3: Report preparation and publication	Scaling specialist	Victor Siamudaala; Sunil Siriwardena; WF gender lead; Essam Mohammed	
Activity 3.1.2: Stakeholder consultations to codevelop scaling strategies			
Subactivity 3.1.1.1: Organise and facilitate 2 stakeholder workshops per country (total of 6)	Scaling specialist, 3 local research scientists (1 per project country - WF, ICIPE, CORAF)	Victor Siamudaala; Sunil Siriwardena; research scientists (ICIPE, Aller Aqua Africa; CORAF); SLU	
Subactivity 3.1.1.2: Report preparation and dissemination	Scaling specialist, 3 local research scientists (1 per project country - WF, ICIPE, CORAF)	Victor Siamudaala; Sunil Siriwardena; research scientists (ICIPE, Aller Aqua Africa; CORAF); SLU	

Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	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
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 (sub-activities to be co-developed with scaling partners and as part of scaling assessments)																						
Activity 3.2.1: Develop innovation platforms for bringing key scaling stakeholders together	Scaling specialist	WF team, CORAF, ICIPE, millers, farmers, NGOs, extension service providers, private sector, financial service providers, and other scaling partners																				
Activity 3.2.2: Identify and set up demonstration sites and model farms	Scaling specialist	WF team, CORAF, ICIPE, millers, farmers, NGOs, extension service providers, private sector, financial service providers, and other scaling partners																				
Activity 3.2.3: Host farmer field days on demo sites and model farms	Scaling specialist	WF team, CORAF, ICIPE, millers, farmers, NGOs, extension service providers, private sector, financial service providers, and other scaling partners																				
Activity 3.2.4: Build partnerships with cooperatives to test and use novel feeds	Scaling specialist	WF team, CORAF, ICIPE, millers, farmers, NGOs, extension service providers, private sector, financial service providers, and other scaling partners																				
Activity 3.2.4: Support establishment of new feed services and businesses by young people, farmers, etc	Scaling specialist	WF team, CORAF, ICIPE, millers, farmers, NGOs, extension service providers, private sector, financial service providers, and other scaling partners																				
Activity 3.2.5: Support small-scale millers to develop new product offerrings based on project'ss innovations	Scaling specialist	WF team, CORAF, ICIPE, millers, farmers, NGOs, extension service providers, private sector, financial service providers, and other scaling partners																				

Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	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
Activity 3.2.6: Build partnerships with NGOs, private sector, and extension service providers to incorporate project's knowledge and innovations into their offerrings to aquaculture farmers	Scaling specialist	WF team, CORAF, ICIPE, millers, farmers, NGOs, extension service providers, private sector, financial service providers, and other scaling partners																				
Output 3.3: Strategic capacity development and public awareness campaigns delivered in order to widely disseminate knowledge, innovations, and tools developed by the project																						
Activity 3.3.1: Stakeholder consultations to codevelop scaling strategies																						
Subactivity 3.3.1.1: Develop first draft of policy brief	Policy consultant; Rodrigue Yossa	All participating project scientists																				
Subactivity 3.3.1.2: Hold online workshop and receive feedback on draft	Rodrigue Yossa	All participating project scientists																				
Subactivity 3.3.1.3: Finalise policy brief and publish	Rodrigue Yossa	All participating project scientists																				
Activity 3.3.2: Disseminate knowledge through workshops, conferences, and mass media																						
Subactivity 3.3.2.1: Develop and publish factsheets (online and printed), BMPs, and project report	Rodrigue Yossa/WF communications specialist	3 local research scientists (1 per project country - WF, ICIPE, CORAF); SLU; 2 PhD students (Nigeria & Zambia); 10 master's students (Kenya); ICIPE; CORAF; WF communications team																				
Subactivity 3.3.2.2: Hold 10 online workshops to promote scale-up	Rodrigue Yossa	Representatives of CORAF; WF communications team; Scaling specialist																				
Subactivity 3.3.2.3: Produce a "benefit story," a short, animated video that summarizes the diverse benefits to farmers and millers of using local, sustainable ingredients	WF communications specialist	Representatives of CORAF; WF communications team																				
Subactivity 3.3.2.4: Produce television and radio programming on project results	WF communications specialist	Representatives of CORAF; WF communications team																				

Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026
			Year 1 (Q1 Q2 Q3 Q4) · Year 2 (Q1 Q2 Q3 Q4) · Year 3 (Q1 Q2 Q3 Q4) · Year 4 (Q1 Q2 Q3 Q4) · Year 5 (Q1 Q2 Q3 Q4)
Subactivity 3.3.2.5: Design and conduct context-specific outreach (based on assessments in output 1.5) to target end-users (farmers and millers) to support scale-up	Representatives of CORAF/Scaling specialist	Representatives of NARS; 3 local research scientists (1 per project country - WF, ICIPE, CORAF); ICIPE	
Subactivity 3.3.2.6: Develop scaling potential outside of project by identifying additional scaling opportunities	Scaling specialist	Representatives of NARS; 3 local research scientists (1 per project country - WF, ICIPE, CORAF); CORAF; ICIPE	
Cross-cutting/regular activities			
Procurement and transfer of project materials	WF logistics team	3 local research scientists (1 per project country - WF, ICIPE, CORAF); Victor Siamudaala; Sunil Siriwardena; ICIPE; CORAF; SLU	
Annual project meetings (rotating countries)	Rodrigue Yossa; Project management unit	1 representative from each partner organisation (traveling to location of meeting)	
Monthly internal WF meetings	Rodrigue Yossa; Project management unit	All participating WF staff	
Regular project phone calls/online meetings	Rodrigue Yossa	3 local research scientists (1 per project country - WF, ICIPE, CORAF)	
MEL check-In/data updates on the MEL platform	WF MEL specialist	MEL team; Rodolfo Dam Lam; 3 local research scientists (1 per project country - WF, ICIPE, CORAF)	
Annual outcome monitoring studies	WF MEL specialist	MEL team;, 3 local research scientists (1 per project country - WF, ICIPE, CORAF)	
Develop annual project donor reports	Project management unit; Rodrigue Yossa	3 local research scientists (1 per project country - WF, ICIPE, CORAF); WF MEL specialist	
Mid-term project review (external)	Consultant; Rodrigue Yossa	Rodrigue Yossa, WorldFish PMU, SLU, ICIPE, CORAF	
Final project review (external)	Consultant; Rodrigue Yossa	Rodrigue Yossa, WorldFish PMU, SLU, ICIPE, CORAF	

Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026
			Year 1 (Q1 Q2 Q3 Q4) · Year 2 (Q1 Q2 Q3 Q4) · Year 3 (Q1 Q2 Q3 Q4) · Year 4 (Q1 Q2 Q3 Q4) · Year 5 (Q1 Q2 Q3 Q4)
Annual external audit	External Auditors; WorldFish Finance Team	Rodrigue Yossa, WorldFish PMU, SLU, ICIPE, CORAF	
Communications activities (in addition to project start-up and outcome 4)			
Develop and release project launch press release	WF communications specialist	Florine Lim; WF communications team	
Develop project webpage and update regularly	WF communications specialist	Florine Lim; WF communications team	
Fish-for-thought events (themed lectures and talks)	WF communications specialist	Florine Lim; WF communications team	
Produce 4 blog posts per year	WF communications specialist	Florine Lim; WF communications team	
Produce 2 social media updates per month	WF communications specialist	Florine Lim; WF communications team	
Produce 2 case/success stories per year	WF communications specialist	Florine Lim; WF communications team	
Produce 1 photo story per year	WF communications specialist	Florine Lim; WF communications team	
Develop a PPT/video abstract for key journal articles/publications	WF communications specialist	Florine Lim; WF communications team	
Publish and circulate project newsletters	WF communications specialist	Florine Lim; WF communications team	
Publish an op-ed for key project highlights	WF communications specialist	Florine Lim; WF communications team	

Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026
			Year 1 Q1 Q2 Q3 Q4 | Year 2 Q1 Q2 Q3 Q4 | Year 3 Q1 Q2 Q3 Q4 | Year 4 Q1 Q2 Q3 Q4 | Year 5 Q1 Q2 Q3 Q4
Project close-out activities			
Project close-out ceremony/meeting	Project management unit; Rodrigue Yossa	All participating partners	
Endline evaluation	MEL specialist	MEL team	
Produce final monitoring, evaluation, and learning report	WF MEL specialist	WF MEL team; Rodrigue Yossa; Rodolfo Dam Lam; 3 local research scientists (1 per project country - WF, ICIPE, CORAF)	
Produce final project donor report	Project management unit; Rodrigue Yossa	3 local research scientists (1 per project country - WF, ICIPE, CORAF)	

Appendix 3: Minutes of the project management start-up meeting for the FASA project conducted by WorldFish on the 13th of July 2022.

WorldFish

Minutes

Project Kick-Off Meeting: Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)

Date: 13th July 2022

Time: 2- 4pm (Malaysia)

Location: Microsoft Team/ Goby Room, WF HQ, Penang

Present

Committee members present	
Yossa, Rodrigue (WorldFish)	Senior Scientist (Project Leader)
Abdul Aziz, Azimah (WorldFish)	Human Resources Specialist
Yeoh, Petrus (WorldFish)	Procurement Specialist
Siriwardena, Sunil (WorldFish - Consultant)	Consultant
Chellappan, Yogeswary (WorldFish)	Senior Program Associate (PMU)
Muniandy, Kalah Devi (Worldfish)	Procurement Specialist
Morais, Hector (WorldFish)	Global Procurement Lead
Chadag, Vishnumurthy Mohan (WorldFish)	Principal Scientist
Abu Bakar, Khairul Rizal (WorldFish)	Research Assistant
Sakala, Chindika (WorldFish)	Senior Accountant
Rossignoli, Cristiano (WorldFish)	Monitoring, Evaluation, and Learning (MEL) and Impact Assessment Research Leader
Lim, Florine (WorldFish)	Team Leader, Communications and Marketing
Khor, Emily (WorldFish)	Portfolio Manager (PMU)
Heese, Anne (IWMI)	Head of Human Resources
Emmanuel, Isaac Toyin (WorldFish)	Accounts Manager
Benzie, John (WorldFish)	Acting Director Aquatic Foods Biosciences
Ahmad Fatan, Nurulhuda (WorldFish)	Research Analyst
Committee members absent with apologies	
Mohammed, Essam (WorldFish)	Interim Director General and Acting Senior Director of Aquatic Foods Systems
Siamudaala, Victor (WorldFish)	Country Director, Zambia and Southern Africa
Nkole, Victoria (WorldFish)	Manager, Operations and Program Delivery
Cullhaj, Megi (WorldFish)	Monitoring Evaluation and Learning Manager
Allison, Edward (WorldFish)	Acting Director Sustainable Aquatic Foods Systems
Khalil, Anar (WorldFish)	Project Management Lead (PMU)
Tan, Ban Swee (WorldFish)	Manager, Research Finance
Tan, Chao Yan (WorldFish)	Project Accountant
Adam, Rahma (WorldFish)	Scientist

WorldFish

Agenda:

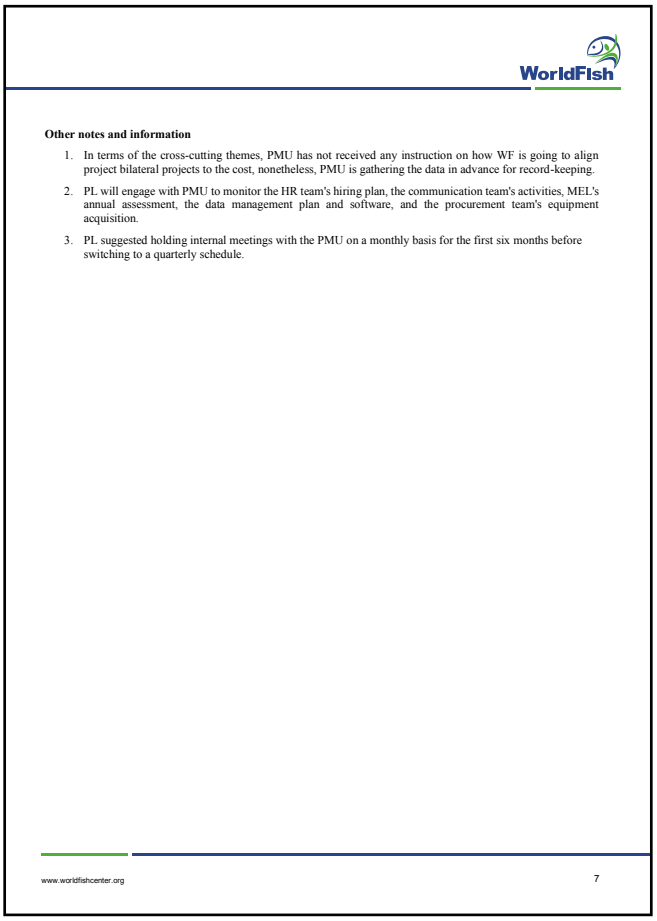
Topic	Discussion	Conclusions
1. Project Overview	• Goal of the project To develop low-cost, highly nutritious fish feeds based on novel ingredients and enable 5,000 smallholder fish farmers in 3 African countries to test and adopt these ingredients and feeds, leading to increased income, improved food security, and reduced waste and pollution. • Basic project information Donor: The Norwegian Agency for Development Cooperation (NORAD) Project title: Development And Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA) Duration: From 01 July 2022 to 30 June 2027 • Partners: ICIPE, CORAF, SLU (Swedish University of Agricultural Sciences), Aller Aqua (Zambia), Natural Resources Development College, Local feed millers & farmer groups. • Budget Year 1: NOK 13,003,171 ~ USD1.2M Year 2: NOK 16,882,516 ~ USD1.6M Year 3: NOK 16,972,512 ~ USD1.6M Year 4: NOK 16,965,889 ~ USD1.6M Year 5: NOK 16,175,913 ~ USD1.6M • Result framework & Roles and responsibilities: Outcome 1: Enhanced capacity of at least two stakeholder groups in each country to integrate best	• A summary of the project was presented by the PL.

	practices toward a more sustainable feed sector. Outcome 2: Quality of at least 15 local ingredients has been improved through processing techniques and the ingredients are used by stakeholders. Outcome 3: 5000 farmers directly or indirectly linked to the project access, test, and use novel fish feed solution. • Implementation plan (please refer to the attachment)	
2. Contractual Obligations	• A progress report and a financial report covering the period from January to December shall be submitted to Norad by 15 April each year. • A final report for the Support Period shall be submitted to Norad no later than 4 months after the end of the Support Period. • An audit report covering the annual financial statements of the Project shall be submitted to Norad by 1 June each year. • Clause 8 FORMAL MEETINGS The Parties shall hold formal meetings once per year, tentatively in September in order to discuss i.a. the results achieved by the Project during the Support Period.	• An outline of the project's contractual obligations was given by PMU.
3. Partners / Sub-grants	• Partners identified: • ICIPE, CORAF, SLU (Swedish University of Agricultural Sciences), Aller Aqua (Zambia), Natural Resources Development College, Local feed millers & farmer groups.	• PMU will be responsible for drafting the partner contracts, and the project coordinators for each country will be updated on its development and completion.

	• To refer to the Clause 11 Transfer of the Grant To a Cooperating Partner	
4. Research Support	• Project mapping: 5 BUSes (Malaysia, Nigeria, Kenya, Zambia and Sweden) • WorldFish science structure: Aquatic Food Biosciences • Cross-cutting themes: (1) Climate and Environment, (2) Social and Economic Inclusion, or (3) Nutrition and Public Health. • Donor contractual requirements information created in OCS: Yes • Regular Internal project review meetings: - WF: Quarterly review meeting will be held to review the project's performance. - Formal Meetings: Donor: PART I- SPECIFIC CONDITIONS	• PMU to complete the BUS creation form and create 5 BUSs. In order to charge part of the expenditures, PMU will share the information (BUS code and AG number) of the respective countries' coordinators. • PL confirmed WorldFish science structure: Aquatic Food Biosciences, Cross-cutting themes 1, 2, and 3. • PMU will organise formal meetings, and invitations will be extended to all relevant parties. • PL suggested holding internal meetings with the PMU on a monthly basis for the first six months before switching to a quarterly schedule.
5. Admin/HR	• Vacant positions are identified	• The majority of the posts will be filled by nationally recruited staff (please refer to the PPT attachment). • PL to confirm with Rahma whether she is available to contribute to this project in order to support the gender component. • PMU will share the FTE for the MEL component with Cristiano and hold a separate meeting to discuss this.
6. Communications and Science Outputs	• Identify the types of publications, communication channels, and dissemination strategy as specified in the project proposal and donor agreement.	• Rodrigue and Florine had a separate discussion earlier, and they planned to discuss it in the coming weeks.

	• Compliance with the CGIAR Open Access and Data Management Policy • To refer to Clause 23 Recognition And Publication	
7. Logistics / Procurement	• Procurement plan developed – including goods required, timing, and lead times. - Equipment (s): Laptops x 5, Tablets x 2, Oxy Thermometer / pH x2, Weighing Scale x 2, GPS x2, tools for wet lab in Zambia • Donor/grant specific procurement regulations reviewed; waiver/derogation requirements identified/confirmed - Clause 5 Award of Contracts - 6 Publication of Procurement Notice	• Equipment is projected for Zambia and Malaysia. Kenya and Nigeria are being respectfully taken care of by ICIPE and CORAF. • PL had a prior discussion with Hector about this requirement and will have the procurement teams validate it in the upcoming weeks. Purchase of the equipment was only budgeted in Year 1. • PMU brought the Procurement Team's attention to the specific procurement policies of the donor.
8. Finance	• Budget structure including key activities budget targets set by WorldFish, donor budget line item definitions, and charge codes (donor AEC). • Required budget changes reviewed – including exchange rates • Budget flexibility reviewed • Format of Budget vs. Actual reports reviewed and agreed • If required, matching fund requirements identified/reviewed. • Budget for OCS updates is developed. • Regular internal project meetings	• PMU presented the attendees with an overview of the budget. A separate meeting with the financial team will be scheduled in the coming weeks. • This currency is subject to extensive fluctuations – and will need close monitoring of 27540. • Purchase of the equipment was only budgeted in Year 1. • Publication only from years 2 to 5. • Quarterly regular internal project meetings
9. Reporting	• Contractual requirements updated in OCS.	• PMU will provide PL access to the reporting templates.

	• Technical and financial reporting schedule and responsibilities established. • Audit requirements identified • Template for reporting (from NORAD webpage).	
10. Risk Management	• Discussion of potential risks - To have a separate meeting with Glenda in the coming weeks. - To refer to clause 3 Implementation of The Project	• PMU will arrange a separate discussion with Anar and Glenda because the project's budget exceeds $1 million USD. PMU will share the outcomes of the project risk assessment checklist with the project team members.
11. RBM / MEL	• Project Log Frame and Time Framework are available. • A consistent monitoring system is planned (key persons identified) for monitoring: - Project's activities implementation; - Achievements of research outputs. • An evaluation system is planned (including data collection strategy) to: - Assess project's outcomes and impacts (donor and WF requirements) - Support specific impact studies • A system for data collection and data sharing is designed (key persons identified).	• PMU will share the FTE with Cristiano after which PL will continue to discuss the plans with the MEL team. • The structure of the bilateral project has not changed, but it has been adjusted to match the new strategy of impact (5 areas) and outcome.
12. Implementation/Work Plan	• Proposal implementation plan is reviewed and necessary adjustments identified. • Is the budget aligned with planned spending AND is this realistic? • To refer to Clause 1: Work Plan and Budget	• No change on the implementation plan, team to continue to use the current work plan, and PMU to support the entire team with the project activities.



Other notes and information

1. In terms of the cross-cutting themes, PMU has not received any instruction on how WF is going to align project bilateral projects to the cost, nonetheless, PMU is gathering the data in advance for record-keeping.
2. PL will engage with PMU to monitor the HR team's hiring plan, the communication team's activities, MEL's annual assessment, the data management plan and software, and the procurement team's equipment acquisition.
3. PL suggested holding internal meetings with the PMU on a monthly basis for the first six months before switching to a quarterly schedule.

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Appendix 4: The hiring plan of the FASA project

1. FASA Project Staffing Plan 2022

#	POSITION	LOCATION	HIRING TYPE	NO. OF POSITION	DURATION	TARGET HIRE DATE
CONSULTANT POSITION						
1	Lead Gender and Social Inclusion Study	MULTIPLE - Zambia, Kenya and Nigeria	Consultancy Service Contract followed by renewal (addendum) in year 2 to 5	1	5 years	Oct-22
2	Lead Climate Change and Environmental Assessments	MULTIPLE - Zambia, Kenya and Nigeria	Consultancy Service Contract followed by renewal (addendum) in year 2 to 5	1	5 years	Oct-22
SCIENTIST POSITION						
3	Scientist (Fish Feeds and Nutrition)	Zambia	Staff Full Time	1	1 year	Oct-22
POST DOCTORAL FELLOW POSITION						
4	Post Doctoral Fellow (Fish Feeds and Nutrition)	Malaysia	Staff Full Time	1	3 years	Oct-22
RESEARCH ASSISTANT POSITION						
5	Research Assistant (Laboratory)	Malaysia	Staff Full Time	1	3 years	Oct-22
6	Research Assistant (Fish Feeds)	Malaysia	Staff Full Time	1	3 years	Oct-22
7	Research Assistant	Zambia	Staff Full Time	1	1 year	Oct-22

Recruitment Timeline 2022

*Estimated timeline for completion

No	POSITION TITLE	# Positions to be hired	PHASE ONE - ADVERTISEMENT				PHASE TWO - INTERVIEW				PHASE THREE - SELECTION				PHASE FOUR - HIRING			
			August				September				October				November			
			WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11	WEEK 12	WEEK 13	WEEK 14	WEEK 15	WEEK 16
1	Lead Gender and Social Inclusion Study (Multiple Locations)	1																
2	Lead Climate Change and Environmental Assessments (Multiple Locations)	1																
3	Scientist (Fish Feeds and Nutrition) - Zambia	1																
4	Post Doctoral Fellow (Fish Feeds and Nutrition) - Malaysia	1																
5	Research Assistant (Laboratory) - Malaysia	1																
6	Research Assistant (Fish Feeds) - Malaysia	1																
7	Research Assistant - Zambia	1																
	Subtotal	*7*																

Job Specification / Description

1. Consultant (Lead Gender and Social Inclusion Study)

Reporting to: Rodrigue Yossa

Location
Multiple Locations (Zambia, Kenya and Nigeria)

Academic Requirements
PhD in Gender and Social Inclusion

Required Skills and Abilities
Organizations that have sufficient capacities and human resources, with:

- Staff member with PhD in Gender and Social Inclusion as it relates to agriculture/aquaculture and in-depth technical training in the area of gender equality and social inclusion.
- A strong track record of high-quality gender analysis and outputs in agriculture/aquaculture and/or fisheries.
- Preferably also experience in studying fish feeds in low-income countries.
- Demonstrated expertise in gender integration in MEL design and delivery, assessments, data analysis, visualization, knowledge management, capacity building, and/or training.
- All official project communication will be in English. Excellent proficiency of spoken and written English from assigned project team.
- Ability to work with interdisciplinary research teams, linking own expertise to other fields, including human nutrition, value chains, climate change, scaling and fish nutrition fields.
- Ability to manage research projects.
- Proven experience implementing research and development projects/activities in Africa.
- Experience with agriculture/aquaculture science and development.
- Proven competency with designing intersectional gender empowerment methodologies and gender and social assessments in Africa.
- Experience with mixed methods and designing, collecting and analyzing qualitative and quantitative data.

Key Accountabilities on the Initiative
The new Norad-funded project "Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)" will be implemented in Nigeria, Zambia, Kenya, with research support from Malaysia and Sweden. WorldFish intends to hire a Service Provider for the NORAD FASA Project for which this Request for Proposals (RFP) is issued to implement the implementation of the project gender research activities in Zambia, Kenya and Nigeria. The primary purpose of this service contract is to lead the Gender and social inclusion work in the FASA project, under the direction of WorldFish Project Leader based in Malaysia. The selected organization will work with an interdisciplinary team of experts from different backgrounds, including fish nutrition, climate change, scaling of innovations, science communication, rural development and bioprocesses.

The selected organization will develop and conduct mixed methods gender and social assessments in the 3 project countries (Nigeria, Zambia and Kenya) using a context-sensitive approach and compiling sex-disaggregated data. These initial assessments will be completed in 6 months and will identify opportunities for the project to advance gender and social inclusion goals of Norad, WorldFish, and other key stakeholders within the novel feeds landscape. Annual assessments will be conducted in the subsequent 4 years of the project. Because the needs, risks, and opportunities associated with the use of novel ingredients are gendered and socially differentiated, a shift to using local ingredients in fish feeds and the development of related businesses may have uneven reach or benefits, placing some social groups, especially women and youth, at risk.

These assessments will enable WorldFish to identify such risks and to ensure that women, youth, and other marginalized groups are prioritized throughout implementation and ensured the same access to project opportunities as non-marginalized groups. The sub activities to be completed to conduct these studies include literature reviews, study design, meetings with partners (local cooperatives and groups of women, youth, fish farmers, and feed millers, etc.), data collection and analysis, and report preparation and publication.

• Preferably, experience with agricultural / animal / aquaculture / fish feed production studies. • Experience with working with rural communities in developing countries. • Proven competency with the dissemination of scientific and technical knowledge products, including a record of publication in Scopus-listed journals. • Demonstrable experience in subcontracting enumerators with gender expertise and supervising staff.	**Roles and Responsibilities:** • Lead the Gender and Social Inclusion work in the FASA project. • Develop research proposal and protocols for Gender and social inclusion work in the FASA project. • Recruit and manage three local Gender specialists working part-time in Nigeria, Zambia and Kenya. • Design and conduct mixed methods gender and social assessments in Nigeria, Zambia and Kenya informed by gender sensitive approaches. • Publish technical, scientific and outreach articles. • Work collaboratively with the Project Leader based at the HQ in Malaysia. • Develop productive partnerships to further gender-feeds research in Nigeria, Zambia and Kenya, through key international and national research institutes and universities. • Build productive relations with investors and development partners from public and private sectors for scaling out gender research results. • Plan, organize, execute and report on project.
2. Consultant (Lead Climate Change and Environmental Assessments)	
Reporting to: Rodrigue Yossa	
Location Multiple Locations (Zambia, Kenya and Nigeria) **Academic Requirements** PhD in Climate Change and Environment **Required Skills and Abilities** Organizations that have sufficient capacities and human resources, with: • Staff member with PhD in climate change and environment as it relates to agriculture/aquaculture and in-depth technical training in the area of life cycle assessment. • A strong track record of high-quality climate change and environment analysis and outputs in agriculture/aquaculture and/or fisheries. Preferably, also experience in studying fish feeds in low-income countries. • Demonstrated expertise in climate change and environment in MEL design and delivery, assessments, data analysis, visualization, knowledge management, capacity building, and/or training.	**Key Accountabilities on the Initiative** The new Norad-funded project "Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)" will be implemented in Nigeria, Zambia, Kenya, with research support from Malaysia and Sweden. It is recognized that environmentally friendly and cost-effective technologies and production practices such as sustainable fish feeds are critical to mitigating the effects of climate change within the aquaculture sector. Thus, WorldFish intends to hire a Service Provider for the NORAD FASA Project for which this Request for Proposals (RFP) is issued to implement the climate change and environment activities of the project in Zambia, Kenya and Nigeria. The primary purpose of this service contract is to lead the climate change and environmental assessment work in the FASA project, under the direction of WorldFish Project Leader based in Malaysia. The selected organization will work with an interdisciplinary team of experts from different backgrounds, including fish nutrition, gender and social inclusion, scaling of innovations, science communication, rural development and bioprocesses. The selected organization will identify opportunities for the project to benefit the environment within the novel feeds landscape in the 3 project countries (Nigeria, Zambia and Kenya). The selected organization is expected to employ life cycle assessment

• All official project communication will be in English. Excellent proficiency of spoken and written English from assigned project team. • Ability to work with interdisciplinary research teams, linking own expertise to other fields, including human nutrition, value chains, gender and social inclusion, scaling and fish nutrition fields. • Ability to manage research projects. • Proven experience implementing research and development projects/activities in Africa. • Experience with agriculture/aquaculture science and development. • Proven competency with designing intersectional climate change and environmental methodologies in Africa. • Experience with life cycle assessment methods and designing, collecting and analyzing qualitative and quantitative data. • Preferably, experience with agricultural / animal / aquaculture / fish feed production studies. • Experience with working with rural communities in developing countries. • Proven competency with the dissemination of scientific and technical knowledge products, including a record of publication in Scopus-listed journals. • Demonstrable experience in subcontracting enumerators with climate change and environment expertise and supervising staff.	(LCA) methods. The initial assessments will be completed in the first 6 months of the project and will find a way for the project to contribute to advance climate change and environment goals of Norad, WorldFish, and other key stakeholders within the novel feeds landscape. Annual assessments will be conducted in the subsequent 4 years of the project. Such assessments of novel ingredients and their production processes will be a key design feature in identifying both cost-effective and environmentally sustainable products. The sub-activities to be completed to conduct these studies include literature reviews, study design, meetings with partners, data collection and analysis, and report preparation and publication. **Roles and Responsibilities:** • Lead the climate change and environment work in the FASA project. • Develop research proposal and protocols for climate change and environment work in the FASA project. • Recruit and manage three local climate change and environment specialists working part-time in Nigeria, Zambia and Kenya. • Design and conduct life cycle assessments on ingredients and fish feeds in Nigeria, Zambia and Kenya. • Publish technical, scientific and outreach articles. • Work collaboratively with the Project Leader based at the HQ in Malaysia. • Develop productive partnerships to further climate change and environment work in Nigeria, Zambia and Kenya, through key international and national research institutes and universities. • Build productive relations with investors and development partners from public and private sectors for scaling out climate change and environment results. • Organize, execute and report on project.
3. Scientist (Fish Feeds and Nutrition)	
Reporting to: Rodrigue Yossa	
Location Lusaka, Zambia **Academic Requirements** PhD in Aquaculture, Aquaculture Nutrition or related fields of Animal Nutrition **Required Skills and Abilities** This job might be for you if you have the below skills and qualifications:	**Key Accountabilities on the Initiative** The new Norad-funded project "Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)" will be implemented in Nigeria, Zambia, Kenya, Malaysia and Sweden. WorldFish is seeking a nationally recruited Research Assistant to support the Scientist (Fish Feeds and Nutrition) in the achievement of the project goal in Zambia.

- PhD in aquaculture, aquaculture nutrition or related fields of animal nutrition.
- At least two year of research experience in aquaculture nutrition and feeds research.
- Excellent proficiency of spoken and written English.
- Proven record of publications in his/her study field.
- Motivation for high quality science and delivery of impact from research.
- Show proven interest and ability to develop and maintain a professional network in the field of aquaculture nutrition and fish feeds research.
- Ability to work within interdisciplinary research teams, linking own expertise to other fields, including human nutrition, value chains, climate change, scaling and gender research fields.
- Ability to work independently and manage research projects.

Desired Skills and Qualifications:

- Strong interpersonal skills.
- Strong technical and scientific writing skills with record of publication in high quality scientific journals.
- Good organizational skills.
- Good leadership and mentoring skills.
- Project management experience.

The primary purpose of this position is to assist in the implementation of the FASA project in Zambia, under the direction of WorldFish Project Leader based in Malaysia and the WorldFish Country Director, Zambia and Southern Africa.

The candidate will work in an interdisciplinary team of experts from different backgrounds, including fish nutrition, gender, climate change, scaling of innovations, science communication, rural development and bioprocesses. The candidate will focus on the implementation on the ground of high quality applied research on fish nutrition and feeds in the laboratory and on-farm, with emphasis on scoping novel local sustainable ingredients, assessing the nutritional quality and digestibility of local ingredients and feeds, estimating the nutrients requirements of local strains of tilapia and African catfish, training of aquaculture stakeholders, communication and outreach and the publication of scientific and technical articles.

Roles and Responsibilities:

- Lead the project work in Zambia.
- Design and conduct ingredient scoping in Zambia.
- Design, execute and report on the laboratory and on-farm fish feeds and nutrition experiments in Zambia.
- Publish technical, scientific and outreach articles.
- Work collaboratively with the Project Leader based at the HQ in Malaysia.
- Develop productive partnerships to further feeds research in Zambia, through key international and national research institutes and universities.
- Build productive relations with investors and development partners from public and private sectors for scaling out research results.
- Mentor BSc/MSc students and interns from national and international universities and organization, who are involved in the project.
- Plan, organize, execute and report on project progress in dialogue with senior as well as junior staff/employees and external partners.
- Contribute to resource mobilization for further feeds work in Zambia and in other WF countries.
- All other duties that may be required from time to time.

4. Post Doctoral Fellow (Fish Feeds and Nutrition)

Reporting to: Rodrigue Yossa

Location

Penang, Malaysia

Academic Requirements

PhD in Aquaculture, Aquaculture Nutrition or related Fields of Animal Nutrition

Required Skills and Abilities

This job might be for you if you have the below skills and qualifications:

- PhD in Aquaculture, Aquaculture Nutrition or related Fields of Animal Nutrition.
- At least two years of research experience in aquaculture nutrition and feeds research.
- Excellent proficiency of spoken and written English.
- Proven record of publications in his/her study field.
- Motivation for high quality science and delivery of impact from research.
- Show proven interest and ability to develop and maintain a professional network in the field of aquaculture nutrition and fish feeds research.
- Ability to work within interdisciplinary research teams, linking own expertise to other fields, including human nutrition, value chains, climate change, scaling and gender research fields.
- Ability to work independently and manage research projects.

Desired Skills and Qualifications:

- Strong interpersonal skills.
- Strong technical and scientific writing skills with record of publication in high quality scientific journals.
- Good organizational skills.
- Good leadership and mentoring skills.
- Project management experience.

Key Accountabilities on the Initiative

The new Norad-funded project "Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)" will be implemented in Nigeria, Zambia and Kenya, with additional research activities conducted in Malaysia and Sweden. WorldFish is seeking a nationally recruited Post Doctoral Fellow or Scientist (Fish Feeds and Nutrition) to support the achievement of the project goal in Malaysia and other project countries. The primary purpose of this position is to achieve the research activities of the FASA project in Malaysia, under the direction of WorldFish Project Leader and Senior Scientist based in Malaysia.

The candidate will work in an interdisciplinary team of experts from different backgrounds, including fish nutrition, gender, climate change, scaling of innovations, science communication, rural development and bioprocesses. The candidate will focus on conducting high quality applied research on fish nutrition and feeds in the laboratory and occasionally on-farm, with emphasis on scoping novel local sustainable ingredients, assessing the nutritional quality and digestibility of local ingredients and feeds, estimating the nutrients requirements of local strains of tilapia, African catfish and carps, training of aquaculture stakeholders, communication and outreach and the publication of scientific and technical articles.

Roles and Responsibilities:

- Design, execute and report on the laboratory and on-farm fish feeds and nutrition experiments, including digestibility and nutrient requirement experiments.
- Achieve the research deliverables of the FASA project in Malaysia.
- Support the design of ingredient scoping in Nigeria, Zambia and Kenya.
- Publish technical, scientific and outreach articles.
- Work collaboratively with the Project Leader based at the HQ in Malaysia.
- Develop productive partnerships to further feeds research in Malaysia, through key international and national research institutes and universities.
- Build productive relations with investors and development partners from public and private sectors for scaling out research results.
- Mentor BSc/MSc students and interns from national and international universities and organization, who are based in Penang.
- Plan, organize, execute and report on project progress in dialogue with senior as well as junior staff/employees and external partners.
- Contribute to resource mobilization for further feeds work in Malaysia and in other WF countries.

5. Research Assistant (Laboratory)

Reporting to: Rodrigue Yossa

Location
Penang, Malaysia

Academic Requirements
Bachelor Degree in (Analytical) Chemistry, Biochemistry or related field.

Required Skills and Abilities
This job might be for you if you have the below skills and qualifications:
- Bachelor Degree in (analytical) chemistry, biochemistry or related field.
- At least 2 years of experience in the management of an analytical laboratory.
- At least 3 years of experience in running analyses in an academic or commercial analytical laboratory.
- Proven competency in processing and analyzing samples at the analytical laboratory.
- Proven record of reporting the results of laboratory analysis.
- Experience with ISO certifications.
- Show proven interest and ability to develop and maintain a professional network in the field analytical laboratory for development research.
- Ability to work within interdisciplinary research teams, linking own expertise to other fields, including human nutrition, value chains, climate change, scaling and gender research fields.
- Ability to work independently and contribute to the management of an analytical laboratory.
- Experience in collecting, organizing and storing analytical data adequately.

Desired Skills and Qualifications:
- Strong organizational skills.
- Strong analytical skills at the laboratory.
- Writing skills.
- Interpersonal skills.
- Communication skills.
- Project management experience.

Key Accountabilities on the Initiative
The new Norad-funded project "Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)" will be implemented in Nigeria, Zambia, Kenya, Malaysia and Sweden. WorldFish is seeking a nationally recruited Laboratory Assistant to support the achievement of the project goal in Malaysia and globally. The primary purpose of this position is to run the analytical fish feeds and nutrition laboratory in Penang, Malaysia.

The candidate will work in an interdisciplinary team of experts from different backgrounds, including fish nutrition, gender, climate change, scaling of innovations, science communication, rural development and bioprocesses. The candidate will focus on the laboratory analysis of ingredients, feeds and fish samples collected in Malaysia and other countries where the project is executed and other WorldFish countries, the maintenance of the analytical laboratory, the calibration and maintenance of analytical instruments and equipment, the training of students and interns, data collection and analysis and the delivery of analytical reports, under the direction of WorldFish Project Leader and Senior Scientist based in Malaysia.

Roles and Responsibilities:
- Organize the analytical fish feeds and nutrition laboratory in Penang, Malaysia.
- Plan and run the laboratory analyses in the analytical fish feeds and nutrition laboratory in Penang, Malaysia.
- Guide scientist and technicians on sample collection and analysis.
- Maintain the overall laboratory and the instruments and equipment using the best practices.
- Develop analytical protocols for crude protein, lipid, energy, ash, acid insoluble ash, crude fiber, etc., that are adapted to the equipment available at the analytical fish feeds and nutrition laboratory in Penang.
- Develop template for sample shipping, data collection and data reporting for the analytical fish feeds and nutrition laboratory in Penang.
- Develop and set a data management method for the analytical fish feeds and nutrition laboratory, in collaboration with the data Manager of WorldFish.
- Work collaboratively with the Operations and Laboratory Manager of WorldFish Penang to ensure that the activities of the analytical fish feeds and nutrition laboratory comply with the rules and regulations of WorldFish.
- Apply and maintain ISO certifications for the analytical fish feeds and nutrition laboratory.

- Mentor students and intern welcomed by the Project Leader and Senior Scientist based in Malaysia.
- Assist in building productive relations with investors and development partners from public and private sectors for the sustainability of the analytical laboratory.
  Support the Project Leader and Senior Scientist based in Malaysia in the financial management of the analytical fish feeds and nutrition laboratory in Penang.

6. Research Assistant (Fish Feeds)

Reporting to: Rodrigue Yossa

Location
Penang, Malaysia

Academic Requirements
A Diploma or Bachelor Degree in related field

Required Skills and Abilities
This job might be for you if you have the below skills and qualifications:
- A Diploma or Bachelor Degree in related field.
- Knowledge in aquaculture and fisheries.
- Practical experience raising fish for research (fish feeding, caring and breeding; monitoring of fish growth and health, etc.).
- Practical experience operating and maintaining a fish rearing facility.
- Knowledge of many production systems (tanks, pond, flow through and recirculating aquaculture systems).
- Knowledge in the collection of research data.
- Knowledge in feed production using pelletizer, dryer, etc.
- Ability and willingness to work for long hours, under difficult field conditions and some weekends especially during experimental periods.

Desired Skills and Qualifications:
- Spoken English.
- Ability to work under minimal supervision.

Key Accountabilities on the Initiative
The new Norad-funded project "Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)" will be implemented in Nigeria, Zambia, Kenya, Malaysia and Sweden. WorldFish is seeking a nationally recruited Aquaculture worker to support the achievement of the project goal in Malaysia and globally. The primary purpose of this position is to support the aquaculture research activities of the project in Penang, Malaysia.

The candidate will work in an interdisciplinary team of experts from different backgrounds, including fish nutrition, gender, climate change, scaling of innovations, science communication, rural development and bioprocesses. The candidate will focus on the rearing of fish in the aquaculture facility, the operation and maintenance of the aquaculture facility, the collection of data of fish growth and water quality parameters, fish sampling, sample collection and processing, feed production, and support in the analysis of ingredients, feeds and fish samples at the analytical laboratory in Penang, Malaysia, under the direction of WorldFish Project Leader and Senior Scientist based in Malaysia.

Roles and Responsibilities:
- Organize, operate and maintain the materials and equipment in the research facility (wet laboratory) for fish feeds and nutrition research in Penang, Malaysia.
- Assist in the planning of experiments in Penang, Malaysia.
- Rear fish, collect data on fish growth and water quality before, during and after the experiments.
- Sample fish and process the samples to make them ready for analysis.
- Assist the scientists and laboratory assistants in Penang to achieve the overall research agenda of the fish feeds and nutrition team.

	• Work collaboratively with the Operations and Laboratory Manager of WorldFish Penang to ensure that the activities of the research facility comply with the rules and regulations of WorldFish. • Guide students and intern welcomed by the Project Leader and Senior Scientist based in Malaysia.

7. Research Assistant

Reporting to: Rodrigue Yossa

Location
Lusaka, Zambia

Academic Requirements
Master of Science in Aquaculture, or related animal production fields

Required Skills and Abilities
This job might be for you if you have the below skills and qualifications:

- Master of Science in Aquaculture, or related animal production fields.
- At least two (02) year of research experience in aquaculture research.
- Excellent proficiency of spoken and written English.
- Proven record of reporting in his/her study field.
- Motivation for high quality science and delivery of impact from research.
- Show proven interest and ability to develop and maintain a professional network in the field of aquaculture nutrition and fish feeds research.
- Ability to work within interdisciplinary research teams, linking own expertise to other fields, including human nutrition, value chains, climate change, scaling and gender research fields.
- Ability to work independently and contribute to the management of research projects.

Desired Skills and Qualification:

- Strong organizational and interpersonal skills.
- Writing and Communication skills.
- Project management experience.

Key Accountabilities on the Initiative
The new Norad-funded project "Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)" will be implemented in Nigeria, Zambia, Kenya, Malaysia and Sweden. WorldFish is seeking a nationally recruited Research Assistant to support the Scientist (Fish Feeds and Nutrition) in the achievement of the project goal in Zambia.

The primary purpose of this position is to assist in the implementation of the FASA project in Zambia, under the direction of WorldFish Project Leader based in Malaysia and the WorldFish Country Director, Zambia and Southern Africa.

The candidate will work in an interdisciplinary team of experts from different backgrounds, including fish nutrition, gender, climate change, scaling of innovations, science communication, rural development and bioprocesses.

The candidate will focus on the implementation on the ground of high quality applied research on fish nutrition and feeds in the laboratory and on-farm, with emphasis on scoping novel local sustainable ingredients, assessing the nutritional quality and digestibility of local ingredients and feeds, estimating the nutrients requirements of local strains of tilapia and African catfish, training of aquaculture stakeholders, communication and outreach and the publication of scientific and technical articles.

Roles and Responsibilities:

- Execute project work designed by the Scientist (Fish Feeds and Nutrition) and Project Leader in Zambia.
- Assist in the design and conduct ingredient scoping in Zambia.
- Assist in the design, execution and reporting on the laboratory and on-farm fish feeds and nutrition experiments in Zambia.
- Collect the data and perform data analysis and interpretation.

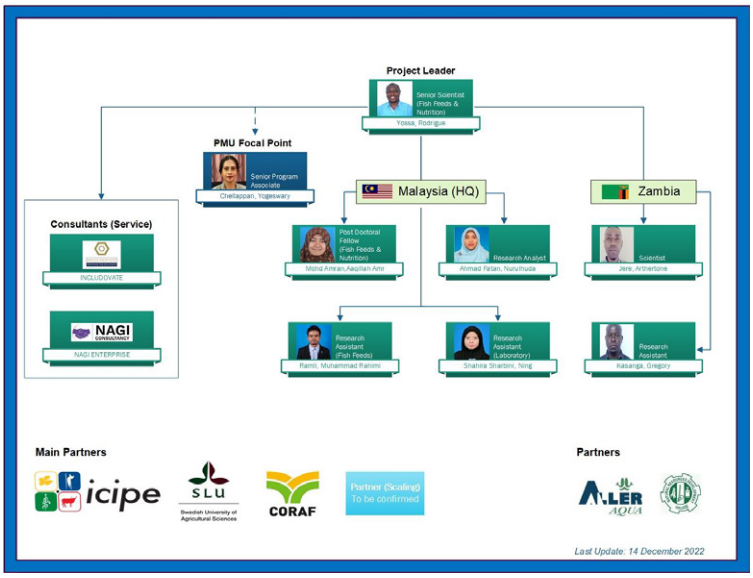
	• Assist in the publication of technical, scientific and outreach articles. • Work collaboratively with the local Scientist (Fish Feeds and Nutrition) and Project Leader based at the HQ in Malaysia. • Assist the Scientist (Fish Feeds and Nutrition) and Project Leader in the development of productive partnerships to further feeds research in Zambia, through key international and national research institutes and universities. • Assist in building productive relations with investors and development partners from public and private sectors for scaling out research results. • Assist in supervising and mentoring students and interns. • Contribute to the reporting on project progress in dialogue with senior as well as junior staff/employees and external partners. • All other duties that may be required from time to time.

2. FASA Project Hiring Report 2022

Description	# of Positions
Proposed Positions to be hired	**7**
Actual Hired Positions	**7**
Outstanding (s)	*0*

#	POSITION	LOCATION	HIRING TYPE	NO. OF POSITION	HIRED DATE	NEW HIRE	START DATE	HIRING STATUS
CONSULTANT POSITION								
1	Lead Gender and Social Inclusion Study	MULTIPLE - Zambia, Kenya and Nigeria	Consultancy Service Contract followed by renewal (addendum) in year 2 to 5	1	Nov-22	Includovate	10 Dec 2022 - 30 July 2023	Completed
2	Lead Climate Change and Environmental Assessments	MULTIPLE - Zambia, Kenya and Nigeria	Consultancy Service Contract followed by renewal (addendum) in year 2 to 5	1	Nov-22	NAGI Enterprise	10 Dec 2022 - 30 July 2023	Completed
SCIENTIST POSITION								
3	Scientist (Fish Feeds and Nutrition)	Zambia	Staff Full Time	1	Oct-22	Arthertone Jere	21 Nov 2022	Completed
POST DOCTORAL FELLOW POSITION								
4	Post Doctoral Fellow	Malaysia	Staff Full Time	1	Nov-22	Aaqillah Amr Mohd Amran	23 Nov 2022	Completed
RESEARCH ASSISTANT POSITION								
5	Research Assistant (Laboratory)	Malaysia	Staff Full Time	1	Oct-22	Ning Shahira Sharbini	03 Feb 2023	Completed
6	Research Assistant (Fish Feeds)	Malaysia	Staff Full Time	1	Oct-22	Muhammad Rahimi Ramli	23 Nov 2022	Completed
7	Research Assistant	Zambia	Staff Full Time	1	Oct-22	Gregory Kasanga	21 Nov 2022	Completed

3. FASA Project Organization Chart



No	Name	Position Title	Duty Post Country
WorldFish FASA Project Team			
1.	Rodrigue Yossa	Senior Scientist (Fish Feed and Nutrition) *(Project Leader)*	Malaysia
2.	Yogeswary Chellappan	Senior Program Associate, Project Management Unit *(PMU Focal Point)*	Malaysia
3.	Arthertone Jere	Scientist (Fish Feeds and Nutrition)	Zambia
4.	Aaqillah Amr Mohd Amran	Post Doctoral Fellow (Fish Feeds and Nutrition)	Malaysia
5.	Nurulhuda Ahmad Fatan	Research Analyst	Malaysia
6.	Gregory Kasanga	Research Assistant	Zambia
7.	Muhammad Rahimi Ramli	Research Assistant (Fish Feeds)	Malaysia
8.	Ning Shahira Sharbini	Research Assistant (Laboratory)	Malaysia
Consultants (Service)			
1.	Includovate	Lead Gender and Social Inclusion Study	Multiple Locations - Zambia, Kenya and Nigeria
2.	NAGI Enterprise	Lead Climate Change & Environmental Assessments	Multiple Locations - Zambia, Kenya and Nigeria
Main Partners			
1.	International Centre of Insect Physiology and Ecology (ICIPE)		
2.	Swedish University of Agricultural Sciences (SLU)		
3.	West and Central Africa Council for Agricultural Research and Development (CORAF)		
4.	Partner (Scaling) - to be confirmed		
Partners			
1.	Aller Aqua Zambia Limited		
2.	Natural Resources Development College (NRDC)		

Appendix 5: Minutes of the global project start-up meeting for the FASA project conducted by WorldFish on the 05th of August 2022.

Minutes

Partners Kick-off Meeting_Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)

Date: 5th August 2022

Time: 8 pm (GMT +8)

Location: Microsoft Teams meeting

Present

No	Committee members present (WorldFish)
1.	Rodrigue Yossa (Project Leader)
2.	Sunil Siriwardena
3.	Nurulhuda Ahmad Fatan
4.	Tan Ban Swee
5.	Florine Lim
6.	Emily Khor
7.	Yogeswary Chellappan

No	Committee members present (ICIPE)
1.	Chrysantus Mbi Tanga

No	Committee members present (CORAF)
1.	James Apochi
2.	Nieyidouba Lamien

No	Committee members present (ALLER AQUA)
1.	Alexander Michael Greiling

No	Committee members present (SLU)
1.	Kartik Baruah
2.	Torbjörn Lundh

No	Committee members present (NRDC)
1.	Alice Tembo
2.	Helen Nkhata Mukemu
3.	Matanda Mwenda

No	Committee members present (Others)
1.	Kafayat Fakoya
2.	Caroline Ayo-Olalusi

Agenda

Topic	Discussion	Conclusions
Welcome and Introduction by Project Leader	1. Donor: The Norwegian Agency for Development Cooperation (NORAD) 2. Project title: Development And Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA) 3. Duration: From 01 July 2022 to 30 June 2027	-
Overview of the Project Objectives and Activities (project general information)	1. 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. 2. Partner: ICIPE, CORAF, SLU, Aller Aqua (Zambia), NRDC, Local feed millers & farmers' groups 3. **Outcome: 1**: Enhanced capacity of at least two stakeholder groups in each country to integrate best practices toward a more sustainable feed sector. **Outcome 2**: Quality of at least 15 local ingredients has been improved through processing techniques and the ingredients are used by stakeholders. **Outcome 3**: 5000 farmers directly or indirectly linked to the project access, test and use novel fish feed solution. 4. Result Framework 5. Implementation Plan & Partner's Roles and Responsibilities	*Kindly refer to the PDF document on result framework and Implementation Plan*

	6. Other Project Plans: MEL, Comms, Gender Work & Climate Change Work	
Partners / Sub-grants	1. The Sub Award Process was shared by WF 2. Pre-Award Risk Assessment (PRA) categories: • Up to US$ 5,000 • US$ 5,001 to US$ 25,000 • US$ 25,001 to US$ 50,000 • Above US$50K 3. PRA questionnaires consists of Which consists of partner's Legal Framework and Governance, Financial Management, Internal Control, Audit, Procurement and Asset Management, Human Resources and Risk Management.	The Pre-award Questionnaires will be distributed to partners in accordance with the categorisation of partners' organisations after WF is able to determine the grant size. *Kindly refer to the PPT slideshow*
HR/Admin	1. Partners will identify the most suitable applicant for the role suggested for the project.	At the stage, partners can now begin identifying the applicant and advising WF in the upcoming weeks.
WorldFish Fraud Management Strategy	1. Fraud, Bribery and Corruption 2. Contact: • WorldFish Official Email: worldfish.whistleblowing@cgiar.org • CGIAR Ethics Email: ethics@cgiar.org Confidential Anonymous line 3. Confidential Anonymous line • Web - www.lighthouse-services.com/worldfish and click on "Report an Incident" • Phone - Find and dial your country number before dialing 800-603-2869	WF emphasises the necessity of fraud, bribery, and corruption detection, prevention, and reporting throughout the course of the project. *Kindly refer to the PPT slideshow*

	• Email - reports@lighthouse-services.com	
Other items as necessary	1. Torbjörn Lundh (SLU): Clarification on the recruitment of the PhD students.	Rodrigue Yossa (WF): It was agreed throughout the project development that the pHd students would be engaged by World Fish and placed at the disposal of SLU. It will be done in conjunction with SLU. The selection process will be completed with SLU, and the final decision will be made by SLU in the same manner as World Fish. In addition, according to the project implementation plan, they will only begin work in the fourth quarter of the first year or the first quarter of the second year.

Appendix 6: The monitoring, evaluation, learning (MEL) and impact assessment plan of the FASA project.

July 2022

Monitoring, Evaluation and Learning (MEL) Plan

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

Citation
This publication should be cited as: Cullhaj M., Ceccarelli.V., Burcham L. Ali A. S.,Ghazali S., Manyise T., Yossa R., Dam Lam R., 2022. Monitoring, Evaluation and Learning (MEL) Plan Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Africa (FASA) project 2022-2027. Penang, Malaysia: WorldFish.

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.

Acknowledgments
Refer to WorldFish Branding Guidelines for acknowledgment, peer-review clause and disclaimer texts.

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Funded by: Norad

Table of contents

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

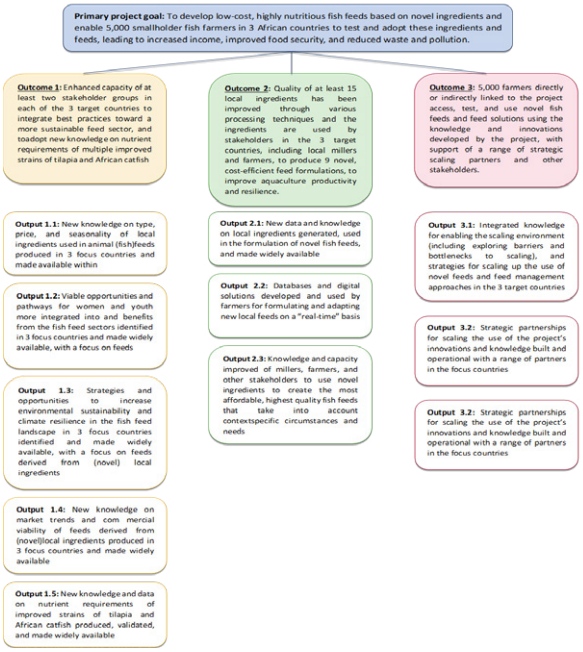


Table 1. Indicators tracking table

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

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

		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)

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 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* *Number of farmers who visit demonstration sites/model farms and attend farmer field days* *Number of farmers who test novel feeds on their farms* *Number of cooperatives promoting, testing, and using novel feeds* *Number of new feed services/feed businesses established by farmers, young people, cooperatives, and other stakeholders.*		6 model farms developed by year 4 (2 per country) 12 farmer field days hosted (2 per country in years 4 and 5) 3,000 farmers visit demonstration sites or attend farmer field days by year 5 (1,000 per country) 1,500 farmers test novel feeds on individual or group farms by year 5 (500 per country) 15 farmer cooperatives promote and test novel feeds by year 5 (5 per country) 12 new feed services or businesses established by year 5 (4 per country)				6 6	- 6 3,0000 1,500 15 12	-Field day reports -Model farm briefs and manuals -Field day reports -Model farm visitation reports -Project reports -Farmer surveys and interviews -Stakeholder interviews and site visit reports -MEL studies -Cooperative surveys and interviews -Site visit reports -MEL studies -KII interviews -Case studies on new businesses

		Number of new millers that change or improve their products based on knowledge and innovations developed by the project *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)*		15 millers include novel feeds or ingredients into their product offerings to farmers by year 5 (5 per country) 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)					15 9	-KII interviews -Market surveys -Briefs on millers using project's Outputs -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 *Number of TV programmes aired* *Number of end-users reached through digital and in-person outreach* *Number of policy briefs published and launched*		-1 radio programme produced and aired -1 TV programme produced and aired -6,000 end-users reached across 3 project countries through outreach programme -1 policy brief in Year 5 (months 48-60)						-Web link to benefits story -Web links to radio and TV programmes and programme airings -Outreach reports from volunteers, community centres, etc. -Policy brief and launch workshop report

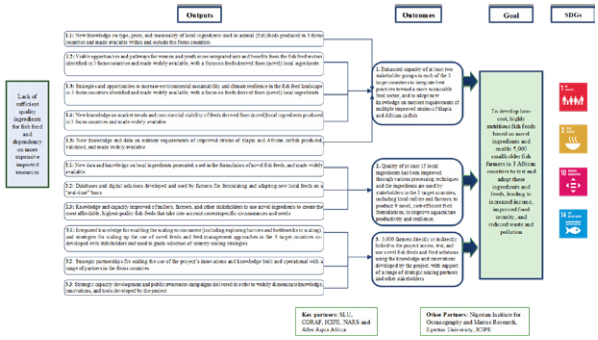
2.1 Theory of Change

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.

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 result 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)

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 strategies
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
Description	
Definition	Sum of demonstration sites / model farms developed
Unit of Measure	Number (of demonstration sites/model farms)

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

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	

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	

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:

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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.

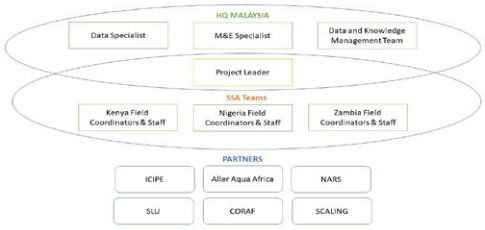
Table 3. Reporting workplan

	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:

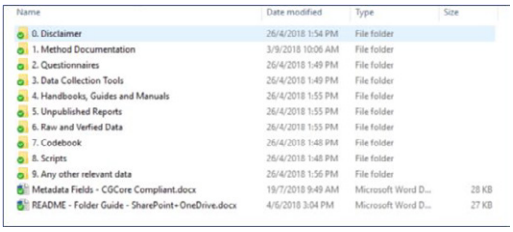
Table 4. Project data management

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

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.

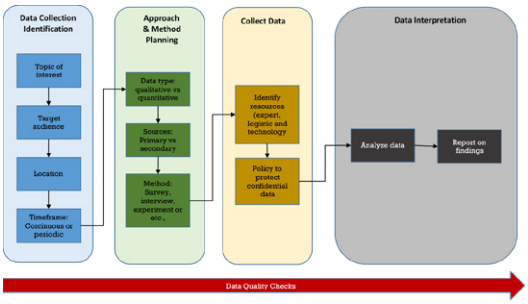
Figure 4. Data folder



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

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

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.

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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

	• 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	

WorldFish

About WorldFish

WorldFish is a nonprofit 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.

For more information, please visit www.worldfishcenter.org

Appendix 7: Report of the first annual workshop of the FASA project that took place from the 28th to 29th of November 2022 at WorldFish HQ, Penang, Malaysia.

Norad

WorldFish CGIAR

Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)

Annual Workshop Report

28 – 30 November 2022, WorldFish Penang, Malaysia

In partnership with

icipe CORAF SLU ALLER AQUA ZAMBIA

Annual Workshop Report

Citation

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Photo credits

Front cover, Neil Palmer/WorldFish.

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Introduction

Workshop objectives

The purpose of the 2022 Annual workshop of the project "Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)" was to bring together project partners to meet in person, discuss the overall project goal and the specific project activities in each country, and conduct the 2023 annual planning for the FASA project.

Date and Venue

The workshop took place from the 28th to 29th November 2022 at WorldFish HQ, Penang, Malaysia, followed by a site visit to Fisheries Research Institute Malaysia, Pulau Sayak and Jitra Aquaculture Extension Centre in Kedah on the 30th November 2022. The first two days of the workshop was conducted both in-person and virtually (hybrid) to accommodate the participants who could not attend in person.

Workshop Participants

Thirty participants attended the first day, and 25 participants attended the second day of the workshop at the WorldFish Headquarter Penang. The participants were representatives from:

1. West and Central Africa Council for Agricultural Research and Development (CORAF)
2. International Centre of Insect Physiology and Ecology (ICIPE)
3. Swedish University of Agricultural Sciences (SLU)
4. Aller Aqua Zambia Limited
5. Includovate (Consultant for Gender and Social Inclusion)
6. NAGI Enterprise (Consultant for Climate Change and Environmental Assessment)
7. WorldFish Zambia Team Members
8. WorldFish HQ Malaysia Team Members

Workshop Activities

The detailed agenda of the workshop and detailed list of participants are in the Appendices A and B, respectively.

Plate1. Group photo taken on the 28th November 2022, during the first day of the FASA project Annual workshop with participants at WorldFish HQ, Penang, Malaysia.

Day 1: Presentations from FASA project partners

Opening

The workshop began with an opening speech of Dr. Mohammed Essam Yassin, the Interim Director General of WorldFish, who welcomed the participants and mentioned how important this project is for WorldFish and its partners, for the aquaculture sector in Africa and for people relying on fish to make a living. Then the participant listened to the recorded speech of Dr. John Benzie, the Acting Director of Aquatic Foods Biosciences, who introduced Aquatic Foods Biosciences Department of WorldFish, highlighting the relevance of fish feeds and nutrition research in contributing to reduce the yield gaps observed in the aquaculture sector in Africa. Thereafter, Dr. Rodrigue Yossa, the Project Leader, spoke on behalf of NORAD and delivered the Norad's welcome speech. Dr. Rodrigue Yossa also presented the objective of the workshop and the detailed agenda of the 3-day workshop. The first day of the workshop mainly focused on the introduction of the project partners and their understanding of their respective contributions to the FASA project, while the third day of the workshop was dedicated to site visits in Malaysia.

Presentations

The presentations were made by representatives of the partner institutions, and mainly included the following elements:

1. Introduction on partner organization and team,
2. Experience in fish feeds and Nutrition,
3. Understanding of the workplan to implement the FASA project in the project countries

Moreover, WorldFish project management and support teams presented on their role and involvement in the FASA project. Copies of the Power Point presentations of the Day 1 are in the **Appendices C** and **D**. The following are the main messages derived from each presentation delivered on the Day 1.

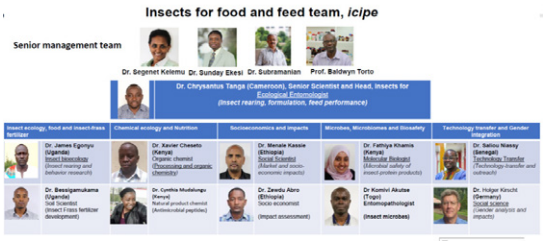
ICIPE

Dr. Chrysantus Mbi Tanga,

Introduction on organization and team:

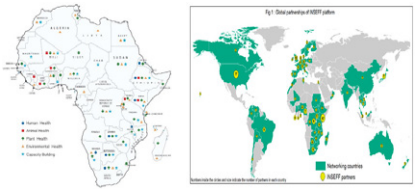
- ICIPE is a Centre of Excellence in Africa- for research and capacity building in insect science and its application.
- An intergovernmental organization- Charter signed by 13 countries worldwide.
- This centre has over than 571 staff from 40 nationalities including several contracted workers.
- Recruit about 150-180 graduate students annually.
- ICIPE work within the framework of One Health and a general framework for the research work within the three thematic areas/program:
  - Human Health
  - Agriculture (Plant & Animal Health)
  - Environment Health

In addition, within this program there is PASET-RSIF a capacity building, supported by African countries.



Research work location

- Has more than 200 partners in 61 countries across 5 continents
- Most of the activities, particularly those under the Insect for food and feed programme, have been mentioned in 494 publications.



Experience in Fish Feeds and Nutrition

- ICIPE has diverse experience in fish feed and nutrition; 2000 edible insects have been identified globally, including 552 edible insects found in Africa. The ICIPE conducted the research listed below on fish feed.
  - Black soldier fly production: A sustainable model of circular economy
  - Insect oils as ingredient in aquafeed and others
  - Policy Engagement, Standard Development & Certifications
  - Scaling insect farms in East Africa
  - Nutritional quality of extruded fish feeds made from insect meal
  - Microbial quality of extruded fish feeds
  - Scaling insect protein for fish production
  - Better carcass quality

CORAF

Dr. James Apochi

Introduction on organization and team:

CORAF (West and Central Africa Council for Agricultural Research and Development):

- National Center of Specialization (NCoS) on Aquaculture supervised by ARCN – Point of entry to Nigeria
- Nigerian Institute for Oceanography and Marine Research (NIOMR), Lagos
- National Institute for Freshwater Fisheries Research (NIFFR), New Bussa
- Nigerian Stored Products Research Institute (NSPRI), Ilorin

Experience in Fish Feeds and Nutrition:

- Cassava flour to replace maize in fish feed – about 40% of cassava flour included
- Study of nutritional and anti-nutritional composition of cassava leaf and production of Cassava leaf protein concentrate
- Production of indigenous less expensive fishmeal from dep sea fish (Lantern fish)
- Probiotic production from the isolation of LAB from the gut of indigenous fish species
- Clupeid fishmeal Production and Utilization
- Use Of baobab leaf meal as a source of Vitamin C in fish feed
- Development of feeds for all stages of catfish and tilapia
- Assessment of the use of maggot meal as a replacement of fishmeal in the diet of catfish

Geographies & Available Facilities:

- Facilities at the NCoS (NFFRI and NIOMR) which needs to be up graded
- The demonstration research will be carried in Fish Farmer's farm with enough ponds (12 pond for each species) to be rented for use.
- Laboratory equipment for chemical analysis not available in NCoS will be sourced from outside

Partnership:

- Grand cereals Limited. Producer of Vital fish feed
- TRITON group of company
- OBA FARMS Limited producer of Crown fish feed
- NIOMR fish feed miller (Government feed miller
- Olam International, Blue crown
- Lawrence Feed mill Ventures
- Abdulsalam Fish Farm

WorldFish Zambia

Dr. Arthertone Jere & Mr. Gregory Kasanga

Overview of the status of feed research in Zambia.

Currently, Fish feeds takes about 60% of the production cost for both smallholder & commercial aquaculture farmers in Zambia. The biggest constraints are limited access to high quality fish feed. In Northern & Luapula provinces, only 16% of fish farmers use high-quality fish feed which limiting farm productivity. Sustainable efforts to resolve feed Challenges is to search for viable alternatives to local fish feed continue to be focus on Zambia.

Experience in Fish Feeds and Nutrition

- Studies conducted on fish feed.
  - A review of aquafeed business models and the feed value chain in Zambia and Malawi.
  - WorldFish pilots last-mile feed business models to boost aquaculture in Zambia

- Project goals:
  - 5 Novel ingredients to be used as key ingredients
  - Novel feed ingredients database development
  - Adoption of local feed diets by 5000 smallholders' farmers in Zambia

Partnership:

- Local Learning Institutions: CBU; UNZA; KMU & MU
- Local Millers: Butemwe milling
- Research Journals: JABS & IAPRI
- Associations: ADAZ & ZNFU
- Research Institutions: NADEC & CFRI
- Statistics: CSO & ZARI
- Farmers & Farmer Cooperative: Buyantashi Co.; Kanzala C & Msekese

WorldFish Malaysia

Dr. Rodrigue Yossa

Introduction

Some activities will be also conducted in Penang includes research work and all aspect of project management. In Malaysia, aquaculture work will include Aquaculture research, aquaculture extension, impact assessment and consultants. Non-aquaculture includes project management, Monitoring and Evaluation (MEL) & Data management, communication, procurement, Finance, Accounting.

- Aquaculture research activities – and WF HQ Penang Team consisted of:
  - Nurulhuda Ahmad Fatan
  - Aaqillah Amr
  - Muhammad Rahimi
  - Ning Shahirah

- Facilities that are available at the WorldFish Penang to conduct the fish feed experiment:
  - Feed making facilities – to produce sinking feed
  - Basic Fish culture facility (aquariums, tanks)
  - Digestibility experiment facility Recirculating Aquaculture System (RAS)
  - Big tanks
  - Lab for proximate analysis

Experience in fish feeds and Nutrition

Journal papers, technical reports, and a feed formulator app have all been developed:

- Apparent digestibility coefficients of local palm kernel cakes, rice bran, maize bran, and sago flour in the GIFT strain of Nile tilapia (***Oreochromis niloticus***)
- Apparent digestibility coefficients of banana peel, cassava peel, cocoa husk, copra waste and sugarcane bagasse in the GIFT strain of Nile tilapia (***Oreochromis niloticus***)
- Assessment of existing and potential feed resources for improving aquaculture production in selected Asian and African countries.
- Free feed formulator application

Partnership:

- Universiti Sains Malaysia (USM)
- Universiti Malaysia Terengganu (UMT)

Question (Q) and Answer (A)

Q: Is there a knowledge exchange where the African partners may receive training on the feed production process and support the entire feed line, including the ability to create their own feed and then market it to the private sector as a business opportunity?
As specified in the project description, the feed will be formulated by experts from outside the African countries.

A: There are many components in the project. First component is the scoping study to select some ingredients based on environmental and gender consideration. The project's PhD students will work on improving national ingredients. The improved ingredients will be returned to the countries, and the feed will be tested on farms in the respective countries.
This means that local students will undertake the work at SLU, thus there will be a component of local capacity building, and they will be able to learn the technologies and bring the innovation back to their home countries.

Additional comments
Q: It is essential to share knowledge in order to educate fish farmers and feed millers. Another key concern is the lack of a sustainability channel through which local governments can engage with feed millers and farmers under their authority to sustain feed production in order to support farmers when the project ends.
A: The issue is not entirely addressed because it will create more local jobs, transfer local technologies, and expand the project output beyond the scope of this project's end. Actually, it is not the role of a feed miller to produce feed ingredients, but feed millers just obtain ingredients from the market and produce feed with them. Thus, the technologies transfer should be positioned in the value chain before it reaches the feed mill. Therefore, if any ingredients are proven useful, a viability study can be conducted to facilitate technology transfer.

Q: Is there any provision in the project that would allow exchange visit? Can experts from the local feed miller from countries be given training in the institution in Europe or any engagement between private sectors?
A: No provision in the project to travel to Sweden for the visit.

Q: How is ICIPE managing the insect and hoe do they deal with some environment concerns?
A: It follows the circular economy model. Pollution is reduced when waste is collected from the environment, and the residues that are left from the growing of flies can become a by-product waste that is more stable as a good source of fertiliser due to the high level of chitin. Furthermore, using insects to compose waste at low temperatures produces very low levels of emission.

Q: The quantity produced in ICEPE is always minimal. How is such a high production of insect meal possible?
A: This is understandable because it is a new technology, but it is continually growing fast. It is possible to expand if there is waste to feed the insect.

Includovate

Dr. Sujata Ganguly

Introduction of organization and team
- Includovate is innovate about inclusion. Not only work on gender but also focus more on social inclusion, so all voices are heard, and no one left behind. Gender is not primarily men and women against each other but need to work together to see the impact and make it sustainable.
- Includovate works on various project with different organizations. Includovate is a social enterprise and believe in capacity building, have regular learning session among researcher as not different people have different understating and perspective in social gender and inclusion.
- Consideration in gender study:
  - Social norms and attitudes need to be differentiated in any gender study and understands
  - Disaggregate analysis i.e., male, or female percentage is not gender. Need to understand behind the stories of male or female participation in any task or work.
  - Decision power between male or female is really participation or not.
  - Needed assessment - bring together everyone respective of any identity and hear their problem, everyone has their own requirement.
  - Social ecological model – different level where individual, household, community, and society

- Have work with WorldFish on extensive literature review on social and gender risk associated with fish feed ingredient.
- Have found number of challenges.
- How can fish feed be produced in affordability and without women and youth is missing out or marginalised
- Project fact from literature review / problem:
  - Identity issue-e.g., farmers and women farmers. Identity can bring confidence
  - GESI blind evidence – reporting mainly in total without segregation of male or women
  - Need to address the root cause- ultimate goal is sustainable impact so need to ensure women are involved and address all the social norms

- Project goals:
  - Identify needs, risks, and opportunities associated with the use of novel ingredients that are gendered and socially differentiated
  - Identify opportunities to advance GSI goals of Norad, WorldFish, and other key stakeholders within the novel feeds landscape.
  - Ensure that women, youth, and OMG are prioritised throughout implementation

- Project component
  - Literature review
  - Building existing information and knowledge without replicating
  - Develop RQs with people from countries
  - Design the study.

- GSI analysis framework
  - Law, policies, institutional practise
  - Cultural, norms, belief
  - Gender roles, responsibilities, and time use
  - Access to and control over resources
  - Power and decision making

- Project component
  - In depth interview
  - Key informant interview
  - Focus group discussion
  - Survey
  - All these will be finalised and discussed with the project leader and team.

- Tentative list of partnerships:
  - Small and medium-scale feed millers and smallholder farmers
  - NARS
  - Scaling partners

NRDC

Dr Rodrigue Yossa, on behalf of Dr. Alice Tembo

Introduction
- NRDC was established in 1964 through a declaration by the First Republican President Dr Kenneth David Kaunda
- The first cohort of students was admitted in 1965 in two three year diploma programmes in Agriculture and a certificate in Home Economics
- Over the last five decades, the programmes have evolved to include ten diploma programmes in agriculture and related disciplines including Fisheries Science.
- Aquaculture Skills Training Centre and E learning platform established and through collaboration and support from WorldFish
- The Fish Laboratory was upgraded through the design and building of a flow through
- Aquaculture system with support from WorldFish.
- Two major research projects were conducted in collaboration with WorldFish and other institutions.
  - Replacing fishmeal with a single cell protein feedstuff in Nile tilapia *Oreochromis niloticus* diets.
  - Performance of *Oreochromis niloticus* and *Oreochromis andersonii* in controlled laboratory conditions in Zambia.
- NRDC ready to host the feed experiments during the project life cycle.

Project goals
- Capacity building of NRDC's Staff in research activities particularly the NRDC's contact person and other staff of Fisheries Science department.
- Exposure of students to research findings through seminars and scientific talks.
- Utilization of novel feed at the Aquaculture Skills Centre to boost fish production and
- adoption by aquaprenuers countrywide.
- Lessons learned from other participating countries on feed experiments and impacts in chosen communities.

Project component
- NRDC shall host the feed experiments in the Fish Lab.
- NRDC shall provide a contact person who will support the researchers in conducting and implementing the feed trials.
- NRDC shall provide a Technician who will support the researchers upgrade the Fish Lab to a Recirculating Aquaculture System.
- NRDC shall participate in the Annual Project Meetings
- NRDC shall receive rentals from WorldFish to facilitate security of the Fish Lab.

Partnership
- WorldFish
- Possibility of building more Partnerships

SLU, Sweden

Prof. Sri. Kartik Baruah

Introduction on organization and team:
- SLU vision is to play key role in development for sustainable life based on science and education. Sustainable is the most important element in every project
- A world class international university although it is just a 40-year old university and has taken a world top 300-400.
- Collaboration is very important and work with private, public and farmers in Sweden and outside Sweden. To achieve a goal with working together
- Try to address issue that are very fundamental to human being.
- Works a lot on sustainable food supply.
- Welfare is also important point concerning the animal ethics in the research.
- Managed pollution in aquatic system for clean water and oceans
- Sustainable cities and rural areas
- Reason to work on fundamental issues is to make the world a better place
- Research and education at SLU
  - Education to produce sustainable experts of the future.
  - Research in natural science, social science, and the humanities. – Transdisciplinary approach, curiosity and problem solving.
  - Unique infrastructure – modern research vessel, research station, experimental parks, database, biobank and world class laboratories.
- Location – SLU is located at three principal locations (Umea, Uppsala and Alnarp)
- SLU is under Ministry of Enterprise and Innovation, that why is SLU is technology driven university

Aquaculture scientific team:

- Research interest- the whole idea is sustainable aquaculture
  - Novel feed – waste to novel feed
  - Artemia research – for larvae fish
  - Nutraceuticals – feed additive come from waste
  - Health management – together with microbial management
  - Epigenetics

- Research areas
  - Wet lab for digestibility and growth experiment- RAS system, multispecies and can adjust the temperature
  - Artemia lab – part and member of international artemia consortium and recognised by FAO
  - Nutraceuticals in health and microbial management

- Experience in training Ph.D. students and research in fish feeds and nutrition:
- Development of a holistic anti-infective strategy for controlling Acute Hepatopancreatic necrosis disease in farmed white-legged shrimp *Paneaus vannamei*. Funding: World Bank
- Bio-conversion of non-food bio-resources to novel feeds for salmonids - a Nordic approach. Funding: NordForsk Grant
- Novel Microbial Ingredients in diets for Atlantic salmon (*Salmo salar*) - Impact on growth performance, health, and robustness. Funding: NordForsk Grant
- New feed resources - molecular insights of bioactive components effect on absorption, gene expression, microbiota, and metabolism in fish. Funding: Netaji Subhas - ICAR International Fellowship, India.
- Sustainable fish farming in Rwanda. Funding: SIDA, Sweden

- Completed studies
  - Interaction effects of plant-derived compounds on the performance of Artemia challenged with pathogenic biotic stressor". Funding - ICAR PhD grant - India
  - Effect of the symbiotic compounds, produced under laboratory conditions, on the growth, reproduction performance and expression of immune-related genes in Zebrafish.
  - Nutritive value and use of locally available low-cost feed ingredients for Tilapia farming in Tanzania. Funding: SIDA, Sweden
  - Brewer's yeast as a protein source in the diet of tilapia (*Oreochromis niloticus*) and freshwater prawns (*Macrobrachium rosenbergii*) reared in a clear water or biofloc environment. Funding: SIDA, Sweden

- Role of SLU in FASA project
  - Capacity Building
  - Supervision of two PhD thesis students: Nigeria & Zambia
  - Contribute to other relevant activities of the project

- PhD Student Activities timelines
  - 2 PhD hiring and registration from Zambia and Nigeria – Y2(Q2)
  - Conduct experiments to prioritise 15 ingredients: biochemical analysis of ingredients –Y2(Q1)-Y3
  - Develop and use processing techniques to improve quality of 15 ingredients-Y2(Q3)-Y3(Q1)
  - Quality checks the improved ingredients, and formulate and produce fish feed, and lab trial Y 2 (Q3) – Y (Q4)
  - Conduct validation study on farm Y 3(Q3) – Y (Q4)
  - PhD defences Y 4(Q2) – Y 5 (Q2

Question and Answer

Q: Concerning the development of a student project, it is important to collaborate with the local Zambian team in the development of the project so that it may reflect what is happening in the country. How would technology be transferred to the country?
A: It is important to obtain input from partners to produce a good PhD proposal, so all PhD selection and research proposals will be developed in collaboration with the countries.

Q: What is the definition of quality feed ingredients?
A: Quality feed is a nutritionally balanced feed that can meet the fish's nutrient requirements. In addition, a quality feed generates low impact on the environment or water quality.

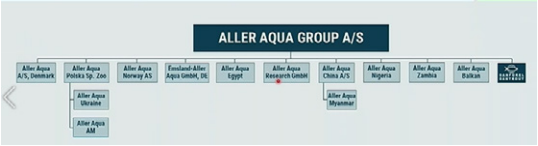
Additional comment:
We must be aware of the actual impact of the objective that we are trying to achieve. For example, if the goal is to incorporate as many locally sourced feed ingredients as possible, this can be achieved, but we may not achieve our goal if the cost of fish farming becomes uneconomical

Aller Aqua

Dr. Alexander Michael Greiling

Introduction on organization and team
- Aller Aqua has more than 58 years of experience in developing and producing the most effective and high-quality fish feed
- Active in 70+ countries and the 3rd largest fish feed producer in the EU
- Employees from over 30 different nationalities
- Currently have 7 factories in Denmark, Germany, Poland, Egypt, China, Zambia, and Serbia
- Produce feed for a large variety of species
- Well known as very careful selection of high-quality raw materials and feed also known to high quality
- Also, do continuous testing of feed at our Research Centre at selected test stations.

Organogram:



- Aller aqua research is a separate entity within the business and not fall under a specific factory in specific countries
- Aller aqua Zambia – built in 2017 and situated in Lake Kariba. The most modern in Africa and production capacity is 50,000 T/year
- Aller Aqua research – established in 2017 in Germany. Trial stations consisted of RAS.
- Aller Aqua research Zambia- Situated in lake Kariba. Main function: Testing new ingredients and formulations, benchmarking, and technical sales support. Has 8 caged (5x5x4 m)

Experience working with WorldFish
- Collaborated in project of replacing fishmeal with single cell proteins, MRD-Pro and DY-Pro, in tilapia *Oreochromis niloticus* diet.
- Role of Aller Aqua:
  - Supply of information on relevant raw materials
  - Supply of fishmeal
  - Assisting in trial setup and induction of local research staff (in Zambia)
  - Provided input to scientific research paper

Workplan to implement the FASA project
- Assist literature research
- Help in RM evaluation
- Provide frequent feasibility updates for various RMs- Includes feasibility assessments
- Assist in reporting
- Assist in designing research protocols and evaluation of trials if needed
- Assist in feed formulation –
- Support on site trainings - has MOU with WorldFish Zambia
- Any other support required by WF if needed

Insight to industry needs regarding raw materials
Two different kinds of challenges:
- Direct – directly to relate any raw material
  - Consistency in composition – to be able to produce consistence feed
  - Availability of volume – production capacity is directly link to the input. Need 400-500 ton / month to satisfy inclusion rate
  - Number of raw materials is limited – has limited of silo

- Indirect – are usually around the raw material
  - Supplier due diligence – not just a feed miller but has standard to meet and cannot accept anything and cannot get information from the supplier
  - Reliability and associated expenses (Transport, supplier) – getting late raw material mean factory could be idle for the days and cost need to be covered
  - Lab testing facilities is limited – Supplier could provide the information before send the material to the factory.

NAGI Enterprise

Dr. Mzime Regina Murisa

Introduction on organization and team
- NAGI is a consultant firm that based in Lusaka Zambia
- Have team member come from different part of Africa with various experience such as impact assessment, climate change etc
- Have experience dealing with multi and transdisciplinary projects
- The FASA project focuses on:
  - Sustainable aquatic food system – focus on climate and environmental impact assessment
  - Alternative, sustainable fish feed versus commercial feed
  - Integrate CC and environmental consideration in fish feed life cycle
    - Weakness in available data –to fil the gaps
    - Improve understanding in term of carbon foot print along the life cycles - where and why?
    - Identify potential opportunities include mitigation pathway within the novel feed ingredients
    - Promote sustainable aquaculture development
- Project key fact
  - Identify the gaps and have data evidence, policy

Experience in Climate Change and fish feeds
- Integrated Aquaculture Project
- Aquaculture Project – known as the Highly Indebted Poor Countries' (HIPC) integrated fish-farming Programme in Mulanje, Thyolo & Phalombe districts of southern Malawi
- Aquaculture Value Chain Project (AVCP)

Partnership:
- Swedish University of Agricultural Sciences (SLU),
- International Centre of Insect Physiology and Ecology (ICIPE),
- Aller Aqua Africa,
- West and Central African Council for Agricultural Research (CORAF)
- Local research scientists in each project country (WorldFish, ICIPE, and CORAF)
- Research scientists of the partners (NARS, ICIPE, CORAF) will contribute to the design of research protocols and implement the research

Question and Answer

Q: Is it possible to NAGI to provide the partners with a template that can be used for data collection for climate change work?
A: Yes, one important thing we want to do is collaborate with consultants and partners to develop strategies for various components and data collection. However, it is important to agree on who is responsible for that and then organize a training session to gather the staff, students on the ground together. We have a template, but we need to make it participatory, inclusive and with a focus on baseline analysis to identify gaps in different components.

Q: Does NAGI have representative in each country? In addition, NAGI staff travel to the project sites.
A: Yes, we will visit the different nations and rely extensively on local experience because each country differs.

Q: In terms of climate change, do you have expertise or potential for measuring gas emissions in the demonstration pond when fish is fed insect-based feed?
A: Yes, it is certainly possible. We mostly follow guideline, but it was designed to be used in developed countries, whereas testing in developing countries was done as part of the Southeast Asia. The guide has to be geographically fitted.

Q: At the Aller aqua experiment site. The cage is 5x5x4 metres. Why are we using this measurement? Because the depth of freshwater fish cages is not as deep as four due to oxygen availability. The average freshwater cage depth is 1.5m.
A: The cages are designed to mimic the cages in Lake Kariba.

Monitoring and Evaluation and Learning

Maggie Culhaj, Timothy Manyise, Saadiah Ghazali

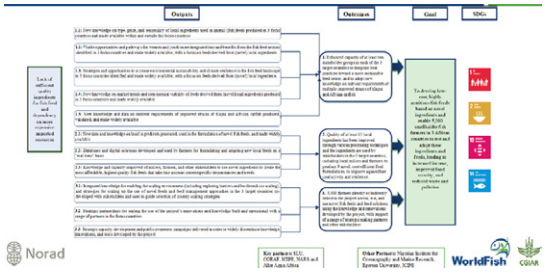
Overview on the MEL activities of the project
- MEL Plan
- Impact assessment plan
- Data Management
- Learning and adaptive management
- MEL system

Introduction on the MEL plan.
- We need MEL to ensure effective implementation and performance measurement by developing a robust and cohesive monitoring approach to ensure the impact program is on a path to success.
- To have a framework / tool that guide the MEL throughout the project
- Documentation on how and what information will be collected and analysis to support better decision making
- To ensure better transparency and accountability
- To generate learning through evidence

MEL component
- Theory of change
- Indicator matrix
- MEL activities overview
- Roles and responsibilities
- Impact assessment – measure toward the time until the project to see if we achieve the intended objectives
- Data management

- Learning and adaptive management
- Impact assessment – measure toward the time until the project to see if we achieve the intended objectives
- Data management
- Learning and adaptive management

FASA theory of change

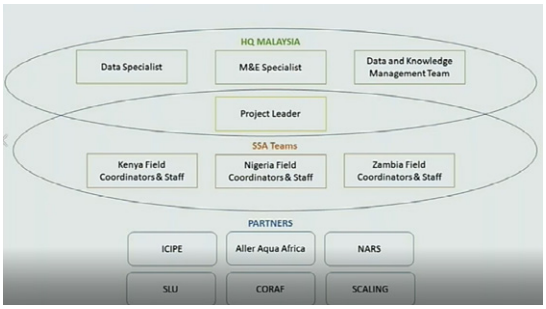


MEL Indicator
- To set target and goal, and track the result
- 37indicators
  - Output indicator (32)
  - Outcome indicator (5)
- To ensure the quality of collection and reporting of results

MEL activities

Have a team to track at three main level:
- Activities and output monitoring
  - Track progress against the workplan
  - Will use MEL web-based platform for planning, reporting, and learning
- Outcome monitoring
  - Outcome will be tracked periodically using performance indicator as per the indicator matrix
  - The result will undergo data quality check
  - Template will be provided
  - Will coordinate with country level team
- Evaluation and impact assessment
  - To assess the effectiveness of the intervention and its effect in achieving goals
  - Will be conducted periodically

Roles and responsibilities
- MEL team will coordinate with country focal points and project manager to collect/ validate data
- Quarterly performance report will be produced and shared with the project stakeholders



Impact assessment plan
- Baseline evaluation
  - Baseline characterization among farmers and feed millers during first 4 month
- Midterm evaluation
- End term evaluation
- Annual assessment
  - Assessment a contextualized system base theory of change
  - Assessing the quality and influence of capacity building
  - Assessing the socioeconomic impact
  - Assessing the effect of establishing innovation scaling partnership structure

Data Management
- Data management plan
  - Written document which is part of MEL that outlines all necessary information from how to collect, manage, analyse, storage and preserve your research data
  - Outline strategy through each research data life cycle
- Data quality Assessment
  - Process of cleaning data with the aim to identify any inconsistency or anomalies in the data
  - Three main stages of data quality assessment

Data collection	Digitization and data entry	Data Analysing
Calibration of instruments to check the precision, bias and/or scale of measurement	Setting up validation rules or input masks in data entry software	Double-checking coding of observations or responses and out-of-range values
Taking multiple measurements, observations or samples	Using controlled vocabularies, code lists and choice lists to minimize manual data entry	Checking data completeness
Using standardized methods and protocols for capturing observations, alongside recording forms with clear instructions	Detailed labeling of variable and record names to avoid confusion	Adding variable and value labels where appropriate
Checking the truth of the record with an expert	Designing a purpose-built database structure to organize data and data files	Verifying random samples of the digital data against the original data
Computer-assisted interview software to: standardize interviews, verify response consistency, route and customize questions so that only appropriate questions are asked	Accompanying notes and documentation about the data	Statistical analyses such as frequencies, means, ranges or clustering to detect errors and anomalous values

Data storage
- Recommended folder structure, wil be shared with project team

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
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

Disemination of data
- Knowledge and information generated in this project will be archived in WorldFish open repositories (Dspace and Dataverse)
- Links:
  - https://dataverse.harvard.edu/dataverse/worldfish
  - https://digitalarchive.worldfishcenter.org/
- Will go through a quality check at various level
- Open access repository and can be shared.

Learning and Dapative management
- The learning agenda for FAA is embedded in the activities carried out for the project implementation
- Collected data will serve to inform management for better decisions and adapting
- Learning opportunities are framed and linked to adaptive management
- Different ways learning tools
  - Review/ assessment/ scoping studies
  - TOC review and adaptation
  - Staff meeting and project review workshop
  - Annual project meeting and outcome monitoring studies
  - Strategic collaborations –stakeholders and partners

Online MEL platform overview
- https://mel.cgiar.org/
- Platform that has been designed for project management implementation from the research to knowledge sharing
- Has been used by some of CGIAR centres

Communications

Mr. Sean Lee

FASA communication plan
- Objectives:
  - Demonstrate to stakeholders and other audiences where how what and why FASA has made difference
  - To ensure investors and partners view FASA as credible, relevant and result oriented
  - Enable staff and partners to learn, communicate and share project knowledge
  - Build a knowledge hub to disseminate project activities / learnings
- To achieve the objectives
  - Maintain FASA reputation and credibility (i.e., branding)
  - Understand the communication needs of target audience
  - Continuous learn from communication effort
  - Maintain strong relationship between project staff and partners

- Key principles
  - Right message – develop credible content
  - Right form- relevant approach
  - Right person
  - Right channel
  - Right context
  - Right support

- Target audience
  - Bilateral donors
  - Partners
  - Policy markers
  - Media
  - Beneficiaries
  - Project staff
  - Country directors
  - WorldFish leadership

- Communication tools and dissemination

- Actions in 2022
  - Set up project website
  - Press release of project launch
  - PPT template
  - Roll up banners
  - Blog on the project launch – CGIAR website
  - Promotion in social media
  - Campaign newsletter to promote the project

- Action 2023
  - Update website
  - Continue to publish blog

Technical Reporting

Dr. Rodrigue Yossa

FASA project Technical report
- Technical reporting team need to send to Dr. Rodrigue and copy to Ms.Yogeswary
  - Dr. Rodrigue Yossa (R.Yossa@cgiar.org)
  - Yogeswary Chellappan (y.chellapan@cgiar.org)
- Quality check for the report from partners
- Technical report submission
  - Technical report for donor is different from partners to WF

Technical report schedule for Donor

Project Implementation Period: 1 July 2022 – 30 June 2027

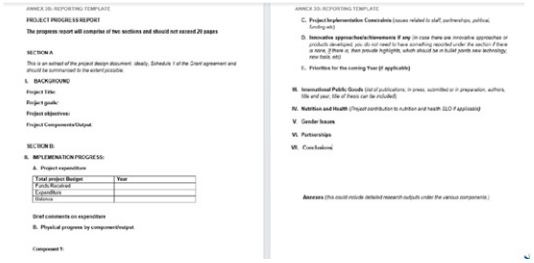
- 1 July – 31 December 2022 (Submission Deadline - 15 April 2023)
- 1 January – 31 December 2023 (Submission Deadline – 15 April 2024)
- 1 January – 31 December 2024 (Submission Deadline – 15 April 2025)
- 1 January – 31 December 2025 (Submission Deadline – 15 April 2026)
- 1 January – 31 December 2026 (Submission Deadline – 15 April 2027)
- 1 July 2022 – 30 June 2027 (Submission Deadline – 31 October 2027)

Technical report of partners and consultants
- Annual technical report will be submitted to donor.
- Midyear technical report will only for internal use and not submit to the donor, just to update if there is amendment in the activities

Project Implementation Period: 1 July 2022 – 30 June 2027

No	Reporting Period	Type of Report	Due Date
1.	October 2022 – December 2022	• FASA_Annual Technical Report 2022Q4	30 January 2023
2.	January 2023 – June 2023	• FASA_Mid-Year Technical Report 2023Q1-Q2	30 July 2023
3.	January 2023 – December 2023	• FASA_Annual Technical Report 2023Q1-Q4	30 January 2024
4.	January 2024 – June 2024	• FASA_Mid-Year Technical Report 2024Q1-Q2	30 July 2024
5.	January 2024 – December 2024	• FASA_Annual Technical Report 2024Q1-Q4	30 January 2025
6.	January 2025 – June 2025	• FASA_Mid-Year Technical Report 2025Q1-Q2	30 July 2025
7.	January 2025 - December 2025	• FASA_Annual Technical Report 2025Q1-Q4	30 January 2026
8.	January 2026 – June 2026	• FASA_Mid-Year Technical Report 2026Q1-Q2	30 July 2026
9.	January 2026 – December 2026	• FASA_Annual Technical Report 2026Q1-Q4	30 January 2027
10.	January 2027 – April 2027	• FASA_Mid-Year Technical Report 2027Q1-Q2	30 May 2027
11.	October 2022 – April 2027	• FASA_Final Technical Report 2022-2027	30 May 2027

Report template



Report detail

2 PROGRESS REPORT

2.1 Any progress reports to be submitted in accordance with the Specific Conditions shall describe the results achieved by the Project during the reporting period. The report shall be set up in a way that allows direct comparison with the latest approved Application, work plan and budget, and shall be signed by an authorised representative of the Grant Recipient.

2.2 The progress reports shall, as a minimum, include:

a) an account of the results achieved so far by the Project, using the format, indicators and targets of the approved results framework. The overview must:
   - show delivered main outputs compared to planned Outputs;
   - show the Project's progress towards achieving the Outcome;
   - if possible, describe the likelihood of the Impact being achieved.

b) an account and assessment of deviations from the latest approved Application and/or work plan;

c) a brief update on the risk management of the Project, including:
   - any new risk factors;
   - how materialized risks have been handled in the reporting period;
   - the effectiveness of mitigating measures;
   - how risks will be handled going forward.

   The update shall include both risks affecting Project achievements and the risks for negative consequences from the Project on its surroundings. Potential negative effects on the cross-cutting issues as referred to in the Specific Conditions article 3 shall always be accounted for.

d) a brief account of work undertaken to prevent instances of corruption and sexual exploitation, sexual abuse and sexual harassment (SEAH) from occurring in the future and, if received any allegations during the reporting period, how these were handled and any actions taken.

Finance – Financial reporting

Mr. Tan Chao Yan

Financial reporting schedule to NORAD
- Annual basis reporting

Project Implementation Period: 1 July 2022 – 30 June 2027

- 1 July – 31 December 2022 (Submission Deadline - 15 April 2023)
- 1 January – 31 December 2023 (Submission Deadline – 15 April 2024)
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- 1 July 2022 – 30 June 2027 (Submission Deadline – 31 October 2027)

Audit reporting schedule
- External audit on annual basis

- 1 July – 31 December 2022 (Submission Deadline - 1 June 2023)
- 1 January – 31 December 2023 (Submission Deadline – 1 June 2024)
- 1 January – 31 December 2024 (Submission Deadline – 1 June 2025)
- 1 January – 31 December 2025 (Submission Deadline – 1 June 2026)
- 1 January – 31 December 2026 (Submission Deadline – 1 June 2027)
- 1 July 2022 – 30 June 2027 (Submission Deadline – 31 October 2027)

Partner reporting schedule

No	Reporting Period	Type of Report	Due Date
1.	October 2022 – December 2022	• FASA_Annual Financial Report 2022Q4	30 December 2022
2.	January 2023 – June 2023	• FASA_Mid-Year Financial Report 2023Q1-Q2	30 July 2023
3.	January 2023 – December 2023	• FASA_Annual Financial Report 2023Q1-Q4	30 December 2023
4.	January 2024 – June 2024	• FASA_Mid-Year Financial Report 2024Q1-Q2	30 July 2024
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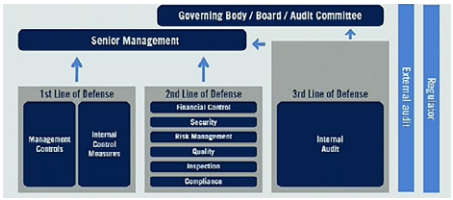
11.	October 2022 – April 2027	• FASA_Final Financial Report 2022-2027	30 May 2027

Risks and Compliances

Ms. Azira Azmi

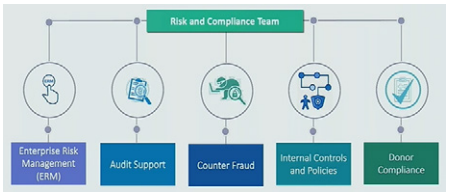
Governance & Risk Management

- To ensure effective control, WF applied the industry best practise 3 lines of defence model
- Framework instituted by Institute of Internal Auditor



What we do to provide support in risk and compliance for the project:

- Provide support in 5 different area:



Procurements

Mr. Hector Morais

- Procurement compliance involve formulating, following, and enforcing process for spend management
- To ensure suppliers, buyers and employees stick to policy and procedure to protect WF from fraud, corruption and rogue spending

Procurement compliance methods

- Implementation of standardized policy and procedure
  - Various threshold - price vs quotation number : > 1000 : 3 quotations
  - Numbers of suppliers: >5000 : 5 suppliers
  - Conflict of interest
  - Procurement committee
  - One drive file management system
  - Filing system that is used by all countries, from the start top the end procurement process

- Online platform to deposit documentation.
- Supplier CSI watchdog checks for
- Database to register supplier

Project Management (Contract and Grant)

Ms. Tan Su Ching

- PMU is WorldFish's central hub for all project management functionality; it sets project management standards, procedures and practices and ensures they are being followed
- PMU facilitates the development and sharing of project management resources, methodologies, tools, and techniques across the organization.

Project Management Unit (Grants and Contracts Team)

- Contracts review and clearance
- Contracts discussion and negotiation with donors and partners
- Contracts maintenance and administration (Fully countersigned copy)
- Follow up any discussion/ Modification/ Addendum if required
- Contract compliance, templates, tools
- Legal matters (Intellectual Property/ Policies/ Guidelines/ Termination/ Dispute Resolution)
- Providing ad hoc whenever necessary in relating to contract updates

Day 2: Planning sessions for years 2023

During the second day of the workshop, the Project Leader gave a comprehensive overview of the current implementation status of the project. Then, each project partner presented its tentative detailed annual workplan for 2023, which was discussed with the workshop participants. At the end of the second day, the Project Leader shared the updated Project Implementation Plan, which considered the delay observed by the project during the project mobilization phase (first semester). Project outputs and deliverables were thoroughly discussed, and the responsibility of each partner re-iterated. The Project Leader also put an emphasis on the necessity for a collaboration between the project partners, in the project countries, during the implementation of the project. It was also discussed what the timeframe, budget and particular outputs/ deliverables are for each team. Copies of presentations delivered during the Day 2 are in Appendix E.

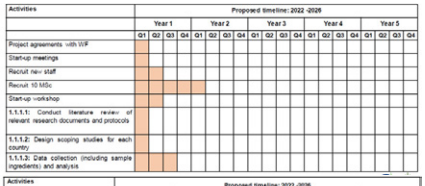
The following are the main messages derived from each presentation delivered on the Day 2.

Presentation by Dr Chrysantus Mbi Tango (ICIPE)

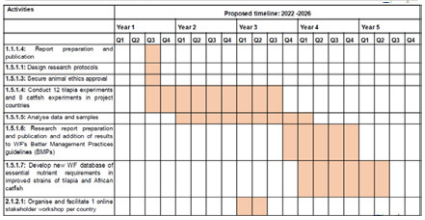
Project work location

- Usenge Fish Cages Lake Victoria, Siaya County
- 100, 300m^2 Ponds in Samia, Busia County near Lake Victoria
- Kenya Marine and Fisheries Research Institute (KMFRI), Sagana, Nyeri County
- Kamuthanga Aqua Fish Farm in Machakos County

Project activities and timelines

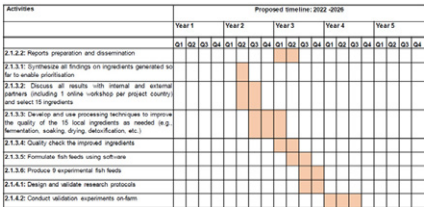


Activities	Proposed timeline: 2022 -2026																			
	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Project agreements with WF																				
Start-up meetings																				
Recruit new staff																				
Recruit 10 MSc																				
Start-up workshop																				
1.1.1.1: Conduct literature review of relevant research documents and protocols																				
1.1.1.2: Design scoping studies for each country																				
1.1.1.3: Data collection (including sample ingredients) and analysis																				

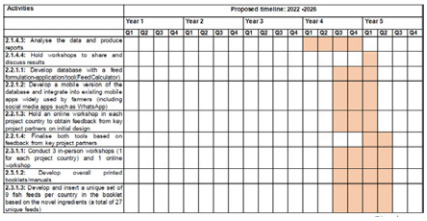


Activities	Proposed timeline: 2022 -2026																			
	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1.1.1.4: Report preparation and publication																				
1.5.1.1: Design research protocols																				
1.5.1.3: Secure animal ethics approval																				
1.5.1.4: Conduct 12 tilapia experiments and 9 catfish experiments in project countries																				
1.5.1.5: Analyse data and samples																				
1.5.1.6: Research report preparation and publication and addition of results to WF's Better Management Practices guidelines (BMPs)																				
1.5.1.7: Develop new WF database of essential nutrient requirements in improved strains of tilapia and African catfish																				
2.1.2.1: Organise and facilitate 1 online stakeholder workshop per country																				

Project activities and timelines



Activities	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
2.1.2.2: Reports preparation and dissemination																				
2.1.3.1: Synthesize all findings on ingredients generated so far to enable prioritisation																				
2.1.3.2: Discuss all results with internal and external partners (including 1 online workshop per project country) and select 15 ingredients																				
2.1.3.3: Develop and use processing techniques to improve the quality of the 15 local ingredients as needed (e.g., fermentation, soaking, drying, detoxification, etc.)																				
2.1.3.4: Quality check the improved ingredients																				
2.1.3.5: Formulate fish feeds using software																				
2.1.3.6: Produce 9 experimental fish feeds																				
2.1.4.1: Design and validate research protocols																				
2.1.4.2: Conduct validation experiments on-farm																				



Activities	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
2.1.4.3: Analyse the data and produce reports																				
2.1.4.4: Hold workshops to share and discuss results																				
2.2.1.1: Develop database with a feed formulation-application tool (FeedCalculator)																				
2.2.1.2: Develop a mobile version of the database and integrate into existing mobile apps widely used by farmers (including social media apps such as WhatsApp)																				
2.2.1.3: Hold an online workshop in each project country to obtain feedback from key project partners on initial design																				
2.2.1.4: Finalise both tools based on feedback from key project partners																				
2.3.1.1: Conduct 3 in-person workshops (1 for each project country) and 1 online workshop																				
2.3.1.2: Develop overall printed booklets/manuals																				
2.3.1.3: Develop and insert a unique set of 9 fish feeds per country in the booklet based on the novel ingredients (a total of 27 unique feeds)																				

Project activities and timelines

Activities	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
2.3.2.1: Organise and facilitate 4 training workshops per country (2 online and 2 inperson)																				
2.3.2.2: Reports preparation and dissemination																				
3.1.1.1: Organise and facilitate 2 stakeholder workshops per country, total of 8																				
3.1.1.2: Report preparation and dissemination																				
3.2.1: Develop innovation platforms for bringing key scaling stakeholders together																				
3.2.2: Identify and set up demonstration sites and model farms																				
3.2.3: Host farmer field days on demo sites and model farms																				
3.2.4: Build partnerships with cooperatives to test and use novel feeds																				
3.2.4: Support establishment of new feed services and businesses by young people, farmers, etc																				

Activities	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
3.2.5: Support small-scale millers to develop new product based on project's innovations																				
3.2.6: Build partnerships with NGOs, private sector, and extension service providers to incorporate project's knowledge and innovations to aquaculture farmers																				
3.3.2.1: Develop and publish factsheets (online and printed), BMPs, and project report																				
3.3.2.5: Design and conduct context-specific outreach to target end-users (farmers and millers) to support scale-up																				
3.3.2.6: Develop scaling potential outside of project by identifying additional scaling opportunities																				

Presentation by Dr. James Apochi (CORAF)

Project team
- Dr. James Apochi
- Dr Ibiyo L.M.O
- Dr. Iretioluwa Caroline Ayoolalusi

Project activities
- Scoping studies on the type, price and seasonality of local ingredients used in fish feeds in Nigeria.
- Re-evaluation of Nutrients requirements of improved strains of tilapia and African catfish using locally available ingredients in Nigeria
- Re-evaluation of nutrients requirements in improved strains of tilapia and African catfish using locally available ingredients in Nigeria.
- Four experiments each on tilapia and African catfish will be carried out
- Update result in the database
- Workshop organization
- PhD student component and research activities

Project work location

- Scoping study will be carried out through assessment survey of selected states per every Geopolitical zone with a total of twenty-two (22) states and FCT chosen to obtain knowledge.
  - North Central: Benue, Nasarawa, Niger, and Plateau States, as well as the Federal Capital Territory.
  - North East: Adamawa, Borno, Taraba, and Yobe States.
  - North West: Kaduna, Kano, Sokoto, and Zamfara States.
  - South East: Abia, Ebonyi, and Imo South
  - South: Akwa Ibom, Delta, and Rivers States
  - South West: Ekiti, Lagos, Ondo and Oyo States.
- Every available ingredient will be collected in the selected local and urban markets with the assistance of field personnel.

Project timeline
- Three months for sampling and data collection and two months for analysis and write up. (Y2)
- Four experiments each on Tilapia and African catfish (Y2-Y4)
- PhD student research on growth performance studies (Y3:Q4-Y4)

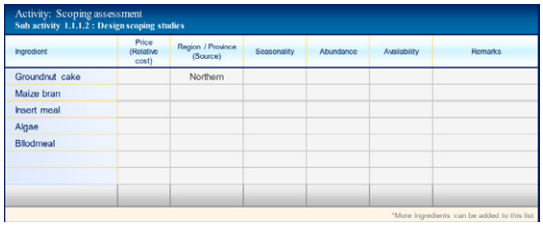
Partnerships
- Farmers and Ingredients marketers
- Fish feed Millers and fish farmers.

Presentation by Dr. Arthertone Jere & Mr. Gregory Kasanga (WorldFish Zambia)

Work plan to implement the FASA project in Zambia
- Implementation plan
  - Conduct projects start up workshop
  - Tentative date: Dec 2022 or Jan 2023
  - Online workshop

- Implement outcome 1
  - Literature review – work with WorldFish and Zambia university's publication
  - Design scoping studies
  - Data collection
  - Report and publication
  - Implementation plan – Output 5
  - Design research protocol (Y1: Q3)
  - RAS system setup at NRDC (Y1: Q1-Q3
  - Secure animal ethics (Y1: Q 3)
  - Conduct experiment (12 experiment) (Y1 –Y3)
  - Data and samples analysis (Y2-Y4)
  - Publication (Y4-Y5)

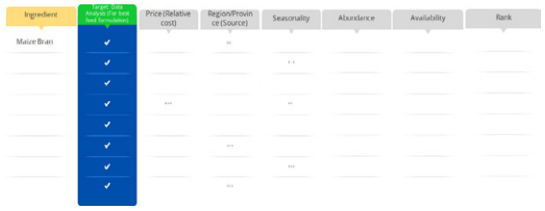
Template for scoping study data collection:



Activity: Scoping assessment
Sub activity 1.1.1.2 : Design scoping studies

Ingredient	Price (Relative cost)	Region / Province (Source)	Seasonality	Abundance	Availability	Remarks
Groundnut cake		Northern				
Maize bran						
Insect meal						
Algae						
Bllodmeal						

*More ingredients can be added to this list



Map where the activities and scoping of ingredient will be conducted.

Overall activities – structured only for 2023
- Project start up engagement (Dec 2022)
- Recruitment of MSc and PhD (Jan 2023 – March 2023)
- Scoping assessment of scoping ingredient (Jan 2023 - Sep 2023)
- Investigate nutrient requirements in improved strains of tilapia (Dec 2022 – Dec 2023)
- Renovate NRDC lab (Dec 2022 – July 2023)
- Partner engagement – (Dec 2022, April 2023, Aug 2023, Dec 2023)
- Laboratory experiment (Jun 2023-Dec 2023)
- Field trial experiment (Jun2023 – Dec 2023)

Question (Q) and Answer (A)

Comment: In addition to the raw material ranking, it was suggested that the inclusion amount that may be used in the fish feed be considered.

Comment: It is important for the government to collect as much quantity data on ingredients together with fertiliser and manure on the agro-ecological system, use of water and energy sources and/or process, particularly for LCA and environmental impact.

Comment: Suggested to have a structured and template for the questionnaires of the scoping studies.

Comment: It was suggested that a standard form is provided, but only one partner will ask the questions, particularly about gender or climate change subject. Because, people from many disciplines have different understanding.

Comment: It is possible to incorporate a standard scoping questionnaire with a country-specific questionnaire. Could also offer online training for conducting the survey. Communication and coordination are also required among the partners in each country.

Comment: In conducting the scoping studies, we should focus on the outcome and output. Additional unrelated questions would interfere the objectives

Comment: Animal and human ethics must be applied, and a research protocol is essential for the application. WorldFish will share examples of research protocols with partners, and once established the Project Leader must approve the research protocols developed by each partner.

Presentation by Dr. Aaqillah Amr and Dr. Rodrigue Yossa (WorldFish Penang)

Detailed planning of Work in Malaysia
- Introduction
  - Conducted lab analysis and digestibility experiment of samples from scoping studies
  - Feed ingredient database development

- Team Members at WorldFish Penang
  - Dr. Aaqillah Amr
  - Nurulhuda
  - Muhammad Rahimi
  - Ning Shahira
  - Dr. Rodrigue Yossa

- Workstation
  - Aquaculture lab- WorldFish Penang

- Work plan timeline
  - Conduct digestibility experiment to identify the potential local ingredients (Y2-Y3)
  - Experiment 1 and 2 (July 22-Jun 23)
  - Experiment 3, 4 and 5 (July 23 – Jun 24)
  - Experiment 6 (July 24 – Dec 24)

- Lab analysis (Y2-Y3)
  - Proximate analysis
  - Anti-Nutritional Factors
  - Apparent digestibility coefficient
  - Database development (Y2-Y3)

- Result discussion with partners and 1 online workshop (Y2:Q4)
  - In order to select relevant ingredient to be used in the PhD study
  - To consider gender and climate change element when selecting the ingredients

- Project management (Y1-Y5)
  - WF support team contribution
  - Monthly meeting (online) with the stakeholders

Question (Q) and Answer (A)

Comment and suggestion: The digestibility study is for Tilapia (in Penang). Suggested to keep as many tissues and samples as possible, so if we want to be innovative and if something new emerges in the future, it can be reinvestigated.

Comment: Assuming 30 ingredients will be received from countries, Malaysia will receive 10 ingredients each country. There are 18 tanks units with swirl separators for faecal collection at the facility at WorldFish Malaysia. As a result, only have six treatments with three duplicates can be used in each digestibility experiment at once, consisting of diets made of five test ingredients and one reference diet at a time. The approaches are to collect all the ingredients at the same time and freeze them until the experiment is ready to be conducted.

Q: Will the digestibility testing be conducted using both raw and processed materials?
A: Yes, at WorldFish, raw materials will be used for the experiment, but PhD students will produce processed materials and conduct digestibility with them at SLU.

Q: So does SLU will receive the same batches as WorldFish, then process and test the digestibility using the same batch raw materials?
A: Yes, the same batches of ingredients but not the same number of ingredients. Malaysia will receive 10 ingredients per countries while SLU will receive five ingredients per country.

Q: Will SLU consider the material flow when fortifying the raw materials? As an example, when you do grain debranning, you will not just get fortified debranning, but you will also get bran that can be sold for additional income, which is not good for fish, but good for terrestrial animals. It is important also, to record the volume of the product that is produced after processing even if it is for different use.
A: Rodrigue will raise this issue with WorldFish's procurement team, as they are in a position to deal with the processes and ensuring that the necessary documents are provided. It would be helpful to know the quantity to be sent in advance

Comment: Make note of the process of importing raw materials to Penang and Sweden, which included customs clearance, import and export permits. The process is not simple, and the respective countries must plan ahead of time if they want to export the material.

Q: Does this mean that when the time comes to manufacture the feed on the ground, someone will already know how to treat a considerable amount of raw material to fortify in the way specified by the project? Will technology be transferred, or will SLU provide enough volume for the local team to produce the feed formulation?
A: SLU will consult with all partners on this matter.

Q: Is the digestibility experiment will be conducted in vivo or in vitro?
A: According to the project description, in vivo testing will be performed in the experiment

Presentation by Dr. Kartik Baruah (SLU Sweden)

General layout of the PhD thesis
- Focus on Tilapia and Catfish
- Novel feed ingredients
- Digestibility study at WF
- Ingredient conditioning and diet formulating
- Growth trial
- Validation study

Important for the student to understand the science

Activities in SLU is mainly on the PhD recruitment and PhD research activities
- Recruitment of PhD student - Advertisement jointly by WFC & SLU
- Registration at SLU
- Doctoral courses – 30 credit courses at SLU (statistics, ethics)
- Lab works at SLU
- Validation study at their home country
- Writing and PhD thesis defences

Some technical things and problem will be faced in the countries need to be discussed further

Question (Q) and Answer (A)

Q: Suggested to look at the influence of feed on the somatic index and hepatosomatic index. Then question on what parameters will be collected in the nutrigenomics study?
A: Will collect sample for transcriptomic analysis, measuring a broad spectrum to see what is happening at the gene level with an emphasis on immunological, metabolic cascade.

Q: Concerning the genetically improved strain against the wild variety of fish. If WorldFish will adopt Tilapia GIFT for digestibility assessment, should SLU use the same fish? Perhaps the outcome will differ if other fish are used.
A: Due to the difficulty in delivering the GIFT to SLU, it is difficult to use the same fish for experiment. Therefore, it is fine to use different improved strain.

Day 3: Site Visit to Fisheries Research Institute Malaysia, Kedah, and Visit to Jitra Aquaculture Extension Centre, Pulau Sayak.

Participants of the 2022 FASA Annual Workshop visited the Department of Fisheries' Research Institute at Pulau Sayak and the Aquaculture Expansion Center at Jitra, in the morning and afternoon respectively, on the 30th November 2022. The goal of the visits was to learn how the Malaysian Government is supporting the aquaculture sector in the country and to get familiar with the infrastructure and management plans that are applied in these institutions.

Plate 2. Welcoming and briefing session by Mr. Mohammed Suhaimee Abd. Manaf, Director Department of Fisheries Research Institute at Pulau Sayak.

Plate 3. Participants visited the feed making facility at the Fisheries' Research Institute at Pulau Sayak

Plate 4. Participants visited the seaweed research facility at the Fisheries' Research Institute at Pulau Sayak.

Plate 5. Welcoming and briefing session by Mr Akmal research officer at the Aquaculture Expansion Center at Jitra.

Plate 6. Participants visited the fish pond facility at the Aquaculture Expansion Center at Jitra.

Outcome of the workshop

The main outcome of the workshop was the revision of the Implementation Plan of the FASA project (Appendix F). This revised Implementation Plan will be submitted to the donor for approval. Going forward, it is this revised plan that will be used to implement the project on the ground.

Next Steps and Conclusion

- Each partner to submit its 2023 Annual Workplan to the Project Leader for approval
- Each partner to implement the 2023 project activities in Kenya, Nigeria, Zambia, Sweden and Malaysia, as per the revised Implementation Plan and the approved annual workplan
- The next annual project workshop will take place in Nigeria in November 2023

List of plates

Appendix A: Workshop Agenda

Agenda

Event : Annual Project Workshop 2022
Date : 28 – 30th November 2022 (Monday – Wednesday)
Location : WorldFish HQ, Penang, Malaysia
Project : Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)
Project Leader & Moderator : Rodrigue Yossa

Day 1

Monday / 28th November 2022 / WF Auditorium/ Presentations from FASA partners		
08.30 – 08.45 am	ETA at WorldFish Lobby. Meet & Greet (coffee/tea served at the foyer)	
Opening (Auditorium)		
09.00 – 09.05 am	Welcome Speech	Essam Mohammed
09.05 – 09.10 am	Introduction to Aquatic Foods Bioscience	John Benzie
09.10 – 09.15 am	Welcome of Norad or Ambassador of Norway	Norad/Norwegian embassy?
09.15 – 09.25 am	Introduction and scope of the meeting	Rodrigue Yossa
Session 1:		
09.25 – 09.40 am	Introduction on organization and team, experience in fish feeds and Nutrition, workplan to implement the FASA project in Kenya (geographies, local partners, available facilities, etc.)	ICIPE (Chrysantus Mbi Tanga)
09.40 – 09.55 am	Introduction on organization and team, experience in fish feeds and Nutrition, workplan to implement the FASA project in Nigeria (geographies, local partners, available facilities, etc.)	CORAF (James Apochi)
09.55 – 10.10 am	Introduction on organization and team, experience in fish feeds and Nutrition, workplan to implement the FASA project in Zambia (geographies, local partners, available facilities, etc.)	WorldFish Zambia (Arthertone Jere)
10.10 – 10.25 am	Introduction on organization and team, experience in fish feeds and Nutrition, workplan to implement the FASA project in Malaysia (geographies, local partners, available facilities, etc.)	Project Leader (Rodrigue Yossa)
10.25 – 10.45 am	Discussion/ Q & A	
10.45 – 11.00 am	Coffee Break at the foyer	
Session 2:		
11.00 – 11.15 am	Introduction on organization and team, experience in market assessments and scaling, workplan to implement the FASA project	ILRI (Edwin Kimani Kang'ethe)
11.15 – 11.30 am	Introduction on organization and team, experience in vocational training and collaboration with WorldFish, workplan to implement the FASA project	NRDC (Alice Tembo)
11.30 – 11.45 am	Introduction on organization and team, experience in training Ph.D. students and research in fish feeds and nutrition, workplan to implement the FASA project	SLU (Sri Kartik Baruah)
11.45 – 12.05 pm	Discussion/ Q & A	
12.00 – 13.00 pm	Lunch at WF Cafeteria	
Session 3:		
13.00 – 13.15 pm	Introduction on organization and team, experience working with WorldFish, workplan to implement the FASA project	Aller Aqua (Alexander Michael Greiling)
13.15 – 13.30 pm	Introduction on organization and team, experience in gender and fish feeds, workplan to implement the FASA project	Gender
13.30 – 13.45 pm	Introduction on organization and team, experience in CC and fish feeds, workplan to implement the FASA project	Climate Change
13.45 – 14.00 pm	Discussion/ Q & A	
14.00 – 14.15 pm	MEL plan and MEL online system	Megi Cullhaj
14.15 – 14.30 pm	Data management plan	Megi Cullhaj

14.30 – 14.45 pm	Impact Assessment Plan	Timothy Manyise
14.45 – 15.15 pm	Coffee Break at the foyer	
15.15 – 15.30 pm	Comms plan	Sean Lee / Anar Khalil
15.30 – 15.35 pm	Technical reporting	Rodrigue Yossa
15.35 – 15.40 pm	Financial reporting	Tan Chao Yan
15.40 – 15.45 pm	Finance and Compliance	Glenda Munyukwi
15.45 – 15.50 pm	Procurement compliance	Hector Morais
15.50 – 16.00 pm	Grants and Contract compliance	Tan Su Ching
16.00 – 16.15 pm	Discussion/ Q & A	
End of open session for all staff		
19.00 – 21.30 pm	Dinner at XX (TBA)	

Day 2

The project leader will give a comprehensive overview of the current implementation plan during these meetings, which will be followed by a discussion of more in-depth planning for the years 2023 and 2024 with provided current budgets, taking into consideration the collaboration between partners and WorldFish.

In this discussion, it will be made clear what the timeframe and particular outputs/deliverables are for each team.

Tuesday / 29th November 2022 / Block J/ Planning sessions for years 2023 & 2024		
08.30 – 08.45 am	ETA at Block J. Meet & Greet (coffee/tea served at the foyer)	
09.00 – 09.05 am	Introduction and scope of the meeting	Project Leader (Rodrigue Yossa)
Session 1:		
09.05 – 10.05 am	Detailed planning of work in Kenya	ICIPE (Chrysantus Mbi Tanga)
10.05 – 11.05 am	Detailed planning of work in Nigeria	CORAF (James Apochi)
11.05 – 11.30 am	Coffee Break at the foyer	
11.30 – 12.30 pm	Detailed planning of work in Zambia	WF Zambia (Arthertone Jere)
12.00 – 13.30 pm	Lunch at WF Cafeteria	
Session 2:		
13.30 – 14.15 pm	Detailed planning of work in Malaysia	Project Leader (Rodrigue Yossa)
14.00 – 14.30 pm	Detailed planning of work in Sweden	SLU (Sri Kartik Baruah)
14.30 – 15.00 pm	Discussion/ Q & A	
15.00 – 15.15 pm	Coffee Break	
Session 3:		
15.15 – 16.00 pm	Updated implementation plan of the FASA project	Project Leader (Rodrigue Yossa)
16.00 – 16.30 pm	Discussion/ Q & A	
End of open session for all staff		

Day 3: Site Visit to Jitra Aquaculture Extension Center, Kedah, and Green Island Feed Mills at Simpang Ampat.

Wednesday / 30th November 2022 /Evergreen Laurel Hotel/ Site Visit	
08.15 – 08.30 am	Pick-up at Evergreen Laurel Hotel Lobby
08.30 – 10.30 am	Evergreen Laurel Hotel to Jitra Aquaculture Extension Center, Kedah
10.30 – 12.00 am	Site Visit
12.00 – 13.00 pm	Lunch
13.00 – 15.00 pm	Jitra Aquaculture Extension Center, Kedah to Green Island Feed Mills at Simpang Ampat
15.00 – 16.00 pm	Site Visit
16.00 – 17.00 pm	Green Island Feed Mills at Simpang Ampat to Evergreen Laurel Hotel
End-	

Day 4: Optional: Individual meetings with key staff at WorldFish Penang

Appendix B: Participant list

Attendance List

Event : Annual Project Workshop 2022
Date : 28 – 30th November 2022 (Monday – Wednesday)
Location : WorldFish HQ, Penang, Malaysia
Project : Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)
Project Leader & Moderator : Rodrigue Yossa

Date : 28th November 2022, Monday
Venue : Auditorium, WorldFish HQ, Penang, Malaysia

No	Organisation	Name of Participant	Attendance
	FASA Partner (s)		
1	CORAF	James Ocheme Apochi	Yes
2	CORAF	Lenient Mercy Onivie Ibiyo	Yes
3	CORAF	Caroline Iretioluwa Ayo-Olalusi	Yes
4	NRDC	Alice Tembo	No
5	SLU	Sri Kartik Baruah	Yes
6	ICIPE	Chrysantus Mbi Tanga	Yes
7	Aller Aqua	Alexander Michael Greiling	Yes
8	Includovate	Sujata Ganguly	Yes
9	Nagi Enterprise	Mzime Regina Murisa	Virtual
10	Nagi Enterprise	Angela Samundengo	Virtual
11	Nagi Enterprise	Fanuel Kapute	Virtual
	WorldFish		
1	Interim Director General and Acting Senior Director of Aquatic Foods Systems	Essam Mohammed	Yes
2	Senior Scientist (Project Leader)	Rodrigue Yossa	Yes
3	Scientist Zambia	Arthertone Jere	Yes
4	Research Assistant	Gregory Mulenga Kasanga	Yes
5	Scientist Malaysia	Aaqillah Amr Binti Mohd Amran	Yes
6	Research Assistant-Laboratory	Ning Shahira Binti Sharbini	Yes
7	Research Assistant-Fish feeds	Muhammad Rahimi Ramli	Yes
8	Research Analyst	Nurulhuda Ahmad Fatan,	Yes
9	Research Assistant	Khairul Rizal Abu Bakar	No
10	Monitoring Evaluation and Learning Manager	Megi Cullhaj	Yes

11	Science Communications Specialist	Sean Lee	Yes
12	Head of Human Resources (IWMI)	Anne Heese	Yes
13	Human Resources Specialist	Abdul Aziz, Azimah	Yes
14	Portfolio Manager (PMU)	Emily Khor	Yes
15	Senior Program Associate (PMU)	Yogeswary Chellappan	Yes
16	Senior Program Associate (PMU)	Pak Song Kee	No
17	Office Administrator	Pauline Michael	Yes
18	Grants and Contracts Manager	Tan Su Ching	Yes
19	Grants and Contracts Specialist	Hanley Ong	Yes
20	Risk and Compliance Analyst	Azira Azmi	Yes
21	Global Procurement Lead	Hector Morais	Virtual
22	Manager, Research Finance	Tan Ban Swee	Yes
23	Project Accountant	Tan Chao Yan	Yes
24	Assistant Accountant	Ooi Jia Qi	Yes
25	Country Director, Zambia & Southern Africa	Victor Siamudaala	No
26	Consultant	Sunil Siriwardena	No
27	Consultant	Rohana Subasinghe	No
28	Manager, Operations and Program Delivery	Victoria Nkole	No
29	Accounts Manager	Isaac Toyin Emmanuel,	No
30	Senior Accountant	Chindika Sakala	No
31	HR Specialist	Lee Huey Ching	Yes
32	HR Manager, Reward and HR Systems	Sim Hui Yee	Yes
33	Compliance and Admin Manager	Fok Siew Choy	Yes
34	Research Assistant	Solehah Hashim	Yes
35	Research Assistant	Nuratikah Azmi	Yes
36	Research Assistant	Difa Dhaniah Zharfan Engcong	Yes
37	Research Assistant	Nurimanina Najwa Shahrin	Yes
38	Research Assistant	Wong Jian Shen	Yes

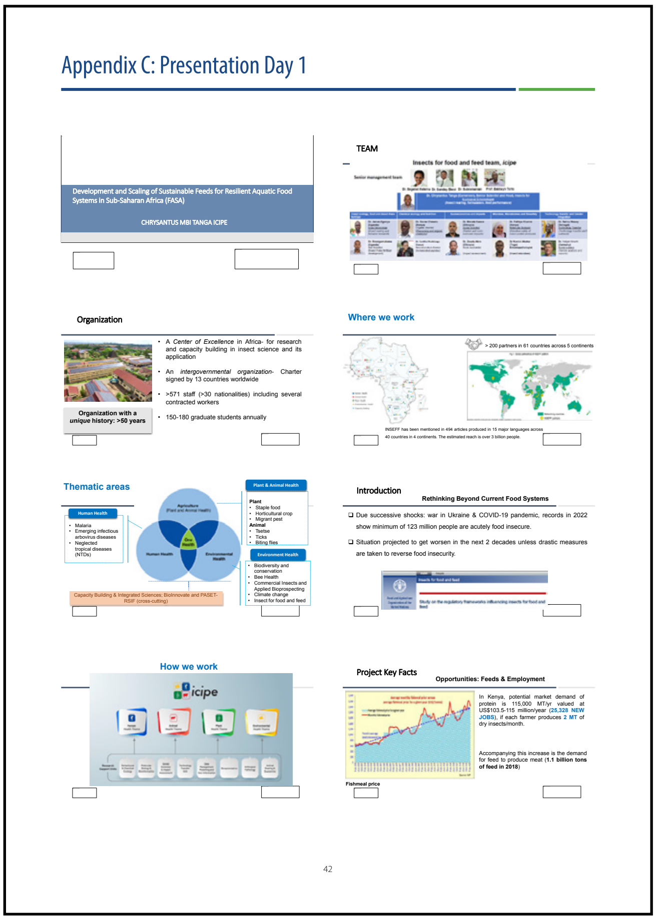
Attendance List

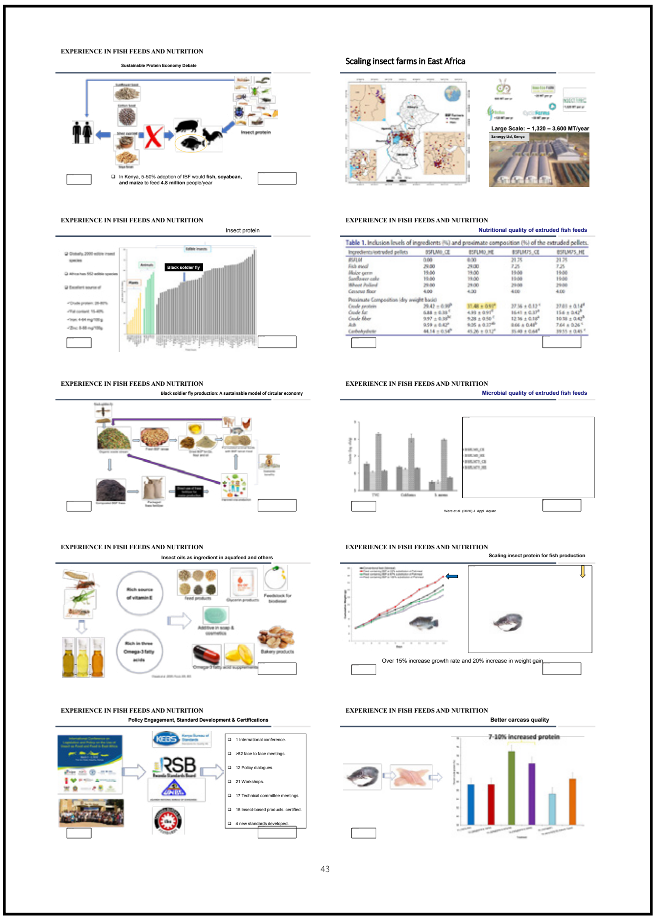
Event : Annual Project Workshop 2022
Date : 28 – 30th November 2022 (Monday – Wednesday)
Location : WorldFish HQ, Penang, Malaysia
Project : Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)
Project Leader & Moderator : Rodrigue Yossa

Date: 29th November 2022, Tuesday
Venue: Black J, WorldFish HQ, Penang, Malaysia

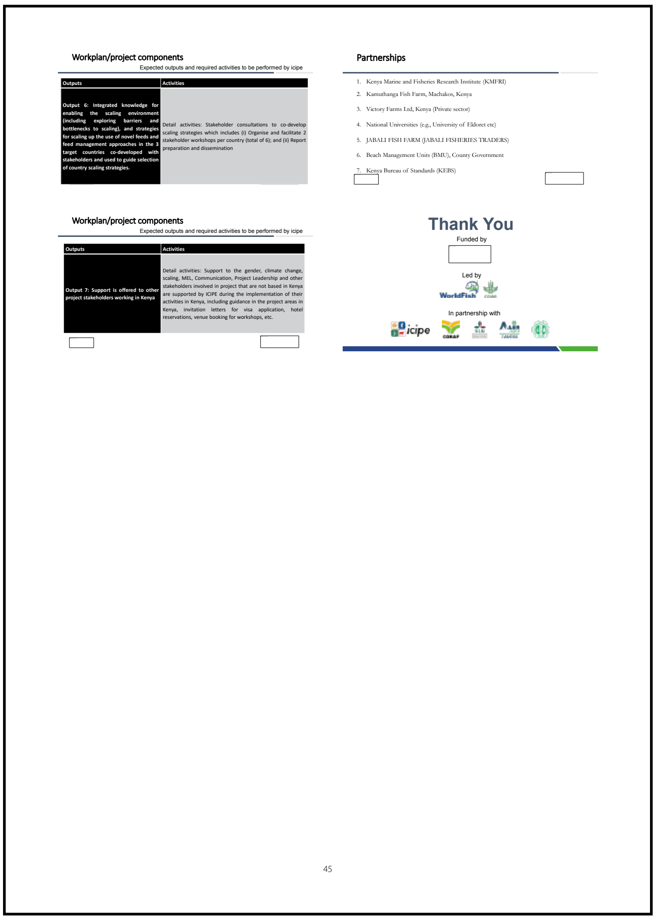
No	Organisation	Name of Participant	Attendance
1	CORAF	James Ocheme Apochi	Yes
2	CORAF	Lenient Mercy Onivie Ibiyo	Yes
3	CORAF	Caroline Iretioluwa Ayo-Olalusi	Yes
4	NRDC	Alice Tembo	No
5	SLU	Sri Kartik Baruah	Yes
6	ICIPE	Chrysantus Mbi Tanga	Yes
7	Aller Aqua	Alexander Michael Greiling	Yes
8	Includovate	Sujata Ganguly	Yes
9	Nagi Enterprise	Mzime Regina Murisa	Virtual
10	Nagi Enterprise	Angela Samundengo	Virtual
11	Nagi Enterprise	Fanuel Kapute	Virtual
	WorldFish		
1	Senior Scientist (Project Leader)	Rodrigue Yossa	Yes
2	Scientist Zambia	Arthertone Jere	Yes
3	Research Assistant	Gregory Mulenga Kasanga	Yes
4	Post-Doctoral Fellow	Aaqillah Amr Binti Mohd Amran	Yes
5	Research Assistant-Laboratory	Ning Shahira Binti Sharbini	Yes
6	Research Assistant-Fish feeds	Muhammad Rahimi Ramli	Yes
7	Research Analyst	Nurulhuda Ahmad Fatan	Yes
8	Research Assistant	Khairul Rizal Abu Bakar	Yes
9	Research Program Manager	Megi Cullhaj	Yes
10	Portfolio Manager (PMU)	Emily Khor	Yes
11	Senior Program Associate (PMU)	Yogeswary Chellappan	Yes
12	Office Administrator	Pauline Michael	Yes

13	Research Finance Manager	Tan Ban Swee	No
14	Project Accountant	Tan Chao Yan	Yes
15	Assistant Accountant	Ooi Jia Qi	Yes
16	Country Director, Zambia & Southern Africa	Victor Siamudaala	No
17	Consultant	Sunil Siriwardena	No
18	Consultant	Rohana Subasinghe	No
19	Manager, Operations and Program Delivery	Nkole, Victoria	No
20	Accounts Manager	Emmanuel, Isaac Toyin	No
21	Senior Accountant	Sakala, Chindika	No


Appendix C: Presentation Day 1
Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)
CHRYSANTUS MBI TANGA ICIPE
TEAM
Insects for food and feed team, icipe
Organization
A Center of Excellence in Africa- for research and capacity building in insect science and its application
An intergovernmental organization- Charter signed by 13 countries worldwide
>571 staff (>30 nationalities) including several contracted workers
150-180 graduate students annually
Organization with a unique history: >50 years
Where we work
> 200 partners in 61 countries across 5 continents
INSEFF has been mentioned in 494 articles produced in 15 major languages across 40 countries in 4 continents. The estimated reach is over 3 billion people.
Thematic areas
Human Health
Malaria
Emerging infectious arbovirus diseases
Neglected tropical diseases (NTDs)
Plant & Animal Health
Plant
Staple food
Horticultural crop
Migrant pest
Animal
Tsetse
Ticks
Biting flies
Environment Health
Biodiversity and conservation
Bee Health
Commercial Insects and Applied Bioprospecting
Climate change
Insect for food and feed
Capacity Building & Integrated Sciences; BioInnovate and PASET-RSIF (cross-cutting)
Introduction
Rethinking Beyond Current Food Systems
Due successive shocks: war in Ukraine & COVID-19 pandemic, records in 2022 show minimum of 123 million people are acutely food insecure.
Situation projected to get worsen in the next 2 decades unless drastic measures are taken to reverse food insecurity.
How we work
icipe
Project Key Facts
Opportunities: Feeds & Employment
In Kenya, potential market demand of protein is 115,000 MT/yr valued at US$103.5-115 million/year (25,328 NEW JOBS), if each farmer produces 2 MT of dry insects/month.
Accompanying this increase is the demand for feed to produce meat (1.1 billion tons of feed in 2018)
Fishmeal price
42


EXPERIENCE IN FISH FEEDS AND NUTRITION
Sustainable Protein Economy Debate
Insect protein
In Kenya, 5-50% adoption of IBF would fish, soyabean, and maize to feed 4.8 million people/year
Scaling insect farms in East Africa
Large Scale: ~ 1,320 – 3,600 MT/year
Sanergy Ltd, Kenya
EXPERIENCE IN FISH FEEDS AND NUTRITION
Insect protein
Black soldier fly
EXPERIENCE IN FISH FEEDS AND NUTRITION
Nutritional quality of extruded fish feeds
Table 1. Inclusion levels of ingredients (%) and proximate composition (%) of the extruded pellets.
EXPERIENCE IN FISH FEEDS AND NUTRITION
Black soldier fly production: A sustainable model of circular economy
EXPERIENCE IN FISH FEEDS AND NUTRITION
Microbial quality of extruded fish feeds
Were et al. (2020) J. Appl. Aquac
EXPERIENCE IN FISH FEEDS AND NUTRITION
Insect oils as ingredient in aquafeed and others
EXPERIENCE IN FISH FEEDS AND NUTRITION
Scaling insect protein for fish production
Over 15% increase growth rate and 20% increase in weight gain
EXPERIENCE IN FISH FEEDS AND NUTRITION
Policy Engagement, Standard Development & Certifications
KEBS
RSB
1 International conference.
>52 face to face meetings.
12 Policy dialogues.
21 Workshops.
17 Technical committee meetings.
15 Insect-based products. certified.
4 new standards developed.
EXPERIENCE IN FISH FEEDS AND NUTRITION
Better carcass quality
7-10% increased protein
43


Primary project goals
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 (30% women and 40% youth), leading to increased income, improved food security, and reduced waste and pollution.
TARGET SITES (LOCATIONS & FACILITIES)
Kamuthanga Aqua Fish Farm in Machakos County
Africa's first certified fish farm with EcoMark Africa label from ARSO using Recirculating Aquaculture System (RAS)
Plug-in type of RAS technology
Expected outcomes
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
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.
Workplan/project components
Expected outputs and required activities to be performed by icipe
Outputs
Activities
Output 1: Participation in annual project meetings and planning a Start-up workshop
Detail activities: Participate in annual project meetings and conduct a project start-up workshop at ICIPE (Kenya) in the year of 2022
Output 2: 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
Detail activities: Conduct 1 scoping assessment, which includes (i) Conducting a literature review of relevant research documents and protocol; (ii) Design scoping studies for Kenya; (iii) Data collection (including sample ingredients) and analysis; and (iv) Report preparation and publication.
TARGET SITES (LOCATIONS & FACILITIES)
USENGE FISH CAGES LAKE VICTORIA, SIAYA COUNTY
Workplan/project components
Expected outputs and required activities to be performed by icipe
Outputs
Activities
Output 3: New knowledge and data on nutrient requirements of improved strains of tilapia and African catfish produced, validated, and made widely available
Detail activities: Investigate nutrient requirements in improved strains of tilapia and African catfish which includes (i) Design research protocols; (ii) Secure animal ethics approval; (iii) Conduct 12 tilapia experiments and 8 catfish experiments in project countries; (iv) Analyse data and samples; and (v) Research report preparation and publication and addition of results to WF's Better Management Practices guidelines (BMPs).
TARGET SITES (LOCATIONS & FACILITIES)
100, 300M² PONDS IN SAMIA, BUSIA COUNTY NEAR LAKE VICTORIA
Workplan/project components
Expected outputs and required activities to be performed by icipe
Outputs
Activities
Output 4: New data and knowledge on local ingredients generated, used in the formulation of novel fish feeds, and made widely available
Detail activities: Stakeholder consultations (1 online workshop per country) to discuss results of activity 2.1.1 and potential benefits, risks, challenges, and hazards to the use of local ingredients which includes (i) Organise and facilitate 1 online stakeholder workshop per country; and (ii) Reports preparation and dissemination.
Detail activities: Validate 9 formulated fish feeds through 6 on-farm pilots (2 per country which include (i) Design and validate research protocols; (ii) Conduct validation experiments on-farm; (iii) Analyse the data and produce reports; and (iv) Hold workshops to share and discuss results (1 workshop per country).
TARGET SITES (LOCATIONS & FACILITIES)
Kenya Marine and Fisheries Research Institute (KMFRI), Sagana, Nyeri County
Workplan/project components
Expected outputs and required activities to be performed by icipe
Outputs
Activities
Output 5: 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 context-specific circumstances and needs
Detail activities: Hold consultation workshops to develop the printed booklets/manuals for ingredients and fish feeds, which includes (i) Organise and facilitate 2 workshops per country (1 online and 1 in-person); and (ii) Reports preparation and dissemination.
Detail activities: Hold workshops to train feed millers and fish farmers on ingredients, feeds, practices, databases, booklets/manuals which includes (i) Organise and facilitate 4 training workshops per country (2 online and 2 in-person); and (ii) Reports preparation and dissemination.
44


Workplan/project components
Expected outputs and required activities to be performed by icipe
Outputs
Activities
Output 6: 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.
Detail activities: Stakeholder consultations to co-develop scaling strategies which includes (i) Organise and facilitate 2 stakeholder workshops per country (total of 6); and (ii) Report preparation and dissemination
Partnerships
1. Kenya Marine and Fisheries Research Institute (KMFRI)
2. Kamuthanga Fish Farm, Machakos, Kenya
3. Victory Farms Ltd, Kenya (Private sector)
4. National Universities (e.g., University of Eldoret etc)
5. JABALI FISH FARM (JABALI FISHERIES TRADERS)
6. Beach Management Units (BMU), County Government
7. Kenya Bureau of Standards (KEBS)
Workplan/project components
Expected outputs and required activities to be performed by icipe
Outputs
Activities
Output 7: Support is offered to other project stakeholders working in Kenya
Detail activities: Support to the gender, climate change, scaling, MEL, Communication, Project Leadership and other stakeholders involved in project that are not based in Kenya are supported by ICIPE during the implementation of their activities in Kenya, including guidance in the project areas in Kenya, invitation letters for visa application, hotel reservations, venue booking for workshops, etc.
Thank You
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icipe
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Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)

By Dr. James Apochi (CORAF)

Norad · WorldFish · CGIAR

Workplan Contd.

Three Months for Sampling and data collection and Two Months for Analysis and write up. The selected states are highlighted below:

North Central: Consisting of Benue, Kogi, Kwara, Nasarawa, Niger, and Plateau States, as well as the Federal Capital Territory.

North East: Consisting of Adamawa, Bauchi, Borno, Gombe, Taraba, and Yobe States.

North West: Consisting of Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto, and Zamfara States.

South East: Consisting of Abia, Anambra, Ebonyi, Enugu, and Imo States.

South South: Consisting of Akwa Ibom, Bayelsa, Cross River, Delta, Edo, and Rivers States.

South West: Consisting of Ekiti, Lagos, Ogun, Ondo, Osun, and Oyo States.

Introduction on organization and team

- CORAF (West and Central Africa Council for Agricultural Research and Development) is in charge of the FASA Project
- National Center of Specialization (NCoS) on Aquaculture supervised by ARCN
  - Nigerian Institute for Oceanography and Marine Research (NIOMR), Lagos
  - National Institute for Freshwater Fisheries Research (NIFFR), New Bussa
  - Nigerian Stored Products Research Institute (NSPRI), Ilorin
- Recruitment of Research Team from NCoS by CORAF
  - Research Leader (Aquaculture Specialist, PhD) will coordinate all the activities of the project
  - Research Scientist (Aquaculture Nutritionist, PhD) full-time and will lead the Activities 1.1, 2.1, 2.2, 3.2, 3.5 and 4.4
  - Research Technician (MSc) full-time
  - Lab Attendant

Partnership

Local partners

1. Grand cereals Limited. Producer of Vital fish feed: Mrs Adedeji, Mobile- +2348036071406
2. TRITON group of company: Mr Ope, +2348134564837
3. OBA FARMS Limited producer of Crown fish feed: Dr. Godwin, +2347031074749
4. NIOMR fish feed miller (Government feed miller): Mr Bernard Edah +2348037729387
5. Olam International, Blue crown: Mr Busayo,+2347062951587
6. Lawrence Feed mill Ventures
7. Abdulsalam Fish Farm

Experience in fish feeds and Nutrition

- **CASSAVA FLOUR**

Cassava was used to replace maize in fish feed due to high cost of maize and maize being the major diet for human. About 40% cassava flour was included in Extruded floating fish feed

- **CASSAVA LEAF PROTEIN CONCENTRATE**

Production of Cassava leaf protein concentrate from the leaves. Studied have been carried out on its nutritional and anti-nutritional composition and have incorporated it into a practical extruded diet for fish.

- **LANTERN FISHMEAL PRODUCTION**

Capturing, processing and utilization of a deep-sea fish species (Lantern fish) for the production of an indigenous less expensive fishmeal is on-going

- **PROBIOTIC PRODUCTION**

The novel production of isolating probiotics (Lactic acid bacteria LAB) from the gut of our indigenous fish species and their subsequent culture and used as an addictive or supplement in fish feed to boost fish's health and increase production.

Facilities

Available Facilities

- Facilities at the NCoS (NFFRI and NIOMR) which needs to be up graded
- The demonstration research will be carried in Fish Farmer's farm with enough ponds (12 ponds for each species) to be rented for use.
- Laboratory equipment for chemical analysis not available in NCoS will be sourced from outside

Experience in fish feeds and Nutrition Contd.

- **CLUPEID FISHMEAL PRODUCTION AND UTILIZATION**

Clupeid fish has been studied with its chemical composition determined and used to produce local fishmeal (WAAPP Fishmeal) which is replacing foreign fishmeal in fish feeds in Nigeria.

- **USE OF BAOBAB LEAF MEAL AS SOURCE OF VITAMIN C**

Baobab leaves studied and used to produce leaf meal as source of vitamin C in fish feeds.

- **DEVELOPMENT OF FEEDS FOR ALL STAGES OF CATFISH AND TILAPIA**

Development of different feeds for fry, fingerlings, juveniles and broodstock of freshwater fish has been carried out.

- **UTILIZATION OF INSECT PROTEIN**

Performance of maggot meal as a substitute for imported fishmeal in the culture of *Clarias gariepinus* Juveniles was investigated. Based on the results, the use of maggot to substitute the costly fish meal to about 75% inclusion level is recommended to fish farmers and feed industry though work is on-going.

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Workplan

Geographies

Scoping study will be carried out through assessment survey of selected states per every Geopolitical zone with a total of twenty two (22) states and FCT chosen to obtain knowledge and current nutrient composition of available feed ingredients in Nigeria to increase data in use for fish feeds project. Every available ingredient will be collected in the selected local and urban markets with the assistance of field personnel in each of the state and locality who could be a staff of the Ministry of Agriculture.

Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)

Arthertone Jere & Gregory M. Kasanga
Yossa Rodrigue - Project Leader

Sustainable Efforts to Resolve Feed Challenges

- Search for **viable alternatives to local fish feed** continue to be focus in Zambia (SADC, 2019; GOM,2020; FAO, 2020).

Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)

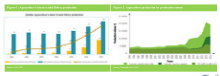
- Introduction 01
- Current Status in Zambia 02
- Sustainable Efforts to Resolve Feed Challenges 03
- Forward plan 04
- Project goals 05
- Partnerships 06

Forward plan

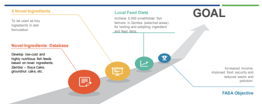
Phase	SCOOPING	RESEARCH	TESTING	CAPACITY
Process	Feed Ingredient & nutrient requirements of strains of Tilapia	Develop 5 novel local ingredients for cost-effective feed.	Testing and use of novel fish feeds	Enhance capacity of 2 stakeholders
Touchpoints	5 novel ingredients to be developed	Southern, Northern, Muchinga, Lusaka, Eastern & North Western Provinces of Zambia	5,000 farmers	(1) Local Miller (1) Fish Farmer Cooperative
Satisfactory Levels	★★★★★	★★★★★	★★★★★	★★★★★

Introduction

- Aquaculture is the fastest growing food production industry/sector in Zambia, increasing from 12.9 to 36.1 tones, 2012–2018, respectively(Mwewa et al., 2021)
- High increase in demand & reduction in availability of quality fish feeds has lead to slow growth of smallholder aquaculture producers in Zambia (FAO, 2020).



Project goals

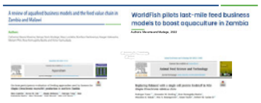


Current Status in Zambia

- Currently, Fish feeds takes about 60% of the production cost for both smallholder & commercial aquaculture farmers in Zambia (GOM,2020; FAO, 2020)
- Smallholder fish farmers in Zambia face a myriad of challenges, but one of their biggest constraints is limited access to high-quality fish feed (Mwema & Mudege, 2022)
- Study conducted in Northern & Luapula provinces of Zambia revealed that only 16% of fish farmers use high-quality fish feed… **limiting farm productivity**
- Smallholders fish farmers are integral to the country's aquaculture sector & are largely responsible for feeding & nourishing its rural populations.
- As such, supporting local production through use of local ingredient if amended can help to uplift the current situation, more studies on the use of different feed ingredient needs to be done (Hua, 2019).

Partnerships

Current Status in Zambia (Studies conducted on Feeds)



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FASA Project Annual Workshop: Introduction and scope of the meeting

By Rodrigue Yossa, Project Leader

Annual Workshop Goal & Frequency

Objectives of annual workshop:

1) Meet in person: synergy and complementarity
2) Discuss project progress in each country
3) Conduct the annual planning for next year
4) Site visit

Annual project workshop cost breakdown - Malaysia (HQ) – x 2 (Y1 & Y5)
Annual project workshop cost breakdown - Nigeria (Y2)
Annual project workshop cost breakdown - Zambia (Y3)
Annual project workshop cost breakdown - Kenya (Y4)

Content

1. Project Objective, Partners and Geographies
2. Annual Workshop Goal & Frequency
3. 2022 Annual Workshops

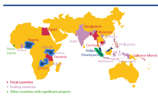
2022 Annual Workshops

Day 1, Monday 28th November 2022 : 3 sessions in Auditorium / WF Auditorium/ Presentations from FASA partners

Day 2, Tuesday 29th November 2022: 3 sessions in Block J / Planning sessions for years 2022-2023 (Nov. 2022- Dec. 2023)

Day 3, Wednesday 30th November 2022: 2 Site Visits

Project Objective, Partners and Geographies



GOAL: July 2022 - June 2017

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.

Consultants

Local feed millers & farmers groups

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Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)

By Alice Tembo NRDC

Project goals

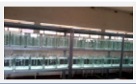
- NRDC Staff capacity building in research activities particularly the NRDC contact person and other staff of Fisheries Science department.
- Exposure of students to research findings through seminars and Scientific talks.
- Utilization of novel feed at the Aquaculture Skills Centre to boost fish production and adoption by aquaprenuers countrywide.
- Vital lessons will be learned from other participating countries on feed experiments and impacts in chosen communities.

Introduction on organization and team, experience in vocational training and collaboration with WorldFish, workplan to implement the FASA project

1. Introduction
2. Project key facts
3. Project goals
4. Project components
5. Partnerships

Project components

- NRDC shall host the feed experiments in the Fish Lab.
- NRDC shall provide a contact person who will support the researchers in conducting and implementing the feed trials.
- NRDC shall provide a Technician who will support the researchers upgrade the Fish Lab to a Recirculating Aquaculture System.
- NRDC shall participate in the Annual Project Meetings
- NRDC shall receive rentals from WorldFish to facilitate security of the Fish Lab.



Flow-through aquaculture system in the NRDC Fish Lab

Partnerships

- WorldFish
- Possibility of building more Partnerships

Introduction

- The Natural Resources Development College (NRDC), one of Zambia's top Agricultural college, was established in 1964 through a declaration by the First Republican President Dr. Kenneth David Kaunda.
- The first cohort of students was admitted in 1965 in two three-year diploma programmes in Agriculture and a certificate in Home Economics.
- Over the last five decades, the programmes offered have evolved to include ten diploma programmes in agriculture and related disciplines. Fisheries Science is one such discipline.
- Diploma Qualification is the flagship qualification offered by the college. Graduates attain level 6 diploma qualifications under the Zambia Qualification Framework (ZQF).
- In line with the college vision, practical learning is core and highly esteemed.
- The Fisheries Science curriculum was upgraded, an Aquaculture Skills Training Centre and E-learning platform established and commencement of students internships from first year of study have been implemented through collaboration and support from WorldFish.
- NRDC has produced over 12,000 quality graduates well versed in hands-on skills since inception who have contributed greatly to national development in various portfolios.

Thank You

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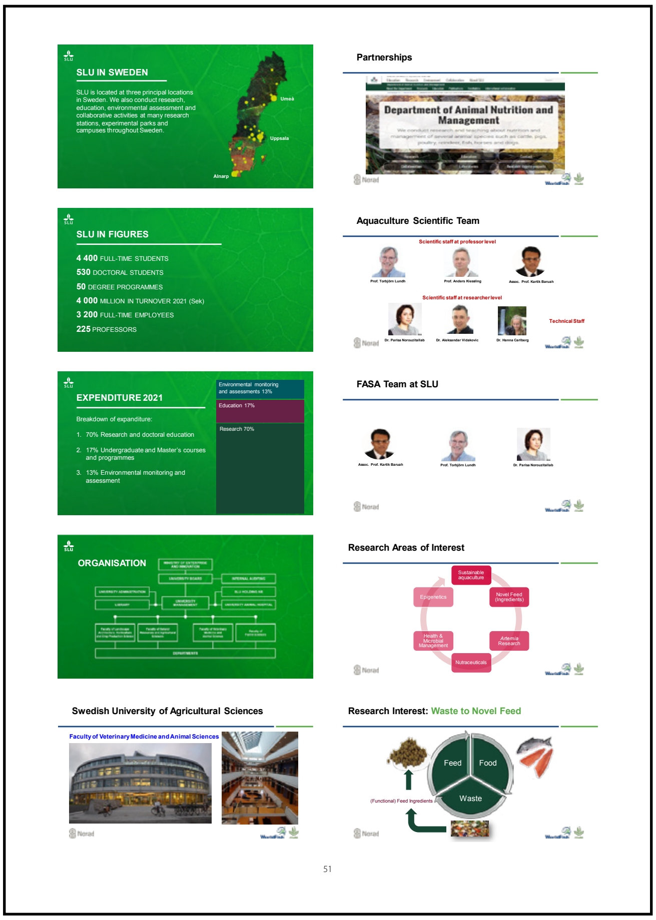
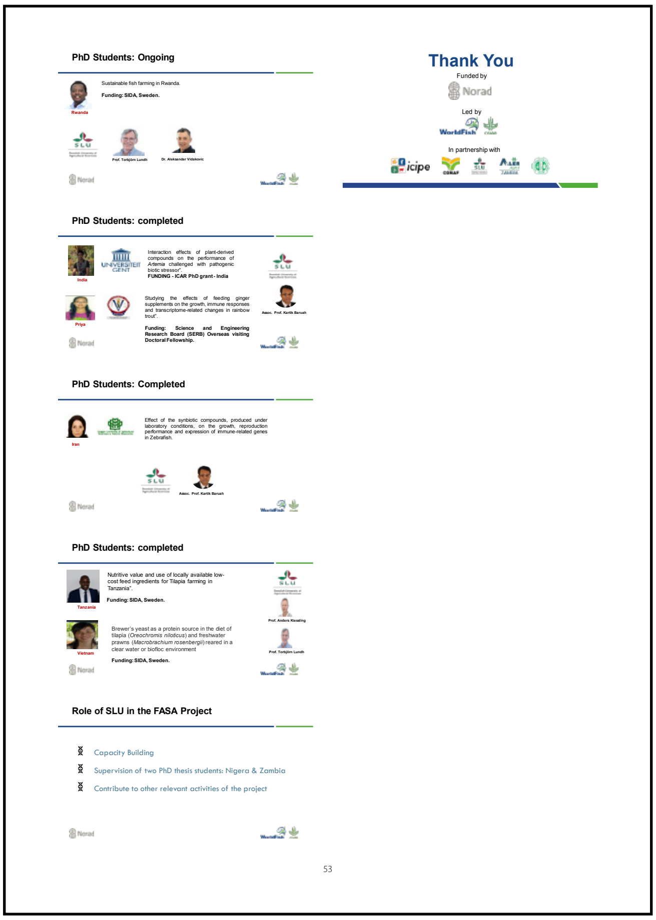
Project key facts

- The Fish Laboratory was upgraded through the design and building of a flow-through aquaculture system with support from WorldFish.
- Two major research projects were conducted in the Wet Lab in collaboration with WorldFish and other institutions. "Replacing fishmeal with a single cell protein feedstuff in Nile tilapia *Oreochromis niloticus* diets" and "Performance of *Oreochromis niloticus* and *Oreochromis andersonii* in controlled laboratory conditions in Zambia."
- NRDC students and staff utilize the upgraded Fish Lab in Basic Research.
- Further upgrade of the Fish Lab will be done to facilitate hosting of the novel feed experiments
- NRDC ready to host the feed experiments during the project life cycle
- NRDC will provide security to the Fish Lab


Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)
Norad
WorldFish
WE TAKE ON FUNDAMENTAL ISSUES THAT AFFECT US ALL
Sustainable food supply
Sustainable cities and rural areas
Animal and human welfare
Biodiversity
Biomaterials and bioenergy
Clean water and oceans
SCIENCE AND EDUCATION FOR SUSTAINABLE LIFE
WE MAKE THE WORLD A BETTER PLACE
VISION
SLU plays a key role in development for sustainable life, based on science and education.
Research & Education at SLU
EDUCATION
WE ARE A WORLD-CLASS INTERNATIONAL UNIVERSITY
Research & Education at SLU
RESEARCH
COLLABORATE WITH US
Research & Education at SLU
UNIQUE INFRASTRUCTURE
50


SLU IN SWEDEN
Partnerships
Department of Animal Nutrition and Management
SLU IN FIGURES
4 400 FULL-TIME STUDENTS
530 DOCTORAL STUDENTS
50 DEGREE PROGRAMMES
4 000 MILLION IN TURNOVER 2021 (Sek)
3 200 FULL-TIME EMPLOYEES
225 PROFESSORS
Aquaculture Scientific Team
EXPENDITURE 2021
FASA Team at SLU
ORGANISATION
Research Areas of Interest
Swedish University of Agricultural Sciences
Research Interest: Waste to Novel Feed
Feed
Food
Waste
51


Research Areas: Wet lab for Digestibility & Growth trials
Research Areas: Nutraceuticals in Health & Microbial Management
Research Areas: Artemia Lab at SLU
PhD Students: Ongoing
Research Areas: Artemia as feed and model organism
PhD Students: Ongoing
Research Areas: Nutraceuticals in Health & Microbial Management
PhD Students: Ongoing
Research Areas: Nutraceuticals in Health & Microbial Management
PhD Students: Ongoing
52


PhD Students: Ongoing
Thank You
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Norad
Led by
WorldFish
In partnership with
PhD Students: completed
PhD Students: Completed
PhD Students: completed
Role of SLU in the FASA Project
Capacity Building
Supervision of two PhD thesis students: Nigeria & Zambia
Contribute to other relevant activities of the project
53

Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)

Introduction to Aller Aqua Research & Aller Aqua Zambia
28.11.2022 - Dr. Alexander M. Greiling

Norad | WorldFish | CGIAR

Introduction to Aller Aqua Research & Aller Aqua Zambia

1. Overview
2. Organogram
3. Aller Aqua Zambia and Aller Aqua Research
4. Prior collaborations with WorldFish
5. Role in FASA project
6. Insights to industry challenges regarding raw materials

1. Overview of Aller Aqua

- More than 58 years of experience in developing and producing the most effective and high-quality fish feed
- Active in 70+ countries and the 3rd largest fish feed producer in the EU
- Employees from 30+ different nationalities
- Factories in 7 countries: Denmark, Germany, Poland, Egypt, China, Zambia, and Serbia
- A large variety of feeds for 30+ species
- Careful selection of high-quality raw materials
- Continuous testing of feed at our Research Center, at selected test stations, and at participating fish farms

2. Organogram

3. Aller Aqua Zambia Ltd.

- Factory built in 2017
- Situated near Lake Kariba
- Joint venture with Oakfield Holding
- The factory is still the most modern of its kind in Africa
- Production capacity 50.000 T/year

3. Aller Aqua Research

- Aller Aqua Research is established in 2013
- Laboratory trials are mostly conducted at Aller Aqua Research in Büsum, Germany
- The trial station consists of several recirculating aquaculture systems, adaptable to different environmental conditions
- Partnership with universities and access to modern laboratories for a variety of analytical methods complete the set-up of Aller Aqua Research
- In close partnership with fish farmers the laboratory trials are scaled up and re-evaluated under field conditions

3. Aller Aqua Research - Trial Station Zambia

- Situated on Lake Kariba (Zambia)
- 4 Employees
- 8 cages (5x5x4m)
- 1 work platform
- Main functions:
  - Testing of new ingredients
  - Testing of new formulations
  - Benchmarking
  - Technical Sales Support

4. Prior collaborations with WorldFish

Project title:
- Replacing fishmeal with single cell proteins, MRD-Pro and DY-Pro, in tilapia *Oreochromis niloticus* diet

Role of Aller Aqua:
- Supply of information on relevant raw materials
- Supply of fishmeal
- Assisting in trial setup and induction of local research staff (in Zambia)
- Provided input to scientific research paper

5. Role in FASA project

- Assist literature research
- Help in RM evaluation
- Provide frequent feasibility updates for various RMs
  - Includes feasibility assessments
- Assist in reporting
- Assist in designing research protocols and evaluation of trials
- Assist in feed formulation
- Support on site trainings

- Workplan:
  - In line with WF workplan; on call if input is needed

6. Insights to industry needs regarding raw materials

Direct RM related challenges:
- Consistency in composition
- Availability of volume
- Number of RMs limited

Indirect challenges:
- Supplier Due-Diligence
- Reliability + associated expenses (direct/indirect)
  - Transport
  - Supplier
- Laboratory testing facilities limited

Gender and Social Inclusion (GSI) in (FASA)

Dr. Sujata Ganguly, Includovate

Norad | WorldFish | CGIAR

WE ARE A CERTIFIED SOCIAL ENTERPRISE

that donates the majority of our profits to furthering our mission.

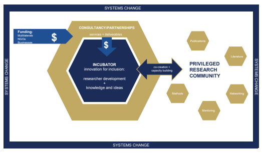
OUR MISSION is to incubate transformative and inclusive solutions for measuring, studying and changing discriminatory norms that lead to poverty, inequality and injustice.

OUR VISION is for inclusive markets, businesses, states and institutions that provide all people with the power, aspiration and ability to innovate for their development and advancement.

Feminist Leadership and Sistership Licence

Headquarter: Australia
Pilot: Ethiopia
Expansion: Papua New Guinea
Scale up potential: Kenya, Tanzania, Rwanda, Uganda, India, and anywhere in the Global South

Social License Model



INCLUDOVATE'S AREAS OF SPECIALISATION
Research, Design, Capacity Building, Monitoring and Evaluation

Includovate's projects

- 55 projects in three years - with more than 50 per cent being in Africa
- Gender Inclusion - using participatory methods is core strength (over 25 per cent)
- Partner organisations/ Researchers in different countries
- At least 8 multi-country projects spread across more than three countries
- World Fish - worked on two earlier research focusing on women empowerment as well as on fish feeds
- At least 3 projects, focusing exclusively on GESI, training, tool kit development

Previous work on fish feeds

Affordable local ingredients for fish feeds in low-income contexts: A social and gender risk and opportunity analysis

Available at:

https://digitalarchive.worldfishcenter.org/handle/20.500.12348/5102

Introduction

Increased global fish demand is increasing intensification.

Fish feed is the main cost and accounts for 40-70 percent of total production costs in intensive farming systems (Enyidi et al. 2017; Singh et al. 2018).

Successful intensification requires a nutritionally balanced diet for fish and low cost production (Bharathi et al. 2019).

How to reduce costs? Shift to using local ingredients in fish feeds & develop related businesses.

But all innovations and investments come with risks *and* opportunities.

Risk of uneven reach/ benefits for women and youth (and other marginalised groups).

How can fish feeds be produced with affordability and without women, youth and OMG missing out?

Project facts from literature review

Using synonyms: "fishers" as men and "fisher wives" as women	Identity issue	Evidence gap	Limited studies on gendered preferences, needs and participation in nutrition and the use of fish feeds
GESI blind aquaculture studies	GESI blind evidence	Lack of disaggregated data	Lack of robust gender-disaggregated data
Limited analyses on gender and social norms	Need to address the root cause	Informal institutions need to be strengthened	Informal institutions do not embrace access and ownership of assets and aquatic resources by women, even if land inheritance statutory laws change

Project goals

1. Identify needs, risks, and opportunities associated with the use of novel ingredients that are gendered and socially differentiated.
2. Identify opportunities to advance GSI goals of Norad, WorldFish, and other key stakeholders within the novel feeds landscape.
3. Ensure that women, youth, and OMG are prioritised throughout implementation

Project components - completed in 6 months

- Start with a literature review to identify country specific gaps
- Build upon existing knowledge, e.g. WEFI
- Co-create/develop RQs with people from the country of study - meet with partners (local cooperatives and groups of women, youth, fish farmers, and feed millers)
- Design it to be repeated

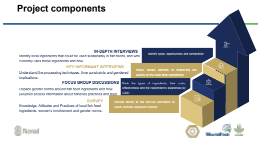
Outputs:
- Country level gender and social inclusion assessment in the Nigeria, Zambia and Kenya using a context-sensitive approach and compiling sex-disaggregated data.
- Gender and Inclusive Development Action Plan (GIDAP)
- Outcome report
- Publications

GSI analysis framework

INTERSECTIONALITY

Laws, Policies, Institutional Practices	Cultural Norms, Beliefs	Gender Roles, Responsibilities & Time Use	Access to, and Control Over Resources	Power & Decision-Making
The extent to which laws, policies, regulations, and institutional practices contain explicit gender biases	Locally accepted rules that influence how females and males behave in different domains	The division of labour between productive (market) economic activity and reproductive (non-market) activity that characterises gender-based roles and activity	How genders behave in different domains related to productive assets and resources and information access	The ability of men and women to decide, influence, & exercise control over material, human, intellectual and financial resource

Project components



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icipe | CORAF | SLU | Aller Aqua Zambia

Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)

Dolore magna aliqua

Norad | WorldFish | CGIAR

Integration of Climate Change and Environmental Considerations in Fish Feeds and Nutrition Research

1. Introduction
2. Project key facts
3. Project goals
4. Project components
5. Partnerships
6. Work Plan

NAGI CONSULTANCY

Presented by NAGI Enterprise

1. Introduction

- The FASA project focuses on
  - Sustainable aquatic food systems
  - Alternative, sustainable fish feeds versus commercial feeds and
  - Integrating climate change & environmental considerations in fish feed life cycles:
    - Highlight weaknesses in the currently available data
    - Improve and broaden understanding of aquaculture fish feed's carbon footprint along value chains - where and how greenhouse gas (GHG) emissions arise
    - Identify potential opportunities including mitigation pathways within the novel fish feeds landscape
    - Promote aquaculture development that is sustainable and optimize resource use and management opportunities

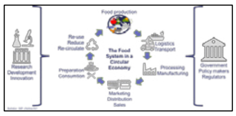
2. Project key facts

- There are gaps in fish feed nutrition research & climate change mitigation
- Most emission intensities have concentrated on seafood value chains
- Additionally, research has concentrated on outsourced commercial feed e.g., sea-based fishmeal vs locally sourced materials
- Impact Assessments are limited to:
  - Few freshwater species
  - Geographic location
  - A few processes like fish production vs. value chain
- Filling gaps requires primary data from feed companies and farmers on a case-by-case level

Project key facts…

- Decision-making and policy must be backed by data and scientific evidence
- Current and projected development of aquaculture following existing governmental policies may not directly reduce GHG emissions and hence, not support climate change mitigation objectives
- Comprehensive approaches have the potential to integrate cc as well as environmental and socio-economic considerations in impact assessments as well as foot-printing
- Previously, only *EIAs* were considered for assessing potential environmental impacts

Landscape Analysis Approach



3. Project goals

- 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.
- WorldFish estimates that 30% of total fish farmers will be women and 40% will be youth.

4. Project Components

1) Climate and Environment Report
2) Life Cycle Assessment
3) Outcome Reports
   1) Draft outcome report
   2) Final outcome report
   3) Environment Risk Assessment
   4) Environmental Assessments plans
   5) Policy briefs

Environmental assessment using SEA

(a). **Screening** - investigate whether the policy, plan or programme falls under the SEA legal framework and undertake preliminary investigations regarding SEA requirements for it

(b). **Scoping** - define boundaries of investigation, including assessment of environmental and social issues and the opportunities, alternatives, and assumptions required

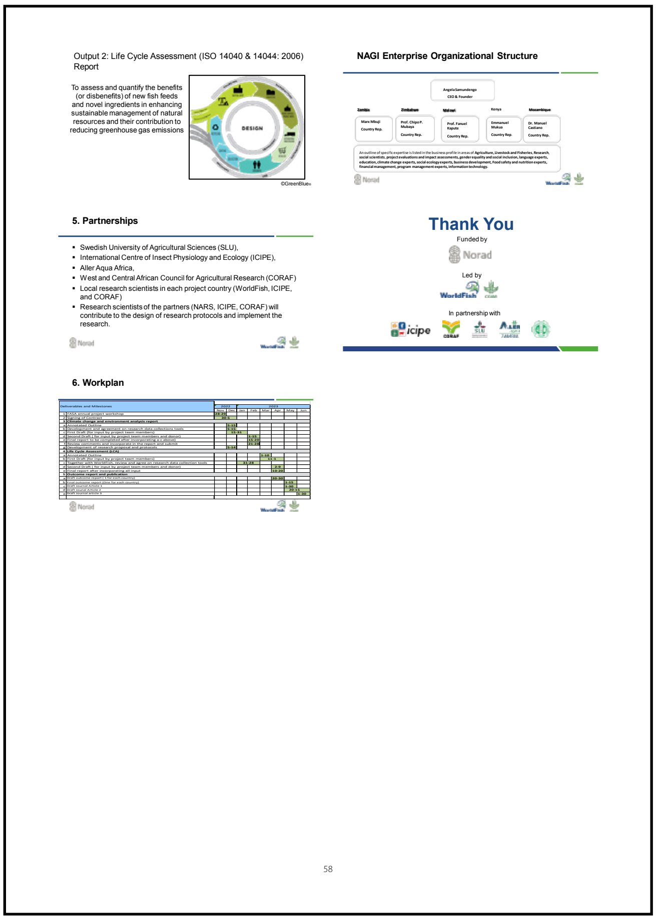
(c). **Documentation** of the state of the environment and social context - to establish a baseline on which to base judgments continuously throughout the SEA process

(d). **Determination** of the likely environmental, health, and social impacts - to guide direction of the SEA

(e). **Informing and consulting** relevant institutions on environmental, health, and social, policies, plans, or programs issues including potentially have transboundary effects

(f). **Influencing** "Decision-making" - for the policy, plan or program based on the assessment

(g). **M&E**- for effects and effectiveness of policies, plans, and programs after their implementation


Output 2: Life Cycle Assessment (ISO 14040 & 14044: 2006) Report
To assess and quantify the benefits (or disbenefits) of new fish feeds and novel ingredients in enhancing sustainable management of natural resources and their contribution to reducing greenhouse gas emissions
DESIGN
©GreenBlue
NAGI Enterprise Organizational Structure
Angela Samundengo
CEO & Founder
Zambia
Zimbabwe
Malawi
Kenya
Mozambique
Marx Mbuji
Country Rep.
Prof. Chipo P. Mubaya
Country Rep.
Prof. Fanuel Kapute
Country Rep.
Emmanuel Mukua
Country Rep.
Dr. Manuel Castiano
Country Rep.
An outline of specific expertise is listed in the business profile in areas of Agriculture, Livestock and Fisheries, Research, social scientists, project evaluations and impact assessments, gender equality and social inclusion, language experts, education, climate change experts, social ecology experts, business development, Food safety and nutrition experts, financial management, program management experts, information technology.
5. Partnerships
Swedish University of Agricultural Sciences (SLU),
International Centre of Insect Physiology and Ecology (ICIPE),
Aller Aqua Africa,
West and Central African Council for Agricultural Research (CORAF)
Local research scientists in each project country (WorldFish, ICIPE, and CORAF)
Research scientists of the partners (NARS, ICIPE, CORAF) will contribute to the design of research protocols and implement the research.
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CORAF
SLU
6. Workplan
Deliverables and Milestones
2022
2023
Nov Dec Jan Feb Mar Apr May Jun
1 FASA annual project workshop 28-29
2 Signing of Contract 30-5
3 Climate change and environment analysis report
a Annotated Outline 5-15
b Development and agreement on research data collections tools 5-15
c First Draft (for input by project team members) 15-31
d Second Draft (for input by project team members and donor) 1-15
e Final report to be completed after incorporating a-c above) 15-20
f Review comments and incorporate in the report and submit 21-28
g Development of research proposal and protocols 5-14
4 Life Cycle Assessment (LCA)
a Annotated Outline 1-10
b First Draft (for input by project team members) 11-1
c Together with WorldFish, review and agree on research data collection tools 31-28
d Second Draft (for input by project team members and donor) 2-9
e Final report after incorporating all input 10-20
5 Outcome report and publication
a Draft outcome report (1 for each country) 20-30
b Final outcome report (One for each country) 1-15
c Draft Journal Article 1 1-30
d Draft Jounal Article 2 20-15
e Draft Journal article 3 1-30
58


Appendix D: Presentation day 1
Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)
Monitoring, Evaluation and Learning
Megi Cullhaj, Timothy Manyise, Saadiah Ghazali
28 November 2022
FASA Theory of Change
Project MEL Activities
1. MEL Plan
2. Impact Assessment Plan
3. Data Management
4. Learning and Adaptive Management
5. MEL System
Indicators
There are overall 37 indicators.
5 – Outcome Level
32 – Output Level
Each indicator has a sheet that defines it, to ensure the quality of collection and reporting of results. They will be collected on a routine (frequently collected, measured, and assessed throughout the project) and periodic (measured annually or at the end of the project) basis.
Monitoring, Evaluation and Learning (MEL)
Megi Cullhaj
MEL Activities Overview
Activity and output monitoring
The 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 target outputs are achieved. To do so, the project will use the MEL Web-based platform that WorldFish has adopted for planning, reporting and learning.
Outcome monitoring
The outcome will be tracked periodically by using mainly performance indicators as per the indicators Matrix, which contains in detail a list of indicators per objective, baseline values, data sources, collection methods, and reporting frequency, etc. The results will undergo data quality check.
Evaluation and Impact Assessment
To assess the effectiveness of the intervention and its effects in achieving the ultimate goals. Impact studies will be conducted periodically by a team of specialists.
Introduction
Why a MEL Plan?
To ensure effective implementation and performance measurement by developing a robust and cohesive monitoring approach to ensure the impact program is on a path to success.
To have a framework/tool that guides the monitoring, evaluation, and learning throughout the life of the project.
To document how and what information will be gathered, analyzed, and used to inform adaptive project management and review progress (support better decision-making).
To ensure better transparency and accountability.
To generate learning through evidence.
The MEL Plan will be reviewed annually, and updated if necessary, and a revised version will be submitted along with the proposed Annual Work Plan.
Roles and Responsibilities
The MEL team will coordinate on an ongoing basis with country focal points and the project manager to collect and/or validate the data.
A brief quarterly performance report will be produced but the MEL team and shared with the project stakeholders to generate learning and adaptive management.
A meeting with the project team (including partners) is recommended.
MEL Plan components
1. Theory of Change and Results or Logical framework
2. Indicators matrix
3. MEL activities overview
4. Roles and Responsibilities
5. Impact Assessment
6. Data Management
7. Learning and Adaptive Management
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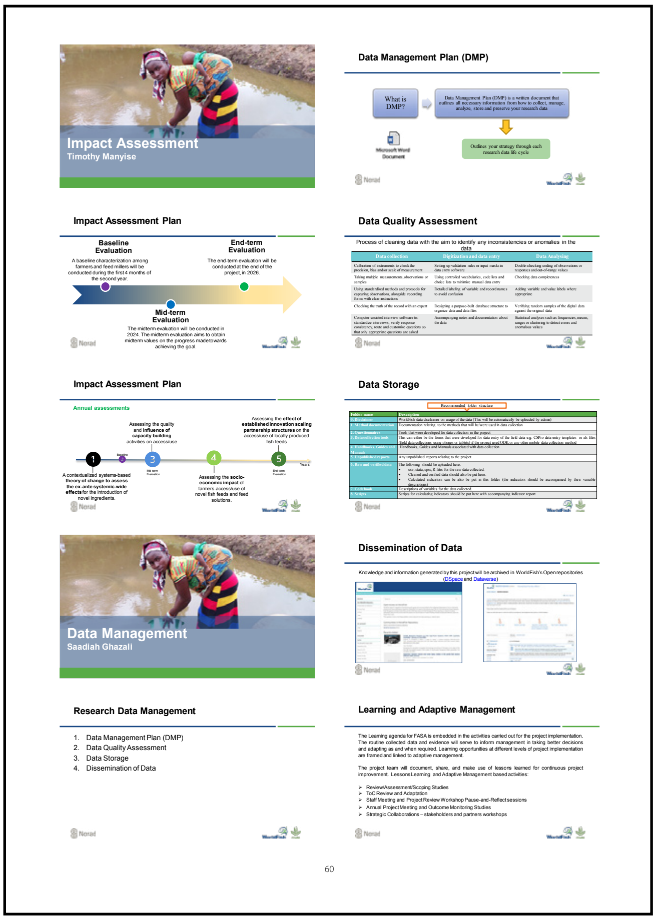
Impact Assessment
Timothy Manyise
Data Management Plan (DMP)
What is DMP?
Data Management Plan (DMP) is a written document that outlines all necessary information from how to collect, manage, analyze, store and preserve your research data
Outlines your strategy through each research data life cycle
Microsoft Word Document
Impact Assessment Plan
Baseline Evaluation
A baseline characterization among farmers and feed millers will be conducted during the first 4 months of the second year.
End-term Evaluation
The end-term evaluation will be conducted at the end of the project, in 2026.
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.
Data Quality Assessment
Process of cleaning data with the aim to identify any inconsistencies or anomalies in the data
Data collection
Digitization and data entry
Data Analysing
Calibration of instruments to check the precision, bias and/or scale of measurement
Setting up validation rules or input masks in data entry software
Double-checking coding of observations or responses and out-of-range values
Taking multiple measurements, observations or samples
Using controlled vocabularies, code lists and choice lists to minimize manual data entry
Checking data completeness
Using standardized methods and protocols for capturing observations, alongside recording forms with clear instructions
Detailed labeling of variable and record names to avoid confusion
Adding variable and value labels where appropriate
Checking the truth of the record with an expert
Designing a purpose-built database structure to organize data and data files
Verifying random samples of the digital data against the original data
Computer-assisted interview software to: standardize interviews, verify response consistency, route and customize questions so that only appropriate questions are asked
Accompanying notes and documentation about the data
Statistical analyses such as frequencies, means, ranges or clustering to detect errors and anomalous values
Impact Assessment Plan
Annual assessments
Assessing the quality and influence of capacity building activities on access/use
Assessing the effect of established innovation scaling partnership structures on the access/use of locally produced fish feeds
A contextualized systems-based theory of change to assess the ex-ante systemic-wide effects for the introduction of novel ingredients.
Assessing the socio-economic impact of farmers access/use of novel fish feeds and feed solutions.
Years
Data Storage
Recommended folder structure
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
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
Data Management
Saadiah Ghazali
Dissemination of Data
Knowledge and information generated by this project will be archived in WorldFish's Open repositories (DSpace and Dataverse)
Research Data Management
1. Data Management Plan (DMP)
2. Data Quality Assessment
3. Data Storage
4. Dissemination of Data
Learning and Adaptive Management
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. Lessons Learning and Adaptive Management based activities:
Review/Assessment/Scoping Studies
ToC Review and Adaptation
Staff Meeting and Project Review Workshop Pause-and-Reflect sessions
Annual Project Meeting and Outcome Monitoring Studies
Strategic Collaborations – stakeholders and partners workshops
60


Online: MEL Platform overview
Click here
Monitoring, Evaluation and Learning
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FASA Project Annual Workshop: Introduction and scope of the meeting
By Rodrigue Yossa, Project Leader
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Content
1. Project Objective, Partners and Geographies
2. Annual Workshop Goal & Frequency
3. 2022 Annual Workshops
Annual Workshop Goal & Frequency
Objectives of annual workshop:
1) Meet in person: synergy and complementarity
2) Discuss project progress in each country
3) Conduct the annual planning for next year
4) Site visit
Annual project workshop cost breakdown - Malaysia (HQ) – x 2 (Y1 & Y5)
Annual project workshop cost breakdown - Nigeria (Y2)
Annual project workshop cost breakdown - Zambia (Y3)
Annual project workshop cost breakdown - Kenya (Y4)
Project Objective, Partners and Geographies
GOAL: July 2022 - June 2017
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.
Consultants
Local feed millers & farmers groups
Focal countries
Scaling countries
Other countries with significant projects
2022 Annual Workshops
Day 1, Monday 28th November 2022 : 3 sessions in Auditorium / WF Auditorium/ Presentations from FASA partners
Day 2, Tuesday 29th November 2022: 3 sessions in Block J / Planning sessions for years 2022-2023 (Nov. 2022- Dec. 2023)
Day 3, Wednesday 30th November 2022: 2 Site Visits
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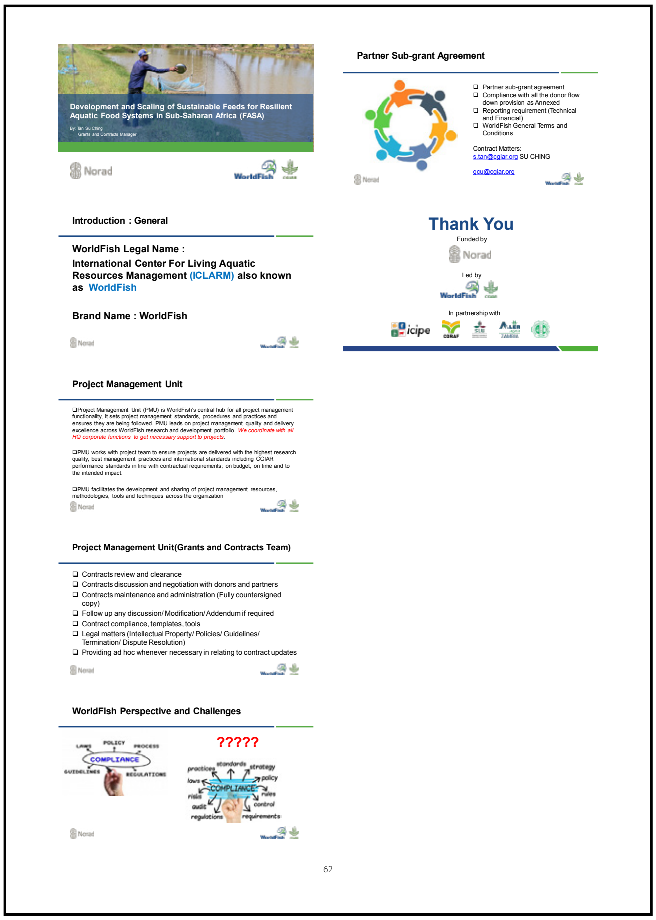
Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)
By: Tan Su Ching
Grants and Contracts Manager
Introduction : General
WorldFish Legal Name :
International Center For Living Aquatic Resources Management (ICLARM) also known as WorldFish
Brand Name : WorldFish
Project Management Unit
❑Project Management Unit (PMU) is WorldFish's central hub for all project management functionality, it sets project management standards, procedures and practices and ensures they are being followed. PMU leads on project management quality and delivery excellence across WorldFish research and development portfolio. We coordinate with all HQ corporate functions to get necessary support to projects.
❑PMU works with project team to ensure projects are delivered with the highest research quality, best management practices and international standards including CGIAR performance standards in line with contractual requirements; on budget, on time and to the intended impact.
❑PMU facilitates the development and sharing of project management resources, methodologies, tools and techniques across the organization
Project Management Unit(Grants and Contracts Team)
❑ Contracts review and clearance
❑ Contracts discussion and negotiation with donors and partners
❑ Contracts maintenance and administration (Fully countersigned copy)
❑ Follow up any discussion/ Modification/ Addendum if required
❑ Contract compliance, templates, tools
❑ Legal matters (Intellectual Property/ Policies/ Guidelines/ Termination/ Dispute Resolution)
❑ Providing ad hoc whenever necessary in relating to contract updates
WorldFish Perspective and Challenges
LAWS POLICY PROCESS
COMPLIANCE
GUIDELINES REGULATIONS
?????
practices standards strategy policy laws COMPLIANCE rules risks control audit regulations requirements
Partner Sub-grant Agreement
❑ Partner sub-grant agreement
❑ Compliance with all the donor flow down provision as Annexed
❑ Reporting requirement (Technical and Financial)
❑ WorldFish General Terms and Conditions
Contract Matters:
s.tan@cgiar.org SU CHING
gcu@cgiar.org
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Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)
By Azira Azmi
Risk and Compliance Analyst
Finance & Compliance
1. Governance & Risk Management
2. Risk & Compliance Team – what we do?
3. Risk & Compliance Team – what have been achieved?
Governance & Risk Management
3 Lines of Defense
❖ WorldFish's risk governance distinguishes between 3 fundamental roles in which all functions manage risks collectively.
❖ The Risk & Compliance Team is the second line of defense
Risk & Compliance Team
What we do?
Risk and Compliance Team
Enterprise Risk Management (ERM)
Audit Support
Counter Fraud
Internal Controls and Policies
Donor Compliance
Risk & Compliance Team
What have been achieved?
✓ Risk assessments that identify weaknesses in internal control (project & country office)
✓ Risk management and fraud prevention training to Implementing Partners
✓ Fraud investigations
✓ Writing policies
✓ Quality Data Review
✓ Project risk assessments
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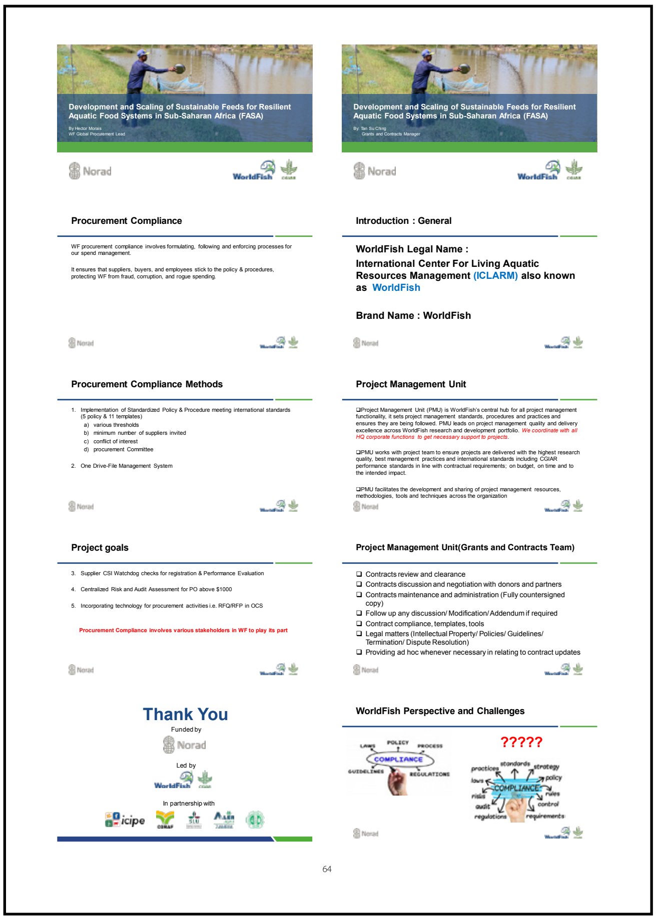
Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)
By Hector Morais
WF Global Procurement Lead
Procurement Compliance
WF procurement compliance involves formulating, following and enforcing processes for our spend management.
It ensures that suppliers, buyers, and employees stick to the policy & procedures, protecting WF from fraud, corruption, and rogue spending.
Procurement Compliance Methods
1. Implementation of Standardized Policy & Procedure meeting international standards (5 policy & 11 templates)
a) various thresholds
b) minimum number of suppliers invited
c) conflict of interest
d) procurement Committee
2. One Drive-File Management System
Project goals
3. Supplier CSI Watchdog checks for registration & Performance Evaluation
4. Centralized Risk and Audit Assessment for PO above $1000
5. Incorporating technology for procurement activities i.e. RFQ/RFP in OCS
Procurement Compliance involves various stakeholders in WF to play its part
Thank You
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Led by
In partnership with
Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)
By: Tan Su Ching
Grants and Contracts Manager
Introduction : General
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Project Management Unit
❑Project Management Unit (PMU) is WorldFish's central hub for all project management functionality, it sets project management standards, procedures and practices and ensures they are being followed. PMU leads on project management quality and delivery excellence across WorldFish research and development portfolio. We coordinate with all HQ corporate functions to get necessary support to projects.
❑PMU works with project team to ensure projects are delivered with the highest research quality, best management practices and international standards including CGIAR performance standards in line with contractual requirements; on budget, on time and to the intended impact.
❑PMU facilitates the development and sharing of project management resources, methodologies, tools and techniques across the organization
Project Management Unit(Grants and Contracts Team)
❑ Contracts review and clearance
❑ Contracts discussion and negotiation with donors and partners
❑ Contracts maintenance and administration (Fully countersigned copy)
❑ Follow up any discussion/ Modification/ Addendum if required
❑ Contract compliance, templates, tools
❑ Legal matters (Intellectual Property/ Policies/ Guidelines/ Termination/ Dispute Resolution)
❑ Providing ad hoc whenever necessary in relating to contract updates
WorldFish Perspective and Challenges
LAWS POLICY PROCESS
COMPLIANCE
GUIDELINES REGULATIONS
?????
practices standards strategy policy laws COMPLIANCE rules risks control audit regulations requirements
64


Partner Sub-grant Agreement
❑ Partner sub-grant agreement
❑ Compliance with all the donor flow down provision as Annexed
❑ Reporting requirement (Technical and Financial)
❑ WorldFish General Terms and Conditions
Contract Matters:
s.tan@cgiar.org SU CHING
gcu@cgiar.org
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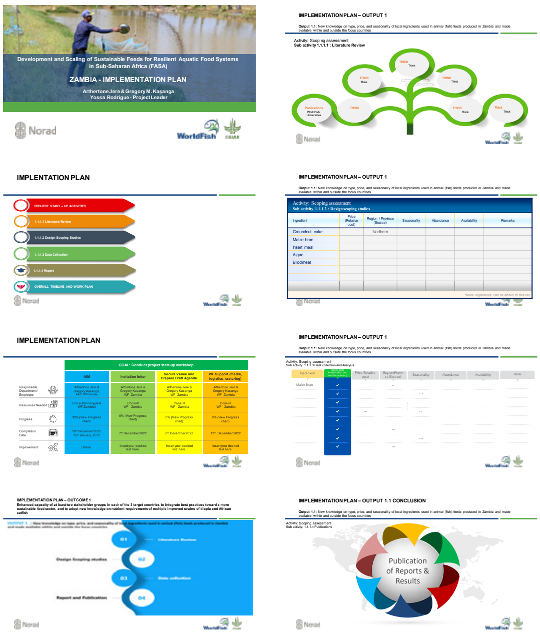
Appendix E: Presentation Day 2



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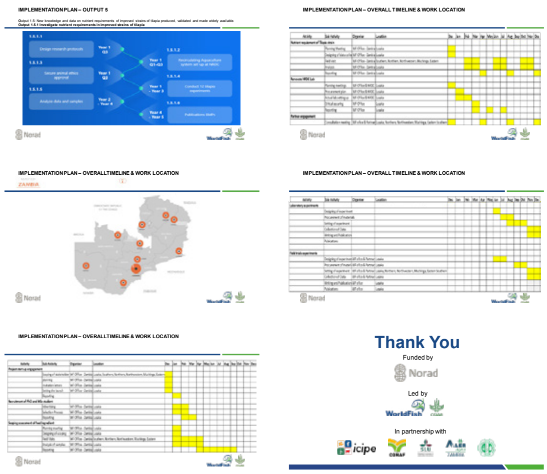

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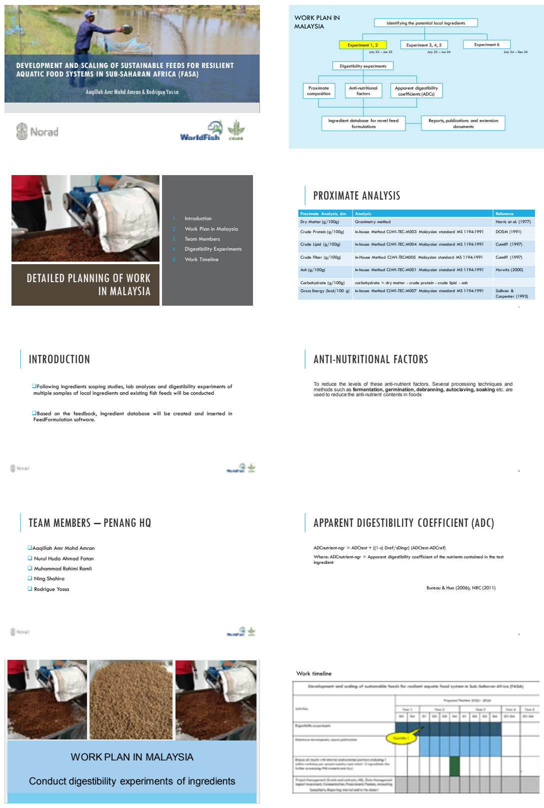

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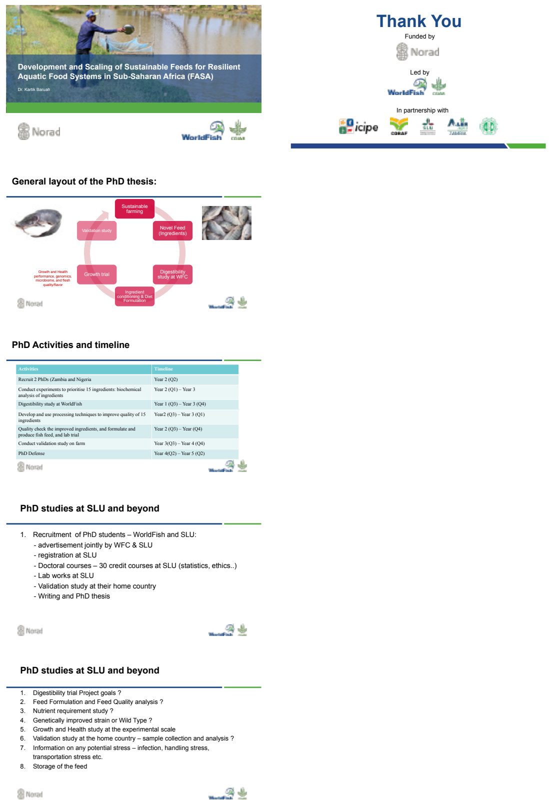

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Project key facts

- ❑Present knowledge and available data on local ingredients with respect to chemical composition, prices, seasonality in Nigeria will be obtained from this project.
- ❑Fish feeds production in Nigeria would significantly increase.
- ❑Production of affordable and quality fish feeds using locally available ingredients.

Outline

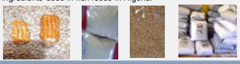
1. Project title
2. Project key facts
3. Project goals
4. Project components
5. Partnerships

Presently with a population of about 220millions and 923,768 sq meters

Project Key facts contd.

- ❑ Formulation of a balanced diet that would meet the needs of the fish species at a more economical cost.
- ❑ Improved nutritional quality of fish feed to enhance optimum growth of fish which will contribute to increase in fish farmers incomes and alleviate poverty.

1. Scoping studies on the type, price and seasonality of local ingredients used in fish feeds in Nigeria.

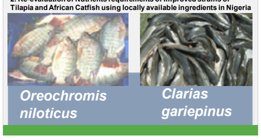


Maize, Clupeid fishmeal, Sun dried 6mm fish feed sample and bagged fish feed previously produced from locally available ingredients

Project goals

- **To conduct assessment studies that will fill in data gaps on locally available ingredients.**
- **Generate necessary background information for the development and scaling of low-cost, highly nutritious, sustainable feeds.**
- **To increase productivity and profitability as selected ingredients would be used to formulate fish feed.**

2. Re-evaluation of Nutrients requirements of improved strains of Tilapia and African Catfish using locally available ingredients in Nigeria



Oreochromis niloticus *Clarias gariepinus*

Goals Contd.

- To determine the nutritional requirements {methionine, lipids, vitamin C, calcium and phosphorus} of improved strains of catfish and tilapia.
- To increase output and improve fish farmers' income.
- To improve feed value chain through dissemination of knowledge acquired.

Introduction

- High cost of feed ingredients and aquafeed produced in Nigeria has been a great concern for fish farmers, feed producers, small holder fish farms and other stakeholders. Greater numbers of fish farmers are moving out of business because the input cost outweighs the profit which is attributed to the high cost of feed ingredients.
- It is important to know and regularly assess the available feed ingredients and their chemical composition for better productivity. The feed ingredients assessment is long overdue because since the work of Eyo (2001) in feedstuff assessment in Nigeria, there has not been a comprehensive revisit up till date.
- Intervention of World fish through CORAF is timely and commendable in the development and production of farm made feeds using locally available ingredients that are sustainable.

Project components

- Literature review.
- Virtual inception meeting to plan out modality of the project.
- Scoping studies to collect samples.
- Analysis of the collected ingredients and fish feeds available in selected urban and local markets in the 6 geopolitical zones and climate hazards related to their use in the short, medium and long run in Nigeria.

Project Components Contd.

- Scoping study will be carried out through assessment survey of selected states per every Geopolitical zone with a total of twenty two (22) states and FCT chosen to obtain knowledge and current nutrient composition of available feed ingredients in Nigeria to increase data in use for fish feeds project.
- Every available ingredient will be collected in the selected local and urban markets with the assistance of field personnel in each of the state and locality.

Project components Contd

- The resulting data will update the existing data of the National Research Council of the United States of America, which is widely used, and will be included in a new WorldFish database available to stakeholders across Africa and beyond.
- Workshops will be organized and conferences attended to share results generated from the research.

Project Components Contd.

- Out of 36 states and FCT in Nigeria the scoping studies will cover 23 selected states across the Country as approved by WorldFish.
- Three months for sampling and data collection and two months for analysis and write up. The selected states are as follows:

North Central: Benue, Nasarawa, Niger, and Plateau States, as well as the Federal Capital Territory.

Ph.D Student's Component

- The Ph.D student research on growth performance studies on the use of five novel ingredients selected from the ingredients collected, analysed and processed from the scoping studies will also be carried out in the last quarter of years three and whole of year four of the projects.
- The demonstration research will be carried in Fish Farmer's farm with enough ponds: ponds for each species will be used by the student.
- Workshop will also be carried out.

Project Components Contd.

North East: Adamawa, Borno, Taraba, and Yobe States.
North West: Kaduna, Kano, Sokoto, and Zamfara States.
South East: Abia, Ebonyi, and Imo States.
South South: Akwa Ibom, Delta, and Rivers States.
South West: Ekiti, Lagos, Ondo and Oyo States.

- Questionnaires will be prepared and administered in the field to collect data on types, current prices and seasonality of the fifteen (15) or more feed ingredients. Data on major producers of the available feed ingredients will also be collected.

Partnerships

- Farmers and Ingredients marketers
- Fish feed Millers and fish farmers.

Project components Contd.

- Samples of the available fish feeds in use in the selected localities will also be collected.
- Bulking of the similar local ingredients will be carried out and composite samples will be taken for all the available ingredients collected and the chemical analysis will be done at Malaysia by WorldFish.
- Write up and Development of ingredient database

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Project Components Contd.
Project 2: Re-evaluation of Nutrients requirements in improved strains of Tilapia and African Catfish using locally available ingredients in Nigeria.

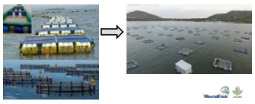
- Investigation of nutrient requirements in improved strains of tilapia and African catfish.
- Amino acids (methionine), Lipids, vitamins, and minerals requirements will be investigated.
- Sampling and Chemical analysis is a strong components.
- Four experiments each on Tilapia and African catfish will be carried out in first three years of the project in Nigeria.

Detailed Planning of Work in Kenya

Activities	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
Project agreements with WF	■																			
Start-up meetings	■																			
Recruit new staff	■	■																		
Recruit 10 MSc	■	■	■	■	■															
Start-up workshop	■	■																		
1.1.1.1: Conduct literature review of relevant research documents and protocols	■																			
1.1.1.2: Design scoping studies for each country	■																			
1.1.1.3: Data collection (including sample ingredients) and analysis	■	■	■																	

Target Sites

USENGE FISH CAGES LAKE VICTORIA, SIAYA COUNTY



Activities	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
1.1.1.4: Report preparation and publication			■																	
1.5.1.1: Design research protocols			■																	
1.5.1.3: Secure animal ethics approval			■																	
1.5.1.4: Conduct 12 tilapia experiments and 8 catfish experiments in project countries			■	■	■	■	■	■	■	■	■									
1.5.1.5: Analyse data and samples					■	■	■	■	■	■	■	■	■							
1.5.1.6: Research report preparation and publication and addition of results to WF's Better Management Practices guidelines (BMPs)												■	■	■	■	■				
1.5.1.7: Develop new WF database of essential nutrient requirements in improved strains of tilapia and African catfish													■	■	■	■	■	■		
2.1.2.1: Organise and facilitate 1 online stakeholder workshop per country									■	■										

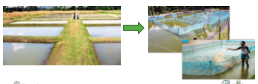
Target Sites

100, 300M² PONDS IN SAMIA, BUSIA COUNTY NEAR LAKE VICTORIA

Activities	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
2.1.2.2: Reports preparation and dissemination									■	■										
2.1.3.1: Synthesize all findings on ingredients generated so far to enable prioritisation						■														
2.1.3.2: Discuss all results with internal and external partners (including 1 online workshop per project country) and select 15 ingredients						■	■													
2.1.3.3: Develop and use processing techniques to improve the quality of the 15 local ingredients as needed (e.g., fermentation, soaking, drying, detoxification, etc.)							■	■	■											
2.1.3.4: Quality check the improved ingredients									■	■										
2.1.3.5: Formulate fish feeds using software										■	■									
2.1.3.6: Produce 9 experimental fish feeds											■	■								
2.1.4.1: Design and validate research protocols											■	■								
2.1.4.2: Conduct validation experiments on-farm													■	■	■					

Target Sites

Kenya Marine and Fisheries Research Institute (KMFRI), Sagana, Nyeri County



Activities	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
2.1.4.3: Analyse the data and produce reports													■	■	■	■				
2.1.4.4: Hold workshops to share and discuss results																	■			
2.2.1.1: Develop database with a feed formulation-application/tool(FeedCalculator)															■	■	■			
2.2.1.2: Develop a mobile version of the database and integrate into existing mobile apps widely used by farmers (including social media apps such as WhatsApp)															■	■	■			
2.2.1.3: Hold an online workshop in each project country to obtain feedback from key project partners on initial design															■	■	■			
2.2.1.4: Finalise both tools based on feedback from key project partners																	■	■		
2.3.1.1: Conduct 3 in-person workshops (1 for each project country) and 1 online workshop															■	■	■	■		
2.3.1.2: Develop overall printed booklets/manuals															■	■	■	■		
2.3.1.3: Develop and insert a unique set of 9 fish feeds per country in the booklet based on the novel ingredients (a total of 27 unique feeds)															■	■	■	■		

Target Sites

Kamuthanga Aqua Fish Farm in Machakos County

Africa's first certified fish farm with EcoMark Africa label from ARSO using Recirculating Aquaculture System (RAS)

Plug-in type of RAS technology

Activities	Proposed timeline: 2022 -2026																			
	Year 1				Year 2				Year 3				Year 4				Year 5			
: Support small-scale millers to develop product based on project's innovations											■	■	■	■	■	■	■	■	■	■
: Build partnerships with NGOs, private r, and extension service providers to porate project's knowledge and ations to aquaculture farmers											■	■	■	■	■	■	■	■	■	■
1: Develop and publish factsheets e and printed), BMPs, and project report																		■	■	■
5: Design and conduct context-specific ach to target end-users (farmers and rs) to support scale-up																			■	■
6: Develop scaling potential outside of ct by identifying additional scaling rtunities																			■	■

Activities	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
3.2.5: Support small-scale millers to develop new product based on project's innovations											■	■	■	■	■	■	■	■	■	■
3.2.6: Build partnerships with NGOs, private sector, and extension service providers to incorporate project's knowledge and innovations to aquaculture farmers											■	■	■	■	■	■	■	■	■	■
3.3.2.1: Develop and publish factsheets (online and printed), BMPs, and project report																		■	■	■
3.3.2.5: Design and conduct context-specific outreach to target end-users (farmers and millers) to support scale-up																			■	■
3.3.2.6: Develop scaling potential outside of project by identifying additional scaling opportunities																			■	■

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Partnerships

1. Kenya Marine and Fisheries Research Institute (KMFRI)
2. Kamuthanga Fish Farm, Machakos, Kenya
3. Victory Farms Ltd, Kenya (Private sector)
4. National Universities (e.g., University of Eldoret etc)
5. JABALI FISH FARM (JABALI FISHERIES TRADERS)
6. Beach Management Units (BMU), County Government
7. Kenya Bureau of Standards (KEBS)

Appendix F : Revised Implementation Plan

The first revision on the implementation plan/work plan - 2022.
The modifications are red color. The "X" in the timeline represent the deletion, meaning the project activity will not be delivered during that period

Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)

Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026																	
			Year 1			Year 2			Year 3			Year 4			Year 5					
			Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18
Project start-up activities																				
Conduct internal AIP project management start-up meetings	AIP project management unit	AIP staff (assistance/support as needed for each meeting)																		
Negotiate, prepare, and sign project agreements with entity partners	AIP project management unit	Kyiv, KNMI, MARA, MARS																		
Conduct general project management start-up meetings (including partners)	AIP project management unit	WorldFish, Stockholm, Stirling, Kyiv, Makerere, & Cornell scientists (& part-time support), ; IMC, KNMI, UNIMAS, Yncl, MARA, MARS, UNIBEN																		
Develop living plan for project	AIP PM team	WorldFish, Stockholm, Stirling, MARA, UNIBEN																		
Recruit core staff	AIP PM team	WorldFish, Stockholm, Cornell Aquaculture, MARA, UNIBEN																		
Recruit 4 PhD students (Nigeria & Zambia), and 10 mix of students (Kenya)	Yncl, IMC	Cornell, Cornell AC scientists (& part-time support), IMC, KNMI, UNIBEN																		
Conduct project start-up workshops in global and sub-project country fora (virtual & in person)	Cornell Aquaculture scientists (& part-time support), Yncl, IMC, UNIBEN	WorldFish, Cornell Aquaculture, MARA, UNIBEN, SUPRI, NARO, Afex Agua Africa, Yncl, Makerere, Cornell AC scientists (& part-time support), IMC, KNMI, UNIBEN																		
Develop detailed project risk framework plan, project monagi(ngoals, and project templates)	AIP communications specialist	Cornell, Yncl, IMC communications team																		
Develop detailed monitoring, evaluation, and learning (MEL) plan	AIP MEL specialist	All MEL team, WorldFish Nerf,																		
Outcome 1: Enhanced capacity of at least two stakeholder groups in each of the 5 target countries to integrate best practices towards a more sustainable food sector, and to adopt new knowledge on nutrient requirements of multiple improved strains of tilapia and African catfish																				
Output 1.1: New knowledge on type, price, and seasonality of local ingredients used in animal fish feeds produced in 5 focus countries and made available within and outside the focus countries																				
Activity 1.1.1: Assigning assessments (to pre-project country)																				
Subactivity 1.1.1.1: Detailed literature review of relevant policy, research, and country documents	Cornell Aquaculture scientists (& part-project country), IMC, Yncl, UNIBEN	Kyiv, Stockholm, Yncl Kenya Nerus, research scientists (SUPRI, Afex Agua Africa, Yncl)	X																	
Subactivity 1.1.1.2: Design scoping studies for each country	Cornell Aquaculture scientists (& part-project country), IMC, Yncl, UNIBEN	Kyiv, Stockholm, Yncl Kenya Nerus, research scientists (SUPRI, Afex Agua Africa, Yncl)	X																	
Subactivity 1.1.1.3: Value chain/cost & benefit survey (with ingredients) and analysis	Cornell Aquaculture scientists (& part-project country), IMC, Yncl, UNIBEN	Kyiv, Stockholm, Yncl Kenya Nerus, research scientists (SUPRI, Afex Agua Africa, Yncl)	X	X																

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Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026																	
			Year 1			Year 2			Year 3			Year 4			Year 5					
			Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18
Subactivity 1.1.2: Report preparation and publication	Cornell Aquaculture scientists (& part-project country), IMC, Yncl, UNIBEN	WorldFish, Stockholm, Stirling, Kyiv, Makerere, & Cornell scientists (& part-project country), IMC, KNMI, UNIBEN			X															
Output 1.2: Drivers and opportunity for increase environmental sustainability and climate resilience in the fish feed industry in 5 focus countries identified and made available publicly, with a focus on feeds derived from cereal-based coproducts																				
Activity 1.2.1: Climate shocks and environmental assessments (to pre-project country)																				
Subactivity 1.2.1.1: Involved literature review of relevant policy, research, and country documents	Climate change consultant	All scientists team, assistance to climate team	X																	
Subactivity 1.2.1.2: Design literature/design and environmental assessment for each country	Climate change consultant	All scientists team, Yncl, Makerere, Stockholm, Nerus, Cornell Aquaculture, national fish farming/aquaculture associations in the focus countries	X																	
Subactivity 1.2.1.3: Value chain/cost & benefit survey (with ingredients) and analysis	Climate change consultant	All scientists team, Yncl, Makerere, Stockholm, Nerus, Cornell Aquaculture, national fish farming/aquaculture associations in the focus countries, Stockholm, Yncl, Makerere, Cornell Aquaculture, Nerus	X	X																
Subactivity 1.2.1.4: Report preparation and publication	Climate change consultant	All scientists team, assistance to climate team	X	X																
Output 1.3: New knowledge on market trade and commercial viability of feeds derived from cereal-based coproducts produced in 5 focus countries and made widely available																				
Activity 1.3.1: Market assessments (to pre-project country)																				
Subactivity 1.3.1.1: Involved literature review of relevant policy, research, and country documents	Policy specialist	Yncl	X																	

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Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026																	
			Year 1			Year 2			Year 3			Year 4			Year 5					
			Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18
Subactivity 1.3.1.2: Detailed literature review of relevant policy, research, and country documents	Market scientist	Kyiv, Stockholm, Yncl, Cornell Aquaculture, MARA, UNIBEN, Afex Agua Africa, Yncl																		
Activity 1.4: Stakeholder consultations to refine sampling (per country) to ensure results (of activity 1) is and potential benefits, risks, challenges, and hazards for the use of local ingredients																				
Subactivity 1.4.1: Planning and facilitate 1 virtual research scientists (& per project country), IMC, KNMI, UNIBEN	Rodrigue Yossa, Virtual research scientists (& per project country), IMC, KNMI, UNIBEN	Kyiv, Stockholm, Yncl, Cornell Aquaculture, Cornell AC scientists (& part-project country), IMC, KNMI, UNIBEN, Afex Agua Africa, Yncl																		
Subactivity 1.4.2: Report preparation and dissemination	Rodrigue Yossa, Virtual research scientists (& per project country), IMC, KNMI, UNIBEN	Cornell Aquaculture, KNMI, UNIBEN, Afex Agua Africa, Yncl																		
Activity 1.5: Produce ingredients at co-formulate fish feeds																				
Subactivity 1.5.1: Synthesis of findings on acceptable ingredients for formulation	Rodrigue, Yossa	Virtual research scientists (& part-project country), IMC, KNMI, UNIBEN																		
Subactivity 1.5.2: Manual all results with internal and external expert (including a online workshop per project country) and select the ingredients	Rodrigue, Yossa	Cornell, Cornell AC scientists (& part-project country), IMC, KNMI, UNIBEN, Afex Agua Africa, Yncl																		
Subactivity 1.5.3: Develop and pre-processing techniques to improve the quality of the local ingredients as needed(e.g., fermentation, cooking, drying, grinding, milling, etc.)	Yossa	Cornell, Cornell AC scientists (Nigeria & Zambia), Afex Agua Africa, UNIBEN, Stockholm Environment Institute																		
Subactivity 1.5.4: Feed formulation and production	Yossa	Cornell, Cornell AC scientists (Nigeria & Zambia), Afex Agua Africa, UNIBEN, Stockholm Environment Institute																		
Subactivity 1.5.5: Quality check for improved ingredients	Yossa	Cornell, Cornell AC scientists (Nigeria & Zambia), Afex Agua Africa, UNIBEN, Stockholm Environment Institute																		
Subactivity 1.5.6: Formulate fish feeds using and basic	Yossa	Cornell, Cornell AC scientists (Nigeria & Zambia), Afex Agua Africa, UNIBEN, Stockholm Environment Institute, Nerus																		
Subactivity 1.5.7: Testing of improved (or) fish feeds	Yossa, Cornell Aquaculture, and Virtual Partners	Yncl, 4 PhD students (Nigeria & Zambia), All Kenya's students (Kenya), Cornell Aquaculture, Cornell AC scientists (& part-project country), IMC, KNMI, UNIBEN, Afex Agua Africa, Yncl, Stockholm Environment Institute																		
Activity 1.6: Validate fit-to-purpose fish feeds through in-vivo feed pilots (4 per country)																				
Subactivity 1.6.1: Design and validate research protocols	Cornell Aquaculture scientists (& part-project country), IMC, KNMI, UNIBEN/Yncl	PhD students (Nigeria & Zambia), All Kenya's students (Kenya), Cornell Aquaculture, Cornell AC scientists (& part-project country), IMC, KNMI, UNIBEN, Afex Agua Africa, Yncl, Stockholm Environment Institute																		
Subactivity 1.6.2: Train and conduct research protocols	Cornell Aquaculture scientists (& part-project country), IMC, KNMI, UNIBEN/Yncl	Cornell, Cornell AC scientists (Nigeria & Zambia), All Kenya's students (Kenya), Cornell Aquaculture, all the farmers contracted/hired, research scientists (SUPRI, Afex Agua Africa), Yncl																		
Subactivity 1.6.3: Analyze the data and produce reports	Cornell Aquaculture scientists (& part-project country), IMC, KNMI, UNIBEN/Yncl	PhD students (Nigeria & Zambia), All Kenya's students (Kenya), Cornell Aquaculture, Cornell AC scientists (& part-project country), IMC, KNMI, UNIBEN, Afex Agua Africa, Yncl, Stockholm Environment Institute																		
Subactivity 1.6.4: Validate fit-to-purpose of feeds through in-vivo farm pilots and produce reports	Cornell Aquaculture scientists (& part-project country), IMC, KNMI, UNIBEN/Yncl	PhD students (Nigeria & Zambia), All Kenya's students (Kenya), Cornell Aquaculture, Cornell AC scientists (& part-project country), IMC, KNMI, UNIBEN, Afex Agua Africa, Yncl, Stockholm Environment Institute																		
Subactivity 1.6.5: Scaling and dissemination (Yncl)	Yncl, IMC	All scientists, Makerere, Stockholm, Afex Agua Africa, Stockholm																		

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Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026																	
			Year 1			Year 2			Year 3			Year 4			Year 5					
			Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18
Output 2.1: Databases and digital solutions developed and used by farmers for formulating and adapting new local feeds on a "real time" basis																				
Activity 2.1.1: Identify on-farm needs, develop dashboard/apps for feed formulation, fish feeds, and nutrient requirements, simulate viable scenarios																				
Subactivity 2.1.1.1: Develop, interface with a Yncl formulation application/tool (Excel/web-based)	Rodrigo Yossa	Rodrigue Yossa, Virtual research scientists (& per project country), IMC, KNMI, UNIBEN, Stockholm Environment Institute, Cornell Aquaculture, Afex Agua Africa, Yncl, Makerere, Stockholm, SUPRI																		
Subactivity 2.1.1.2: Develop a mobile version of the database and integrate into existing farmer apps widely used by farmers (including asset farmer apps such as Farmbrite)	Rodrigo Yossa	Rodrigue Yossa, Virtual research scientists (& per project country), IMC, KNMI, UNIBEN, Stockholm Environment Institute, Cornell Aquaculture, Afex Agua Africa, Yncl, Makerere, Stockholm, SUPRI																		
Subactivity 2.1.1.3: Train on-farm scientists in each project country to deploy (workers) tool (via virtual means as needed)	Rodrigo Yossa	Rodrigue Yossa, Virtual research scientists (& per project country), IMC, KNMI, UNIBEN, Stockholm Environment Institute, Cornell Aquaculture, Afex Agua Africa, 4 PhD students (Nigeria & Zambia), All Kenya's students (Kenya), Yncl, Makerere, Stockholm, SUPRI																		
Subactivity 2.1.1.4: Validate both tools based on feedback from key project partners	Rodrigo Yossa	Rodrigue Yossa, Virtual research scientists (& per project country), IMC, KNMI, UNIBEN, Stockholm Environment Institute, Cornell Aquaculture, Afex Agua Africa, Yncl, Makerere, Stockholm, SUPRI																		
Output 2.2: Knowledge and capacity increased of millers, farmers, and other stakeholders to use most beneficially (i.e. create the most affordable, tailor-made, fish feeds that take in the account context-specific circumstances and needs																				
Activity 2.2.1: Develop/promote business/ toolkit/manuals for ingredients and fish feeds and make available to the public																				
Subactivity 2.2.1.1: Involved in-person workshops to for each project country and a online workshop	Rodrigo Yossa	Stockholm Environment, Nerus(Kenya), Virtual research scientists, UNIBEN, SUPRI, Afex Agua Africa, 4 PhD students (Nigeria & Zambia), All Kenya's students (Kenya), Yncl, Makerere, Stockholm, SUPRI																		
Subactivity 2.2.1.2: Develop, train and deploy toolkit/manuals	Rodrigo Yossa, Virtual Environment specialist	Stockholm Environment, Nerus(Kenya), Virtual research scientists, UNIBEN, SUPRI, Afex Agua Africa, 4 PhD students (Nigeria & Zambia), All Kenya's students (Kenya), Yncl, Makerere, Stockholm, SUPRI																		
Subactivity 2.2.1.3: Develop and conduct 1 virtual and 4 in-person ToT for feed-specialists to scale-up and train farmers and millers (to conduct scale-up)	Rodrigo Yossa	Stockholm Environment, Nerus(Kenya), Virtual research scientists, UNIBEN, SUPRI, Afex Agua Africa, 4 PhD students (Nigeria & Zambia), All Kenya's students (Kenya), Yncl, Makerere, Stockholm, SUPRI																		
Subactivity 2.2.1.4: Monitor, document, and collect lessons learned	Rodrigo Yossa	Stockholm Environment, Nerus(Kenya), Virtual research scientists, UNIBEN, SUPRI, Afex Agua Africa, 4 PhD students (Nigeria & Zambia), All Kenya's students (Kenya), Yncl, Makerere, Stockholm, SUPRI																		
Activity 2.3: Increase awareness and capacity of millers and farmers on the benefits of using local feeds																				
Subactivity 2.3.1: Develop and conduct 1 virtual and 4 in-person ToT for feed-specialists to scale-up and train farmers and millers (to conduct scale-up)	Rodrigo Yossa, Virtual Environment specialist	Stockholm Environment, Nerus(Kenya), Virtual research scientists, UNIBEN, SUPRI, Afex Agua Africa, 4 PhD students (Nigeria & Zambia), All Kenya's students (Kenya), Yncl, Makerere, Stockholm, SUPRI																		
Subactivity 2.3.2: Develop and conduct virtual and in-person farmer training workshops (to scale-up)	Rodrigo Yossa, Virtual Environment specialist	Stockholm Environment, Nerus(Kenya), Virtual research scientists, UNIBEN, SUPRI, Afex Agua Africa, 4 PhD students (Nigeria & Zambia), All Kenya's students (Kenya), Yncl, Makerere, Stockholm, SUPRI																		
Subactivity 2.3.3: Monitor, document, and collect lessons learned	Rodrigo Yossa, Virtual Environment specialist	Stockholm Environment, Nerus(Kenya), Virtual research scientists, UNIBEN, SUPRI, Afex Agua Africa, 4 PhD students (Nigeria & Zambia), All Kenya's students (Kenya), Yncl, Makerere, Stockholm, SUPRI																		
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 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 5 target countries co-developed with stakeholders and used to guide selection of country scaling strategies																				

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Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026																	
			Year 1			Year 2			Year 3			Year 4			Year 5					
			Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18
Subactivity 3.1.1: Annual assessments of enabling and constraining factors for scaling (5 per project country, at the end of years 1, 2, 3, 4)																				
Subactivity 3.1.1.1: Design scaling assessments for each country (national plans for each) and do as needed	Scaling specialist	Kyiv, Stockholm, Yncl, Makerere, All scientist team, Expert Advisory Group																		
Subactivity 3.1.1.2: Data collection and analysis, including online stakeholder workshops (1 workshop per country at the end of year 1 and 2 more workshop up two years (total 10 workshops)	Scaling specialist	Kyiv, Stockholm, Yncl, Nerus(Kenya), IMC, gender lead, Expert Advisory Group, Cornell Aquaculture																		
Subactivity 3.1.1.3: Report preparation and dissemination	Scaling specialist	Kyiv, Stockholm, Yncl, Nerus(Kenya), IMC, gender lead, Expert Advisory Group																		
Activity 3.1.2: Stakeholder consultations to collaborate within scenarios																				
Subactivity 3.1.2.1: Organizing and facilitate 5 stakeholder workshops per country (total of 25)	Scaling specialist, Virtual research scientists (& per project country), IMC, KNMI, UNIBEN	Kyiv, Stockholm, Yncl, Virtual Nerus, research scientists (SUPRI, Afex Agua Africa, Yncl)																		
Subactivity 3.1.2.2: Report preparation and dissemination	Scaling specialist, Virtual research scientists (& per project country), IMC, KNMI, UNIBEN	Kyiv, Stockholm, Yncl, Virtual Nerus, research scientists (SUPRI, Afex Agua Africa, Yncl)																		
Output 3.2: Dynamic partnerships for scaling the use of the project's innovations and knowledge built and operational with a cadre of partners in the focus countries, Sub-activities to be developed with a clear overview and an level of scaling ambitions																				
Activity 3.2.1: Develop/implement platforms for bringing/new scaling stakeholders together	Scaling specialist	MPI team, KNMI, MPR, IMDA, Schools, NGOs, extension service providers, private sector, financial service providers, and other scaling partners																		
Activity 3.2.2: Identify partner up/extension/service (one) and model farms	Scaling specialist	MPI team, KNMI, MPR, IMDA, Schools, NGOs, extension service providers, private sector, financial service providers, and other scaling partners																		
Activity 3.2.3: Hold Action Field Days or other site visit/study tours	Scaling specialist	MPI team, KNMI, MPR, IMDA, Schools, NGOs, extension service providers, private sector, financial service providers, and other scaling partners																		
Activity 3.2.4: Develop/coordinate/host with cooperatives to train and scale-up local feeds	Scaling specialist	MPI team, KNMI, MPR, IMDA, Schools, NGOs, extension service providers, private sector, financial service providers, and other scaling partners																		
Activity 3.2.5: Support establishment of new feed service entrepreneurs by service models, farmers, etc.	Scaling specialist	MPI team, KNMI, MPR, IMDA, Schools, NGOs, extension service providers, private sector, financial service providers, and other scaling partners																		
Activity 3.2.6: Support small-scale millers to develop new, more effective business solutions, processes	Scaling specialist	MPI team, KNMI, MPR, IMDA, Schools, NGOs, extension service providers, private sector, financial service providers, and other scaling partners																		
Activity 3.2.7: Develop/implement app with Metro, private sector, and extension service providers to incorporate project knowledge and innovations into their offerings to smallholder farmers	Scaling specialist	MPI team, KNMI, MPR, IMDA, Schools, NGOs, extension service providers, private sector, financial service providers, and other scaling partners																		
Output 3.3: Strategic capacity development and public awareness campaigns delivered in order to widely disseminate knowledge, innovations, and tools developed by the project																				
Activity 3.3.1: Stakeholder consultations to a) develop comms strategies																				

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Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026																	
			Year 1			Year 2			Year 3			Year 4			Year 5					
			Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18
Activity 3.3.2: Develop/implement comms strategy/plan (5 per project country, and the overall project)	Project management unit, Makerere Yossa	Cornell Aquaculture scientists (& part-project country), IMC, KNMI, UNIBEN (as appropriate)																		
Activity 3.3.3: Develop comms materials	Yncl Nerus, Makerere Yossa	Makerere Yossa, Stockholm Nerus, Yncl, KNMI, UNIBEN																		
Activity 3.3.4: Develop comms products	Yncl Nerus, Makerere Yossa	Makerere Yossa, Stockholm Nerus, Yncl, KNMI, UNIBEN																		
Annual external audit	External Auditor, Stockholm Nerus to Yncl	Rodrigue Yossa, Stockholm Nerus, Yncl, KNMI, UNIBEN																		
Communications activities (in addition to project start-up and outcome 1)																				
Develop and conduct launch comms plans	AIP communications specialist	Makerere, AIP communications team																		
Develop and conduct workbook and additional materials	AIP communications specialist	Makerere, AIP communications team																		
Conduct thought leader (internal/external and media)	AIP communications specialist	Makerere, AIP communications team																		
Produce 4 blog posts per year	AIP communications specialist	Makerere, AIP communications team																		
Produce 2 video stories per year	AIP communications specialist	Makerere, AIP communications team																		
Produce 2 newsletters stories per year	AIP communications specialist	Makerere, AIP communications team	X																	
Produce 1 white-lists set year	AIP communications specialist	Makerere, AIP communications team																		
Develop a PPT/video abstract for key journal articles/publications	AIP communications specialist	Makerere, AIP communications team																		
Update and evaluate project newsletters	AIP communications specialist	Makerere, AIP communications team																		
Update an electronic press database	AIP communications specialist	Makerere, AIP communications team																		
Project close-out activities																				
Project close-out workshop/meeting	Project management unit, Rodrigue Yossa	Cornell Aquaculture partners																		

Outcomes, Outputs, Activities, & Subactivities	Lead(s)	Associates (co-deliverers)	Proposed Timeline: 2022 - 2026																	
			Year 1			Year 2			Year 3			Year 4			Year 5					
			Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18
Midline evaluation	MEL specialist	MEL team																		
Update final indicators, stakeholders, planning map report	All MEL specialist	All PM team, Rodrigue Yossa, WorldFish Nerus, Virtual research scientists (& per project country), IMC, KNMI, UNIBEN																		
Endline final science demo review	Yncl, management unit, Makerere Yossa	Virtual research scientists (& per project country), IMC, KNMI, UNIBEN																		

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About WorldFish

WorldFish is an international, not-for-profit research organization that works to reduce hunger and poverty by improving aquatic food systems, including fisheries and aquaculture. It collaborates with numerous international, regional and national partners to deliver transformational impacts to millions of people who depend on fish for food, nutrition and income in the developing world.

The WorldFish headquarters is in Penang, Malaysia, with regional offices across Africa, Asia and the Pacific. The organization is a member of CGIAR, the world's largest research partnership for a food secure future dedicated to reducing poverty, enhancing food and nutrition security and improving natural resources.

For more information, please visit www.worldfishcenter.org