

Fund International Agricultural Research (FIA)

Project Report

BASIC INFORMATION

Report Type <i>Select category: progress or final</i>	Final Report
Name of International Agricultural Research Centre (IARC)	International Center for Living Aquatic Resources Management (ICLARM) also known as WorldFish
Abbreviation of IARC	ICLARM
Project title <i>Full and short title</i>	Piloting inclusive business and entrepreneurial models for smallholder fish farmers and poor value chain actors in Zambia and Malawi
Reporting Period <i>(DD-MM-YYYY) – (DD-MM-YYYY)</i>	10-05-2019 to 31-12-2022
Grant Type	Full Proposal
GIZ Project Number <i>Numeric (12-digit format <00.0000.0-000.00>)</i>	8.7860.2-001.00
Contract Number <i>Numeric (8-digit format <00000000>)</i>	81235254
Countries of implementation <i>Specify all individual countries plus respective in-country regions of intervention</i>	Zambia (Northern and Luapula Provinces) and Malawi (Southern Region)
Primary Research for Development (R4D) Phase(s) <i>Select category: Discovery, proof of concept, piloting, scaling.</i>	Piloting

Contract Start Date <i>(DD-MM-YYYY)</i>	10 th May 2019
Contract End Date <i>(DD-MM-YYYY)</i>	9 th May 2022
No-cost extension (NCE) <i>Was an NCE granted during the project period? Select: yes/no. If Yes please mention the period of extension.</i>	Yes Dates: 10 th May 2022 to 31 December 2022
Project Coordinator	Name: Dr. Netsayi Noris Mudege
	Email: n.mudege@cgiar.org
Project partners <i>Name and role/task of the partner (one -two bullet points) One Partner per line/cell Add lines if required</i>	Departments of Fisheries in Zambia and Malawi To validate the training materials and alignment of project activities with government priorities
Department of Fisheries Zambia	Collaborate in training and monitoring IBEMS, validating training materials, and ensuring project activities align with government priorities.
Department of Fisheries Malawi	Collaborate in training and monitoring IBEMS, validating training materials, and ensuring project activities align with government priorities.
Aller Aqua	Training of IBEMS and farmers in Zambia on feeding tables. Feeding tables are charts that show the quantity of feeds/ nutrients to for fish at different stages of their life cycle to meet their physiological needs. Setting up feed shops and ensuring access to feed by feed operators in Zambia. Meeting with Malawi's feed operators to design feed supply models that will work for them.
Novatek	Training of IBEMS and farmers on feed tables Setting up feed shops and providing access to feed by feed operators in Zambia. Meeting with Malawi's feed operators to design feed supply models that will work for them.
Collaboration established with GIZ projects	

<p><i>Project title, project contact, type of collaboration</i> <i>One project per line/cell.</i> <i>Add lines if required.</i></p>	<p>WorldFish and GIZ in Zambia used to have monthly meetings to share project experiences and lessons learnt.</p>
<p>Fish for food security project in Zambia</p>	<p>WorldFish and GIZ Zambia held monthly meetings to share experiences and lessons learnt.</p> <p>WorldFish and GIZ Zambia championed the setting up a Multi-Stakeholder Platform in Zambia - Zambia Forum for Sustainable Fisheries and Aquaculture – which is being led by the Department of Fisheries.</p>
<p>Kulima Project and the Aquaculture value chain for higher income and food security (AVCP) in Malawi in Malawi</p>	<p>WorldFish and GIZ Malawi held monthly meetings to share experiences and lessons learnt.</p>
<p>Contribution to SDG</p> <p><i>To which SDGs will the project contribute - please list them.</i></p>	<p>The projects contributed to SDG5 (Gender Equality) by seeking to increase women's involvement and benefit from the aquaculture sector. The project also targeted women and youth with training on better management practices, and business practises and training of IBEMS on gender-equitable control of productive assets, resources and knowledge (SDG5). The project contributed to SDG 2 (Zero Hunger) by increasing the availability of farmed fish for consumption to improve food security among households and access to cheap animal-source protein and micro-nutrients for rural consumers. Training products and materials from the project sought to increase the technical education, business, and entrepreneurial skills of both aquapreneurs and smallholder farmers to achieve SDGs 1 (No Poverty) and 2 (Zero Hunger).</p>

List of Abbreviations

Provide a list of abbreviations used in the text

AICCRA	<i>Accelerating Impacts of CGIAR Climate Research for Africa</i>
DOF	<i>Department of Fisheries</i>
IBEMS	<i>Inclusive Business Models</i>
FO	<i>Feed Operators</i>
HO	<i>Hatchery Operators</i>

<i>AQTEVET</i>	<i>Aquaculture Technical, Vocational, and Entrepreneurship Training for Improved Private Sector and Smallholder Skills</i>

Brief Report

1. Project description

Briefly describe the project by outlining

a) The challenges addressed

b) The intended goal/purpose

c) Approach used to achieve the goal/purpose

Base your information on your project proposal (max 300 words).

The project addressed the challenges of low productivity and low profitability in the aquaculture sector in Zambia and Malawi. These challenges result from a lack of access to quality seeds/fingerlings, access to fish feeds, lack of adequate support from public sector extension services and limited access to microfinance to invest in aquaculture production. The project goal was to establish pro-poor, gender and youth-inclusive business models that provide sustained access for smallholder fish farmers with productivity and profitability enhancing fish seed, knowledge and increased access to fish for enhanced nutrition of consumers. The project had five outcomes: 1 Increased distribution of better quality inputs by aquapreneurs to fish farmers in their cluster areas; 2 Greater linkages between aquapreneurs, smallholders and input suppliers and service providers; 3 Increased production, productivity and profitability of smallholders; 4 Increased involvement of women and youth in fish farming activities; 5 Increase availability of and access to fish by local and district consumers.

The project identified aquapreneurs, also referred to as IBEMS trained them, and provided continued coaching and mentorship to effectively set up their IBEMs to reach women, men and youth fish farmers using innovative training materials and approaches. Aquapreneurs provided extension and training support to farmers within their cluster areas to ensure a critical mass purchased the products (feed and seed) they produced or sold so their businesses could be sustained in the longer term. The project used farmer registers to identify a cluster of farmers each IBEM was supposed to reach. Each IBEM was given a target to train at least 42 individual farmers in their respective clusters and provide markets for aquaculture inputs such as fingerlings and fish feed.

The project worked closely with the Departments of Fisheries and other stakeholders to organize and facilitate farmer field schools and other approaches to adequately train smallholder farmers on using quality seed and feed and good management practices. To this end, relevant and innovative training materials were developed. It also provided linkages between IBEMS and relevant private-sector actors, including feed manufacturers.

2. Brief summary of project progress

Provide a brief but comprehensive summary of the current status/progress of the project. (max. 300 words)

Output 1: 73 (104%) IBEMS (41 in Zambia and 32 in Malawi) were trained. Feed IBEMS sold high-quality feed to smallholders, earning €64,309 in Zambia and €31,938 in Malawi. Zambia's IBEMS received 30 tons of feed and Malawi 32.5 tons of feed from the project. Additionally, feed IBEMS in Zambia purchased 27.7 tons of feed independently. By December 2022 Malawi's IBEMS had purchased 7.5 tons in additional feed. The feed IBEMS reached 1105 farmers with high-quality feed and training. We tested three models of feed distribution (Agroshops, Cooperatives and Small farms). The gross margin ratio for the three tested models ranged from 7.5 to 8.5%. In Zambia, Hatchery Operators (HOs) produced 1,638,483 fingerlings worth 93,565.35 EUROS and sold

951,504 fingerlings worth 56,069 EUROS. HOs in Malawi produced 894,557 fingerlings worth 26,862.2 Euros and sold 232,545 fingerlings worth 6,983 EUROS. (See Annexes 1, 2, 3, 4 and 5 for project's progress and impacts). Before the project, none of the IBEMS produced quality fingerlings for sale.

An impact evaluation of WorldFish work in Zambia showed that fish farmers from the treatment districts (68%) responded more positively to having access to quality fingerlings than fish farmers from control districts (27.5%). Farmers in focus group discussions this is due to the increased number of hatchery operators in the treatment districts who offer quality seed. These hatchery operators in the treatment districts were established through the support of the IBEMS project. Another reason found by the study (through focus group discussion) was that several farmers in the treatment districts, through WorldFish training, could nurse and produce quality fingerlings for their ponds. Based on these findings, the improvements found in the treatment districts can be directly attributed to the IBEMS project (See Annex 2). In Malawi, 86% of farmers mentioned that they had challenges accessing seed compared to 44% of respondents who mentioned a similar challenge during the independent end-of-project evaluation of the IBEMS project (See Annex 1)

Output 2: Innovation platform meetings were hosted to develop customized products and services to target the IBEMS. For example, in Zambia, Aller Aqua trained 250 IBEMS and smallholder farmers on feed tables. In Malawi, the feed IBEMS met with feed private sector companies to develop a model of importing feed from Zambia resulting in some of the IBEMS coming together to import feed from Zambia. In Zambia, when sex reversed fingerlings were introduced the conversion rate was very low. It was through the innovation platform meeting that this issue was raised and addressed through the provision of more technical support to IBEMS and knowledge sharing. The same learning from the Zambia innovation platform was utilised in Malawi. Twenty-four per cent of those who participated in the Innovation platform meetings were women. Through the platform, Malawi IBEMS engaged with commercial feed companies to develop a model to collectively order and import feed from Zambia to reduce transport costs. (See Annexes 6, 7 [on innovation platform], 8 and 9).

Output 3: The project adapted training materials into iciBemba and Chichewa for smallholder farmers (Annexes 10, 11, 12 and 13 for training materials). Using these materials, IBEMS trained 3,672 farmers (37% women). 81% of farmers reported receiving training compared to 8% at baseline (Annexes 1 and 2 for targets, Annexes 14 to 21 for training reports). Adopting technologies such as using quality feeds and seeds and better management practices of aquaculture increased farm household income by 88% and 129% in the first and second growing cycles (see logframe).

IBEMS in Zambia utilized business skills acquired through mentorship and coaching by the project to secure €175,351 in additional funding from competitive bids from WorldBank and USAID funded projects. Six IBEMS migrated to digital financial records, others received tax clearances to supply schools and institutions, and four previously unregistered IBEMS registered businesses.

The fish supply in the communities has improved (see logframe).

Output 4: The M&E Plan was implemented, and production, sales and training data were collected. Baseline end-line surveys and impact assessments were conducted.

3. Innovations and Scaling

Please follow the same structure for each innovation by responding to questions a)-g).

a) Name/describe the innovation

- b) Specify the innovation by using the nomenclature of the definition in the footnote¹.
- c) Mention whether the innovation is (-1-) already existing and used in this project, or (-2-) is currently being developed by thy project, (-3-) will be available at the end of the project
- d) What is/will be your approach for scaling? Do/did you perform a scaling scan?
- e) Who are/will be the intended beneficiaries/users of the innovation?
- f) Is there project staff with scaling expertise and funds available?
- g) Who are/will be the scaling partners to assure broad based dissemination?
(max. 400 words)

Innovation 1: Inclusive Business Models (Agroshops, Cooperatives and Small-Scale Farmers) to ensure access to quality feeds, seed and extension services and training for fish farmers

Institutional Arrangements- Business Models are available for use.

We used the CGIAR's Initiative on Aquatic Foods funds to perform a scaling scan (Annex 22). We will scale the innovation through continued working with large private sector players and SMEs through the established innovation platform.

Agro-dealers, Hatchery Operators, and SMEs benefit from the inclusive business models through receiving mentorship from business incubators and access financing mechanisms to grow their businesses. Smallholder farmers will benefit from access to inputs and output markets and training and extension services from trained businesses.

There are staff with scaling expertise. The model has been adopted and scaled out by the AICCRA project in Zambia under its accelerator grant program. IBEMs (in Zambia) used the skills acquired in business plan development to secure additional funding to scale out the business model. Private sector actors such as Aller Aqua and Novatek have engaged with SMEs through the innovation platform to develop feed distribution mechanisms and to offer additional training to IBEMS and farmers on feeding tables.

Scaling partners: Large private sector companies in the aquaculture sector, public sector (Departments of Fisheries), Finance Institutions

Innovation 2: Sex-Reversed Fingerlings using hormonal feeds to have all male tilapia to promote faster and uniform growth under culture system

Technology – Better Management Practice

The technology was used in the project. However, it has yet to be widely used by smallholder hatchery operators producing fingerlings for sale to smallholder fish farmers.

We piloted the innovation and discussed it with stakeholders during innovation platform meetings. A challenge was raised in Zambia and Malawi, where the fingerlings were not sex reversing at an expected rate. Further training addressed this challenge when it was discovered that the hatchery operators were not correctly using the sex reversal feed, and the conversion rate went up to 88%. A challenge yet to be addressed is that the hormonal feeds sometimes run out of stock from suppliers affecting sex reversal for IBEMS. Farmers are demanding sex-reversed fingerlings because of their better performance, but the quantities produced are still low.

Smallholder farmers will use the sex-reversed fingerlings to produce better-quality fish.

¹ **Innovation:** Innovations can be defined as: *New, improved or adapted (knowledge) products (e.g., decision support system, toolbox, dashboard, capacity development curricula); technologies (e.g., variety, crop management practices); services (e.g., strategy development, monitoring, policy implementation) or institutional arrangements (e.g., policy instrument, contract, partnership approaches, business models)*

We have staff with experience in scaling and experienced in producing sex-reversed fingerlings and training intended producers and users. Funds are not yet available.

Scaling partners include private sector partners that produce sex-reversal feed, Hatchery operators and fisheries departments.

4. Limitations, solutions, and lessons learned.

Briefly describe:

a) Unexpected obstacles encountered. These can be planning errors, unforeseen external risks (outside the project's sphere of influence), unsuccessful coping mechanisms, etc.

b) Solutions taken and/or planned. How do/did you strategically and/or operationally address the obstacles/risks encountered?

c) Unintended positive and/or negative results encountered?

d) What are your take-aways and lessons learned for the implementation of the project and for future projects?

(max 500 words)

The first major obstacle was the low temperatures in Zambia that negatively impacted fingerlings production during winter. The project influenced partner organizations and projects to fund greenhouses to two best-performing IBEMS. Two SMEs have greenhouses that can produce 5 million fingerlings annually, including during winter.

In 2022, several hatchery operators' ponds dried up due to climate-related weather impacts (9 in Zambia and 2 in Malawi). In Malawi, one hatchery operator lost ponds due to cyclone Idai. Some hatchery operators temporarily transferred their broodstock to hatcheries that still had water. In Malawi, hatchery operators were encouraged to deepen their ponds to avoid drying due to prolonged dry spells. In Zambia, some hatchery operators have secured funds to drill boreholes.

We experienced challenges recruiting broodstock from the wild, including 1) high losses to theft as brooders were being conditioned in hapas at Lake Chiuta and 2) a high mortality rate at the station due to the limited time the fish was conditioned at the lake. IBEMS experienced mortalities due to poor fish handling during the winter season. We mentored and coached IBEMS on-farm to reduce the number of mortalities experienced to normal levels.

Only 7% of IBEMS in Zambia are women compared to 37% in Malawi. Women failed to meet the set criteria for inclusion as IBEMS, particularly related to 30% co-financing for feed IBEMS and ownership of at least four ponds for HOs. Two potential female HOs refused to participate when selected. All IBEMS and their spouses were trained in business management and entrepreneurship. The team used a household approach to mentor and coach all selected IBEMS to address the gender gap. Wives of selected male IBEMS and their young adult children actively participated in hatchery activities and training. Four women from cooperatives and an additional five female household members of selected male HOs have participated in the training of hatchery operators. For FOs we selected SMEs and individuals that demonstrated close collaboration between the husband and wife in managing the business.

COVID-19-related mobility restrictions led to the suspension of fieldwork and training. We secured a six-month no-cost extension to finalize pending work.

Lessons Learnt: The creation of innovation platforms can effectively address problems affecting the aquaculture sector by enabling the collective identification of challenges and solutions. For example, after identifying the need to ensure quality seeds for good business, seed IBEMS in Zambia are now pursuing certification from ZABS to create smallholder farmer confidence. Through the innovation platform, feed IBEMS identified feed procurement as a problem in Malawi

and engaged private feed actors in Zambia to develop models for collective feed imports. Coordinating with other projects to address critical challenges is valuable. Climate-smart approaches should be implemented to promote efficient water use considering weather variability and climate change impacts. Constant engagement with private sector players, simplified training materials, leveraging public investments, business mentorship, and coaching are critical for sustainable business operations. Partnership with the DOF improves business returns and capacity building. Incorporating financing mechanisms and financial products is attractive to entrepreneurs.

5. Highlights

Mention 2-3 highlights that you would like to share with the public. For instance, what is your team proud of having achieved in the last year or what were major breakthroughs?

Explain why.

(max. 200 words)

1. Over 73% of smallholder farmers reported having access to quality fingerlings, up from 14% at the project baseline. Over 83% of smallholder farmers now have access to commercial feed. 81% of farmers reported receiving training compared to 8% at baseline.
2. Using developed local language better management practices manuals, IBEMS trained 3,672 farmers (37% women) (2,295 in Zambia and 1,046 in Malawi). Trained farmers had improved uptake of better management practices, which resulted in a rise in average farm household income by 88% in the first growing cycle and 129% in the second. Farmers' income per fishpond rose from €24 to €44 in the first growing season and from €44 to €55 in the second.
3. The Inclusive Business Models developed by the project have been adopted and scaled out by other projects, such as the AICCRA project in Zambia. From the training they received and the initial investment of €40,000, IBEMS in Zambia have had higher gross margins and also have been able to leverage additional investments worth €191,598 from other funders to scale up the inclusive business models.

6. Monitoring, Evaluation and Impact Assessment

Baseline data.

Please briefly describe the availability, size, and sampling strategy for baseline data.

If none was collected, please justify.

(max. 200 words)

In Zambia, the baseline was the census data collected by the AQTEVET project to understand the smallholder fish farming systems in Northern and Luapula provinces. The census collected the following data:

1. The demographics of the farmers
2. Fish farming background
3. Resources and fish species cultured
4. Gender, youth and the division of roles in fish farming
5. Access to input and output markets
6. Production constraints and opportunities
7. And the Global Positioning System (GPS) of the farming households

2,341 (14% women) active and inactive smallholder fish farmers were surveyed in the regions where the IBEMS project was implemented. In Zambia, we used the baseline data to map the communities and provide IBEMS with farmer registers to identify farmers within their clusters that

they could target. In Zambia, only 14% of those interviewed were women. This figure also alerted us to the need to develop strategies such as working with cooperatives, training IBEMS on integrating gender and training spouses to ensure that women could also gain access to knowledge, information and technologies. The results of these efforts are evident in the impact evaluation study. For example, 66% of female farmers in the treatment districts mentioned having access to quality fingerlings compared to female farmers in control districts (34%)(See Annex 2).

Malawi collected similar information to Zambia but used a household sampling approach based on a sampling frame provided by the Department of Fisheries for each target district. A proportionate random sampling of households engaged in fish farming was conducted per district. The farmer survey sample size was based on the standard sample size calculation (Cochran, 1963), which yielded a sample of 375 farmers based on a total population of 15,465 smallholder aquaculture farmers in Malawi. We adjusted the sample to 415 farmers to cover 5% non-responses and 5% attrition during the end-line survey.

The experiences with the Zambia baseline influenced the design and implementation of the Malawi baseline survey. We trained enumerators on gender and inclusion to ensure that at least 30% of those reached were women. where we aimed to have 50% of respondents being women. The baseline study in Malawi also helped to identify additional communities to set up IBEMS where there was the greatest need for seed but underserved

Impact assessment/Evaluation.

Please describe your plans for assessing the project's contribution to outcomes and impacts, i. e. conducting both baseline and end-line surveys for causal attribution, and any further methods for measuring change, i. e. in income, food security, and sustainable land management. (max 200 words).

In Zambia, we conducted an Independent impact evaluation (See Annex 2) of WorldFish work in the Northern and Luapula provinces, including the work by the IBEMS project. We used a Quasi-Experimental Research Design utilizing propensity score matching and a control group

The impact evaluation tested the following hypotheses:

1. Farmers in WorldFish intervention areas have more access and control over resources, technology, and aquaculture information.
2. Women are more encouraged to participate in aquaculture activities in the targeted WorldFish intervention areas.
3. The aquaculture structures/institutions introduced by WorldFish promotes climate resilience and smallholder productivity (especially among women).

Using GIZ farmer registers to select respondents randomly, 644 responses were collected from 322 households in the treatment districts and 356 responses from 178 households from the control districts. The surprising result was how much having small SMEs and individuals acting as last-mile distributors had huge positive impacts on access to inputs, output markets and services. Over 70% of the farmers in those districts where the IBEMS project was implemented (treatment districts) had sustained access to critical input and output services due to the private sector-led Inclusive Business and Entrepreneurial Models (IBEMs) set up by the WorldFish projects compared to less than 30% of farmers in control districts. Surprisingly, more female farmers mentioned using developed training manuals and books than men. The fact that the manuals were available in local languages and designed in a simple and accessible way promoted their use by women. Also, it promoted the sustained adoption of aquaculture and better management practices. The findings show increased agro-businesses that deal in aquaculture products, increased female

entrepreneurs and farmers and a change in mind-set on gender roles as significant impacts of WorldFish projects in aquaculture in the treatment districts.

In Malawi, we conducted an Independent end-of-project evaluation focusing on the project's four outputs. We used the Organization for Economic Cooperation and Development – Development Assistance Committee (OECD-DAC) evaluation tool to measure the project's impact. The evaluation employed a mixed-method design comprising qualitative and quantitative approaches using survey questionnaires, key informant interviews, focus group discussions and observations in the field.

In Malawi, the project led to improved feed and seed access. For example, before the project, women cooperatives indicated efficiency in that, before the project, they started the cycle with around 300-450 fingerlings, but now they start the cycle with around 800-950 fingerlings. However, in terms of gender equity, and inclusivity, local systems and practices of patriarchy remain a constraint, and more intensive, deeper, and long-term gender-transformative agri-food systems programs are required if the changes witnessed are to be consolidated rather than merely fleeting and even reversed. Rural homesteads in Malawi have diverse and fluctuating livelihood portfolios. As a result, in future projects, it may be important to consider how fish farming (including inputs and outputs) integrates into crop farming in a complementary manner. Similar projects must holistically comprehend the basis on which homesteads make livelihood choices and their overall livelihood pathway.

7. Collection of sex-disaggregated data

Briefly describe

a) Were data collected for this project disaggregated by sex?

b) Yes: give some examples of activities where this was done, i. e. for trainings

c) No: outline the reasons

(max. 150 words)

The project collected sex-disaggregated data throughout its implementation.

1. Sex disaggregated data on IBEMS
2. We collected sex-disaggregated data on the number of farmers trained by IBEMS. IBEMS trained 3,672 farmers (37% women)
3. All data collected by the project, including routine monitoring data, baseline data and impact assessments, was sex-disaggregated and used the Women Empowerment in Agriculture Index.
4. The impact assessment in Zambia and the end of project evaluation in Malawi also conducted a sex-disaggregated analysis.
5. Attendance registers from all workshops and innovation platform meetings are sex-disaggregated

Research, monitoring, and evaluation activities collected and analyzed sex-disaggregated data, particularly the spatial location of each farmer's household; the demographics of smallholder farmers; the resources and fish species cultured; decision-making as well as the division of roles in fish farming; access to input and output markets; fish consumption, and production constraints and opportunities.

8. Gender inclusion

Briefly describe

a) Were you able to consider gender aspects in project activities as outlined in your project proposal?

b) If yes, briefly describe how your project considered gender in its activities, which methods/ instruments were used, and which impacts were achieved as a result.
c) If no, what challenges arose in regard to including women?
d) How can your gender measures be primarily categorized? Select category²(reach, benefit, empower. See Footnote for definition.) and explain your choice.
(Max. 300 words)

The project considered gender targets of 50% women. However, only 37% of those smallholders trained were women, and 7% and 37% of IBEMS in Zambia and Malawi were women. Women failed to meet some of the criteria for inclusion as IBEMS, particularly related to 30% co-financing for feed IBEMS and ownership of at least four ponds for HOs. Two selected women HOs refused to participate.

To cater for the gender gap, IBEMS and their spouses were trained in business management and entrepreneurship and mentored and coached on better management practices. We used a household approach to mentor and train HOs. Wives of selected male HOs and their young adult children actively participated in hatchery activities and training. To include women as HOs and FOs, the team designed an approach to include cooperatives with many women members.

For FOs, we selected SMEs and individuals demonstrating close collaboration between the husband and wife in managing the business. Using learnings from Zambia, Malawi selected more women hatchery operators. The IBEMS in Zambia were selected from the baseline, which only had 14% of respondents being women. Participants were asked if they wanted to become IBEMS. Those who mentioned that they were interested were selected for further evaluation. However, very few women volunteered to be IBEMS compared to men. Instead of using the baseline to select IBEMS in Malawi, we worked closely with extension workers to identify women who could participate if provided with adequate support and mentorship. The project team approached these women and encouraged them to become IBEMS, promising that the project would give them training, mentorship and support.

To better incorporate women in fish farming activities, a series of aquaculture training seminars were conducted by WorldFish in Zambia and Malawi to foster gender-integrated business strategies by IBEMS. This approach seeks to consider gender in all stages of development and assess the implications of any planned action on gender equity and raising awareness on the critical role of women in fish farming. Training seminars focused on the role of men in fostering gender-transformative approaches, as opposed to placing the burden solely on women, to create opportunities for individuals to challenge gender norms and address power inequities actively. IBEMS also target women with training and collect sex-disaggregated data to ensure women participate and benefit from project activities.

The project adapted training materials into local languages (iciBemba and Chichewa) for use by smallholder farmers, especially women.

9. Youth inclusion

Briefly describe how your project considered the needs of youths in its activities.

- a) Was this planned in the proposal?*
b) How were activities adjusted to cater to the needs of or attract youths?
c) Which impact did including youth have on the project outcome?
d) Provide the age range defined as "youth" in your project/country of implementation.

² **Reach, benefit, empower:** Reach relates to an increase in female participation in project activities; Benefit relates to a differential improvement in females' livelihoods and wellbeing; Empowerment refers to a positive impact on psychological and social standing of women

(max. 300 words)

The project does not have youth indicators. However, during on-farm coaching and mentorship visits for IBEMS, the team members engage with families, including young people. We defined young people as those between the ages of 15 and 35 as defined by the African Union's African Youth Charter.

Agroshops with youth workers were selected for capacity development activities. Young employees of Hatchery Operators and Feed Operators sometimes attended training sessions and capacity-building events. One young feed entrepreneur was among the team that won the USD50,000 competitive grant under the WorldBank funded AICCRA project.

To understand the participation of youth in aquaculture, the project team and aquaculture enterprises affiliated with the project collected gender and age-disaggregated data at all phases of implementation.

Reports, Manuals, Publications and Media

Provide hyperlinks to as many sources of information as possible or attach them to this report (see instructions for high volumes of documents).

10. Peer-reviewed publications (only)

List and NUMBER all peer-reviewed publications (e.g., journals, book-chapters) that have been published (or accepted for publication) by the reporting deadline. Note that we record the number of peer-reviewed publications, as such the proper numbering of reference list entries is important.

Please use APA (American Psychological Association) style to format your bibliometric entries (e.g., Authors, Year, Title, Volume, Pages, DOI).

After each reference entry, please provide the relevant status in brackets (fully published or accepted).

None published though one paper titled, 'Piloting Inclusive Business models in Aqua-feed Supply chains in Zambia: An Action-Oriented study' is being finalised for submission

11. Other publications/relevant documents

Please use APA (American Psychological Association) style to format your bibliometric entries.

1. Mubaya CP., Ndebele-Murisa MR., Mutopo P., Kapute F., Helliker K. (2023). End-Term Project Evaluation Report: Piloting Inclusive Business and Entrepreneurial Models (IBEMs) for Small-Scale Fish Farmers and Pro-Poor Value Chain Actors in Malawi 2019-2022. WorldFish Zambia. <https://hdl.handle.net/20.500.12348/5486>
2. Kwaku A. (2023). Climate-Hotspots Gender Impact Assessment. A CGIAR Gender Platform Funded Impact Evaluation. WorldFish Zambia. <https://hdl.handle.net/20.500.12348/5565>
3. Mwema CM, Mudege NN, Lundeba M, Nankwenya B, Kakwasha K, Phiri M, Basiita RK and Siamudaala V. 2021. A review of aquafeed business models and the feed value chain in Zambia and Malawi. Penang, Malaysia: WorldFish. Program Report: 2021-08. <https://hdl.handle.net/20.500.12348/4724>
4. Mwema CM., Maluwa, A., Chisusu, D., Mudege NN (2021). Project Start-Up and Stakeholder Workshop Report: Piloting Inclusive Business and Entrepreneurial Models for Smallholder Farmers and Poor Value Chain Actors in Malawi. Penang, Malaysia: WorldFish. <https://dx.doi.org/20.500.12348/4986>
5. Mwema CM., Maluwa, A., Chisusu, D., Lundeba, M., Mudege NN (2021). Innovation Platform Report, Malawi: Piloting Inclusive Business and Entrepreneurial Models for Smallholder Farmers and Poor Value Chain Actors in Zambia and Malawi. Penang, Malaysia: WorldFish. <https://hdl.handle.net/20.500.12348/5182>
6. Mwema CM, Mudege NN and Siamudaala V. (2022). Piloting inclusive aquafeed business models: Experiences and outcomes in Zambia. Penang, Malaysia: WorldFish. Program Report: 2022-27. <https://hdl.handle.net/20.500.12348/5328>
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<https://hdl.handle.net/20.500.12348/5071>
10. Mudege NN, Lundeba M, Peterman MA, Chungu P, Allen P, Kanyembo H, Mutakela M, Sichone M, & Basiita RK, 2021. Better Management Guidelines for smallholder fish farmers in. Penang, Malaysia: CGIAR Research Program on Fish Agri-Food Systems
<https://hdl.handle.net/20.500.12348/4502>
11. Catherine Mwema 2021 Gender-integrated business strategies empower women in Zambia
<http://blog.worldfishcenter.org/2021/06/gender-integrated-business-strategies-empower-women-in-zambia/>
12. Mary Lundeba (2020). Hatchery Operator Model. Penang, Malaysia: WorldFish.
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13. Mwema CM (2021). Feed Operator Model. Penang, Malaysia: WorldFish.
<https://hdl.handle.net/20.500.12348/4572>
14. Mary Lundeba 2021 Innovating Zambia's aquaculture sector boosts food security
Innovating Zambia's aquaculture sector boosts food security | WorldFish
(worldfishcenter.org)
15. Agness Chileya Fish Farming-a lucrative business
<https://allafrica.com/stories/202112080915.html>
16. Mary Lundeba (2021). The Seed Innovation Platform Workshop Proceedings. Penang, Malaysia: WorldFish.
17. Catherine Mawia Mwema and Mercy Sichone (2021). Feed distribution and training report for feed operators in Zambia. Penang, Malaysia: WorldFish.
18. Dorothy Chisusu, Alinafe Maluwa, Catherine Mawia Mwema (2021). Business plan training for feed and seed operators in Malawi. Penang, Malaysia: WorldFish
19. Mwema CM (2021). Mentoring and Coaching of Feed operators in Malawi. Penang, Malaysia: WorldFish.
20. Mwema CM (2021). Mentoring and Coaching of Feed operators in Zambia. Penang, Malaysia: WorldFish.
21. Mary Lundeba (2021). Hatchery Operator On-Farm Training, Mentorship and Coaching Report in Zambia. Penang, Malaysia: WorldFish.
22. Alinafe Maluwa (2021). Broodstock Distribution Report Malawi. Penang, Malaysia: WorldFish.
23. Catherine Mawia Mwema (2021). Business plan training in Zambia. Penang, Malaysia: WorldFish.
24. Alinafe Maluwa (2021). Malawi hatchery operator list. Penang, Malaysia: WorldFish.

25. Media Coverage

List all media types (social media posts, films, radio coverage) as well as project websites that have been used in displaying project information and/or impact.

Pictures, videos, reports, manuals, and audio from the project were published on the WorldFish website, the Monitoring, Evaluation, and Learning (MEL) platform, and social media platforms, in accordance with the CGIAR data protection and open access policy. The following are the social media platforms used to disseminate information:

- WorldFish Facebook
- WorldFish and Famer Producer WhatsApp Groups

- WorldFish LinkedIn Account
- WorldFish Twitter Account @worldfishcenter

Blogs:

1. <https://worldfishcenter.org/blog/gender-integrated-business-strategies-empower-women-zambia> -
2. <https://worldfishcenter.org/blog/worldfish-pilots-last-mile-feed-business-models-boost-aquaculture-zambia>

Newspaper article

- <https://www.times.co.zm/?p=113409> –

Video

[Transforming smallholder aquaculture business models in Zambia \(youtube.com\)](#)

26. Annexes

Provide a list of the annexes attached to the report

1. Mubaya CP., Ndebele-Murisa MR., Mutopo P., Kapute F., Helliker K. (2023). End-Term Project Evaluation Report: Piloting Inclusive Business and Entrepreneurial Models (IBEMs) for Small-Scale Fish Farmers and Pro-Poor Value Chain Actors in Malawi 2019-2022. WorldFish Zambia. <https://hdl.handle.net/20.500.12348/5486>
2. Kwaku A. (2023). Climate-Hotspots Gender Impact Assessment. A CGIAR Gender Platform Funded Impact Evaluation. WorldFish Zambia
3. Lundeba M. 2022. End of Project Workshop Report: Piloting inclusive business and entrepreneurial models for smallholder fish farmers and poor value chain actors in Zambia and Malawi Project. Penang, Malaysia: WorldFish.
4. Lundeba M (2022) Report on the final monitoring of seed and feed IBEMS in the northern region of Zambia December 2022
5. Video
6. Mudege NN and Mwema C. (2021). Innovation Platform Concept Paper. Piloting inclusive business and entrepreneurial models for smallholder farmers and poor value chain actors in Zambia Penang, Malaysia: WorldFish. Note.
7. Mwema CM., Maluwa, A., Chisusu, D., Lundeba, M., Mudege NN (2021). Innovation Platform Report, Malawi: Piloting Inclusive Business and Entrepreneurial Models for Smallholder Farmers and Poor Value Chain Actors in Zambia and Malawi. Penang, Malaysia: WorldFish. <https://hdl.handle.net/20.500.12348/5182>
8. Mudege NN and Mwema C. 2020. Stakeholder workshop report: Piloting inclusive business and entrepreneurial models for smallholder farmers and poor value chainactors in Zambia. Penang, Malaysia: WorldFish. Workshop Report.
9. Mwema CM., Maluwa, A., Chisusu, D., Mudege NN (2021). Project Start-Up and Stakeholder Workshop Report: Piloting Inclusive Business and Entrepreneurial Models for Smallholder Farmers and Poor Value Chain Actors in Malawi. Penang, Malaysia: WorldFish. <https://hdl.handle.net/20.500.12348/4986>
10. Mudege NN, Lundeba M, Mark P, Chungu P, Peter Allen P, Chisusu D, Maluwa A and Komugisha RB. 2021. Better Management Guidelines for smallholder fish farmers in Malawi. Penang, Malaysia: WorldFish. Manual

11. Mudege NN, Lundeba M, Mark P, Chungu P, Allen P, Chisusu D, Maluwa A, Phiri M and Komugisha RB. 2021. Better management guidelines for smallholder fish farmers in Malawi; Ndongomeko Zamakono Zoyendetsera Ulimi wa Nsomba za Alimi Ango'noang'ono m'Malawi. Penang, Malaysia: WorldFish. Manual.
<https://hdl.handle.net/20.500.12348/5071>
12. Mudege NN, Lundeba M, Peterman MA, Chungu P, Allen P, Kanyembo H, Mutakela M, Sichone M, & Basiita RK, 2021. Better Management Guidelines for smallholder fish farmers in. Penang, Malaysia: CGIAR Research Program on Fish Agri-Food Systems
<https://hdl.handle.net/20.500.12348/4502>
13. Mudege NN, Lundeba M, Peterman MA, Chungu P, Allen P, Kanyembo H, Mutakela M, Sichone M, & Basiita RK, 2020. Inshila Shisuma Isha Ukutungulwilamo ba Kasunga uwe Sabi Banono mu Zambia. Penang, Malaysia.
14. Chisusu, D., Maluwa, A., Mwema, C (2021) Business Plan training for seed and feed operators in Malawi
15. Lundeba, M (2023) on the Monitoring of the Seed IBEMs in Malawi
16. Catherine Mawia Mwema and Mercy Sichone (2021). Feed distribution and training report for feed operators in Zambia. Penang, Malaysia: WorldFish.
17. Dorothy Chisusu, Alinafe Maluwa, Catherine Mawia Mwema (2021). Business plan training for feed and seed operators in Malawi. Penang, Malaysia: WorldFish
18. Mwema CM (2021). Mentoring and Coaching of Feed operators in Malawi. Penang, Malaysia: WorldFish.
19. Mwema CM (2021). Mentoring and Coaching of Feed operators in Zambia. Penang, Malaysia: WorldFish.
20. Mary Lundeba (2021). Hatchery Operator On-Farm Training, Mentorship and Coaching Report in Zambia. Penang, Malaysia: WorldFish.
21. Catherine Mawia Mwema (2021). Business plan training in Zambia. Penang, Malaysia: WorldFish.
22. Aquatic Foods Initiative. December 2022: Aquatic Foods Initiative WP5 Meeting in Chisamba, Zambia. Group 2 Plenary Presentation Inclusive business models – scaling readiness Assessment. Aquatic Foods Initiative.

Logical Framework – Achievements

Instructions

Reporting period:

- For annual progress reports the information should only refer to the past calendar year (January 1 - December 31).
- For final reports, the information should refer to the complete project duration (cumulative).

Customize the rows to fit your case:

- All relevant outputs and activities should be listed in the table as provided in the logframe section of your project proposal or –last year’s final version of your submitted progress report (Excel).

- Activities should be nested within outputs.
- If you have more than three activities per output, please add more rows. If you have less than three activities, remove rows.

Status of activity:

- Select the status that best fits to the achievement of your activity (at the end of the reporting period) and as described in the column on “description of achievement”.

Logframe content <i>Please copy the exact wording from the proposal log frame</i>	Description of achievement <i>Brief description of activities realized and respective achievement. If relevant, please also explain adjustments realized. Do not list indicators here.</i>	Status of activity Select: <i>Not started yet</i> <i>Ongoing -on track</i> <i>Ongoing -delayed</i> <i>Completed</i> <i>Dropped</i>
Purpose: Establishment of inclusive business and entrepreneurial models that provide sustained access for smallholder fish farmers in Zambia and Malawi with productivity and profitability enhancing fish seed, feed and knowledge and increased access to fish for enhanced nutrition of consumers.	<i>No information required</i>	<i>No information required</i>
Output 1. Inclusive business and entrepreneurial models (IBEMs) established and functional for piloting to service local smallholder farmers	Output 1: 73 (104%) IBEMs (41 in Zambia and 32 in Malawi) were trained. The feed IBEMs sold high-quality feed to smallholders, earning €64,309 in Zambia and €31,938. in Malawi in revenues. Additionally, feed IBEMs in Zambia purchased 27.7 tons of feed independently. The feed IBEMs reached 1105 farmers with high-quality feed and training. We tested three models of feed distribution (Agroshops, Cooperatives and Small farms). The gross margin ratio for the three tested models ranged from 7.5 to 8.5%. In Zambia, Hatchery Operators (HOs) produced 1, 638,483 fingerlings worth 93,565.35EUROS and sold 951,504 fingerlings. HOs in Malawi produced 894,557 fingerlings worth 26,8627.2 Euros and sold 232,545 fingerlings.	Completed
Output 2. Innovation platforms with private and public actors established and functional for greater linkages to local aqua-preneurs and smallholder farmers for inputs, training,	Innovation platform meetings were hosted. In Zambia, the AICCRA project used the platform to engage various stakeholders in Multistakeholder workshops on aquaculture attended by 78 participants (24% women) to develop customized products and services to	completed

service provision, and output market linkages.	target the IBEMs. Through the platform, Malawi IBEMs engaged with commercial feed companies to develop a strategy to collectively order and import feed from Zambia to reduce transport costs. Aller Aqua has trained 250 IBEMs and smallholder farmers on feed tables.	
Output 3. Innovative training materials, utilizing key research innovations that have been tested at proof of concept stage, and approaches on hatchery and best management practices, business skills development, entrepreneurship, and gender, youth, and nutrition integration developed	<p>The project adapted training materials into iciBemba and Chichewa for smallholder farmers. Using these materials, IBEMs trained 3,672 farmers (37% women). Adopting technologies increased farm household income by 88% and 129% in the first and second growing cycles. Farmers' income per fishpond rose from €24 to €55 in the first and second growing seasons. 81% of farmers reported receiving training compared to 8% at baseline.</p> <p>IBEMs in Zambia utilized business skills acquired through mentorship and coaching to secure €175,351 in additional funding. Six IBEMs migrated to digital financial records, others received tax clearances to supply schools and institutions, and four previously unregistered IBEMs registered their businesses.</p> <p>The fish supply in the communities has improved. About 25,704 (51% women) are estimated as eating healthy and nutritious foods as a result of the project</p>	Completed
Output 4. Assessments evaluating the efficacy of the IBEMs (including their abilities to be sustained and inclusive of different social groups), innovation platforms, and innovative training materials and approaches developed.	The M&E Plan was implemented, and production, sales and training data were collected. Baseline endline surveys and impact assessment were conducted.	Completed
Output 1. Inclusive business and entrepreneurial models (IBEMs) established and functional for piloting to service local smallholder farmers	<i>No information required</i>	<i>No information required</i>
Activity 1.1. Project partner meeting to modify the IBEMs for piloting based on detailed analysis of past successes, challenges, and opportunities for improvement, among other factors such as costs, seasonality, existing farming	In 2020 and 2021, we hosted online stakeholder meetings in Zambia and Malawi to validate the feed and seed models. The meetings were attended by representatives of private sector companies and government representatives, including representatives from the Department of Fisheries, international organizations, NGOs and smallholder farmers.	Completed

systems. See annex 8 for Zambia and Annex 9 for Malawi.	The meetings achieved outcomes related to the validation of the feed models and seed models and providing relevant information to stakeholders to create buy-in. In 2022 we held an end-of-project meeting to disseminate the findings and create regional buy-in from the models that had been piloted. Stakeholders from Zambia, Malawi and Zimbabwe attended the end-of-project meeting hosted in Zambia's Northern and Luapula provinces.	
Activity 1.2. Identify local entrepreneurial individuals based on a clear and focused selection criteria (e.g., good sites with perennial water sources, interest in business, located near a critical mass of fish farmers), with the aim to identify up to 50% women and youth.	In Zambia, we used the census data to select individuals that had expressed interest in becoming IBEMS. We assessed these individuals based on the criteria set for seed and feed IBEMS. Only 7% of IBEMS in Zambia and 37% of IBEMS in Malawi are women falling short of the 50% women and youth participation we had anticipated at the beginning of the project. Women failed to meet some of the criteria for inclusion as IBEMS, particularly related to 30% co-financing for feed IBEMS and ownership of at least four ponds for HOs or refused to participate when selected. To cater for the gender gap, in 2021, all IBEMS in Zambia and Malawi and their spouses were trained in business management and entrepreneurship.	Completed
Activity 1.3. Set up the IBEMs with aqua-preneurs in roughly 16 focal districts in northern Zambia and southern Malawi and provide bi-monthly training and constant mentoring support.	73 IBEMS (41 in Zambia and 32 in Malawi) were established. We completed several business mentorship visits, coaching and training visits in Zambia and Malawi, respectively. All IBEMS were mentored and coached i) to develop and implement gender-responsive business plans, ii) record keeping; (iii) basic financial accounting and management; (iv) marketing and advertisement; (v) feed handling and storage; (vi) fish feeding regimes. Hatchery operators were additionally mentored on hatchery management practices, fingerlings handling, and fish production. We also created Whatsapp groups in Malawi and Zambia where IBEMS could quickly ask technical questions, get quick responses, and share other updates, including opportunities and successes. The Whatsapp group were a new addition to the approach outlined in the proposal.	Completed

<p>Activity 1.4. Work with private and public actors to develop quality broodstock available for sale to local aqua-preneurs (hatcheries) as well as pro-poor feed products and feed distribution channels through the IBEMs (aqua-preneurs).</p>	<p>The project worked with local entrepreneurs in collaboration with the Department of Fisheries to develop quality broodstock and pro-poor feed products and feed distribution channels through the IBEMs (aqua-preneurs).</p> <p>In Zambia, the project distributed 3000 broodstock of <i>Oreochromis macrochir</i> and <i>Oreochromis tanganicae</i> to seed IBEMs. From this initial broodstock, the seed IBEMs/ Hatchery Operators developed an additional 38,178 broodstock.</p> <p>In Malawi, the project distributed 2918 broodstock. From this initial broodstock, the seed IBEMs/ Hatchery Operators developed an additional 35,660 broodstock.</p>	Completed
<p>Activity 1.5. Develop a comprehensive database of existing fish farmers in each district using DoF, NGO, and/or private sector fish farmer registers. The project will utilize this database to help aqua-preneurs target farmers (women, men, and youth), providing information and engaging them in farmer field schools and through demonstration ponds for marketing and selling their inputs.</p>	<p>The farmers' database for Zambia was completed in 2020. Malawi implemented a baseline survey in 2021. Due to limited baseline funds, Malawi could not conduct a complete fish farmer census. The database shows the demographics of the farmers, fish farming background; resources and fish species cultured; gender, youth and the division of roles in fish farming; access to input and output markets; production constraints and opportunities; and location/distribution of smallholder farmers.</p>	Completed
<p>Output 2. Innovation platforms with private and public actors established and functional for greater linkages to local aqua-preneurs and smallholder farmers for inputs, training, service provision, and output market linkages</p>	No information required	No information required
<p>Activity 2.1. Carry out a private sector landscaping/mapping exercise to determine existing (and potential) value chain actors who are interested and willing to invest in input supply and service delivery in project focal areas.</p>	<p>Private sector mapping was completed in 2020. The results of the mapping exercise were used to recruit and design the IBEMs</p>	Completed

<p>Activity 2.2. Set up innovation platforms with these private/public actors to bring them together with other project stakeholders (including aquapreneurs and fish farmers) to determine the various opportunities to support and supply inputs and services to local aquapreneurs and smallholder farmers.</p>	<p>The project established innovation platforms that are operational. While WorldFish hosted the workshop at the beginning, by the end of the project, the platforms had been handed over to the IBEMS. Please see the design and handover of the platform in Innovation Platform Concept Paper Annex 7. The IBEMS have continued with the Innovation platforms using a WhatsApp group. The IBEMs have continued operating and sharing information via social media networks, where WorldFish staff, government and private sectors have been added. Via WhatsApp, the innovation platform members share information on fish harvest, markets, fish weight, fish illnesses and government regulations. Further, in Zambia, the AICCRA project holds physical innovation platform meetings on aquaculture from time to time based on its project calendar.</p>	<p>Completed</p>
<p>Activity 2.3. Participate in the aquaculture roundtable in Malawi ensuring that male and female farmer representatives participate in the various aquaculture round table meetings to influence decisions and policies. Setting up local farmer and local stakeholder discussion groups (local stakeholders can include private sector actors and government) in roughly 6 focal districts in Malawi.</p>	<p>We set up the local innovation platform in Malawi and hosted four meetings. We also hosted an online meeting where we invited the Aquaculture round table representative to share more about our platform and how we could work with and be integrated into the Aquaculture round table. 2 IBEMS attended an aquaculture round table meeting in Malawi funded the GIZ.</p>	<p>Completed</p>
<p>Activity 2.4. Meet formally with innovation platform members on a quarterly basis for regular knowledge sharing and learning and scaling their overall support helping develop the smallholder aquaculture sector.</p>	<p>We hosted six innovation platform meetings (four in Zambia and 2 in Malawi) between 2021 and 2022. The end-of-project meeting hosted in Zambia included innovation platform members from Malawi and Zambia who shared experiences and lessons learnt with each other and also with development partners and other regional players such as those from Zimbabwe. Innovation platform meetings were held with IBEMs, the private sector and government representatives. Building on the project's innovation platform, the AICCRA project in Zambia held two innovation platform meetings to address some of the themes and challenges addressed by the GIZ project.</p>	<p>Completed</p>

<p>Output 3. Innovative training materials, utilizing key research innovations that have been tested at the proof of concept stage, and approaches on hatchery and best management practices, business skills development, entrepreneurship, and gender, youth, and nutrition integration developed.</p>	<p><i>No information required</i></p>	<p><i>No information required</i></p>
<p>Activity 3.1. Modify existing training materials and approaches developed/used by the FISH CRP (with WorldFish and University of Stirling) for training aqua-preneurs and for training of trainer purposes for reaching smallholder farmers. Explore options for developing both digital and non-digital training materials.</p>	<p>The project adapted training materials for use by smallholder farmers. The English and iciBemba manuals have been widely distributed and used in Zambia. The English and Chichewa training manuals for Malawi were tested and validated with IBEMS during a ToT. The project awaits the materials to be approved by the government of Malawi through the Department of Fisheries for widespread use and distribution in Malawi</p>	<p>Completed</p>
<p>Activity 3.2. Regular training and mentoring support carried out with local aqua-preneurs and support them (as appropriate) with training smallholder farmers within their cluster areas, especially women and youth.</p>	<p>All IBEMS have been trained, receive mentorship and coaching and have access to farmer training materials developed by the project. Using developed materials, IBEMS trained 3,672 farmers (37% women). All trained IBEMS expressed confidence that they could train other farmers on BMPs for aquaculture and regarded the training as useful (please see Annex 2)</p>	<p>Completed</p>
<p>Activity 3.3. Facilitate the coming together of selected local aqua-preneurs and fish farmers each year to reflect on project implementation and performance and for knowledge sharing and learning purposes and modifying implementation processes the subsequent year.</p>	<p>We hosted six innovation platform meetings (four in Zambia and 2 in Malawi) between 2021 and 2022, where IBEMS and other stakeholders shared knowledge and experiences and discussed solutions to challenges. In 2022 we hosted an end-of-project meeting to which several stakeholders were invited. The project shared lessons learnt and experiences at the meeting.</p> <p>Feed IBEMS identified feed procurement as a problem in Malawi through the innovation platform. They decided to come together to import feed in bulk from Zambia. They identified two representatives who travelled to Lusaka in 2022 to engage with private feed actors in Zambia to develop models for collective feed imports.</p>	<p>Completed</p>

Activity 3.4. Develop capacities of project staff and partners using on-the-job training approaches for enhanced delivery of project outputs and achievement of outcomes.	Project staff were trained to use the CGIAR monitoring, evaluation and learning platform for planning and reporting. The project also had a MEL specialist to facilitate the implementation of the project MEL plan. Further, the project also hired a postdoctoral fellow.	Completed
Output 4. Assessments evaluating the efficacy of the IBEMs (including their abilities to be sustained and inclusive of different social groups), innovation platforms, and innovative training materials and approaches developed.	<i>No information required</i>	<i>No information required</i>
Activity 4.1. Production and sales of seed by local aqua-preneurs monitored monthly and their yearly profitability, by sex and age of the aqua-preneurs.	Production and sales data was collected from the IBEMs. WorldFish trained the aquapreneurs on record management and provided standard forms for data collection on fish production and sales. The data was then entered into an excel sheet for analysis.	Completed
Activity 4.2. Sales of feed by aqua-preneurs to smallholder farmers monitored monthly and their yearly profitability, by sex and age of the aqua-preneurs.	Feed sales from the feed IBEMs were monitored and reported. WorldFish trained the aquapreneurs on record management and provided standard forms for data collection on fish production and sales. The data was then entered into an excel sheet for analysis.	Completed
Activity 4.3. Production and sales of fish harvested during the course of the project (proxy for assessing the nutritional benefits local/district consumers receive from increase fish production.	We conducted an end-term evaluation which assessed the production and sales of harvested fish from smallholder farmers that benefited from the project. (See Annexes 1 and 2)	Completed
Activity 4.4. Private sector feedback on the effectiveness and utility of setting up and maintaining innovation platforms, and specifically the benefits they derived from being part of the platforms and linking to aqua-preneurs and smallholder farmers for uptake of their products (including microfinance options) or to purchase harvested fish or the like and their interest moving forward supporting the sector.	Representatives from private sector actors participated in 4 innovation platform meetings and gave their feedback on the business models and how best they could support the IBEMs (See Annexes 8 and 9). The IBEMs provided their feedback during the training, mentorship and multi-stakeholder platform meetings. See Annexes 8,9 and 14 to 21.	Completed

<p>Activity 4.5. Aqua-preneur and smallholder farmer feedback on the effectiveness of the training materials and approaches used to develop their capacities on hatchery and best management practices, business skills development, entrepreneurship, and gender, youth, and nutrition integration.</p>	<p>Aqua-preneur validated the training manuals before they were rolled out for use. They also gave feedback, assessed any training they received from WorldFish (see training reports), and provided WorldFish with feedback from farmers using the materials. The feedback they gave concerning language use, appropriate images and messaging was incorporated during the finalization of the training manuals.</p>	<p>Completed</p>
<p>Activity 4.6. Shifts in attitudes about increased involvement of women and youth in aquaculture from multi-stakeholder perspectives and how this could influence future efforts to support the smallholder sector.</p>	<p>Shift in attitudes were assessed during the end-term evaluation in Malawi and the impact assessment in Zambia. Further, a Knowledge, Attitudes and Practices (KAP) survey was conducted. The Zambia impact evaluation (Annex 2) observed the impact on feed and hatchery operators' attitudes towards gender. Female operators mentioned that they had become mentors for female farmers in their operational districts, leading to more women showing interest in fish farming. Intentional efforts were made to include more women in the client base through the formation of women fish farmer groups and promoting gender equality in fish farming. In Malawi (See Annex 1), the project made improvements in terms of access to feed, seed, and gender equity. However, patriarchal systems and practices remained a constraint, requiring more long-term and transformative programs to consolidate the changes. The involvement of youth in fish farming was not given sufficient attention, and their specific constraints and enabling factors for their participation need to be addressed through targeted approaches. The project's success in increasing production and income has sparked the interest of the youth, making it easier to engage them in future work.</p>	<p>Completed</p>
<p>Activity 4.7. New developments in the sector (e.g., reduced imports, an increased number of larger-scale private hatcheries, increased donor investments) that positively or negatively influence actors operating in different nodes of the smallholder value chain.</p>	<p>The number of local hatchery operators increased in various farmer clusters in both Zambia and Malawi. We have also observed a decline in fish imports into Zambia. Fish imports reduced by 16% from 95,536MT in 2019 to 79,941 in 2020. However, since our project was a pilot project and small in scale, we cannot attribute this decline in fish imports to the project. However, it is clear that if the model</p>	<p>Completed</p>

	we piloted is upscaled, it can significantly contribute to a reduction in fish imports by increasing local fish production due to increased knowledge of better management practices and availability and accessibility of inputs and outputs markets.	
Activity 4.8. Disseminate the various science and communications outputs (e.g., outcome stories, policy briefs, infographics, blogs) developed from the assessments to private/public actors and donors to raise awareness of investment opportunities and engage in scaling of the research throughout Zambia and Malawi, and potentially, in other FISH CRP focal and scaling countries in Africa.	<p>We used project meetings, innovation platforms, multi-stakeholder platforms, and the CGIAR MEL system to disseminate science outputs. We also published several blogs. In the end-of-project meeting, we invited various stakeholders, including those from funding organizations, government, and research institutions from Zambia, Zimbabwe and Malawi. The GIZ project manager for the project also attended the project closure meeting. The video will be published and shown at meetings where WorldFish showcases its work.</p> <p>On Facebook, search for:</p> <ul style="list-style-type: none"> • WorldFish • WorldFish Zambia and Malawi <p>Other social media accounts include:</p> <ul style="list-style-type: none"> • WorldFish LinkedIn Account • WorldFish Twitter Account @worldfishcenter 	Completed

Outcome Targets

GENERAL EXPLANATIONS

Accuracy: Please be as accurate and specific as possible when reporting numbers. If you estimate numbers, please indicate this in the Method & Source field and provide a brief rationale for the estimate (if possible).

Zero values: If your project did not contribute to a given indicator, enter a "0" value.

Numeric values: Please only include numeric values in cells that ask for numbers below (Count) Explanations on the composition of the numbers should be included in the methods/source description

Beneficiaries: These are the entities that are intended to benefit from the project. In many cases, these are the local farmers, but may also be households, small enterprises, extension agents or others. Note that we request sex-disaggregated numbers.

Reached: Reaching beneficiaries can be considered the first step on the causal pathway leading from the development of an innovation to its adoption. Beneficiaries are often reached through training (including field days, workshops, visits to demonstration farms, etc.) or the dissemination of knowledge (e.g., radio broadcast, smart-phone app, etc.). Yet, reach does NOT equal adoption but rather can be seen as a prerequisite for adoption.

Adoption: Adoption refers to the actual use of an innovation. Beneficiaries first learn about an innovation and if they are convinced of its usefulness, they may adopt the innovation. Beneficiaries must have the necessary means to adopt an innovation (e.g., knowledge, financial means, etc.). Similarly, the environment (e.g., policies, culture, community) needs to support or at least not oppose the adoption of an innovation to guarantee an effective use.

Direct: Beneficiaries that directly benefitted from project activities. This includes activities that are conducted by the project through formal collaboration and subcontracting of other entities. However, these entities must either receive money or be tied by a formal contract (e.g., MoU) to be considered an extension and integral part of the project.

Indirect: Beneficiaries that benefitted indirectly from project activities through 3rd parties, government activities, etc., outside the realm of the FIA-financed project. "Outside the realm of the project" means that the project is not directly connected (through money flows or contractual agreements) to the implementing agencies. For example, a research project may have handed over or sold a new variety to a seed distributor. Adoptions resulting from the seed distributor activities will then be counted as indirect effects. Similarly, if a neighbor observes an innovative activity of a project participant and starts implementing the innovation on her own farm, this would be considered an indirect (or spillover) effect.

	Count <i>Provide numbers only</i>	Method/Source <i>For each field below, please provide precise information on how this data was collected, i. e. training participant list, household dietary survey (max. 200 words for each cell)</i>
1) Number of beneficiaries reached:		
a. All beneficiaries reached as a direct result of the project	73	List of local entrepreneurs directly engaged with the project through co-financing.
b. Female beneficiaries reached as a direct result of the project	14	List of local entrepreneurs directly engaged with the project through co-financing.
c. All beneficiaries reached as an indirect result of the project	3,672	List of farmers trained by the IBEMs.
d. Female beneficiaries reached as an indirect result of the project	1,359	List of farmers trained by the IBEMs.
2) Number of beneficiaries that have adopted technologies/innovations:		
a. All adopters as a direct result of the project	73	List of local entrepreneurs that directly engaged with the project through co-financing and produced fingerlings own fingerlings/additional broodstock or stocked and sold commercial feed in their agro-shop due to the project support.
b. Female adopters as a direct result of the project	14	List of local entrepreneurs that directly engaged with the project through co-financing and produced fingerlings own fingerlings/additional

	Count <i>Provide numbers only</i>	Method/Source <i>For each field below, please provide precise information on how this data was collected, i. e. training participant list, household dietary survey (max. 200 words for each cell)</i>
		broodstock or stocked and sold commercial feed in their agro-shop due to the project support.
c. All adopters as an indirect result of the project	2,681	Percentage of farmers who reported adopting training received from the IBEMs and assessed through independent evaluation study.
d. Female adopters as an indirect result of the project	992	Percentage of female farmers who reported adopting training received from the IBEMs and assessed through independent evaluation study.
3) Number of beneficiaries who consume healthy and nutritious food:		
a. All beneficiaries who consume healthy and nutritious food as a direct result of the project	NA	
b. Female beneficiaries who consume healthy and nutritious food as a direct result of the project	NA	
c. All beneficiaries who consume healthy and nutritious food as an indirect result of the project	25,704	Estimates from farmer households that reported to have been stocked or produced fish for either consumption or both consumption and income. It does not include households who bought fish in the local markets.
d. Female beneficiaries who consume healthy and nutritious food as an indirect result of the project	13,109	Estimates from farmer households that reported to have been stocked or produced fish for either household consumption or for both household consumption and income. It does not include households who bought fish in the local markets.
4) Area (ha) under sustainable land management:		
a. Area (ha) under sustainable land management as a direct result of the project	192	Estimates from average hectares of IBEMs particularly hatchery operators who received direct support from the project and adopted efficient land use management practices.
b. Area (ha) under sustainable land management as a indirect result of the project	4021	Estimates from average hectares of farmers reached by the IBEMs. Only farmers who adopted the technologies/innovations were included in the calculations.