WorldFish

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Aquaculture Technical, Vocational and Entrepreneurship Training for Improved Private Sector and Smallholder Skills (AQ TEVET) Project

Brief on Lessons Learned and Best Practices of the AQ TEVET Project

Hilda M Munyua, Netsayi Noris Mudege, Lizzy Muzungaire, Keagan Kakwasha, Mary Lundeba and Agness Chileya

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About WorldFish
WorldFish is an international, not-for-profit research organization that works to reduce hunger and poverty by improving 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. Headquartered in Penang, Malaysia and with regional offices across Africa, Asia and the Pacific, WorldFish is a member of CGIAR**,** the world's largest global partnership on agriculture research and innovation for a food secure future.

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- Public sector - Department of Fisheries Zambia (DoF) and
- Civil Society –Our special gratitude to the smallholder fish farmers for their inspiring collaboration in the implementation of the project.

Contact
WorldFish Communications and Marketing Department, Jalan Batu Maung, Batu Maung, 11960 Bayan Lepas, Penang, Malaysia. Email: worldfishcenter@cgiar.org

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List of acronyms

AQ TEVET	Aquaculture Technical, Vocational, and Entrepreneurship Training for Improved Private Sector and Smallholder Skills
KFTI	Kasaka Fisheries Training Institute
NATSAVE	National Savings and Credit Bank
NORAD	Norwegian Agency for Development Cooperation
NRDC	Natural Resources Development College
SMEs	Small and Medium Enterprises
TEVET	Technical Education, Vocational and Entrepreneurship Training
TEVETA	Technical Education, Vocational and Entrepreneurship Training Authority

1. Background

WorldFish is an international, non-profit research organization that works to reduce hunger, malnutrition and poverty by improving aquatic food systems. WorldFish has been working towards improving the livelihoods of the poor, marginalized and vulnerable people through fisheries and aquaculture for over 45 years. The mission of WorldFish is 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. WorldFish collaborates with like-minded international, regional and national partners to deliver transformational impacts to millions of women, youth and men who depend on fish for food, nutrition and income in Africa, Asia and the Pacific. WorldFish is a member of the CGIAR's global partnership on agriculture, research and innovation for a food secure future.

The Aquaculture Technical, Vocational, and Entrepreneurship Training for Improved Private Sector and Smallholder Skills (AQ TEVET) project is a 3-year 10 months project which commenced in July 2018 and was expected to end in December 2021. However, in November 2021, the project was granted a four-month no-cost extension to finalize activities delayed due to the COVID-19 pandemic. The project is implemented in Zambia's Northern, Luapula and Lusaka provinces. The project seeks to: create opportunities for youth employment; ensure a fit between curricula of the TEVET system and skills set required by the private sector; strengthen linkages between smallholder farmers and the private sector to improve input supply, aggregation and sale of produce; and to increase production and productivity of smallholder farmers. The AQ TEVET project has a budget of NOK20 million (US$2.4 million) and is funded by the Norwegian Agency for Development Cooperation (NORAD).

The goal of AQ TEVET is "to increase the number of human resources working for the private sector, and the number of smallholder commercial fish farmers with enhanced aquaculture knowledge and up-to-date practical skills to help sustainably grow the sector and make it more inclusive." The project's objective is to develop the aquaculture knowledge and practical skills of students and smallholder commercial fish farmers (especially women and female youths) participating in TEVET to find gainful employment in the private sector. The project is led by WorldFish and is implemented in partnership with Musika, BluePlanet Academy (BluePlanet) and Natural Resources Development College (NRDC). The project has two components:

Component 1: Upgrading the fisheries science curriculum (long- and short-term courses) and training tools and developing an online training platform and internship program at NRDC but with links to other TEVET institutions to scale the upgraded training “package” over the course of the project.
Component 2: Enhancing the technical education, vocational, and entrepreneurship skills of rural women, men, and youth smallholder commercial fish farmers and increasing their linkages to input/output markets and entrepreneurship opportunities via private sector extension support and services delivery.

This brief presents key achievements, and lessons learned and best practices of the AQ TEVET project implemented in Zambia between July 2018 and April 2022 based on the experiences of the project.

2. Key achievements of the AQ TEVET project

Below is a summary of key achievements of the AQ TEVET project on key result areas under the two project components. Overall, the project achieved its targets despite the challenges of COVID-19, inflation and inadequate infrastructure. The lockdowns during the pandemic affected both the supply and demand end of the aquaculture value chain. Restrictions on international and local travel, social distancing, and working from home meant people could not meet physically, or only a few could go to work. Limited imports disrupted the supply chains, leading to limited access to inputs and outputs and challenges with distribution. Poor performance of industries led to reductions in income, limited spending (mainly on household budgets) and a change in consumption patterns. Investments weakened, and prices of commodities increased, leading to depreciation of the Zambian Kwacha and rising inflation. Students could not attend classes physically, and colleges were closed during the lockdown period. BluePlanet developed the online learning platform, and WorldFish set up the computer training laboratory at NRDC equipped with 18 computers for use by the fisheries and aquaculture students. However, student numbers increased, and the existing IT infrastructure became inadequate. The project surpassed target indicators for some result areas but did not meet other targets, such as gender targets.

Photo credit: Agness Chileya, WorldFish

The key achievements of result areas against targets are summarised in Table 1.

Table 1. Summary of achievements on key result areas against targets

Component 1 key result areas	Target indicators	Result	Achievement Status (%)
1. Enhanced knowledge base of students trained at the NRDC	135 students (50% female) trained have enhanced knowledge of aquaculture using the upgraded curriculum, tools, and online training platform	137 students (44% female) trained using the upgraded curriculum	101.5
2. Enhanced practical skills of students gained from student attachments specifically tailored to address the needs of the individual private company	Student attachments: 135 students successfully interned with over 30 private companies	A student attachment guide was developed to enhance learning by fixing the frequency of attachments to two and improving the mode of assessment. In December 2021, 74 students (36 from Year 1 and 38 from Year 2) went on industrial attachment	74
3. TEVET institutes in Zambia adopt/modify the curriculum, training tools, online training platform and internship program for integration within their institutions	Two additional TEVET institutes in Zambia adopt/modify the curriculum training tools, online training platform, and internship program for integration within their institutions	NRDC modified the curriculum and training tools and is currently implementing the curriculum. KFTI has modified the curriculum and is waiting for accreditation before implementation. Mulungushi University has expressed interest in adopting / modifying the curriculum, and drafting of the MoU is in progress	50+
4. Enhanced organization of farmers trained on TEVET, and services provided by the private sector	1,000 cluster farmers identified, organized and trained on TEVET and provided services by the private sector	1,685 farmers were trained (228 (13.5%) female)	168.5
	Enhanced capacities of 10 private sector companies to provide constant support and services to smallholders	Six private sector companies (3 large companies and 3 SMEs) providing support and services to smallholders Five graduates completed an internship in 2020 and 2021.	60
	Enhanced capacities of interns through opportunities provided by private sector partners identified when carrying out to help graduates apply their technical and provide extension support to smallholder fish farmers.		

Component 1: upgrading curriculum, developing training tools at NRDC, developing an online platform and internship programme

The key achievements under Component 1 are presented under each of the three key result areas. An end-line evaluation has not been carried out yet to assess progress made by the project in achieving its objectives and the effectiveness and efficiency with which project implementers used resources to achieve outcomes.

1: Enhanced knowledge base of students trained at the NRDC

- The AQ TEVET project upgraded the NRDC aquaculture diploma curriculum in 2019, and implementation commenced in January 2020. NRDC reviewed sixteen (16) courses and added five new courses to address the bias towards capture fisheries. The curriculum upgrading exercise also responded to the identified human resource needs of private and public sector employers, namely: i) Introduction to aquaculture and fisheries in Zambia; ii) Aquaculture systems and facilities; iii) Fish hatchery management; iv) Fish production management and v) Fisheries and aquaculture statistics. The project enhanced the knowledge base of aquaculture of 137 (44% female) students against a target of 135 (50% female) using the upgraded curriculum and tools developed, the online training platform and internship programme. This reflects an achievement rate of 101.5%.

- The project established a fully equipped aquaculture skills training center at NRDC. The skills training center consists of an office, four broodstock ponds, six nursery ponds and four production ponds, a hatchery and a feed storeroom. The hatchery has a production capacity of about 1,000,000 fingerlings per year. The training center provides facilities for hands-on experience and supports students' research. The facility also provides an opportunity for practicing and prospective aquaculture farmers and business people participating in short courses in aquaculture to practice what they learn. The training center is expected to generate revenue from the short courses, fingerlings, and table-size fish from production ponds.

Aquaculture skills training center at NRDC

- BluePlanet developed a digital knowledge platform for aquaculture. The platform complements the main aquaculture courses of the fisheries and aquaculture science diploma at NRDC. It allows students to gain extra knowledge through short videos, followed by assignments. Students access the platform using a computer

laboratory set up by WorldFish at NRDC. The lab is equipped with 18 desktop computers. Because these computers are not enough, some students use their smartphones to access the platform. An estimated 100 videos have been developed and are available on the video library.

NRDC students accessing the Online training platform

- With support from the project, NRDC finalized and validated the short-term curriculum in 2020. The first short-term training course focusing on "Introduction to Fish Farming" was hosted in October 2021 with nineteen participants, eight of whom were female.

- Thirteen participants (six female) attended the course on entrepreneurship. The training workshop aimed to, a) inculcate an entrepreneurial spirit in students so that they are ready for the market, b) learn business management skills and the skill to pitch a business idea to potential funders, and c) to train students how to develop a business plan and help them develop business plans for a business idea they have. The training, which comprised online workshops, face-to-face workshops, and field visits, also included motivational talks from young entrepreneurs, coaching and mentorship from private business and finance institutions. The AQ TEVET project established linkages to financial institutions such as Agora Microfinance Zambia, National Savings and Credit Bank (NATSAVE) and others) who talked to trainees about fundable businesses, financial issues to consider and insurance options. Agbit trained students on how to pitch business ideas successfully.

- The AQ TEVET project developed a learning toolkit for the long-term curriculum.

2: Enhanced practical skills of students gained from student attachments / internships

- Twenty-five companies (12 fish producers, five feed companies, and eight companies working in capture fisheries) have expressed interest to host students in industrial attachment and graduates on internships to help students strengthen their practical skills in aquaculture. The companies are willing to provide accommodation for students on attachments. Previously, students were required to make their accommodation arrangements, excluding from doing internships those who could not afford accommodation and making it hard for female students if they could not find suitable accommodation due to the remoteness of the area and other factors.

- Before the AQ TEVET project, attachments were held once at the end of Year 2. An

internship guide was crafted by the project to rationalize the frequency of attachments, improve the mode of assessments, and vary activities carried out each time to enhance learning. Initial discussions anticipated having five industrial attachment sessions (one at the end of every semester) by the end of the course. However, the industrial attachment / internship guide promotes two eight-week attachment sessions (end of Year 1 and 2) and an optional internship session in Year 3. Under the AQ TEVET project intervention, 74 (36 from Year1 and 38 from Year2) students went on attachment in December 2021 based on the new internship and industrial attachment guide against a target of 135.

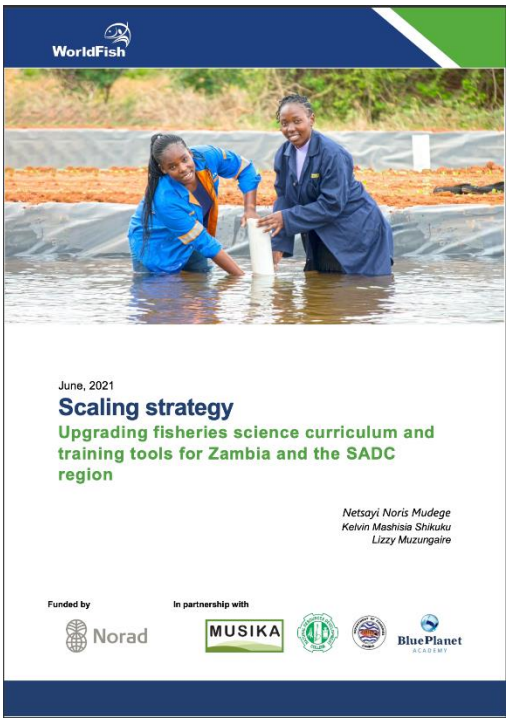
- The project established linkages between the entrepreneurship skills trainees and finance institutions such as NATSAVE for possible access to business start-up finance if their proposed idea was good. Six students received a prize award (start-up capital) of US$1,000 to start one collective business in the first quarter of 2022.

- Students gained practical skills at the aquaculture skills training center by using the facility to apply theoretical knowledge.

3: TEVET institutes in Zambia adopt/modify the curriculum, training tools, online training platform and internship programme.

- NRDC has modified and implemented the upgraded curriculum, training tools, online training platform and industrial attachment and internship programme. There were delays with the service provider contracted to upgrade the curriculum, so the project engaged the University of Zambia, NRDC and the Curriculum Development Centre in Zambia to upgrade the curriculum. The excellent partnership between WorldFish and NRDC helped fast-track the steps that the design team had overlooked such as the duration of curriculum updating, approvals and validation by the various committees and certification. There has been collaboration with KFTI to improve KFTI's curriculum. KFTI upgraded its curriculum, and partly due to encouragement from the AQ TEVET project, it is now using its upgraded curriculum to seek accreditation from the Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA).

- Mulungushi University has expressed interest in adopting and modifying the upgraded package for short courses and collaborating with NRDC to run the courses and scale them out. NRDC, BluePlanet and Chinhoyi University of Technology in Zimbabwe have developed a scaling proposal to scale the upgraded curriculum package. The AQ TEVET project has also developed a scaling strategy for the upgraded fisheries science curriculum, training tools, online training platform and internship program for Zambia and the Southern Africa Development Community (SADC) region.



AQ TEVET Scaling strategy

- The online training platform developed by BluePlanet has more than 100 videos uploaded. Users reviewed the platform regularly, and most of them considered it convenient to use and were happy with the content and the video quality.

- The online training platform developed by BluePlanet has been scaled to Lake Harvest fish farm in Zambia and Zimbabwe, Skretting and Foodtech in Uganda, Rwanda, Tanzania and Kenya. (FoodTech in Tanzania and Côte d'Ivoire). The platform also has activity (is being used) in Egypt, Morocco, Algeria, Libya, Ethiopia, Democratic Republic of Congo, Namibia, South Africa, Cameroun, Nigeria, Ghana, Côte d'Ivoire and Senegal, among others.

Component 2: Enhancing the technical education, vocational and entrepreneurship skills of rural women, men and youth smallholder commercial fish farmers and increasing their linkages to input/output markets and entrepreneurship opportunities via private sector extension support and services delivery

The key achievements under Component 2 are presented under indicators on result area 4 below.

4: Enhanced organization of farmers trained on TEVET and services provided by the private sector.

- Six (6) companies have invested in the smallholder aquaculture value chain in the northern region of Zambia, and their capacity to provide support and extension services to smallholders has been strengthened. The six companies have created an additional network of 15 SMEs acting as the last mile distributors of feed and seed and extension service delivery. This has been achieved against a target of 10

private sector companies to provide constant support and services to smallholders. This reflects an achievement of 60%.

Mr. Chacha of Triple Blessings Triple Blessings

Small-scale fish farmers at Tungati village, Luwingu district at one of their fish ponds

- 1,685 farmers (228 (13.5%) female) have been organized and trained on TEVET against a target of 1,000 (50% female). Out of these, 832 (208 [25%] females) have adopted better management practices such as improved construction and rehabilitation of ponds, feeding, and stocking single-sex fingerlings.

Mr. Msanshi, Director of Hopeways Fish farm demo ponds

Mr.Felix Mulenga, Director of Kasakalabwe Multipurpose group at training

- Before July 2018, smallholder aquaculture farmers had little knowledge about farming practices to improve their yield and practiced poor farming methods such as use of recycled seed and fed their fish with plants leaves, kitchen left-over *nshima*. However, since WorldFish and partners implemented the AQ TEVET project, farmers have adopted better management practices such as improved pond construction and rehabilitation, buying and using same-sex fingerlings, and commercial fish feeds. Through the support of the project, 805,177 fingerlings were produced by private sector actors in the last quarter of 2021, and 547,832 (68%) fingerlings were sold to farmers out of the total produced. This is a greater improvement considering that there were no sources of high-quality fingerlings in the region prior to project implementation. The private sector has delivered

extension services and provided access to inputs and outputs. The profit margins of smallholder fish farmers increased by 32.6%.

- In 2020, one of the SMEs - Kasakalabwe Multipurpose Cooperative, started breeding catfish and produced 16,000 catfish fingerlings in their first production cycle. Of these, they sold 12 000 to smallholder farmers. The work of Kasakalabwe introduced first-time farmers to catfish farming, providing farmers with a choice of either catfish or tilapia or both, aligning with available resources and climate variability. The demand for catfish fingerlings is very high. However, there was a challenge of getting mature male catfish to continue production since catfish farming is relatively new in Zambia, and parent stock was not readily available. However, Kasakalabwe is raising catfish parent stock from their first production. This cooperative has reached and trained 12 cooperatives and offered extension services in order to reach more women.

Training through cooperatives to reach more women

- Triple Blessings (another SME) supported farmers in marketing their fish while providing quality seed, commercial feeds and extension support to smallholder fish farmers.

Mr. Cosmas Chachi, Director of Triple Blessings Ltd. feeding fish at the training site

Marketing of fish through Triple Blessing

- Hopeways Farms and General Dealers (the third SME) produced and sold same-sex fingerlings to smallholders, provided extension services, and offered training to smallholder fish farmers.

Hopeways – an SME offering training Extension and inputs to fish farmers

Greenhouse at Hopeways to facilitate fingerlings production

- To mitigate against cold temperatures, the AQ TEVET project team provided greenhouses (an innovation by the project team that was not in the project design) to selected SMEs and cooperatives (Hopeways and Kasakalabwe) to improve tilapia fingerlings production and meet the high demand for quality seed.

- AQ TEVET project has established 16 demonstration ponds for training smallholder fish farmers. Four field days were held where 361 (30.2 % female) participants attended to facilitate technology transfer.

- AQ TEVET piloted the integration of distillers' grain and cassava aggregation in the smallholder fish farming sector as an alternative fish feed with six farmers in Mbala, Mungwi, and Kasama districts. Results showed poor growth of fish fed on the feed; hence it was not recommended.

- Five graduates completed their internship programme with SMEs in 2020 and 2021.

- Gender integration has been ensured by working with 12 women cooperatives, getting women to host demo plots, involving women in experiments, coaching and mentoring women and working with traditional leaders.

3.0 Lessons learned and best practices of the AQ TEVET project

The AQ TEVET project monitoring, evaluation and learning (MEL) process was derived from the project design and is linked to the delivery processes and learning. The MEL process ensured the regular exchange of information, reporting, and identifying and documenting the lessons learned. Learning is a continuous process and helps to keep the project on track. Learning commenced right from project inception to the end of the project. The AQ TEVET project understands lessons learned to be the outcome of a learning process after reflecting upon an experience. The experience can either be positive or

negative. A lesson learned results from an innovation, decision, approach, or action based on the experience or challenge. It explains what should be done given such an encounter to address a challenge, what process, behavior or performance changed and what can be generalized based on the lesson identified and the action taken to improve implementation, efficiency or effectiveness. A lesson learned is thus defined as knowledge or understanding gained from experience distilled from past activities that should be actively considered in future actions and behaviors. A lesson learned is a generalization based on an experience by a project or programme that can help improve decision-making future action or avoid repeating past mistakes. A lesson is useful if others can learn from it. For others to learn from it, a lesson needs to be instructional, and the change must be communicated.

In the context of the AQ TEVET project, best practices are defined as positive activities that are recommended for others to use under similar situations. Lessons learned are defined as the outcome of a learning process after reflecting upon an experience. Lessons learned are based on an experience by the project and working to solve a problem or innovate. Lessons learned can be used to improve future action or avoid repetition of past mistakes. The process of identifying, capturing and documenting lessons learned and best practices was done through the monitoring and reporting mechanism right from the inception of the project, regular meetings with partners and stakeholders, the mid-term evaluation, and group discussions during annual project meetings and the final project annual meeting held on 25-26 November 2021. During the project's final annual meeting, the project team and stakeholders worked in four groups to distil the key lessons learned under components 1 and 2. The project team considered all observations from stakeholders, including partners and beneficiaries, through consulting them. The following section presents key lessons learned under three sections: i) project design; and results under ii) Component 1 and iii) Component 2 of the AQ TEVET project. This brief is based on ideas and experiences captured through the life span and distilled at the project's final annual meeting. While the lessons learned apply to the experiences of the AQ TEVET project, some have broader applicability beyond the project.

3.1 Project design

Lesson 1: Implementation time frames

Background: The overall goal of the AQ TEVET project was to "increase the number of human resources working for the private sector, and the number of smallholder commercial fish farmers with enhanced aquaculture knowledge and up-to-date practical skills to help sustainably grow the sector and make it more inclusive." NRDC upgraded its long course curriculum in 2019. The review focused on the needs of the aquaculture industry, identified during the needs assessment carried out in 2018. The needs assessment first mapped and identified employers who wish to or already employ aquaculture graduates. After the mapping and identification exercise, the project team interviewed industry (private and public) actors to:

1) assess these firms' human resource training needs to ascertain the specific content of the NRDC's upgraded aquaculture and fisheries science curriculum, training tools, online training platform, and the internship program.
2) identify barriers for engaging women and female youths to work for private firms and identify solutions to barriers as well as available opportunities

The curriculum was upgraded and validated in 2019.

Experience /challenge: The entire process of upgrading the curriculum from gap analysis to completion of the upgraded fisheries and aquaculture curriculum took about a year and a half. Implementation of the upgraded curriculum started in January 2020 instead of January 2019 as planned initially. However, the curriculum upgrading process could have taken longer than this, considering that making changes after reviewing the diploma required government approval. The strategic partnership between WorldFish and NRDC helped to fast-track. WorldFish and NRDC signed an MOU through the Ministry of Agriculture and following this, various government departments responsible for TEVET and higher education training such as TEVETA, UNZA and other stakeholders were involved for guidance right from inception of the curriculum review process and this made it easier for them to accept the gaps that were identified in the old curriculum by the project, and owned the review process.

Innovation: The entire process of upgrading the curriculum from gap analysis to completion comprised actors from public, private, education and training institutions. The AQ TEVET project management team and NRDC worked creatively to address the challenge of the 2019 cohort that had completed Year 1 based on the old curriculum. As a result, the first cohort of 37 students (30% females) graduated in December 2021, completing the full upgraded fisheries and aquaculture curriculum.

Analysis: The NRDC leadership and teaching team showed commitment and devoted more time and effort to upgrade the curriculum instruct the 2020 Year 2 students on the upgraded curriculum. They also worked creatively to ensure that cohort took the two courses they had missed in Year 1 during Year 2. The decision to swap two units from Year 2 to Year 1 and vice versa ensured that the class that graduated in December 2021 had covered the full upgraded curriculum. However, additional time will be required to follow up on the graduates to assess the impact of the upgraded curriculum.

Recommendation: To improve the project design, future projects of the nature of curriculum upgrading and scaling should have realistic time frames that take into consideration the whole cycle of curriculum upgrading, validating and implementation, development of learning toolkits (for long and short courses) and the digital platform, graduate internships programme, joining the labour market or starting their aquaculture businesses and assessing the effectiveness of the curriculum before scaling. It is further recommended that project designs of similar projects of this nature engage the government at various levels for sustainability and ownership of results.

Lesson learned: The AQ TEVET project management team and NRDC worked creatively to ensure students under Cohort 1 (the class that graduated in December 2021) undertook the full upgraded curriculum and graduated before the end of the project by swapping units for Year 1 to Year 2 and vice versa. The experience of the AQ TEVET project shows that it would have been desirable to assess the performance of the December 2021 graduates (employed in the private sector) within the project cycle to ascertain the effectiveness of the upgraded curriculum.

Where possible, project designs of curriculum upgrading and scaling should have a minimum of five years of implementation to allow for time to track results and ensure the project goal and objectives are attained. Project implementation should commence after the curriculum is upgraded and validated. In addition, working with the right partners on the project contributed to generating the desired results. NRDC as a partner on the project,

helped ease the process of getting government approval, having provided a precise fisheries and aquaculture-science-curriculum gap analysis.

Lesson 2: Gender equity and diversity

Background: The aquaculture sector in Zambia is male-oriented and is dominated by the private sector. According to the AQ-TEVET project design, 40% and 35% of the targeted beneficiaries were women and youth, respectively. Women and youth were to be integrated into private sector business models and be trained on tilapia better aquaculture management practices. The project team has employed various strategies to ensure equal opportunities and treatment for all and bring women and youth on board along the aquaculture value chain.

Strategies include marketing strategies – where call for application and social media, electronic and print media, information technology, making the fisheries and aquaculture program more attractive. The Aquaculture Skills Training Centre also works with women and youth groups and cooperatives who visit the facility to learn. The marketing strategy incorporates interventions that provide opportunities for women, youth and men in communities to address gender inequities . Women and female youth enrolled in the course, and 137 students (44% female) were trained using the upgraded curriculum. Of the 1,685 farmers who were organized and trained on TEVET, 228 (13.5%) were female and out of the 832 farmers who have adopted better management practices, 208 (25%) were female).

Experience / Challenge: Since youth are active online (on social media platforms), the AQ TEVET management team targeted youth through various strategies, including information technology. The updated curriculum, Aquaculture Skills Training Centre, and digital knowledge platform developed by BluePlanet appealed to female and male students, and NRDC increased. However, the number of female students was lower than the target set (44% against a target of 50%). At the onset of the project, the number of women involved in aquaculture was low, and only 14% of the farmers enumerated during the smallholder fish farmer census were women.

Some members of the Pibelibe smallholder fish farmers cooperative in

Constraints to women's participation in fish farming were primarily linked to social-cultural norms prevailing in the Northern and Luapula provinces. Aquaculture is perceived as a

male domain. Women also do not own land, so they were reluctant to invest in aquaculture, fearing that they would leave the fishponds behind with the husbands who owned the land in the event of a divorce. Women also mentioned inadequate financial and human capital endowments necessary to engage in aquaculture as a key constraint for participating in aquaculture.

Innovation: The AQ TEVET project leadership responded to some of the challenges and provided incentives to women fish farmers by subsidizing fingerlings and commercial feeds. The project also adopted the following approaches:
The AQ TEVET project leadership made a deliberate effort to involve women. For example:

1) Highlight women working in aquaculture by writing blogs and other media articles and involving women farmers as host farmers for demonstration plots. Out of 10 demonstration plot host farmers, 5 were led by women. Demonstration ponds were managed by cooperatives and this increased women participation in aquaculture. Most of the married women never owned land for aquaculture but it was easier for them to be given land by the traditional authority if they formed a cooperative.
2) Target women in course marketing and advertising to motivate females to enrol at NRDC and the short courses. Advertisements posted online or published have also included a line that says females to encourage female applicants.
3) Deliberately recruit female interns to work with SMEs on the project.
4) Depict women participating in aquaculture activities in some of the available films and use female voice-over narration in all videos on the platform.
5) The project also invited women as guest speakers on radio programs provided SMEs with guidelines to promote the participation of women and youth in training and extension.
6) It also developed training materials in the local language that is accessible to women who have low levels of education.
7) Some SMEs started working with traditional authorities to lobby for interested women to be allocated land to set up ponds as individuals or as part of cooperatives.

These innovations and the planned project interventions attracted more women into aquaculture, but the target of having 40% of the beneficiaries as women has not been reached.

Analysis: Women and youth empowerment is necessary to encourage more women and female youth to participate in aquaculture. The root causes of the gradual increase in the number of women venturing in aquaculture courses or interventions were affirmative action to favour and promote opportunities for women and female youth to participate in aquaculture activities. The use of female voices and images in films, videos and advertisements, involvement of traditional authorities and subsidies also encouraged women to regard aquaculture as a sector they can join and be proud of. With these interventions, the number of women participating in training activities increased to 28%. Further work is needed to fully address the challenge of gender and youth inclusion and increase the numbers of women and female youth participating in the project to 40%.

Recommendation: For effective programmes and projects focusing on the involvement of women and female youth in aquaculture value chain activities, it is essential to consider the whole aquaculture value chain. The project interventions should thus include incentivizing activities on marketing and processing where women are predominant.

Where possible, the project teams could also work closely with traditional authorities to so that women can be given land for farming and encourage them to participate in aquaculture.

Lesson learned: As projects strive to increase the participation of women and youth in activities along the aquaculture value chain, projects should challenge social and cultural norms that constrain women, bridge the gender gaps in investments, and increase opportunities in marketing and processing.

3.2 Component 1

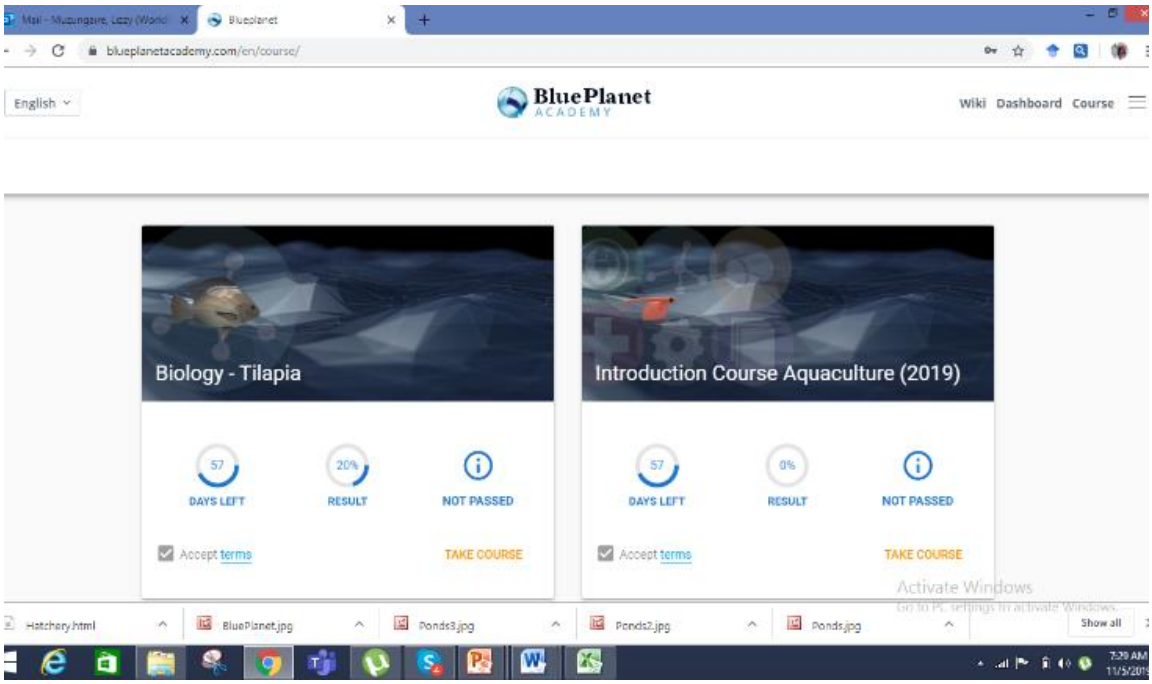
Component 1 focused on upgrading the fisheries/aquaculture curriculum (long- and short-term courses), training tools, online training platforms, and internship programs of TEVET institutions in Zambia, namely NRDC but with links to other TEVET institutions to scale the upgraded training "package" over the course of the project. The lessons learned are presented under three result areas under this component namely:

- Result area 1: Enhanced knowledge base of students from the TEVET institute trained.
- Result area 2: Enhanced practical skills of students from the TEVET institute gained from internships specifically tailored to address the needs of the individual private company.
- Result area 3: TEVET institutes in Zambia adopt/modify the curriculum, training tools, online training platform and internship program for integration within their institutions.

Lesson 3: Result area 1 – Enhanced knowledge base through online training platform

Background: According to the project design, BluePlanet was expected to develop[a digital knowledge platform and upload relevant content comprising videos, films, aquaculture reference materials and other relevant documents for use by 137 students at NRDC, staff, the AQ TEVET team and other TEVET institutions in Zambia and beyond.

Experience / Challenge: BluePlanet developed the online platform and uploaded more than 100 high-quality videos, user manuals, courses and other documents. BluePlanet worked with NRDC to set up accounts for NRDC students and staff. NRDC students could access the platform through the Information Technology laboratory established by WorldFish at NRDC – fully equipped with 18 desktop computers or from their smartphones. The platform was reviewed regularly by users, most of whom considered it convenient to use and were happy with the content and the video quality. However, there were challenges of speed and quality of internet connectivity. The bandwidth was low, and it took very long to download high-quality videos. High-speed connectivity was needed to download content. The average internet speed in Zambia in 2021 was estimated at 2285.64 Kilobits per second, and generally, there is low internet penetration. Students using smartphones found it expensive to use because of the bundles required.



Aquaculture Online Training Platform developed by BluePlanet

Innovation: The BluePlanet and the AQ TEVET management decided to upload the videos on an external drive at NRDC so that they could be accessed offline. The management further suggested the editing of the quality of videos to give the best viewing experience given the low internet speed, and high cost of internet in Zambia to allow for low/high bandwidth options. Several students have used BluePlanet Academy and have taken courses within the platform. BluePlanet also sent in videos for uploading on the NRDC server, although students could only access videos offline but not course contents.

Analysis: Following the action of editing the videos to make them lighter, a review of the platform indicated that students could download the videos uploaded on the online platform, with 84.3% indicating that the video quality was good. The same percentage of students agreed they completed their online course assignments on time.

Recommendations: The quality of the videos uploaded on the digital knowledge platform have been edited to give the best viewing experience. However, future projects on online learning should ensure the availability of high bandwidth and edit the quality of videos to match the information technology infrastructure available in the country and create the classroom experience in an online format.

Lesson learned: Projects of the nature of online learning should be pegged to bandwidth infrastructure available in a country to ensure access by students, staff, and other actors. As a result of editing the quality of the videos and making them lighter, students, staff and other actors could download videos and complete their courses online.

Lesson 4: Result area 2 – Enhanced practical skills of students - Industrial attachments

Background: The AQ TEVET project conducted a skills-gap analysis to identify entry points for upgrading the aquaculture and related course content of TEVET institutions with a particular focus on NRDC and Kasaka Fisheries Training Institute (KFTI). The gap analysis also focused on how the courses could incorporate the needs of the private sector. To ensure quality graduates with the requisite skills and competencies are churned out in adequate numbers, actors between fisheries as well as aquaculture industry, and those in education and training institutions worked together to: i) upgrade the fisheries and aquaculture curriculum of NRDC, KFTI; ii) develop training tools; and address needs of private sector based on findings of a tracer study of past graduates, which showed that graduates lacked relevant practical skills training.

To close the gap of graduates not having adequate skills, the initial thinking of the AQ TEVET project team anticipated that students would go on industrial student attachments in government and commercial private sector firms five times during the course duration. They were supposed to go on attachment for one month at the end of every semester. This was to enable students to adequately develop their practical skills by marrying theory learned in the classroom with fieldwork.

Experience / Challenge: The management of NRDC responsible for the industrial attachment programme soon realized that sending students out at the end of every semester meant that the students and their supervisors worked continuously with no time for recess, leading to stress and depression. Students needed a break to improve memory, keep them focused, and develop neural connections. Two sessions of industrial attachments per year proved expensive for the students and parents. The programme's costs for training institutions doubled as they needed to meet costs for monitoring and following-up students throughout the country for assessment. Host institutions also found it a burden and expensive to take students who required close guidance and mentoring twice a year.

Innovation: The AQ TEVET management decided to have only one industrial attachment undertaken at the end of Year 1 and Year 2. The team modified the project design to promote students' mental and physical health, boost self-esteem, and improve students' communication skills through engaging with SMEs and smallholder fish farmers. This change in design to have attachments once a year allowed students time to rest and was affordable for parents, host institutions, and NRDC staff. The change also helped improve efficiency and avoid wasting valuable resources by host institutions that found it difficult to support two attachment sessions per year. Training institutions that would have required more resources to travel all over the country to monitor and assess students five times during the course duration found it sustainable by reducing the attachments to once per year.

Analysis: The AQ TEVET management analyzed the implications of having two compared to five industrial attachment sessions and realized that a balance between students' mental and physical health and the cost-effectiveness to training and host institutions was needed to ensure the programme's success. One attachment session per year ensured a win-win situation where students had time for rest, and the programme was affordable and convenient to training and host institutions.

Recommendations: Training institutions that incorporate industrial student attachment in their training methodology must balance the benefits of attachment with the recess students need for mental and physical health, convenience and cost to host and sustainability of training institutions.

Lesson learned: Experience plays a critical role in the learning process, and students need a relevant setting through industrial attachment to acquire and apply knowledge and skills. Attachments expose students to the work environment and create opportunities to market themselves after graduation. It is practical to have a programme that balances students need for recess for mental and physical health, considers the convenience and cost of host institutions in the public and private sector, and ensures the sustainability of training institutions.

Lesson 5: Result area 3 – Increased opportunities for students to find gainful employment with private companies or set up their own aquaculture-related businesses

Background: Th Background: The AQ TEVET project is preparing students for employment and entrepreneurship in the aquaculture industry through the upgrading of the curriculum and design of an industry responsive internship program. Due to COVID-19 restrictions, the project intervention of conducting a short course on entrepreneurship and linking students to microfinance could only be accomplished in 2021. Three graduates from the 2018, 2019 and 10 students from the class that graduated in December 2021 were identified to participate in the course. The course was to equip the graduates and students with skills that address the needs of the private sector and entrepreneurship in the aquaculture industry. The entrepreneurship training also linked students to sources of micro-finance to help them access funds to pursue their business plans.

Experience / Challenge: The project had limited funding, and consequently, AQ TEVET could only take ten students and three graduates from the class of 2018 and 2019 on the AQ TEVET project. The management team selected the top students (5 female and 5 male) from the cohort, which graduated in December 2021 based on their academic grade point average (GPA), plus three additional participants employed as project interns. However, four students dropped off the course for various reasons like heavy workload because of combining the full-time diploma course and the short-course at the same time. The course included motivational talks and linkages to NATSAVE and other microfinance companies. NATSAVE also provided feedback on the business plans that the graduates developed. The project offered the six students who successfully completed the course a prize award (start-up capital) of US$1,000 to advance one collective business idea. Innovation: The AQ TEVET management team engaged the donor to utilize some project funds to support students who came up with innovative business plans. Students were incentivized to work as a team on one of the ideas they had developed, to receive seed funds of US$1,000) to implement the business plan.

Analysis: Four out of 10 students dropped out of the entrepreneurship training course. The six students who completed the course were about to sit for their final exams, and the AQ TEVET management would make follow-up on the business idea they selected and

support the team to implement it. The lesson was that academic excellence does not necessarily culminate into practical entrepreneurial excellence.

Recommendations: Future projects identifying graduates to attend the entrepreneurship training should opt for a rigorous selection process based on the motivation and commitment of the graduates. Students should be asked to submit their business plans or write their motivation for applying for the course and why they should be selected for the training.

3.3 Component 2

Component 2 focuses on enhancing the technical education, vocational, and entrepreneurship skills of rural women, men, and youth smallholder commercial fish farmers and increasing their linkages to input/output markets and entrepreneurship opportunities via private sector extension support and services delivery. The results areas under Component 2 include:

Result area 5a: Enhanced organization of farmers trained on TEVET and provided services by the private sector.

Result areas 5b: Enhanced capacities of the private sector to provide TEVET training support and services to smallholders.

Lesson 6: Result area 2 – Creating opportunities for capacity development of supply chain intermediaries

Background: The AQ TEVET project design anticipated that interventions would create opportunities for internship / attachment opportunities for students and graduates in the northern region. This was to enable them to introduce the better aquaculture practices, support SMEs (small gender and youth inclusive businesses) within the aquaculture supply chain into the capacity development process to address the individual needs of private companies, government and smallholder farms. The project design also expected students at NRDC to get the opportunity for student attachment with some of the private sector partners to develop their technical and vocational skills on how to provide extension support to smallholder fish farmers to ensure sustainability.

Experience / Challenge: Although the first cohort of students who have undertaken the whole upgraded curriculum had not graduated yet at the time of documenting the lessons learned, the AQ TEVET management team sent out graduates from earlier classes who had completed the entrepreneurship course to go on internship from July to December 2020 to work with and provide technical assistance to SMEs in the northern region.

The project placed interns at four SMEs: Kasakalabwe Multipurpose Cooperative, which produces catfish fingerlings; Hopeways Farms and General Dealers who are producers of tilapia fingerlings; Triple Blessings, which distributes commercial fish feeds and also an off-taker of fish produced by smallholder farmers; and Zhonkghai International, a cassava

processing plant that was testing the use of distiller's grain – a by-product of cassava as a source of fish feed or concentrate. The interns introduced the SMEs to best practices such as proper management for hatcheries, production of same-sex fingerlings and feeding fish using commercial feeds. This approach proved to be successful. An intern assisted one cooperative to manage the hatchery and biosecurity protocols to be certified by the Zambia Bureau of Standards as a fingerlings' producer. The interns also provided extension services to smallholder aquaculture farmers in northern Zambia. SMEs who benefitted from the interns requested more time with the interns to establish their businesses more sustainably.

Francis Bwalya (left), intern training farmers at Kasakalabwe Women Multipurpose Cooperative
Thandiwe Foroma (right) intern on a motorbike coming from training farmers

Analysis: The interns introduced better aquaculture management practices to SMEs, such as hatchery management and production of same-sex fingerlings, because of the training they had received through the AQ TEVET project interventions. The interns learned a lot from the six-month hands-on experience, using resources on the online platform developed by BluePlanet and advice from government extension and research station staff. However, six months was not adequate to groom the graduate interns on the entire cycle because it takes a minimum of eight months for fish to grow.

Innovation: The AQ TEVET management offered continuous training to the project interns to improve their knowledge and skills. For example, interns were trained in hatchery management and business planning and management skills to improve their knowledge. In addition to skills that the interns got from the short course aquaculture training, the interns used other online resources. They consulted other experts at research institutes and those offering extension services. AQ TEVET management team agreed to support the second term for interns for a further six months in 2021 by re-allocating funds allocated for de-risking SMEs. This enabled the interns to advance their knowledge and experience and support the day-to-day management of the operations in the greenhouse and SMEs such as Kasakalabwe to advance their businesses and start generating income. SMEs who wish to retain the interns after that would engage them directly (independent from the project). The SMEs appreciated the better management practices and extension services. Some SMEs, e.g. Kasakalabwe and Triple Blessings, were already discussing the interns for possible employment.

Analysis: The AQ TEVET project's internship programme successfully provided interns

with opportunities to apply their knowledge, have hands-on experience and learn from other experts in aquaculture. The SMEs supported some of the gaps identified in private sector companies. After the planned six months, stopping the programme would have meant some initiated activities would be left with no one to support them. The additional six months in 2021 was beneficial to both the graduates and industry players. It enabled the interns to reinforce the industrial attachment they had, apply knowledge, gain practical skills and knowledge on interventions they had initiated, such as the greenhouses and prepare them for employment.

Recommendations: Although the internship programme has been tested under the AQ TEVET project, more time will be required to equip graduates with adequate hands-on experience to complete the whole aquaculture cycle, which takes about eight months in the private sector partner's setting. Likewise, private sector companies needed more time to benefit from the knowledge and skills of interns and students on industrial attachment based on the upgraded curriculum study programme. Additional time would provide the interns sufficient time to support extension services to smallholder fish farmers. Future projects of this nature should explore having a longer internship period or two six-month internship rounds to ensure students and graduates get opportunities to get more hands-on experience and are able to start their own business.

Lesson learned: Projects of the nature of the aquaculture graduate internship with SMEs require more than one six-month internship terms if graduates and SMEs are to benefit from hands-on experience and knowledge along the entire value chain. As a result of adding a second six months term of internship and re-allocating the risk mitigation budget for SMEs, both students and SMEs benefitted from more hands-on experience and knowledge from interns to improve the performance of SMEs along the whole aquaculture value chain.

Lesson 7: Result area 5b - Enhanced capacities of the private sector to provide training and services to smallholders

Background: Only 3% of the smallholders in Northern and Luapula provinces exclusively used commercial feeds. The project strengthened the capacity of Aller Aqua, (a private sector partner) to provide feeds and private extension services to cooperatives, farmers' groups and commercial smallholder farmers. It took time for the 25 kg fish feed packages to be sold, but more farmers adopted commercial feeds as awareness of the benefits increased and sales improved. Farmers acknowledged that the feeds were of high quality and effective, leading to fish growing faster and bigger, but they perceived the feed price as very expensive. They raised many questions: Could the feeds be subsidized? Could the prices be reduced? Could Aller Aqua avail smaller packaging that farmers could afford? WorldFish and Musika communicated feedback from farmers to Aller Aqua.

Pricilla Singina, Technical Representative of Aller Aqua fish feed distributor in Kasama district

Experience / challenge: The experience of the AQ TEVET project has demonstrated the benefits of commercial fish feeds as opposed to using traditional feeds. Farmers, however, perceived the 25 kg packages of commercial fish feeds that were available on the market to be too expensive. Feedback on reducing prices and availing of smaller packages that farmers could afford was provided to Aller Aqua. In the course of project implementation, Aller aqua started packaging and stocking fish feeds in 25kg, 10kg, 5kg and 1kg to allow farmers to buy what they could afford. However, the smaller packages (10kg, 5kg and 1kg) packages were very few and sold out quickly.

Innovation: Aller Aqua obtained a list of fish farmers from WorldFish and Musika, made regular follow-up calls with farmers and evaluated their suggestions. Aller Aqua started making smaller packages that farmers could afford (farmers would in the long run, end up buying much more than the 1, 5 or 10kg). The fish feed sales improved, and farmers acknowledged increased production and profits. WorldFish and Musika decided to de-risk the SMEs by paying 30% for the feeds, and the SMEs passed on a small discount to the farmers. The SMEs acknowledged that the subsidy they got injected capital into their businesses, and they were able to continue stocking more feeds after the initial subsidy period. With the capital from the increased sale of feeds, rural SMEs such as Triple Blessings could source more inputs from larger sales outlets like Aller Aqua and act as the "last mile" distributors. Last-mile distributors directly transport and deliver different size packages of animal feeds to rural smallholder fish farmers in remote areas and facilitate extension services within the farming communities.

Analysis: Aller Aqua obtained a list of fish farmers from WorldFish and Musika, made regular follow-up calls with farmers, and evaluated and responded to suggestions for smaller feed packages. Aller Aqua sold more feeds to smallholder farmers because smallholder farmers could afford the smaller feed packages. Additionally, the 30% subsidy offered by the AQ TEVET project to SMEs enabled the SMEs to pass on a small discount to smallholder farmers. In so doing, farmers bought more fish feeds and hence the SMEs made good profits, making it possible for them to continue stocking more feeds.

Recommendation: Fish feed producing companies targeting smallholder markets should make available different sizes of packages based on rules of behaviour of consumers (smallholder fish farmers) and what they can afford for fast turnaround of feeds.
Lesson learned: Producing several size packages of commercial fish feed based on the

needs of smallholder fish farmers and their behaviour translates to more fish feed sales. Packaging of fish feed for smallholder farmers should be done in different sizes of packages based on rules of behaviour of consumers and what different categories of farmers can afford for faster turnaround of feeds.

Lesson 8: Result area 5b – Enhanced capacities of the private sector to provide TEVET training support and services to smallholders

Background: The AQ TEVET project design was to work with large private sector companies in the aquaculture value chain and encourage them to invest in quality fingerlings, commercial feeds and output markets in Luapula and Northern provinces. The project had set targets of partnering with 10 large companies to provide commercial fish feeds and public extension services to cooperatives, farmers groups, SMEs and smallholder commercial fish farmers.

Experience / Challenge: Hopeways Enterprise and Kasakalabwe Multipurpose Cooperative, which operate hatcheries, found it hard to breed warm water species like tilapia and produce fingerlings in Northern and Luapula provinces when the temperatures dropped. Although the SMEs / cooperatives were feeding the fingerlings in adherence to better management practices, smallholder fish farmers complained that the fingerlings they bought were small and did not grow to the anticipated mature fish market size. As such, some of the fish produced did not fetch good prices. The AQ-TEVET soon found out that the challenge was the low water temperatures.

Innovation: Tilapia prefers warmer temperatures of 24° to 30 ° C for optimum growth, while the Northern region has average high temperatures of 23.1 °C which negatively affects fish growth. The AQ-TEVET management team innovated and provided Hopeways Enterprises Ltd. and Kasakalabwe Multipurpose Cooperative with greenhouses to be able to control temperatures and address the challenge of low temperatures. With the greenhouses, water temperature could be controlled and the higher temperatures resulted in better growth and development of fingerlings and growth of fish to the expected harvesting parameters.

Analysis: Breeding for tilapia was effective in warm water temperatures. However, during winter, the project found it hard to breed warm water species like tilapia and produce fingerlings in Northern and Luapula provinces when the temperatures dropped. Kasakalabwe Multipurpose Cooperative resorted to produce quality and more seed under greenhouse conditions in order to maximise oxygen levels, provide adequate food requirements, and improve feed utilization efficiency. Hopeways established an indoor hatchery for egg incubation within the greenhouse and constructed two ponds and stocked broodstock for fingerling production within the greenhouse, resulting in increased fingerlings and fast growth due to the favourable temperatures. After these changes, Hopeways can now harvest fingerlings weekly, even during winter months.

Recommendation: For areas that experience very low temperatures during the winter season, the project should consider the use of greenhouses to ensure that farmers have access to quality seed at the start of the fish farming season.

Kasakalabwe Womens Multipurpose Cooperative celebrating their greenhouse

Lesson learned: Adoption of greenhouses is critical in breeding tilapia for quality seed production during winter in Zambia and other countries in southern Africa with conditions similar to those of Zambia.

Lesson 9: Result area 5b - Enhanced capacities to link smallholder fish farmers to inputs and markets

Background: The AQ TEVET project design anticipated working with large companies in the aquaculture value chain and encouraging them to invest in aquaculture in Luapula and Northern provinces. The project had targets of partnering with 10 companies to provide commercial fish feeds and public extension services to cooperatives, farmers, groups, SMEs and smallholder commercial farmers.

Experience / Challenge: Aquaculture is still in its infancy stages in the northern region of Zambia, but there is a huge opportunity due to the large freshwater sources. The AQ TEVET project leaders engaged with 10 large companies, but most were reluctant to invest in the northern region because of the distance from Southern and Lusaka provinces where they were located, low commercialization in Northern and Luapula provinces, and perceived risks of low demand for commercial fish feeds. The large companies focused more on the profit margins, and negotiations took very long. Only three large companies, namely Aller Aqua, Novatek and Zhongkai International (Z) Ltd. signed MOUs with Musika to provide private extension services and commercial feeds to smallholder farmers.

Some of the commercial fish feeds firms that have invested in the northern region

Innovation: The AQ-TEVET project leaders changed tactics and worked with small to medium enterprises (SMEs) who already had a presence in the northern region. This model proved successful. The project signed MOUs with three SMEs, namely Kasakalabwe Multipurpose Cooperative, Hopeways Enterprises Ltd., and Triple Blessings. These SMEs received training and toolkits. In addition, the three SMEs got the support of an intern and a motorbike, which helped improve efficiency with which they provided extension services to fish farmers. The interns contributed to improved SMEs' knowledge and helped them achieve their targets quickly. The three large companies and SMEs have improved input and market linkages to smallholder fish farmers. These service providers have organized smallholder fish farmers, integrated them into their respective business models, and provided training on better aquaculture management practices. The SMEs and large companies are also offering extension services.

Analysis: Most large companies working on aquaculture inputs and markets were reluctant to partner with the AQ TEVET project in the northern region of Zambia because of the perceived risks of working with smallholder fish farmers. Some did not expect the smallholder farmers to have the purchasing power to buy large volumes of commercial fish feed to give them a good return on investment. The AQ TEVET project management team worked with the three large companies that had signed MOUs and were willing to invest in the region and local SMEs already on the ground in Luapula and Northern provinces. These SMEs were able to build on their networks and knowledge of the region.

Recommendation: Future projects working with smallholder farmers of aquaculture should engage with SMEs already on the ground in rural areas. They know the community well, which enhances the sustainability of project interventions.

Lesson learned: When looking for aquaculture investors of inputs and markets in remote rural areas, it is effective to engage with SMEs already on the ground and understand the local situation and with large companies that manufacture commercial feeds. Understanding the local context by local SMEs helps to appreciate the needs, challenges and opportunities for investment. Local SMEs have good networks and knowledge of the region, which encouraged them to invest in fish farming in the northern region. Understanding the local context also helped to defray the perceived risks large companies

had of associating with smallholder fish farmers in a rural set up, such as not being able to move large volumes of commercial fish feed because smallholder farmers do not have money.

4.0 Conclusion

The AQ TEVET project was a complex initiative that was made even more challenging by the restrictions of COVID-19 in 2020 and 2021. The results from the 3-year 10 months initiative demonstrate that the AQ TEVET scaling model of upgrading the curriculum to ensure graduates from TEVET institutions have the knowledge and practical skills that meet the needs of the aquaculture private sector value chain. The initiative has also shown that working through private sector service providers (SMEs and large companies) to provide inputs, markets, extension services, and training to smallholder farmers is viable and scalable. By design, the allocated implementation period is considered too short to attain the goal to "increase the number of human resources working for the private sector, and the number of smallholder commercial fish farmers with enhanced aquaculture knowledge and up-to-date practical skills to help sustainably grow the sector and make it more inclusive." Overall, the project was quite successful and valuable lessons have been learned regarding realistic time frames for projects that entail upgrading curriculum, capacity building and scaling. Useful lessons have been learned on gender equity and working with SMEs already on the ground in rural areas and large companies. Although the lessons learned are specific to the AQ TEVET project context, they have been documented and disseminated to share ideas on how others working on similar projects can improve processes, performance and decision making. Some of the lessons can inform future projects of similar design and replicate success or avoid falling into similar mistakes.

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About WorldFish

WorldFish is an international, not-for-profit research organization that works to reduce hunger and poverty by improving 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. Headquartered in Penang, Malaysia and with regional offices across Africa, Asia and the Pacific, WorldFish is a member of CGIAR, the world's largest global partnership on agriculture research and innovation for a food secure future.