Funded by

Norad

MUSIKA
Making Agricultural Markets Work for Zambia

WorldFish

EVALUATION REPORT

Mid-term Evaluation of Aquaculture Technical, Vocational, and Entrepreneurship Training for Improved Private Sector and Smallholder Skills (AQ TEVET) Project

27 NOVEMBER 2020

By

Mulenga Mukanu

Sharper Sikota

Liseteli Ndiyoi

Contents

Contents ii

List of Figures iv

List of Tables v

Acronyms vi

Executive Summary 1

1 Introduction 10

1.1 Project Background 10

1.2 Purpose and Scope of the Evaluation 10

2 Methodology 11

2.1 Evaluation approach 11

2.1.1 Mixed Method 11

2.1.2 Gender Responsive Evaluation 11

2.1.3 Participatory Approach 11

2.2 Analytical Framework 12

2.3 Stakeholder Mapping and Sampling 13

1.1.1 Qualitative Data Collection 15

1.1.2 Stakeholder consultation in the AQ TEVET Evaluation 15

2.3.1 Methodological limitations 16

2.4 Data Management 16

2.4.1 Data Cleaning 16

3 Evaluation Findings 17

3.1 Project Design and implementation strategy 17

3.1.1 Relevance 17

3.1.2 Coherence 19

3.1.3 Effectiveness 20

1.1.3 Efficiency 32

3.1.4 Gender Equity 35

3.1.5 Visibility 38

3.1.6 Lessons Learned 40

4 Conclusions and Recommendations 46

5 Appendices 48

5.1 Data collection tools 48

5.1.1 Informant interview guide – Component 1 48

5.1.2 Key Informant interview guide – Component 2 53
5.1.3 Farmer Focus Group Discussion guide 58
1.1.4 Student Questionnaire 61
5.1.4 Farmer Questionnaire 66
5.2 Statistical Tables 76
5.2.1 Farmer 76
5.2.2 Student 92

List of Figures

Figure 1: Stakeholder consultation in the AQ TEVET(n=123) 16
Figure 2: Fisheries science enrolment statistics from 2017 to 2020 21
Figure 3: what course/module/lesson was delivered and do you feel this was appropriate 22
Figure 4: Photo of Aquaculture Skills Training Centre at NRDC (photo by Mulenga Mukanu) 24
Figure 5: Spatial distribution of the farmers in Northern and Luapula provinces Source (WorldFish, 2019) 26
Figure 6: Number of Smallholders linked and trained with the private sector 27
Figure 7: Comparison of baseline and midterm results on access to extension services 28
Figure 8: photos of fish ponds that were constructed before and after the training 28
Figure 9: Changes in key aquaculture practices among smallholder fish farmers 29
Figure 10: Average income per growing cycle 30
Figure 11: A recruitment advert with women 36
Figure 12: Trends in female enrolment 38
Figure 13: Web page with information on AQ TEVET 39

List of Tables

Table 1: Primary Data Collection methods 12
Table 2: Evaluation questions 12
Table 3: Stakeholder sample 14
Table 4: Focus group discussions with beneficiary farmers 15
Table 5: Number of students enrolled, dropped out prior to completion of diploma program 22
Table 6: What do you plan to do after graduating from this program? 24
Table 7: Results Framework for AQ TEVET Project. 42

Acronyms

AQ TEVET	Aquaculture Technical, Vocational, and Entrepreneurship Training for Improved Private Sector and Smallholder Skills Project
COVID-19	Coronavirus disease 2019
CSEntry	CSPro's Entry tool
CSPro	Census and Survey Processing system
DAC	Development Assistance Committee
FGD	Focus Group Discussion
KFTI	Kasaka Fisheries Training Institute
KII	Key Informant Interviews
MSC	Most Significant Stories of Change
NORAD	Norwegian Agency for Development Cooperation
NRDC	Natural Resources Development College
OECD	Organisation for Economic Co-operation and Development
SME	Small to Medium Enterprise
TEVET	Technical Education, Vocational and Entrepreneurship Training
ToR	Terms of Reference
ZESCO	Zambia Electricity Supply Corporation

Executive Summary

Introduction

The purpose of the midterm evaluation was to assess the project performance and progress made by the Aquaculture Technical, Vocational, and Entrepreneurship Training for Improved Private Sector and Smallholder Skills (AQ TEVET) project towards achieving its intended outcomes. The evaluation provided an independent evaluation of progress achieved at mid-term with a specific focus on i) What has worked well, what did not work well and why? ii) What lessons can be drawn and how they will shape the current and future aquaculture projects. The evaluation focused on the period between June 2018 and September 2020. AQ TEVET is a 3.5-year project (June 2018 to December 2021) funded by Norwegian Agency for Development Cooperation (NORAD). The WorldFish leads the project, and it is implemented in Lusaka, Northern and Luapula Provinces of Zambia in partnership with Musika, BluePlanet and Natural Resources Development College (NRDC).

The evaluation used a mixed-methods approach which included a detailed review of project documents, key informant interviews, focus group discussions, structured interviews with farmers and students; field visits to project sites and observations. Mixed-method approach was adopted to triangulate findings. The evaluation adopted a series of evaluation questions organised according to the Organization for Economic Co-operation and Development's Development Assistance Committee (OECD DAC) evaluation criteria. These questions included assessing the project's relevance, coherence, effectiveness, efficiency, gender, visibility, recommendations and lessons learnt.

AQ TEVET Project

The overall goal of the 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". The project comprises two components:

The first component focuses 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. This component has the following results areas:

- **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**: Increased opportunities for students to find gainful employment with private companies or set up their own aquaculture-related businesses.
- **Result area 4**: TEVET institutes in Zambia adopt/modify the curriculum, training tools, online training platform, and internship program for integration within their institutions.

The second component 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. This component has the following results areas:

- **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.

Evaluation Findings

Relevance

EQ1 How is the upgraded curriculum, online tools, and online training platforms intervention important to the students and aquaculture industry?

The curriculum upgrade was necessary to meet the needs of the continually evolving aquaculture industry, and the need for well-trained, practically skilled, and competent graduates who will contribute effectively to the growth of the industry. The upgraded curriculum will strengthen the entrepreneurial capacity of students to enable them to establish fisheries-based enterprises and create jobs and socio-economic opportunities for other citizens, thereby reducing unemployment in the country. The process of upgrading the curriculum strengthened the capacity of the training officers in the faculty of fisheries science at Natural Resources Development College (NRDC) and Kasaka Fisheries Training Institute (KFTI). Online training platforms were meant to appeal to the youths who are the majority of students enrolled in the fisheries program at NRDC.

EQ2 How well has been the linking of farmers to the private sector (input and output markets) met the needs of the following? i) Smallholder commercial farmers ii) Aquaculture industry

The project integrated farmers with commercial aquaculture players in the private sector; as a result, farmers have sustained access to quality fingerlings, commercial feed, and other extension services. Linking smallholder farmers with private sector actors reduce farmer dependence on the government for extension services because the private sector can provide services in areas where the government may not reach.

Farmers that are directly linked to the private sector to project to develop business models that are responsive to the needs of farmers and link farmers to input and output markets. Since fish is a key source of animal protein increasing accessibility to fish in rural Zambia can improve nutrition outcomes to rural household.

Coherence

EQ3. How are the upgraded curriculum, tools, and online training platform consistent with the human resources need of the private sector?

Upgrading the curriculum, tools and online training platform is coherent with the project object of developing the aquaculture knowledge and practical skills of students participating in technical education, vocational, and entrepreneurship training to enable them to find gainful employment in the private sector. Activities that have so far been undertaken to achieve different results under project component 1 are coherent with project objectives. The Government of Zambia through the University of Zambia have since endorsed the upgraded curriculum and rolled it for implementation beginning January 2020.

EQ4. Has the project's objective/plan to link smallholder farmers to the markets/private sector has so far been achieved?

The initial project plan was to connect farmers to big actors in the aquaculture value chain. While it took longer than anticipated to negotiate with and convince big private sector companies to invest in the region, the project signed MoUs with Aller Aqua, Novatek and Zhonghkai. Other big private sector players were approached but were reluctant to expand their reach to the new market in the Northern and Luapula provinces because of low demand for feed, and relatively low volumes of fish harvested. The project was able to sign MoUs with 3 of the 10 large companies targeted. As a result, the project changed its approach, and instead, Musika engaged small to medium enterprises (SMEs) who already had a presence in the Northern region. Currently, in addition to the three big private sector companies operating in the regions, the project through Musika has signed memorandums of understanding with Kasakalabwe multipurpose cooperative, Hopeways, and Triple Blessings. These SMEs are responsible for developing the aquaculture value chain through the project activities of linking small scale farmers to inputs and output markets as well as the provision of aquaculture better management practices, training, and extension services.

Effectiveness

EQ5. How successfully were upgrading of aquaculture curriculum, online tools, and online training platforms intervention?

The upgraded curriculum was introduced to 69 students (33 in the first year, and 36 in the second year) in January 2020. Third year students were further introduced to the online training platform, bringing the number of students trained on the different components of AQ TEVET to 88. This number represents 65% (38% females) of the progress made against the target of training 135 students by the end of the project in 2021. In addition, discussions with informants from NRDC and the students showed that the newly constructed aquaculture skills training centre, computer laboratory with infrastructure for the online training platform as well as the new curriculum have made fisheries and aquaculture program more attractive. This increased the enrolment figures from 58 students (66% males, 34% females) in 2019 compared to 25 students in 2018. Nine out of sixteen courses (56%) were completely changed to respond to the needs of the industry and the students.

EQ6. To what extent are the practical skills of students through internships specifically tailored to address the needs of the private sector improved since 2018?

The project is still preparing students for both employment and entrepreneurship in the aquaculture industry through the upgrading of the curriculum and design of an industry responsive internship program. The internship program which reinforces the compulsory industrial attachment component of the training program at NRDC will provide further opportunity for students to have hands-on training and enable them to interact with potential employers. While the internship program has been designed and validated by private sector players and other actors in the industry, the program was not fully rolled out due to COVID19 related closure of the college. Consequently, no internship assessments have been done as students are yet to access the additional internship opportunities in the updated internship program. The entrepreneurship training and linking students to micro-finances will help students to have a source of funding for their businesses. The entrepreneurship training will be conducted in 2021 as the closure of academic institutions due to the Covid 19 crisis disturbed the planned implementation of project activities.

EQ7. Are there students that have successfully found employment with companies operating in the aquaculture value chain or have set up their own businesses since 2018?

The objective of enabling students to set up their aquaculture businesses have not been achieved. However, the activities leading to this objective were in draft form at the time of the midterm review and were ear-marked for 2021. Due to the outbreak of COVID-19 pandemic, and the resulting closure of NRDC, this activity could only be rolled out after the NRDC reopened. Implementation of the entrepreneurship training and linking students to micro-finance will only be possible in 2021. The project also has plans to identify ten interested final year students at the end of 2020 who could then be given some training and coaching on starting their enterprises at the beginning of 2021. The project has encouraged collaboration between NRDC and private sector companies which has resulted in some graduates from the fisheries program at NRDC employed. For instance, 6 students out of 135 have successfully found employment with companies operating in the aquaculture value chain. The six employed students represent 4% progress towards the target of 135 employed students. We, therefore, recommend concerted effort from WorldFish and its partners towards this objective for it to be fully achieved in the remaining timeframe of the project.

EQ8. How has been the objective of scaling the upgraded fisheries and aquaculture curriculum for adoption by other TEVET institutes in Zambia been successful so far?

The upgraded curriculum package has been scaled up to KFTI for implementation beginning 2020 while two universities (Copperbelt and Mulungushi) have shown interest. The project collaborated with the University of Zambia to evaluate the KFTI upgraded curriculum as part of its contributions to improving the quality of training offered by other tertiary institutions in the country. BluePlanet has scaled up the online training platform to private companies for the training of their staff. The companies include Lake Harvest in Zimbabwe, Skretting in Uganda, Rwanda, and Kenya and FoodTech Africa in Tanzania and Ivory Coast.

EQ9. To what extent was the linking of smallholder farmers to input and output markets as well as extension services provided by the private sector achieved or likely to be achieved?

The project has significantly contributed to development of the aquaculture markets in Northern and Luapula provinces. Six private commercial players have signed agreements with the project to integrate smallholders into their respective business models, and provide extension services. At the time of evaluation, the private sector commercial players had organized, trained and provided various extension service support to 577 (21% women) smallholder farmers at the time of the evaluation. The number of farmers organized and trained represents 58% of the progress made against the target. The training and extension services were contributing to improved knowledge of aquaculture better management practices with smallholder farmers. Farmers acquired knowledge on pond construction, commercial feed, quality seed, fish health and business management. For instance, 49.9% of the farmers interviewed had improved knowledge of aquaculture practices, and 19% stated that they improved the state of their existing fishponds, while 73% constructed new ponds.

Efficiency

EQ10. How cost-effective is the implementation of AQ TEVET? Were the resources used in the best possible way?

By design, the project was cost-effective, and the resources available are sufficient to achieve its overall objective. The review of the audited reports and the burning rates show that resources have been used according to donor requirements. One way the project improved efficiency was to have three full-time staff placed in Kasama to oversee the implementation of project activities in Luapula and Northern province, which has reduced the travel cost of staff from Lusaka. Furthermore, the secondment of a member of staff from NRDC as a Project Manager under component 1 increased the efficiency of the activities of upgrading the curriculum, which would have otherwise taken longer.

EQ11. What evidence is there to indicate that the project activities of linking smallholder farmers to the input and output market as well as extension services provided by the private sector was implemented with due efficiency under the given circumstances?

The resources available in the project were used efficiently and according to plan. For example, Kasakalabwe Multipurpose Cooperative and Triple Blessings received motorbikes and interns, which helped improve efficiency with which they provide extension services to fish farmers. Furthermore, interns helped SMEs achieve their targets quickly and improved aquaculture knowledge.

Visibility

EQ14. To what extent has the project strengthened partnerships between WorldFish and partners?

The project has brought together various stakeholders in the aquaculture sector in Zambia, including government departments. The project has a communications specialist who oversees communication of all project activities to the public. A number of blogs have been produced

and made available in the public domain. The AQ TEVET project was launched at NRDC. Stakeholders were invited to the launch, including permanent secretary from the Ministry of Livestock and Fisheries who was the guest of honour. The aquaculture radio programs sponsored by the project and presented by representatives from SME's have been key in engaging farmers and increasing the visibility of the project.

Gender Equity

EQ12. How has been the change in women and youth participation in aquaculture since 2018?

Since 2018, 21% of female smallholder fish farmers have been integrated into the private sector business models and have been trained on aquaculture better management practices, linked to output markets as well as the supply of inputs. However, the number of women participating in the project is still below desired levels though numbers are slowly growing. Although the stakeholders reported an increase in the number of women and youth participating, the numbers are not yet adequate. Women bemoaned traditional norms that hinder the recognition of women in fish farming. Furthermore, women are overburdened by household chores; as a result, they have little time to start fish farming businesses. For instance, some women are not involved in the fish farming business because they fear that when divorce, they may leave the fishponds with the man. The project has devised and implemented additional strategies to encourage women's participation. These strategies include:

1) working with cooperatives with a large majority of women;
2) providing training guidelines to SMEs to ensure that the women attending project activities can benefit and;
3) incentivizing women fish farmers through subsidizing fingerlings and feed has the potential to attract more women into fish farming.

Additional strategies are required if the target of having 40% of beneficiaries as women is to be reached. These could include working very closely with traditional authorities to encourage women to participate in project activities.

EQ13. What has the project achieved so far in terms of encouraging women and youth participation in aquaculture?

The project was designed to be gender-sensitive at all levels. For instance, there is a good representation of women among the WorldFish and NRDC staff working on the project activities. There have also been efforts to attract female students to enrol in the fisheries and aquaculture program at NRDC through adverts in the media sponsored by WorldFish. The communication department at WorldFish also designed some billboards with images of women working in fishponds to motivate females to enrol. The private sector has also been engaged so that they deliberately include female interns during recruitment. In the online training platform by BluePlanet, some of the educational films posted on the platform also depict women participating in aquaculture related activities. The voice-over narration of all videos are done by a female narrator. Deliberate efforts such as including females in the advertisements have been made to encourage female applicants to apply for fisheries and

aquaculture programmes at NRDC. The SMEs were also encouraged to include women during training and other activities like inviting women as guest speakers on radio programs. The training plans submitted by SMEs are required to indicate how many women are targeted to participate and also to ensure that women participate effectively during training.

Lessons learned and success stories

Lessons Learnt

Although the AQ TEVET project is on track to achieve the majority of its targets, one of the key lessons that can be drawn is the need to account for local contextual issues when setting targets to avoid the pitfall of overambitious targets. For instance, the time allocated for upgrading the curriculum of a government-run institution should have adequately accounted for the additional validation procedures required by different government stakeholders. Prevailing economic environment and private sector performance could have been used to assess the likelihood of large profit-driven enterprises engaging with the project which required investments into a new market further away from Lusaka. Also, cultural norms which are potent influencers of behaviours should be accounted for in activities that require behaviour change. The target to engage at least 40% of women smallholder farmers should have accounted for the barriers that keep women from meaningfully engaging in fish farming to understand what is achievable during the project lifecycle.

Success stories

1. Implementation of the upgraded curriculum at NRDC and its scaling up to KFTI. In addition, through the support of the project, KFTI which was previously not accredited with TEVETA is now undergoing the accreditation process

2. Online training platform launched and being accessed by third-year aquaculture and fisheries students at NRDC. The platform has also been scaled up to 7 more programs at NRDC.

3. Scale-up of online training platform to Lake Harvest in Zimbabwe and Skretting in Uganda, Rwanda, and Kenya. The online training platform led by Blue Planet academy has been scaled up to Lake Harvest fish farm operating in Zambia and Zimbabwe. Discussions with BluePlanet showed that the platform is also being scaled up to other African countries, including FoodTech Africa in Tanzania and Ivory Coast. This scaling-up effort contribute to improved knowledge on aquaculture in the private sector in Africa.

4. Computer lab set up at NRDC with 18 fully functional computers for students to access the online training platform.

5. Construction of the aquaculture skills training centre at NRDC with ponds and indoor hatchery to help practical skills development in students.

6. Availability of interns and motorbikes facilitated extensions services. Extension services have resulted in improved skills and knowledge on aquaculture best management practices

among smallholder commercial fish farmers and consequently increasing the demand for commercial feed and quality seed.

7.Linkage of farmers to output market has created a ready market for fish which is a big motivator for farmers to engage in fish farming and implement aquaculture better management practises.

Conclusions and Recommendations

The purpose of the midterm evaluation was to assess the implementation progress made by the AQTEVET project. Generally, there is evidence of progress made by the project on both enhancing students' knowledge through the upgrading of the curriculum and other interventions and increasing the number of smallholder commercial fish farmers linked to the markets for increased production and productivity. The project has opened up aquaculture markets for farmers, and we recommend that private sector-smallholder farmer linkages should continue with particular emphasis on the items listed below.

1. Although fish feed is now stocked in Kasama, as well as other SMEs in the different districts closer to farmers, there is still a need to invest in last-mile distributors. Smallholder fish farmers in far-flung areas are still facing challenges in accessing commercial feed since transporting the feed from Kasama adds to the already high cost of purchasing the commercial feed. The project should consider the feasibility of using last-mile distributors who can stock the commercial feed within the farming communities.

2. While access to quality fingerlings has improved, through farmer training and information dissemination through radio programs, the project has generated a huge and unmet demand for quality fingerlings. Particularly sex-reversed fingerlings which are on high demand are not yet widely available. Because of the lack of enough fingerlings to meet the project generated demand, some farmers are still using the low-quality seed, which has stunted growth. Therefore, if the productivity and profitability of the smallholder fish farmers are to be improved, the availability of quality seed has to be increased. The project should consider establishing breeder farmers in each fishing community to supply quality seed as close to the farmers as possible.

3. The project should consider having financing mechanisms for the promising farmers and vulnerable groups like women and youth. Extension services have improved farmer's skills and knowledge. However, to move from subsistence fish farming to commercial production, promising fish farmers need access to finance to acquire inputs like feed, and equipment as well as to upgrade their existing ponds. While stakeholders, suggested that microfinance loans may not be appropriate due to high-interest rates and short payment periods, grants with favourable repayment terms could be an option. We propose that appropriate financing schemes be explored to assist farmers sustainably.

4.The project should continue to expand its approach of working with cooperatives such as Kasakalabwe to reach more women farmers. Women are more likely to engage in fish farming through a cooperative than as individuals because it is relatively cheaper, and it is easier for

them to access land as members of cooperatives compared to as individuals. The project can reach more women through cooperatives than targeting them only as individual farmers.

5.The project should continue sponsoring and producing aquaculture radio programs as this is an important channel for communication which is contributing to farmers engaging in fish farming and improving their skills and knowledge.

1 Introduction

1.1 Project Background

Developing the aquaculture sector has, in recent years, become a policy priority in Zambia. The government, with its cooperating partners, have made investments to promote and support the participation of small and medium-sized farmers in the aquaculture value chain to improve livelihoods and combat poverty through increased per capita income. Zambia currently has a high rate of youth unemployment. There are also noticeable disparities between men and women in the labour force, especially a lack of women working formally in the fisheries sector who have received fisheries skills training. The current Technical Education, Vocational and Entrepreneurship Training (TEVET) system in Zambia faces challenges, including developing skills that are relevant to the private sector. There are poor linkages between smallholder fish farmers and the private sector, which create challenges for organizing smallholders to improve input supply, TEVET, aggregation and sale of their outputs, and for their greater participation in other aquaculture value chain activities.

In response, WorldFish is implementing the Aquaculture Technical, Vocational, and Entrepreneurship Training for Improved Private Sector and Smallholder Skills (AQ TEVET) project, a 3.5-years project (2018 to 2021) with funding from the Norwegian Agency for Development Cooperation (NORAD). The project is implemented in Lusaka, Northern and Luapula Provinces of Zambia in partnership with Musika, BluePlanet and Natural Resources Development College (NRDC). The overall goal of the project 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 comprises two components:

Component 1 focuses 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.

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.

1.2 Purpose and Scope of the Evaluation

The purpose of the midterm evaluation was to assess the project performance and progress towards achieving its intended outcomes to generate evidence-based feedback for program planning. The evaluation was intended to provide evidence of progress achieved at mid-term with a specific focus on i) What has worked well, what did not and why ii) What lessons can be drawn and how can they shape the current and future aquaculture projects. iii) Whether it's necessary to change the project approaches to address emerging issues.

2 Methodology

2.1 Evaluation approach

The evaluation team adopted a mixed-method design. The design stemmed from our understanding of the TORs. To address each component of AQ TEVET project, the team approached this assignment with a mixed-methods approach, drawing on both primary and secondary data. The evaluation included elements of observations, participatory evaluation, and a gender-sensitive approach. Each of these approaches adopted a different methodology to ensure triangulation. We briefly explain each methodology and approaches in the following sub-sections:

2.1.1 Mixed-Method

The evaluation team used a mixed-method approach for quantitative and qualitative data gathering.

Quantitative component: we designed two separate questionnaires for the beneficiaries in the two components of the AQ TEVET project. A student questionnaire was administered to second and third-year students at NRDC to better understand the implementation of activities under component 1 of AQ TEVET project. In addition, a farmer questionnaire was administered to smallholder commercial fish farmers to better understand the implementation of activities under component 2. The questionnaires were developed based on the findings from the document review and in consultation with WorldFish. The finalized questionnaires were installed on smartphones Census and Survey Processing System (CSPro) platform ready for data collection.

Qualitative component: We conducted key informant interviews with purposively selected WorldFish staff, partners (NRDC, BluePlanet, Musika, NORAD and any other stakeholders linked to the project). In addition, we carried out Focus Group Discussions (FGDs) with smallholder fish farmers to get an in-depth understanding of the progress under component 2 of the AQ TEVET project. The data from the FGD complemented the quantitative findings. All interviews and FGDs were conducted while adhering to the COVID-19 preventive measures.

2.1.2 Gender Responsive Evaluation

The gender-responsive evaluation enabled us to assess the progress made in empowering women and female youth in aquaculture by the AQ TEVET Project. Since the project focuses on reducing the disparity between women and men engagement in aquaculture, we designed our evaluation to understand if the project was responding to the needs of women.

2.1.3 Participatory Approach

The judgements and experience of stakeholders and beneficiaries were best able to identify the most relevant theories of change and meaningful outcomes from among several possibilities. Therefore, the evaluation team engaged actively with WorldFish staff, partners (NRDC, BluePlanet, Musika, and NORAD) and any other stakeholders linked to the project to be able to collect accurate and up-to-date data. We understood that identification of local needs and priorities gave direction to programme development, service provision and created effective policies. Therefore, we actively engaged with project beneficiaries (youth, women, and men), students, lecturers, SMEs, smallholder commercial fish farmers and other stakeholders linked TEVET curriculum at NRDC in the data collection process.

Table 1: Primary Data Collection methods

Data collection method	Relevance to the evaluation
Questionnaire	The questionnaire was designed to reach small holder fish farmers and students from NRDC. This was designed to widen the evidence base on results areas and offer some perspectives on the degree to which there have been changes for the outcome and impact result areas. This survey also allowed the team to triangulate reporting of results and provide a benchmark comparison with the baseline data.
Focus Group Discussions (FGDs)	Consultations with smallholder fish farmers through FGDs enabled the team to have detailed discussions on component 2 of AQ TEVET project. Each FGD was of composed of 8 to 12 fish farmers for it to be divergent enough to provide views while making it easy to facilitate. The discussions enabled the team to obtain in-depth understanding from project beneficiaries on their perception of project activities and possible challenges and opportunities to draw lessons and recommendations.
Key Informant interviews (KII)	Key informants had an in-depth appreciation of the AQ TEVET Project. These semi-structured interviews allowed the team to gather additional insightful and in-depth information leading to a better appreciation of the evaluation results. Through stakeholder consultations, the team managed to identify programmatic priorities, approaches, challenges, lessons learnt, recommendations and a full range of DAC criteria questions were answered.

2.2 Analytical Framework

The evaluation was guided by key evaluation questions which were informed by the OECD DAC criteria. Table 2 outlines the evaluation questions.

Table 2: Evaluation questions

Relevance
EQ1. How are upgraded curriculum, online tools, and online training platforms intervention important to the students and aquaculture industry?
EQ2. How well has been the linking of farmers to the private sector (input and output markets) met the needs of the following? i) Smallholder commercial farmers ii) Aquaculture industry?
Coherence
EQ3. How are the upgraded curriculum, tools, and online training platform consistent with the human resources need of the private sector?

EQ4. Do you believe that the project's objective/plan to link smallholder farmers to the markets/private sector has so far been achieved?
Effectiveness
EQ5. How successfully were upgrading of aquaculture curriculum, online tools, and online training platforms intervention?
EQ6. To what extent are the practical skills of students through internships specifically tailored to address the needs of the private sector improved since 2018?
EQ7.Are there students that have successfully found employment with companies operating in the aquaculture value chain or have set up their own businesses since 2018?
EQ8. How has been the objective of scaling the upgraded fisheries and aquaculture curriculum for adoption by other TEVET institutes in Zambia been successful so far?
EQ9. To what extent was the linking of smallholder farmers to the input and output market and extension services provided by the private sector achieved or likely to be achieved?
Efficiency
EQ10. In your opinion, how cost-effective is the implementation of AQ TEVET? Were the resources used in the best possible way?
EQ11.What evidence is there to indicate that the project activities of linking smallholder farmers to the input and output market as well as extension services provided by the private sector was implemented with due efficiency under the given circumstances (*applies to component 1 as well*)?
Lessons learnt/ Recommendations
EQ12.What key lessons did you learn from the project implementation of AQ TEVET? What worked well and not?
Visibility (Networks & partnerships)
EQ13.To what extent has the project strengthened partnerships between WorldFish and partners?

2.3 Stakeholder Mapping and Sampling

We combined both purposive and simple random sampling procedures to identify participants for the different components of the study, as shown below.

2.3.1 Quantitative sampling

The sample size estimation method that we used for sampling respondents was as follows:

$$n = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1 + \frac{z^2 \times p(1-p)}{e^2 N}}$$

Where:

$n =$ Sample size
$z =$ Z-score which is estimated at 95% confidence interval, $z =$1.96
$e =$ Degree of accuracy expressed as a proportion of 5%.
$p =$ Proportion of the population, in this case, since the proportion is unknown, it will be left at 50%.
$N =$Population size

The smallholder fish farmer census carried out in Northern and Luapula provinces of Zambia identified 2341 farmer households. The AQ TEVET project integrated 441 smallholder farmers into the private sector business models and these farmers were trained on aquaculture better management practices, linked to output markets and input markets. Of these, 89 are individual beneficiaries, and 352 are members of the eight cooperatives. Using the above formula, we calculated a sample of 72 individual farmers, but only 36 interviews were conducted. In the sample size calculation, we assumed the standard 80% power (the probability of correctly rejecting a hypothesis when it is false), 5% significance level (the probability of incorrectly rejecting a hypothesis when it is true) and a conservative prevalence at 50%.

We used a simple random sampling approach to select 36 farmers for the survey. All women in the target population were included in the final sample as they are underrepresented. Furthermore, we administered the survey to 47 students at NRDC.

Table 3: Stakeholder sample

Target Population	Population size	Instrument	Sample	Sampling technique
Smallholder commercial farmers in Mansa Under Hope Ways Agro-dealers	62	Farmer Questionnaire	17	Simple random sampling
Smallholder Commercial farmers in Luwingu District	16	Farmer Questionnaire	10	Simple random sampling
Aller AQUA Farmers accessing commercial feed in Northern Province	11	Farmer Questionnaire	9	Simple random sampling
Students from NRDC	63	Student Questionnaire	47	Simple random sampling

2.3.2 Qualitative sampling

For the qualitative section, we used purposive sampling since there will be no attempt to make the sample representative. We purposively sampled 175 members who participated in the FGDs. Table 4 shows the number of FGDs that were carried out per cooperative with members ranging 7 to 10 per FGDs.

Table 4: Focus group discussions with beneficiary farmers

Cooperative name	Membership	% of total	Sample	FGDs	Sampling
Pipelibe Multi-cooperative Society	102	29.0	53	3 FGDs	Purposive
Kasakalabwe Multi-cooperative Society	27	7.7	14	2 FGD	Purposive
Kamakonde Fish Farming Club	25	7.1	13	2FGD	Purposive
Kafula Muyonga Cooperative	30	8.5	16	2 FGD	Purposive
Lukulu SouthCooperative	34	9.7	18	2FGDs	Purposive
Kamuzwazi Cooperative Youth Contractors in Mbala District	28	8.0	15	1 FGD	Purposive
Tengelo Chinasha Cooperative	84	23.9	44	4 FGDs	Purposive
Hellen Grays Recovery	22	6.3	12	2FGDs	Purposive
Total	352	100.0	184	**18 FGDs**	

2.3.3 Stakeholder consultation in the AQ TEVET evaluation

We purposively sampled individuals from the following key groups of stakeholders: 1) Government; 2) Implementing organization and partners and, 3) Private sector. The primary selection criterion of the informant to be interviewed was knowledge and involvement in the AQ TEVET project activities through their institution. Figure 4 summarises the stakeholders that participated in the data collection process.

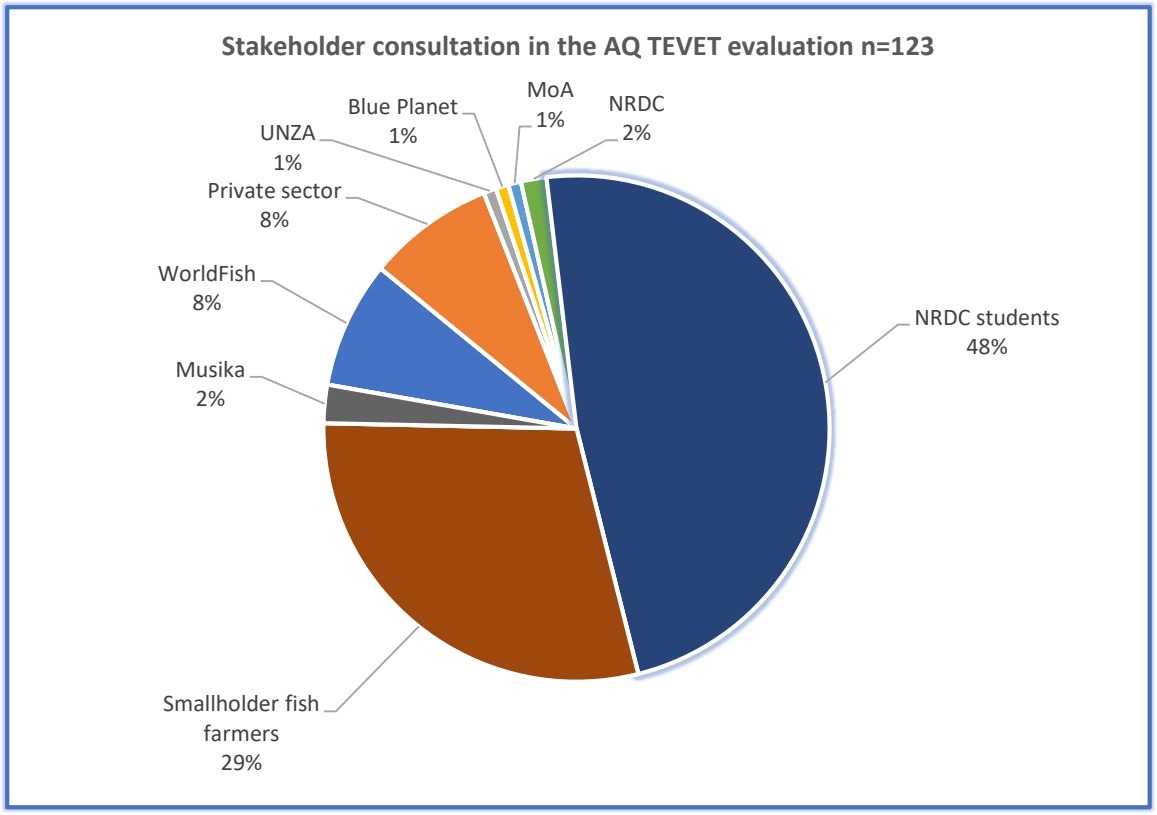

Figure 1: Stakeholder consultation in the AQ TEVET(n=123)

2.3.4 Methodological limitations

The key informant interviews were done online due to health concerns following the outbreak of COVID-19. However, this did not significantly affect our data collection as all the informants had proper internet connections and allocated sufficient time for the interviews. The consultant was able to reach and interview farmers and students, respectively. The calculated sample size for farmer interviews was 72, but only 36 interviews were conducted. The lower than the planned number of farmer interviews was mainly due to logistical constraints arising from long distances and the poor road network leading to individual farmers in both Northern and Luapula province. The impact of the reduced sample size is, however minimal as the finding from FGD with a total of 175 farmers complemented the quantitative survey.

2.4 Data Management

The electronic versions of the two quantitative instruments (Farmer and Student questionnaire) were developed using CSPro and installed on an android tablet. Responses were recorded on the tablet during the interviews, and completed questionnaires were transmitted to the server after quality checks were done. The consultant managed the server, and issues of confidentiality were strictly observed throughout the evaluation.

2.4.1 Data Cleaning

Data cleaning for all datasets were done in CSPro and Stata. We developed a set of data-cleaning do-files. For example, special Stata and python programs were developed to automate the process of

identifying errors of different types including identifying duplicates, out-of-range values in nominal and ordinal variables, missing values, and missing and mismatched case identifiers.

3 Evaluation Findings

The section presents the midterm evaluation findings of the project covering the period between June 2018 to September 2020. The findings are presents in seven different sub-sections: (i) relevance of the project; (ii) coherence of the project activities; (iii) effectiveness of the project activities (iv) efficiency of the project; (v) women and youth; (vi) challenges faced by the project; and (vii) conclusion and recommendations.

3.1 Project Design and implementation strategy

The section assessed the design of the project and its implementation strategies to meet the desired outcomes and ultimately, the project goal. Several documents were assessed and are listed at the end of this report as materials consulted. The project has a project proposal and a results framework indicating key outcomes, outputs and activities that need to be executed to achieve each result area. In addition, there is a project brief that summarises what the project's purpose and a theory of change and impact pathway that explains how each of the intended outcomes is going to be achieved and this available in the public domain (see here). The project manager secondment from the Natural Resources Development College helped to achieve a number of results, especially the upgrade of the curriculum for fisheries science which could have otherwise taken long.

"I think the project manager secondment worked to our advantage because the processes that were involved in the curriculum review were just too many such that if we did not have someone who knew these processes, I don't think we could have completed the process by now. Of course, if you look at the initial plan you may see that we delayed by six months or so, but this could have been worse" – WorldFish KII

The project has contract agreements with partners mainly Musika and Blue Planet that outlines the roles and responsibility of each partner, including their reporting requirements. Both document review and interview with informants ascertained that Musika reports every quarter whilst BluePlanet reports annually. The midterm review team reviewed all progress reports from these partners. The project leader explained that WorldFish and its partners hold monthly meetings with partners to discuss the progress made with regards to the implementation of the project. We reviewed the project meeting minutes as well as the minutes from the annual implementation planning meeting. A review of minutes of meetings with partners show that there has been significant management and strategic discussions among partners. We found this practice to useful to project hence it should continue with the remaining implementation period of the project as well as in the implementation of future projects.

3.1.1 Relevance

Evaluation Question 1: How are the upgraded curriculum, tools, and online training platform important to students and the fisheries sector?

This evaluation question seeks to understand whether the design of the project objectives was appropriate to meet the needs of the beneficiaries. Interviews with key informants and students showed that the upgrading of the curriculum, training tools and online training platform was relevant to the students and the aquaculture industry in Zambia. A study carried out by WorldFish at the beginning of the project revealed that commercial private sector players were having challenges in employing fisheries science graduates from NRDC because the graduates did not have adequate aquaculture practical skills and knowledge (see here). Only 16% of NRDC graduates for the period between 2013 and 2018 were employed in the private sector, yet the college is the main and oldest institution providing fisheries science training in the country. The private sector preferred hiring expatriates on account that the local human resources required further training if they were to be hired. Zambia's aquaculture subsector is dominated by the private sector (Kaminski et al., 2018; see here). The 2019 department of fisheries annual report shows that the country's aquaculture production in 2018 was at 36,105 metric tonnes with the private sector/commercial farms contributing to 85% of the total production of fish from the farms (DOF, 2019). It is therefore, relevant, to have a curriculum that addresses the needs of the private sector. It is also relevant to have a curriculum that equips students with relevant skills and knowledge to enable them find gainful employment in the private sector as a key mechanism for growing the industry to enhance food and nutrition security and reduce unemployment at the same time. In the 7th National Development Plan 2015 to 2021, the Zambian government has estimated that with a growing population, an additional 108,000 metric tonnes of fish will be needed to meet the per capita fish supply of 12kg per person (Ministry of National Development Planning, 2017, see here). Thus, efforts to upgrade the curriculum and increase human resources is very important as it creates managers who can manage the fisheries sector sustainably.

The fisheries science curriculum for NRDC was upgraded in 2019 with the support of the project. The upgraded curriculum now includes comprehensive training in aquaculture and entrepreneurship which were missing in the old curriculum. The University of Zambia endorsed the upgraded fisheries and aquaculture curriculum on 10th December 2019 to authorise its implementation in January 2020. The University of Zambia is a quality controller and underwrites the diploma certificates conferred by NRDC. The upgraded curriculum addressed the following issues that were missing in the old curriculum:

1. The need for well-trained, practically skilled and competent graduates who will contribute effectively to the growth of the industry upon graduation
2. The historical bias towards capture fisheries which resulted in graduates that were inadequately trained for the aquaculture industry, which is rapidly growing and is generally private-sector driven
3. The need to strengthen the entrepreneurial capacity of students to enable them to establish their fisheries-based enterprises and create jobs and socio-economic opportunities for other citizens upon graduation instead of always looking for employment

Evaluation question 2: How is the linking of smallholder farmers to input and output markets through private sector commercial players important to smallholder commercial farmers and the fisheries sector?

Linking smallholder farmers to markets is the main activity under the second component of the project to enhance aquaculture knowledge for smallholders, especially women and youth. As indicated in the previous evaluation question, recent studies have shown that the private sector players dominate aquaculture in Zambia and there is a disconnection between smallholder farmers and the commercial private sector commercial players, especially in the Northern and Luapula provinces (Kaminski et al., 2018). Of the 2,341 farmers surveyed at baseline in the project, only 30% were youth, 14% were women, and only 13% of the smallholder commercial farmers had access to commercial feed, and 48.8% lacked fingerlings. It was also found that typically, smallholder fish production cycle lasted for more than a year (12 months) when ideally it should only take about 6 months. Poor market linkages to input suppliers (the private sector) were seen to contribute to the lengthy production cycle as farmers use poor quality inputs. It was therefore, relevant, to link smallholders with commercial players to address the constraints affecting them.

Key informants in the Ministry of Agriculture pointed out that the smallholder fish farmers were the majority in the country. Thus if smallholder farmers are given a favourable market for them to produce quality fish, it would be easier to close the fish supply deficit of 108,000 metric tonnes of fish required to increase per capita fish consumption of 12Kg per person per year. The country is endowed with abundant land and water resources that can support fish farming. About 15 million hectares of water in southern Africa is found in Zambia (WorldFish, 2020). Focus group discussions with smallholder farmers revealed that farmers felt it was relevant to link them to private sector players with ability to provide extension service support. This linkage helped them to acquire knowledge on aquaculture better management practices as well as accessing inputs such as feed and seed. Linking smallholder farmers with private sector actors reduce farmer dependence on the government for extension services because the private sector can provide services in areas where the government may not reach. These activities are contributing to the growth of the aquaculture industry.

3.1.2 Coherence

Evaluation question 3: How are the upgraded curriculum, tools, and online training platform consistent with the human resources need of the private sector?

This evaluation question addresses the coherence of the project. As indicated above, the project has five result areas, and this section discusses the coherence of activities meant to achieve project result area 1 to 4. The activities undertaken include (i) fisheries and aquaculture curriculum gap analysis and sharing results in a multi-stakeholder platform (workshops); (ii) private sector human resources needs assessments and an alumni tracer study; (iii) hiring consultants to review the curriculum at NRDC; (iv) reviewing the curriculum and developing short-term courses at NRDC; (v) developing internship program for students at NRDC and (vi) developing scripts and taking videos, photos, and animations for the online training platform. In addition, the project also carried out some capital investments which include the construction of an aquaculture skills training centre as well as setting up a computer laboratory equipped with 18 desktop computers and a server. All these activities were coherent with the objective of developing the aquaculture knowledge and practical skills of students participating in the fisheries program at NRDC to enable them to find gainful employment in the

private sector. Other activities included scaling of the curriculum review processes to Kasaka Fisheries Training Institute (KFTI) –a public college that is offering a two-year certificate in fisheries science. The online training platform has also been scaled to a private sector commercial player known as Lake Harvest, which operates in both Zambia and Zimbabwe.

Evaluation question 4: To what extent were project activities of linking smallholder farmers to the markets/private sector coherent with the project objective?

This section addresses the coherence of the activities meant to achieve project results in area 5. The activities undertaken include

1. assessment of commercial private sector players (market actors) such as feed millers or suppliers of feed including suppliers of fingerlings, aquaculture equipment as well as output off-takers (buyers of fish);
2. assessment of smallholder farmers and developing maps for sharing with the private sector to stimulate their investments into the smallholder aquaculture;
3. developing partnership through signing memoranda of understanding with private sector players to enhance the organization and training of smallholders within auspices of private sector extension service support;
4. developing the capacity of the private sector to deliver extension services through cost-share investments; and
5. carrying out aquaculture related technology demonstrations with smallholder farmers.

All these activities were coherent with the objective of developing the aquaculture knowledge and practical skills of smallholder commercial fish farmers (especially women and female youth). The project has since signed MOUs with six private sector commercial players namely Aller Aqua; Kasakalabwe multi-cooperative, Triple Blessings Centre; Novatek Animal Feed; Hope Ways Enterprises and Zhongkai.

3.1.3 Effectiveness

Evaluation question 5: How effective were project activities and outputs in achieving project outcomes?

Result area 1: Enhanced knowledge base of students from the TEVET institute trained

The performance indicators for this result area are: (i) endorsed upgraded fisheries and aquaculture curriculum; (ii) number of student enrolments and, (iii) number of students trained using the upgraded curriculum.

- **Endorsed upgraded fisheries and aquaculture curriculum:** The project has been successful with the curriculum review following its endorsement by the University of Zambia and the management from NRDC. This output marks a significant milestone to enhancing the aquaculture knowledge of students from NRDC on account that it offers the necessary skills needed by the aquaculture industry. However, the limitation for this result area is that change in knowledge is solely measured by students' access to training using the upgraded

curriculum, and graduating from NRDC. It would be better to also get feedback from the employers especially in the private sector on the performance of the students trained on the upgraded curriculum. However, this can only be done beyond 2021 after the closure of the project.

- **Number of student enrolment:** Evaluation findings show that there has been an increase in the number of student enrolment (Figure 2). Discussions with informants from both WorldFish and NRDC attribute the rise in the number of student enrolment in fisheries science to project activities particularly the upgrading of the curriculum, construction of the aquaculture skills training centre and introduction of the online training platform. Marketing strategy has also been mentioned as one of the key activities that made the fisheries science training more attractive to prospective students. Moreover, 83% of the fisheries and aquaculture students felt that the upgraded curriculum was preparing them for a formal career path; hence they found the training to be useful and attractive. The presence of information on AQ TEVET and curriculum review on various online platforms like the WorldFish website and Facebook page suggests evidence of increased public awareness which likely influenced an increase in fisheries student enrolments. However, we feel that if this continues, there might be a need to make additional investments in infrastructure as the existing one may not be able to accommodate the rising number of students in the faculty of fisheries science. For example, the computer lab can only accommodate up to 18 students.

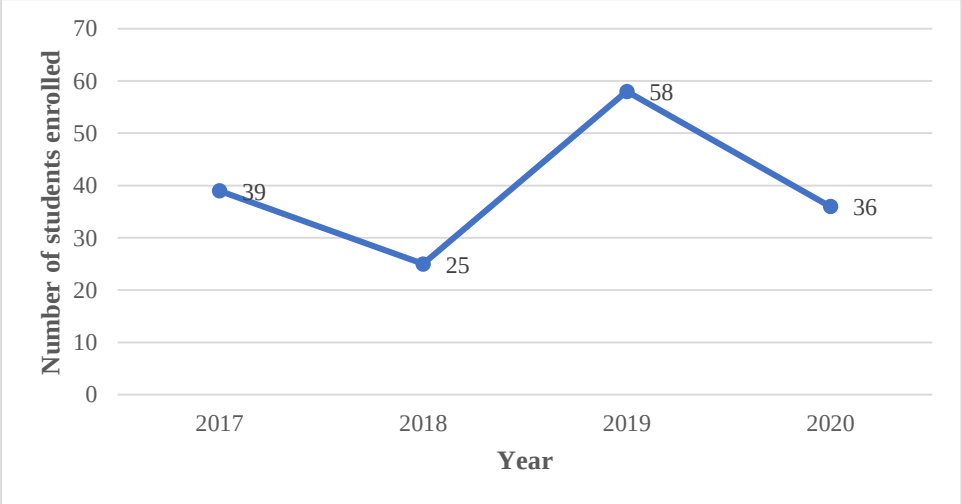

Figure 2: Fisheries science enrolment statistics from 2017 to 2020

- **Number of students trained using the upgraded curriculum and online training platform:** The upgraded curriculum was introduced to 69 students (33 in the first year, and 36 in the second year) in January 2020 (see Table 5). Third years were further introduced to the online training platform, bringing the number of students trained on the different components of AQ TEVET to 88. This number represents 65% progress made against the target of training 135 students by the end of the project in 2021. Furthermore, access to the online training platform has been scaled up to students in other programs at NRDC. For example, a basic aquaculture course will be introduced in seven out of the nine programs

offered at the institution from the beginning of the next academic year. All students undertaking this course will have access to the online training platform. Students trained using the upgraded curriculum were asked to indicate the courses that they felt were appropriate for their future career path, and the results are displayed in Figure 3.

Table 5: Number of students enrolled, dropped out prior to completion of diploma program

Year of student	Enrolment statistics	Students who dropped out	Existing students at the time of evaluation
Third years (enrolled in 2018)	25	6	19
Second years (enrolled in 2019)	58	22	36
First years (enrolled in 2020)	36	3	33
Total			**88**

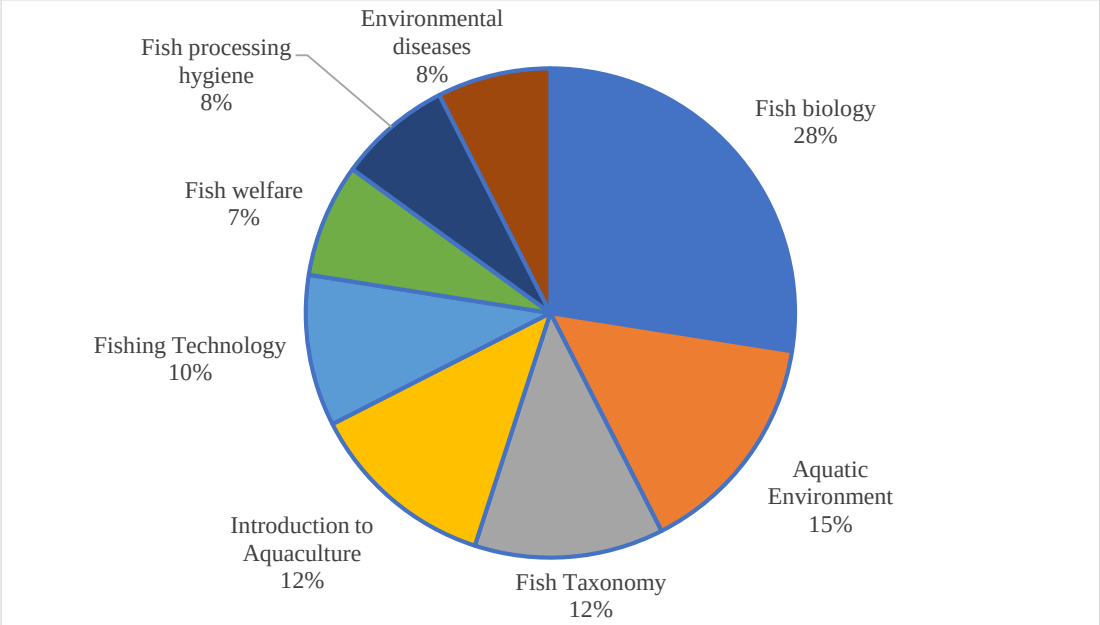

Figure 3: what course/module/lesson was delivered and do you feel this was appropriate

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***

The performance indicator for this result area is the number of student internships carried out with private companies, with a target of 135 students taking part in the internship reviews by the end of the project.

The fisheries program at NRDC includes a compulsory industrial attachment component which students undertake at the end of the second year of study. Students who undertake this industrial attachment are assessed by both the hosting institution and NRDC to graduate. The AQ TEVET project included developing an internship program as part of the upgraded curriculum package. This internship program reinforces the existing industrial attachment component of the fisheries training at NRDC by providing an additional internship at the end of the first year of study. At the time of the evaluation, all surveyed third-year students (100%) had undertaken an internship in the form of the industrial attachment. None of the second-year students reported undertaking an internship because the industrial attachment occurs between December and February in the second year of study. The additional internship opportunity identified by the AQ TEVET upgraded internship program was yet to be implemented. Additionally, 92% (43 out of 47) of the second and third -students surveyed reported having undertaken some form of aquaculture related practical training. The majority of students (65%) indicated that they organized the practical training by themselves, while 20% indicated the only practical training they have received is laboratory/class-based at NRDC. Only six students (14%) indicated that they undertook the practical training at private firms that have MOUs with NRDC.

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

This result area was measured by (i) number of students who set up (or intend to set up) their own aquaculture-related businesses and (ii) number of students at the end of the project who have found gainful employment with private companies operating in the aquaculture value chain.

At the time of the evaluation, no student had set up their own aquaculture related business. It was understood that students were not fully exposed to business development and linking to finance institutions following the outbreak of COVID 19 as the college was closed from March to July 2020. However, several outputs that support this result area have been delivered, including the aquaculture skills training centre at NRDC to help the fisheries and aquaculture students carry out their practical learning. During the evaluation team's visit to NRDC, we noted that the training centre has a four-roomed building, housing an indoor hatchery and separate rooms for feed formulation and storage, a small office, and ablution block. In addition, the centre has the following facilities (i) six nursery ponds ($20m^2$ each); (ii) four Broodstock ponds ($50m^2$ each); (iii) four production ponds ($300m^2$ each); and (iv) a sedimentation pond ($600m^2$) for biosecurity and waste control system. To further reinforce biosecurity measures, footbaths have been constructed at the main entry point (see Figure 4). The college has developed a sustainability plan for the management of the skills training centre after the closure of the project.

Figure 4: Photo of Aquaculture Skills Training Centre at NRDC (photo by Mulenga Mukanu)

Key informants from WorldFish explained that once students are fully exposed to business development, plans are that the students will be linked to microfinance institutions such as the Citizen Economic Empowerment Commission (CEEC) for them to be able to receive funding for their business proposals. In 2019, the project through NRDC hosted a Fisheries Awareness and Sensitization Seminar for students at NRDC involving current and past fisheries science students and private companies. The seminar aimed to raise awareness of the AQ TEVET project activities at NRDC and to motivate students' interest in fisheries and aquaculture. Private sector representatives and carefully selected NRDC alumni made motivational talks to educate the students of possible career paths in fisheries vis-à-vis potential employers and possible career prospects and entrepreneurial opportunities in the aquaculture value chain. Interviews with the students revealed that 77% would like to start an aquaculture business after they graduate, while 60% stated they would like to find employment in an aquaculture related company (Table 6).

Table 6: What do you plan to do after graduating from this program?

Variables*	Count	Percentage
Start an aquaculture business	36	76.6
Find employment in aquaculture related company	28	59.6
Pursue further aquaculture related studies	6	12.8
Semi intensive aquaculture farmer	1	2.1
Go for internship	1	2.1
Total	47	

*Multiple responses: respondents were asked to select all the options that applied

Result area 4: ***Two (2) additional TEVET institutes in Zambia adopt or modify the curriculum, training tools, online training platform, and internship program for integration within their institutions***

The performance indicator for this is the number of TEVET institutes that adopt/modify the curriculum, training tools, online training platform, and internship program for integration within their institutions. This result area only targets two institutions by the end of the project in 2021.

At the time of the evaluation, the upgraded curriculum package had been scaled up to Kasaka Fisheries Training Institute and was introduced to 42 students in July 2020. KFTI offers a 2-year certificate in fisheries and aquaculture. The curriculum review for KFTI was done back to back with NRDC as KFTI showed interest in the early stages when they were invited to the presentation of results on curriculum gap analysis which also covered their college. KFTI is a public training institution, and surprisingly, it had no quality controller at the time of the curriculum upgrade. However, building on the relationship that WorldFish has with the University of Zambia, the University has since agreed to monitor the quality of training offered by KFTI and to start up this process, KFTI was requested to register for accreditation with TEVETA. At the time of the evaluation, KFTI had not made significant progress with registration of their college under TEVETA and attributed the delay to COVID 19 restrictions on movements and meetings. In addition, WorldFish reported that two public universities, namely, Mulungushi University and Copperbelt University expressed interest in working with WorldFish to have their fisheries and aquaculture curriculum reviewed to respond to the needs of the industry. Mulungushi University has since signed an MOU with WorldFish (a copy can be made available on request).

Furthermore, BluePlanet has scaled up the Tilapia production online training platform to Lake Harvest of Zimbabwe with over 100 movies developed for the private fish farm's internal procedures. Lake Harvest is currently testing the content of the online training platform with 20 employees. BluePlanet adapted the online training platform for Lake Harvest to include restricted videos tailor-made for the company's internal procedures. BluePlanet is also scaling the online training platform to Skretting –a feed supplier in Zambia, Uganda, Kenya, Rwanda, Ivory Coast, and Tanzania (through Food Tech Africa). The project has met the target of scaling up the upgraded curriculum package and training tools by more than 100% even before the end of the project. However, there is a need to monitor the implementation of the curriculum and the innovations that have been scaled to the named institutions to ensure sustainability. There is also a need to put up the implementation strategy with the institutions that have expressed interest. It is not clear how WorldFish is going to scale the curriculum and online training platform with institutions that have expressed interest considering that the project is coming to an end in 2021.

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

The performance indicators for this result area are: (i) number of private companies with enhanced capacities to provide TEVET support and services to smallholders –the target for this indicator is ten companies by the end of the project in 2021, and (ii) number of farmers organized and trained on TEVET by the private sector –targeting 1000 farmers by the end of the project

The project has significantly contributed to developing the aquaculture markets in Northern and Luapula provinces. The project assessed commercial market players in the private sector, and at the time of the evaluation, six memoranda of understanding were signed with six private sector companies (Figure 6). These MoUs represent 60% progress made against the target of 10 commercial players by the end of the project. Stakeholders from Musika explained that it took more time than anticipated to convince commercial actors, especially those located in Lusaka, to expand their business to Northern and Luapula province on account that there is high risk in investing in smallholder aquaculture. Smallholder fish farmers were characterised with low investments; hence the private sector players were a bit sceptical in investing in them for fear of not getting their return on investments.

However, of the three biggest feed millers in the country (Aller Aqua, Skretting and Novatek), Aller Aqua and Novatek have signed MOUs with the project. The outcomes of the MOUs include the following

1. opening of a new aquaculture input supply store in Kasama;
2. construction of a catfish hatchery by Kasakalabwe in Kasama;
3. supply of sex-reversed tilapia fingerlings by Hope Ways in Mansa;
4. establishment of a readily available fish market in Luwingu district by Triple Blessings Centre.

The maps showing the spatial distribution of smallholder fish farmers in the Northern region developed through the project influenced the decision by Aller Aqua to open an outlet in Kasama as they could easily visualize the presence of potential customers (Figure 5).

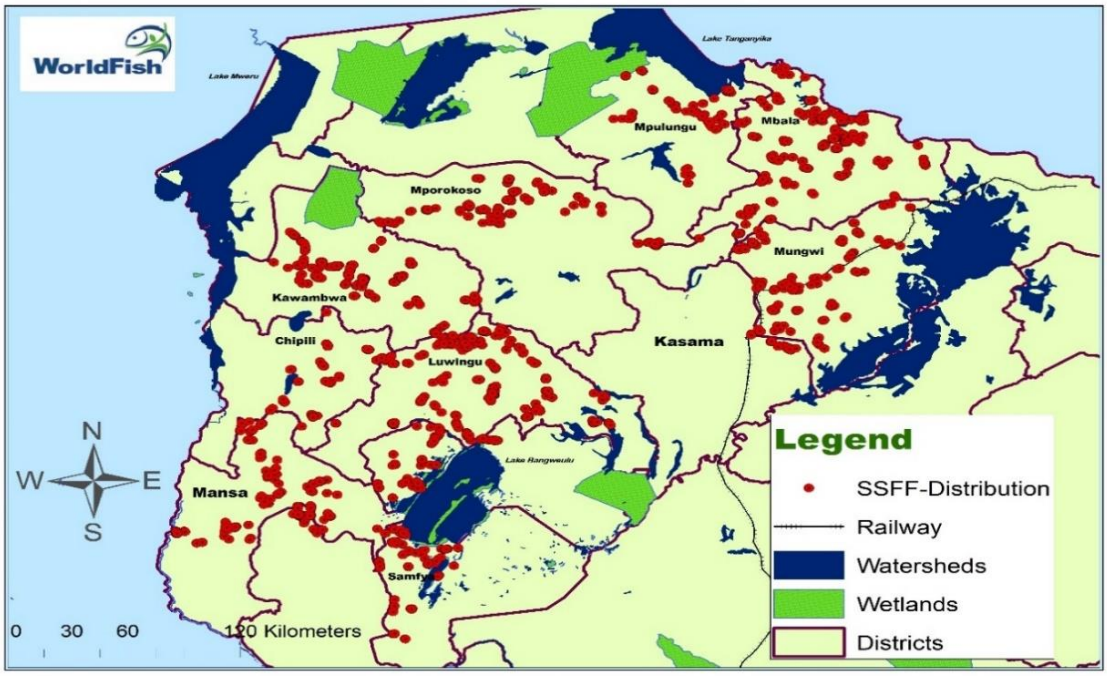

Figure 5: Spatial distribution of the farmers in Northern and Luapula provinces Source (WorldFish, 2020)

The private actors that have signed MOUs with the project had trained 577 smallholder farmers at the time of the evaluation. The number of farmers organized and trained represents 58% of the progress made against the target. Figure 6 shows the number of farmers trained by each private actor. Unlike other actors who trained farmers at their respective farms, Kasakalabwe adopted a cooperative approach where each cooperative had a demonstration fishpond where farmers in that particular cooperative could learn. We found this model to be very useful and effective because it promoted interaction between farmers, and more women were participating in the training hosted by cooperatives compared to the training that was done at individual farmers' farms. Other actors had not trained any farmer at the time of the survey because the agreement was just signed in the same month of the evaluation.

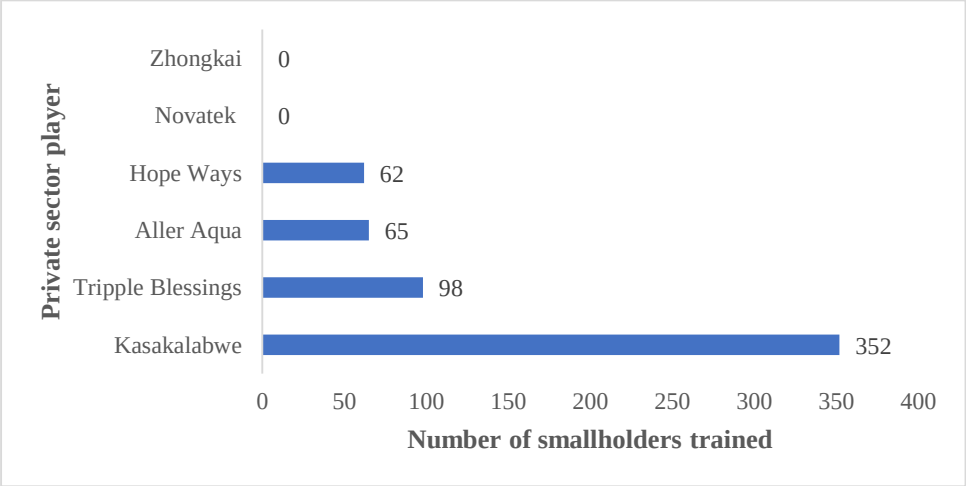

Figure 6: Number of Smallholders linked and trained with the private sector

The project's activities also intended to organize and train smallholder fish farmers (including women and youth) by the private sector on TEVET. Through these activities, the projected aimed to achieve the following: i) enhanced aquaculture knowledge and practices among smallholder fish farmers, ii) increased productivity and profitability, iii) increased women and youth engagement in aquaculture and, iv) establishment of lead farmers.

i) Enhanced aquaculture knowledge and practices among smallholder fish farmers

Discussions with the private sector commercial players showed that smallholders received various training, mostly targeted on the lower end of the value chain activities such as species selection, site selection, pond construction, fishpond management and biosecurity. This was also reflected in the WorldFish and Musika progress reports as well as in the interviews with the smallholder farmers. Majority of the smallholders that received the training indicated that training carried out by the private sector has helped them improve their knowledge and skills in aquaculture management practices. A respondent narrated:

> *"I have known how to construct a fish pond and also how to stock fish in my fish pond. Before the training, I used to think that you just have to dig a fish pond as long as there is a water*

source and then put fish, but now I know about site selection; that a fish pond needs to have an inlet and outlet and the size of a fish pond determines the number of fingerlings I am going to stock. This is really helpful." –A woman farmer from Pibelibe cooperative trained by Kasakalabwe narrates how the training has changed her knowledge in aquaculture.

Farmers reported that linkages with the private sector made it easier for them to access extension services, including feed and fingerlings. Our findings showed that 74% of farmers have access to quality fingerlings compared to 23% at baseline. Access to markets for their fish increased from 31% at baseline to 61% at midterm (Figure 7). Figure 8 further shows a photo of fish ponds that were constructed before and after the training on pond construction.

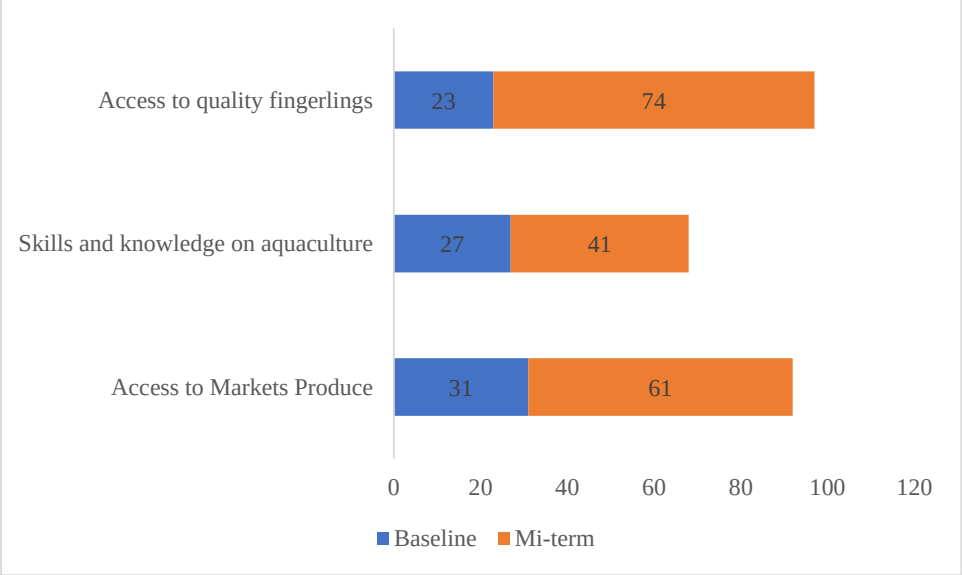

Figure 7: Comparison of baseline and midterm results on access to extension services

Figure 8: photos of fish ponds that were constructed before and after the training

Figure 9 compares the change in key aquaculture practises of the source of fish feed, use of commercial feed and use of sex-reversed fingerlings between baseline and midterm evaluation findings. At baseline, 19% of farmers surveyed reported using commercial feed (3% exclusively used commercial feed, while 16% used both commercial and non-commercial feed)[1]. At midterm, 67% of the farmers interviewed received training on better management practices, and 25% of the trained farmers used commercial feed. These results show that training farmers on better management practices significantly increased the usage of commercial feed. It should be noted that better management practices training was just one of the formal training that the farmers received. Other forms of training include pond construction, biosecurity and fish health. A farmer reported to have received at least one of these training was considered to have received formal training. This composition of farmers comprised 75% of the sample. At baseline, this was reported to be 27.2%.

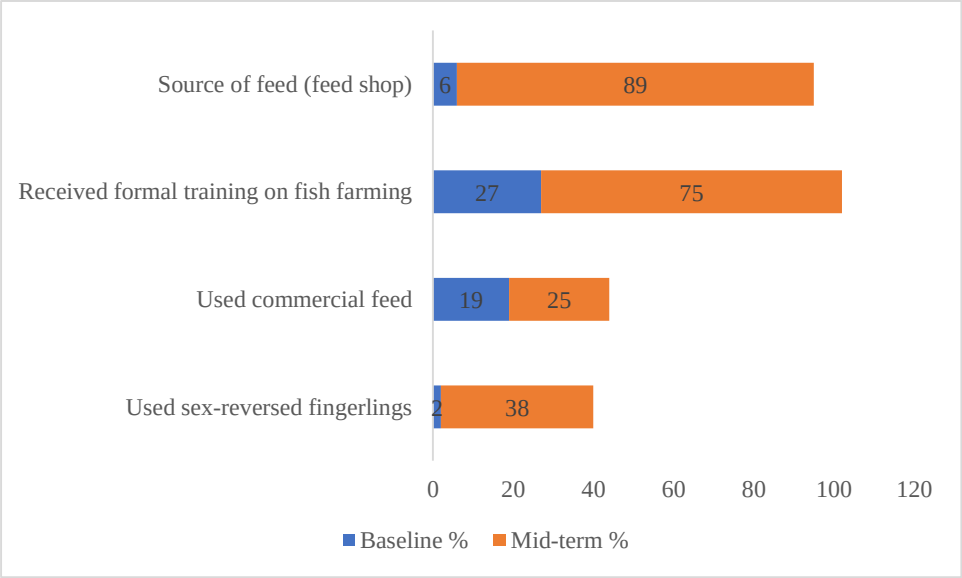

Figure 9: Changes in key aquaculture practices among smallholder fish farmers

ii) Increased productivity and profitability

The profitability and productivity among fish farmers have improved compared to baseline findings. Of the farmers surveyed at midline, 25% reported having used commercial feed as compared to 19% at baseline. However, some farmers said they are yet to see an increase in the productivity and profitability of the fish they are farming. These farmers are those who still have no access to the quality sex-reversed fingerlings and the commercial feed. For instance, the hatchery at Kasakalabwe is still not operational, in part due to the lack of feed for the catfish. In comparison to the baseline, the average income from fish sales at midterm increased to K1,675 from K1,263, as seen in Figure 10.

[1] Smallholder fish farmers population census report 2020: Northern and Luapula provinces, Zambia

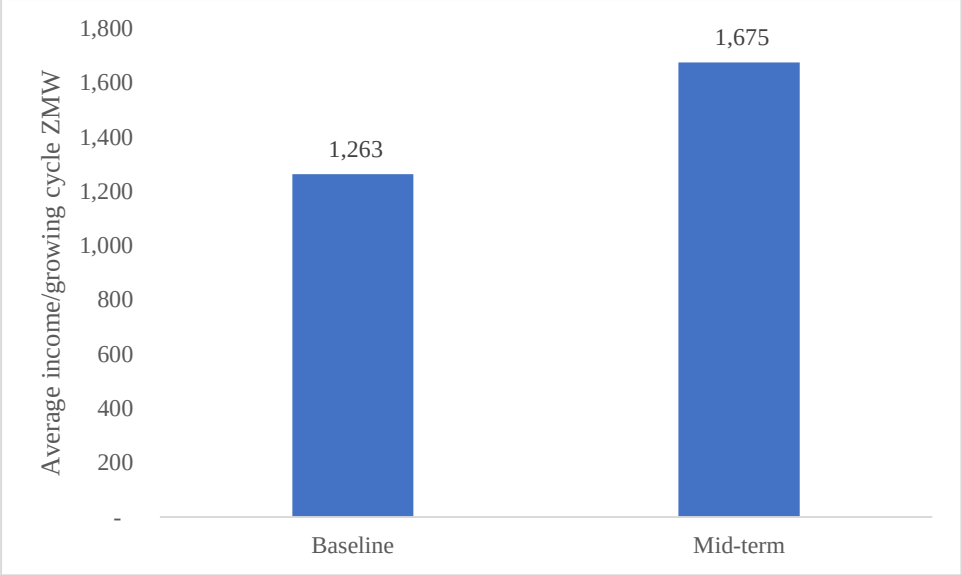

Figure 10: Average income per growing cycle

iv) Increased women and youth engagement in aquaculture

Women engagement in aquaculture was identified as one of the key priorities of the project. The MOUs signed with the private sector actors indicate that 40% of the farmers they target and reach must be women farmers. The private actors reported challenges meeting this target and identified cultural norms among the reasons keeping women from taking up fish farming as a business. Zambia is a highly patriarchal society which puts significant barriers for women to participate meaningfully in society. One stakeholder explained:

> *"The biggest challenge is that men own most land. Most women leave their maiden home to live with their husbands. It is difficult for these women to construct a pond without the husband's permission. But it is easier for women to own land as a cooperative. That is why we are eager to work with cooperatives, especially the ones that have a good number of women." Kasakalabwe KII*

Women and youths expressed a desire to engage in fish farming. However, they noted that fish farming is labour and resource-intensive, and they did not have the money required for them to startup. While women and young people appreciate the training and extension services they receive, they felt what was required was access to loan or grant facilities to help them set up their businesses.

One of the ways being explored by Triple Blessings to attract more women into fish farming is using a family approach. The family approach works very well to overcome the cultural norm of men being the head of the household, and husband is the main decision-maker. A stakeholder from Triple Blessings explained that they use the family approach where they encourage all the adults (especially the wife and youths) in the family to be present as they offer extension services to the men who are usually pond owners. Data from the farmer census showed that although men indicate that they own fish ponds, they also acknowledge that their spouses are involved in the fish farming. Women should be involved because even if they cannot construct ponds, they could learn other aspects of the

business. However, the key informant from Triple Blessing added that this approach has not been very successful so far as few women are transitioning to own individual ponds. Therefore, there is a need to explore additional strategies to encourage women to own ponds. Triple Blessings stated they are still encouraging women to own ponds but added '*I'm not sure what else can be done, but our approach needs assistance if we are to have more women on board'.* A stakeholder at WorldFish explained that the family approach is a good strategy. He added:

> *"Some strategies are required to push women to the forefront of fish farming. For example, if a man has got seven ponds, like a particular farmer in Luwingu. He had seven ponds. He has claimed four ponds for himself, allocated two ponds to his wife, and he has given one pond to his daughter. This was a deliberate move on his part to promote his wife and daughter to participate and benefit from fish farming. All pond owners in the household will need to be trained since they are fish farmers. This is an example of how a family approach could work for the project." WorldFish KII*

v) Transition of smallholder fish farmers to be lead farmers

The role of lead farmers is to be an example for upcoming fish farmers by showcasing the outcomes of best management practices in fish farming. A stakeholder from WorldFish explained:

> *"Lead farmers are supervisors of other farmers. Lead farmers get detailed technical training so that they can support smallholder farmers whenever they face any technical challenges. Farmers can easily reach a lead farmer for assistance compared Hopeways (or Kasakalabwe or Triple Blessings) because these may be located a distance away from the farmer" Musika KII*

The project has not as yet established lead farmers because of the delay in the project activities such as supplying sex-reversed fingerlings and access to feed. However, some positive outcomes are already being seen on the pond construction activity with farmers. Kasakalabwe felt confident that some lead farmers would be established before the end of the project as they have laid the required groundwork through the training and extension services they have provided. What remains to be done for Kasakalabwe to establish lead farmers is to assist farmers stock their ponds with catfish fingerlings. This activity is in the pipeline. Triple Blessings has identified five potential lead farmers but is yet to offer them training. Once these farmers sell their fish and make a profit, they will encourage others to join fish farming.

Triple Blessing plans to work with at least 30 commercial oriented farmers before the end of 2020. They plan to support these farmers so that they can buy 50 kg of fish every month from each farmer. This will provide Triple Blessing with a constant supply of fish. Triple blessings expressed confidence that it would reach this target. It had already enrolled five commercially oriented smallholder farmers. The strategy, however, did not include specific details about how many women will be included among the 30 farmers being targeted. A stakeholder explained:

> "*We have 25 more farmers to find. We want farmers who will act on the goals set and be able to take our advice for continuous improvement. They should have the desire to grow their business with our encouragement. It is not easy, but with time and effort, we can find these farmers. This is a new target, so we are hoping to identify 20 by the end of the year". Triple Blessing KII*

Triple Blessing stakeholders added that their main focus is to change the mindset of fish farmers from just keeping fish as a hobby to selling and generating income. Although they are yet to train farmers on better management practices, Triple Blessings stated that they continuously encourage farmers to be business-minded in their fish farming. A key informant from Triple Blessings explained:

> *"But now we are training them on how to rear fish and telling them the benefits of fish farming. We tell them that fish farming will improve their livelihood if they run it like a business. We ask them to make a budget for fish farming like what maize farmers who sell to the Food Reserve Agency do. They commit to maize farming. They look for capital to buy inputs and make sure that all is well, then they make a profit after selling to FRA. We are telling fish farmers to be as dedicated to fish farming and to make sure they have all the necessary inputs required". Triple Blessings KII*

3.1.4 Efficiency

Evaluation question 6: How cost-effective is the implementation of AQ TEVET? Were the resources used in the best possible way?

By design, the project was cost-effective, and the resources available are sufficient to achieve its overall objective. The review of the audited reports shows that resources have been used according to donor requirements. One way the project improved efficiency is to place three full-time staff in Kasama to oversee the implementation of project activities in Luapula and Northern province. Locating staff in Kasama has reduced the travel cost of staff from Lusaka. Furthermore, the secondment of a member of staff from NRDC as a Project Manager under component 1 increased the efficiency of the activities of upgrading the curriculum, which would have otherwise taken longer.

The project faced challenges with efficient use of resources for upgrading the curriculum. A stakeholder from WorldFish explained:

> *"A consultant from the UK was engaged in the upgrading of the curriculum. The consultant delivered the gap analysis report, but the upgrading of the curriculum was not done to a large extent. So, the project ended up engaging the University of Zambia, NRDC and the Curriculum Development Centre here in Zambia to upgrade the curriculum. After the local experts took over the upgrading exercise still took a bit of time. It could have been that we underestimated the level of work. The curriculum itself is a government policy document, and changing a government policy document in a year requires much of the work to be done beforehand". WorldFish KII*

The UK based consultant did not engage adequately with the local consultant who would have helped them to address all the needs raised in the gap analysis. Delays in finalising the curriculum resulted in there being less time for monitoring the effect of the upgraded curriculum. The consultant was only paid for work delivered, so not much was lost apart from time.

In terms of the skills training centre, everything went according to the budget except for ZESCO connection which was not part of the original budget. This cost was not included in the budget during the project design stage. The assumption at the time was that the centre would connect to the existing NRDC electricity connection. However, the Zambia power company (ZESCO) advised that due to the nature of activities that would be undertaken by the centre, there was a need to connect the centre

to using a phase 3 to boost the power available. The project management team approached NORAD for permission to vary the capital equipment budget line to pay for the connection. The request was granted. The project paid for the connection in July 2020. However, due to delays by ZESCO NRDC is still waiting for the centre to be connected.

The delays of power connection by ZESCO have also delayed WorldFish to pay the consultant because the government engineers could not certify the construction without power connection from ZESCO. In the process, there has been a change of engineers. The new government engineer agreed to certify the centre even without a ZESCO connection because of the availability of solar power provided pond dykes are raised. At the time of the review, work was going on at the centre to raise the dykes. It is estimated that the centre will be fully operational by the end of November 2020. Broodstock to stock the ponds is available and waiting to be dispatched. The project installed solar power at the aquaculture training centre to promote sustainability by reducing reliance on the unreliable power supply from ZESCO. This means some activities can be implemented even without the ZESCO connection.

NRDC has shown commitment and ownership of the skills training centre. A stakeholder from WorldFish explained:

> *"They [NRDC] are adequately prepared. They have given a significant amount of land for the aquaculture training centre. They have taken ownership of the process and are planning to keep expanding even after the project. NRDC fenced a large area to protect it for the aquaculture training centre as they have plans to expand. The college has also developed a sustainability plan since projecting what investments are needed and profits that can be made since they plan to run the training centre for profit so that it can sustain itself. This is a good indicator that they are prepared. NRDC has also invested resources like the borehole to have constant water supply to the aquaculture training centre. It has also provided 24-hour security from the time constructions began. There has been a lot of commitment from them; availability for meetings, monitoring of construction and if anything is not working well they summon the government engineer". WorldFish KII*

BluePlanet stakeholders believe their budget line was used efficiently. By August 2020, BluePlanet had used 94% of their budget towards developing the online training platform for Tilapia in Africa which consists approximately 85 animations/movies, 4 courses in Tilapia (Biology, Welfare and environment, Diseases of Tilapia and Hygiene – processing) and approximately 300-400 questions.[2] Filming of the smallholder farmer aquaculture related activities included in the videos was done by WorldFish staff in Zambia. Key Informants from BluePlanet explained that it is nearly impossible to find animation studios or e-learning producers that can achieved what achieve with the limited budget that was available to them.

Evaluation question 7: What evidence is there to indicate that the project activities of linking smallholder farmers to the input and output market as well as extension services provided by the private sector was implemented with due efficiency under the given circumstances?

[2] BluePlanet Technical report appendix 3b

Stakeholders agreed that the resources available in the project are being used efficiently. They felt that overall, work for all partners has progressed according to plan. The stakeholders at Kasakalabwe and Triple Blessings added that the motorbikes and interns have added to the efficiency with which they provide extension services to fish farmers. A stakeholder at Triple Blessings further added that if there were a possibility of hosting more interns, it would help them achieve their targets quickly. One stakeholder explained:

> *'We have used project resources efficiently because the motorbike we received from Musika has helped us cover long distances. The motorbike is very handy to reach farmers in far-flung areas. It is a major resource. The reading materials on fish farming have been useful to the farmers" Kasakalabwe KII*

WorldFish and Musika reported holding monthly management meetings to facilitate efficient planning and implementation of the project activities. The two organizations also collaborate quite strongly and benefit from each other's strength. For instance, aquaculture experts from WorldFish reviewed radio programs hosted by SMEs. They advised on how to improve the programming from a technical aquaculture perspective as well as to make the programs more inclusive by engaging women. Both Musika and WorldFish participate in the training being conducted by the SMEs to provide technical backstopping and capacity building for SMEs by doing a training debrief after the session highlighting the areas the SMEs can improve in future sessions of the training. Triple Blessings and Kasakalabwe were satisfied with the leadership of Musika and WorldFish whom they said were always available to provide support when needed. However, there have been some challenges. For example, the ice-making machine provided to Triple Blessings by Musika is currently not functional despite efforts to try and configure it.

Some stakeholders felt some of the project targets such as recruiting 40% women smallholder farmers, transforming the aquaculture practises of smallholder fish farmers and engagement of a large number of big private sector actors were overambitious. And could not be achieved within the project life span of 3 years. It was suggested that the objectives of this project could be better achieved using a programmatic approach. A program approach can have phases with specific milestones so that each phase is adequately delivered. This would avoid the risks associated with trying to achieve too many things in a short period. A programmatic approach would also allow for time to adequately navigate the many bottlenecks in the aquaculture sector in Zambia. SMEs engaged in the project also felt that there is not enough time to see the impact of their input on farmer outcomes. They explained:

> *"This is not a two-month process; neither is it for a year, it needs farmers to be trained, and they slowly get on board then eventually see the benefits. As of now, the people who are harvesting the fish are not the ones we trained; we already found them traditionally rearing fish. The farmers we have trained, have not yet harvested their fish. We are in October now. Our contract is supposed to end in December. If this end date is maintained, it means we will leave the trained farmers hanging. And so, the goals that we set together with Musika and WorldFish would not have been met. I think that if we continue to work together on this project for maybe two more years and are working hard the way we currently are doing; the results would be amazing". Triple Blessings KII*

3.1.5 Gender Equity

Evaluation question 8: How has been the change in women and youth participation in aquaculture since 2018?

Women are eager to participate in fish farming, and they reported benefitting from the training provided by the project. One of the driving factors for women participation in fish farming is the promise of better profits compared to crop farming which can help them improve household welfare, especially the education of their children. A female FGD participant explained:

> "*People are having foresight and have come to realise that fish farming is beneficial and is better than maize farming, profit-wise. Some farmers even sell fish to the school feeding program. It is beneficial and us women getting involved helps us earn income which brings self-respect". Nsombo, female FGD participant*

> "*As a woman have learned a lot as well, and it is beneficial. We are hoping to farm better and make sizable profits so that when we do have children, they will live well". Pibelibe Cooperative female FGD participant*

Forty-two percent (42%) of the FGD participants for this evaluation were women. Although few women who own ponds or are individual fish farmers, women are participating in fish farming as most of them were tend to family ponds. The number of women participating in the programs was still below the desired target of 40%. However, most women asserted that they needed financial support and access to land through headmen and chiefs for them to engage actively in fish farming. They bemoaned traditional norms that hinder the recognition of women in fish farming. For instance, some women are not involved in the fish farming business because they fear that when divorced, they may leave the fishponds with the husband. Additionally, women are overburden by household chores and have little time to start aquaculture businesses.

Although the stakeholders reported an increase in the number of women and youth participating, the numbers are not yet adequate to reach the 40% female participation target. Project documents reviewed indicate that of the 315 smallholder fish farmers reached by September 2020 for various support including; training, aquaculture advisory on better management practices, radio programs, provision of off-taking for fish and supply of inputs-feed, 63 were female indicating a 20% female participation.[3] Additional strategies are required if the target of having 40% of beneficiaries as women is to be reached. Kasakalabwe, for instance, stated that they are exploring whether incentivizing fish farming for women, e.g. through subsidizing fingerlings and feed will attract more women to fish farming. A stakeholder added that women often face financial challenges:

> *"Sometimes, one can find a woman who is interested in fish farming, but the feed is expensive. For a baseline minimum of 1000 fish, one needs to spend a minimum of K5000 on feed. The cost of Novatek feed, for example, is K320 per bag. That figure is just for feed. To buy 1000 fingerlings, you will spend K1000. So, lack of finances is what is keeping women behind. Women are hungry to be part of this project, but they lack the financial capacity to do it." Kasakalabwe KII*

[3] Musika AQ TEVET project Quarterly Progress Report Quarter 3 2020

A key informant at Kasakalabwe also stated that as a cooperative, they also employ women to do casual jobs around the facilities which also motivate women to be involved in other activities at the cooperative.

Evaluation question 9: What has the project achieved so far in terms of encouraging women and youth participation in aquaculture?

The project was designed to be gender-sensitive at all levels. For instance, there is a good representation of women among the WorldFish and NRDC staff working on the project activities. There have also been efforts to attract female students to enrol in the fisheries and aquaculture program at NRDC through adverts in the media sponsored by WorldFish. The communication department at WorldFish also designed enrolment materials with images of women working in fish ponds to motivate females to enrol (Figure 11).

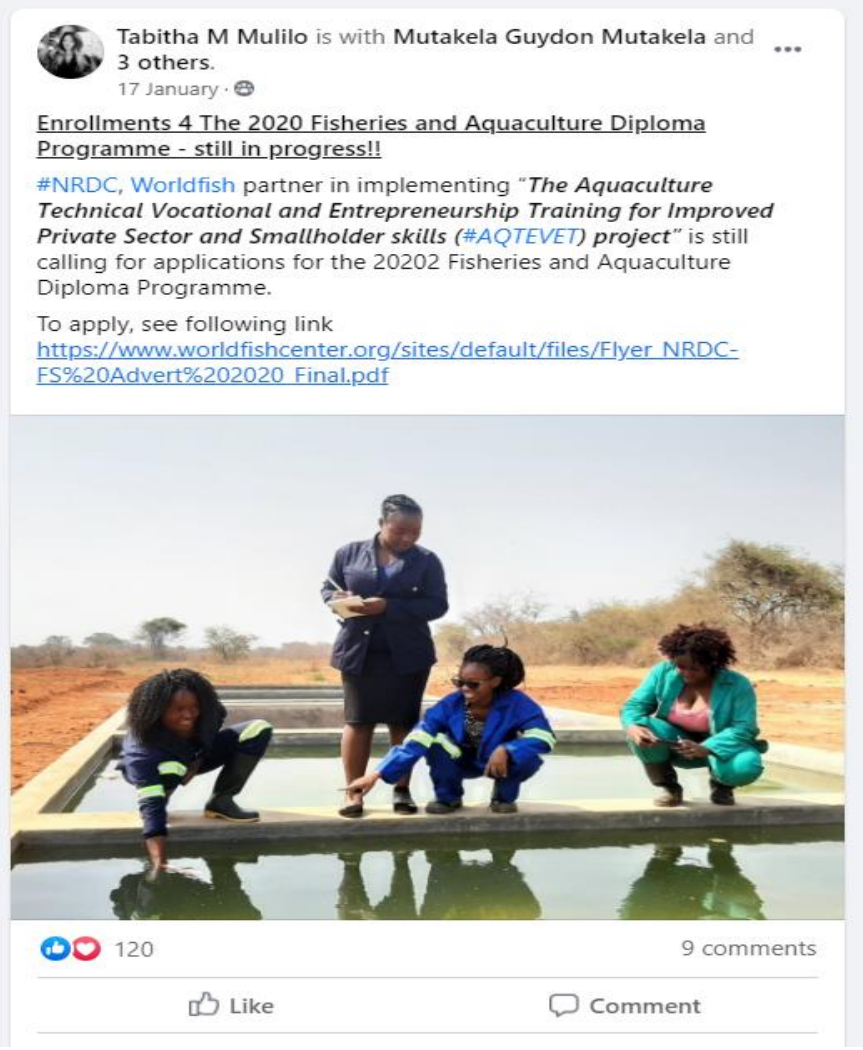

Figure 11: A recruitment advert with women

The private sector has also been engaged so that they deliberately include female interns during recruitment, but this has not been monitored to assess the impact. The number of women enrolling,

however, still remains lower than males as some of the more ingrained beliefs might take time to be addressed. A stakeholder from WorldFish explained:

> *"Since aquaculture is viewed as a science, women do not want to do it because of the belief that science subjects are difficult and are the preserve of men. Aquaculture is viewed as a course for men. Even some managers in the private sector say construction of fish ponds is a heavy load of work and can only be done by men. But when you look at other activities along the aquaculture value chain women are doing well. Women are engaged in activities like feeding the fish and managing hatcheries. High-quality fingerlings are being produced where women are involved." WorldFish KII*

Through the BluePlanet Academy online platform, the project has changed the way to deliver aquaculture competence to the students. The online platform meets the needs of young people for ICT based solutions to problems. A female narrator was used for the videos that are posted on the platform to appeal to female students. In some of the videos, women are filmed participating in several aquaculture related activities. The WorldFish communication team has worked with NRDC to design a fisheries and aquaculture strategy that is being implemented by the faculty of fisheries science. Women have been deliberately included on billboards, and are encouraged to apply for the fisheries and aquaculture programme at NRDC in advertisements on radio, television and other online platforms.

The needs of women and female youth have equally been incorporated into the internship program; sixteen students from NRDC were consulted through a survey during the process of developing the internship program. Two male and two female students were further engaged to obtain insights on their needs which were incorporated into the internship program that was developed. Also, the internship program will be facilitated in such a way that female students will be placed in value chain activities such as hatchery management involving the production of fingerlings, feeding, marketing, and encourage them to participate in decision making so that they can take up leadership roles. This placement may help them to identify activities where they can take up roles within the aquaculture value chain.

The activities of component two were tailored to address the low number of women engaging in smallholder fish farming. During monthly meetings between Musika and WorldFish, there is continued emphasis on how more women can be targeted and engaged in aquaculture. The SMEs were also encouraged to include women during training and other activities like inviting women as guest speakers on radio programs. The training plans submitted by SMEs are required to indicate how many women are targeted to participate. Training reports are also scrutinized to counter check how many women attended based on the attendance list.

In terms of enrolment, there has been a steady increase in female enrolment into the aquaculture and fisheries program at NRDC, with 38%[4] of the current enrolment being female, as shown in Figure 12.

[4] AQ TEVET Results Framework

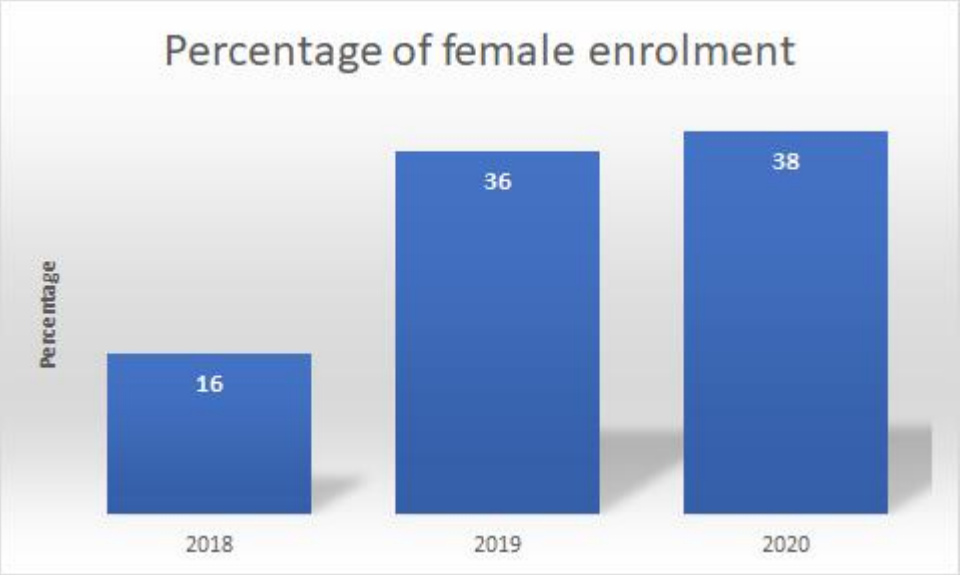

Figure 12: Trends in female enrolment

3.1.6 Visibility

Evaluation question 10: To what extent has the project strengthened partnerships between WorldFish and partners?

The project has brought together various stakeholders in the aquaculture sector in Zambia, including government departments. For instance, the Department of Fisheries is always informed of any activities being undertaken by the project. A representative of the department participated in the farmer census that was done in Northern and Luapula province. In addition, project publications like the Best Management Practices and smallholder farmer maps have been shared with partners and the government, which is another way of increasing the project's visibility. Also, outputs like the farmer census data, maps showing the location of smallholder farmers in Luapula and Northern province as well as a database of hatchery operators have been shared with stakeholders. Through their engagement with farmers, the SMEs collaborating with the project have also increased WorldFish's and Musika's visibility to the public, especially through the radio programs.

The project has also taken several measures to ensure the visibility of project activities to the general public. The project has a communications specialist who oversees communication of all project activities and results to the public. Several blogs have been produced and made available in the public domain (see Figure 13). The public and other TVET institutions know about the project activities going on at NRDC as a result of the availability of information on AQ TEVET project online. The AQ TEVET project was launched at NRDC aquaculture related stakeholders were invited to the event including permanent secretary from the ministry of livestock and fisheries who was the guest of honour.

Figure 13: Web page with information on AQ TEVET

The aquaculture radio programs sponsored by the project and presented by representatives from SMEs have been vital in engaging farmers and increasing the visibility of the AQ TEVET project. An SME added:

> *"We talk to officials about the project. The biggest improvement was when we signed an M.O.U. After signing, we were allowed to sit on the radio Mano for five successive Sunday afternoons for half an hour. We spoke to a massive audience; we answered questions. We got a massive response because we asked people to send us names and phone numbers if they were interested in fish farming. That is how we started to get the names of farmers who have now become involved in our catfish program. Radio programs were a tremendous help". Kasakalabwe KII*

The radio programs also helped identify some fish farmers with a stakeholder from Kasakalabwe adding '*the farmers we are currently working with are as a result of them hearing us on the radio programs*. From the radio programs, Kasakalabwe was able to register 104 farmers who expressed interest in fish farming. Kasakalabwe is also using other methods such as WhatsApp groups and social media platforms to spread information with good results. They also maintain a list of email addresses for the people who have contacted the cooperative. Farmers also mentioned that radio programs should continue as they are a good platform for them to continue learning about aquaculture. About 75% of the farmers mentioned listening to a radio program on a community radio station.

3.1.7 Lessons Learned

Evaluation question 11: What key lessons did you learn from the implementation of AQ TEVET project? What worked well and not?

Although the AQ TEVET project is on track to achieve the majority of its targets, there are several key lessons learnt:

1. There is a need to account for local contextual issues when setting targets to avoid the pitfall of overambitious targets. For instance, the time allocated for upgrading the curriculum of a government-run institution should have adequately accounted for the additional validation procedures required by different government stakeholders. Prevailing economic environment and private sector performance could have been used to assess the likelihood of large profit-driven enterprises engaging with the project which required investments into a new market further away from Lusaka. Also, cultural norms which are powerful influencers of behaviours should be accounted for in activities that require behaviour change. The target to engage at least 40% of women smallholder farmers should have accounted for the barriers that keep women from meaningfully engaging in fish farming to design strategies to address these and to understand what is achievable during the project lifecycle.
2. When engaging private sector players in a region with low commercialisation, there is a need to set realistic targets and time frames. Private sector actors are profit-motivated and want to make sure investments make economic sense before committing themselves. Although finally succeeding in signing MoUs with six private sector actors by 2020, the project experienced long drawn out negotiations as private sector players hesitated to invest in Northern and Luapula provinces. Four out of the six private actors signed MOUs in 2020.
3. Demand creation needs to move hand in hand with efforts to make the product available.
    a. While the project has successfully created demand for the good quality seed by smallholder farmers, quality seed, especially sex-reversed fingerlings, are not yet readily available to be accessed by smallholder fish farmers. As a result, most farmers are still culturing poor quality fingerlings with stunted growth
    b. Although the feed is now as close as it has ever been, distance and cost are still barriers for smallholder fish farmers to access the commercial feed. The need to invest in last-mile distributors can hardly be overemphasised

What worked well

Our findings show smallholders' that the project has scored several successes which include:

1. Implementation of the upgraded curriculum at NRDC and its scaling up KFTI. Also, as a result of their participation in the project, KFTI is now undergoing the accreditation process with TEVETA.
2. Online training platform launched and being accessed by 3rd-year aquaculture and fisheries students at NRDC. The platform has also been scaled up to seven more programs at NRDC who will, beginning next academic year, take an introductory aquaculture course.

3. Scale-up of online training platform to Lake Harvest, a private aquaculture enterprise. Scaling up the platform will contribute to improved knowledge on aquaculture in the private sector
4. Computer lab set up at NRDC with 18 fully functional computers for students to access the online training platform
5. Construction of the aquaculture skills training centre at NRDC with ponds and indoor hatchery to help practical skills development in students
6. Availability of interns and motorbikes facilitated extensions services. Extension services have resulted in improved skills and knowledge on aquaculture best management practices among smallholder commercial fish farmers and consequently increasing the demand for commercial feed and quality seed
7. Linkage of farmers to output market has created a ready market for fish which is a big motivator for farmers to engage in fish farming and implement aquaculture better management practises
8. Feed demonstrations which have increased the demand for feed by smallholder fish farmers in Northern and Luapula provinces.
9. Having interns and staff based in the field meant that some activities could go on, and farmers continued receiving support even when COVID19 related restrictions were put in place

Table 7: Results Framework for AQ TEVET Project.

LEVEL	EXPECTED RESULT	INDICATORS	BASELINE 2018	TARGET 2019	TARGET 2020	FINAL TARGET 2021	PROGRESS TO DATE (Mid-term Review)
GOAL	To increase the number of human resources working for the private sector and 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.						
OBJECTIVE	To develop the aquaculture knowledge and practical skills of students and smallholder commercial fish farmers (especially women and female youth) participating in technical education, vocational, and entrepreneurship training to enable them to find gainful employment in the private sector.						
OUTCOME 1	Enhanced knowledge base of students from the TEVET institute trained	Number of students trained have enhanced knowledge about aquaculture	NRDC student intake for 2018 is currently at 25 (16% female, and 13.6% female youth) 6 students dropped and only 19 students (47% female, 53% male) remained for the 2018 intake. This intake is not using the upgraded curriculum	35 (30% female, 25% female youth) 58 students were enrolled in 2019 and 22 have dropped and the 36 that remained have been introduced to the new curriculum. That is 19 + 36 new students (36% female, 64% male)	35 + 45 new students (40% female, 35% female youth) 33 students were enrolled in 2020 and have been introduced to the new curriculum 55+33 (38% female, 62% male)	80 + 55 new students (50% female, 45% female youth)	The upgraded curriculum was introduced to 69 students (33 in the first year, and 36 in the second year) in January 2020. Third years were further introduced to the online training platform, bringing the number of students trained on the different components of AQ TEVET to 88 (representing 65% progress made against the target of training 135 students by the end of the project in 2021)
OUTPUT 1.1	Upgraded curriculum, tools, and online training platform	-Up-to-date curriculum (both long- and short-term courses), training tools, and online training platform developed and piloted. -Upgraded curriculum has been developed and introduced to the students in January 2020	Existing curriculum, and training tools Curriculum, training tools, and online training platform designed	Curriculum, training tools, and online training platform finalized and piloted Reflection and learning cycles set up to strengthen Year 1 curriculum, tools, and platform and refine design of Year 2 curriculum, tools, and platform if necessary	Reflection and learning cycles set up to strengthen Year 2 curriculum, tools, and platform and refine design of Year 3 curriculum, tools, and platform if necessary	Upgraded curriculum, training tools, and online training platform	Curriculum, training tools, and online training platform finalized. An aquaculture skills training centre has been constructed and a computer laboratory with infrastructure for the online training platform set up and made available to the students.
OUTPUT 1.2	Faculty training manual developed to implement the upgraded curriculum,	Faculty training manual developed and piloted	No faculty training manual currently exists	Revisions to the new faculty training manual	Revisions to the new faculty training manual	Revisions to the new faculty training manual	The training manual has been revised and finalized.

	tools, and online training platform						
OUTCOME 2	Enhanced practical skills of students from the TEVET institute gained from internships specifically tailored to address the needs of the individual private company	Number of student internships carried out with private companies	Past practical experience of students identified in detail	35 (30% female, 25% female youth)	35 + 45 new students (40% female, 35% female youth)	80 + 55 new students (50% female, 45% female youth)	At the time of the evaluation, all surveyed third- year students (100%) had undertaken an internship in the form of the industrial attachment. None of the second- year students reported undertaking an internship because the industrial attachment occurs between December and February in the second year of study. The additional internship opportunity identified by the AQTEVET was yet to be implemented though
OUTPUT 2	Internship program design	Internship program plan developed and piloted	No internship program plan currently exists	Internship program plan developed and piloted	Changes to internship program plan if necessary	Changes to internship program plan if necessary	
OUTCOME 3	Increased opportunities for students to find gainful employment with private companies or set up their own aquaculture-related businesses	Number of students at the end of the project who have found gainful employment with private companies operating in the aquaculture value chain Number of students who set up (or intend to set up) their own aquaculture-related businesses	Number of students who found gainful employment with private companies or set up their own aquaculture-related businesses from past intakes (if possible)	N/A	N/A	~25 students who found gainful employment and ~10 students who set up their own aquaculture-related businesses	The project has encouraged collaboration between NRDC and private sector companies which have resulted into some graduates from the fisheries program at NRDC employed. For instance, 6 students have successfully found employment with companies operating in the aquaculture value chain.
OUTPUT 3.1	Intern performance review sheets developed Note yet	Mid-term and final review sheets	Past reviews carried out by private companies	35	35 + 45 new students	80 + 55 new students	
OUTPUT 3.2	Plans to link students to financial institutions developed	Number of plans to link students to financial institutions (and % funded)	Past plans to link students to financial institutions	N/A	N/A	~10 plans to link students to financial	

	Not yet					institutions developed and implemented and at least 20% funded	
OUTCOME 4	TEVET institutes in Zambia adopt/modify the curriculum, training tools, online training platform, and internship program for integration within their institutions	Number of TEVET institutes that adopt/modify the curriculum, training tools, online training platform, and internship program for integration within their institutions	Current number of TEVET institutes that have an existing fisheries or aquaculture curriculum or that wish to include	N/A	N/A	2	New curriculum scaled up to KFTI and two universities in Zambia (Copperbelt & Mulungushi) have expressed interest. WorldFish and Mulungushi University signed an MOU in September 2020, and has an MOU with Chinhoyi university of Technology in Zimbabwe, whose objective to develop a practical aquaculture curriculum among others. Blue Planet has scaled up the online training platform to private companies for the training of their staff. The companies include Lake Harvest in Zimbabwe, Skretting in Uganda, Rwanda, and Kenya and FoodTech Africa in Tanzania and Ivory Coast.
OUTCOME5	Enhanced organization of farmers trained on TEVET and provided services by the private sector	Number of farmers organized and trained on TEVET by the private sector. Number of farmers organized and provided services by the private sector	300 (40% female and 35% female youth) 250 (40% female and 35% female youth)	450 (40% female and 35% female youth) 400 (40% female and 35% female youth)	450 (40% female and 35% female youth) 350 (40% female and 35% female youth)		2341 farmer households identified (14% female, 86% male), and mapped. Of these, 577 farmers (21% female) have been integrated into the private sector business models and have been organized and trained on aquaculture better management practices, linked to output markets for sell of their produce as well as supply of inputs-feed/seed.

OUTPUT 5.1	Total population census of fish farmers in selected districts and research on their existing farming systems and household characteristics to inform the cluster farmer selection criteria	-Population census of fish farmers in selected districts -Farming systems and household characteristics analysis	Population census and farming systems and household analysis carried out	Additional analysis if required	Additional analysis if required		
OUTPUT 5.2	Training materials on best management practices and other promotional materials developed	-Training and promotional materials	Training and promotional materials developed	Training and promotional materials developed	Training and promotional materials developed		Training and promotional materials developed
SUB-OUTCOME 5.1	Enhanced capacities of private sector to provide TEVET training support and services to smallholders	-Number of private companies with enhanced capacities to provide TEVET support and services to smallholders	The private sector landscaping and capacity needs assessment (see below) will identify private companies to begin training 3 companies in 2018	4 companies	3 companies		6 commercial private actors (60% out of the 10 target) have signed memoranda of understanding with the project and have since invested into the smallholder aquaculture markets by integrating smallholders into their respective business models.
OUTPUT 5.1.1	Private sector landscaping and capacity needs assessments carried out and plans developed	-Private sector landscaping report (likely in 2018 but ongoing as additional companies enter the market) -Number of capacity needs assessments carried out -Number of capacity development plans developed	1 landscaping analysis carried out 5 Number of capacity needs assessments carried out 3 Number of capacity development plans developed	Updates to the landscaping report 4 Number of capacity needs assessments carried out 4 Number of capacity development plans developed	Updates to the landscaping report 4 Number of capacity needs assessments carried out 3 Number of capacity development plans developed.		

4 Conclusions and Recommendations

From the findings, we conclude that the project objectives and activities were relevant to the needs of the beneficiaries (smallholder fish farmers and aquaculture students at NRDC) and the aquaculture industry at large in Zambia. The project activities that have been implemented so far are also consistent with the project objectives under component 1 and component 2. Under component 1, the curriculum has been upgraded and is currently being used by 1st and 2nd-year students at NRDC. Short term courses were also developed and validated and are awaiting rollout. The online training platform was also developed and is currently being accessed by 3rd-year students at NRDC. The aquaculture skills training centre was constructed, but not yet open for use by students. The internship program was drafted and is awaiting implementation. The upgraded curriculum package was upgraded to Kasaka Fisheries Training Institute. Under component 2, farmers have been linked to input for seed and feed and output markets for their produce. Besides, the project is working with six private actors who have received training to provide extension services to smallholder fish farmers. However, due to the delay experienced getting private actors on board, some services like demonstration of production enhancing and labour-saving technologies are yet to be implemented. Also, the project faces challenges in reaching its gender targets. We further conclude that project resources are being used efficiently and the project's overall burn rate stands at 66%.

Based on our findings, we recommend the following be considered for the project is to attain its targets by 2021:

1. The project should facilitate availability of commercial feed as close to the smallholder farmers as possible. Smallholder fish farmers in far-flung areas are still facing challenges in accessing commercial feed which through the project is now being stocked by some retailers in Kasama. Transporting the feed from Kasama to the fishing community adds to the already high cost of purchasing the commercial feed. Therefore, the project should consider the feasibility of using last-mile distributors who can stock the commercial feed within the farming communities.
2. The project should facilitate the availability of quality fingerlings. The project, through the extension services provided by private actors, has generated demand for quality seed. However, these remain relatively unavailable, and farmers are still using the low-quality seed, which has stunted growth. Therefore, if the productivity and profitability of the smallholder fish farmers are to be improved, the availability of quality seed has to be increased. The project should consider establishing breeder farmers in each fishing community to supply quality seed as close to the farmers as possible.
3. The project should consider having financing mechanisms for the promising farmers and vulnerable groups like women and youth. Extension services have improved farmer's skills and knowledge. However, they still cannot implement what they have learnt and therefore require support through access to finances to help them get them started. Moreover, aquaculture is a resource-intensive venture which is relatively new, and thus most of the inputs like feed and equipment are not cheap. We propose that appropriate financing schemes be explored to assist farmers sustainably.

4. The project should scale up Kasakalabwe's approach of targeting cooperatives instead of individual farmers to establish more women smallholder fish farmers. Women are more likely to engage in fish farming through a cooperative because it is relatively cheaper, and it is easier for them to access land as compared to them doing it as an individual. Therefore, more women are most likely to be found in cooperatives than as established individual farmers.
5. The project should continue sponsoring and producing aquaculture radio programs as we found this to be an important channel for communication which is contributing to farmers engaging in fish farming and improving their skills and knowledge.

5 Appendices

5.1 Data collection tools

5.1.1 Informant interview guide – Component 1

Target Stakeholders: WorldFish, NRDC, BluePlanet, Kasaka, Ministry of Agriculture, Ministry of Fisheries and Livestock, UNZA, TEVET.

Dear respondent

We are conducting a midterm evaluation of the AQ TEVET project to understand the progress that the project has made and make recommendations for the remaining periods as well as the design of the future projects. You have been shortlisted to provide information regarding activities around upgrading the fisheries/aquaculture curriculum (long- and short-term courses), training tools, online training platforms, and internship programs of TEVET institutions in Zambia.

With your permission, we would like to use tape recorders to assist us in capturing your responses accurately. The taped conversation will be used solely for the purposes of aiding our note-taking accuracy. Your responses will remain confidential and will not be linked to you. Do we have your permission to use a tape recorder?

Background Information	
	Date of Interview…….
	Name of Interviewer……. Respondent No…….
	Full name of the respondent……
	Sex……Organisation……Position…….
	Have you been involved in any activities that WorldFish has carried out under AQ TEVET project? Yes/No
	If Yes, what activities were you involved in?

	When was that?	
Relevance		
EQ1 How is upgraded curriculum, online tools, and online training platforms intervention important to the students and aquaculture industry?		
1)	How is upgraded curriculum relevant to students and aquaculture industry?	
2)	How is the online training platform relevant to students and aquaculture industry?	
3)	How is the internship program relevant to students?	
4)	How is the training of students on entrepreneurship and linking to micro- finance institutions is important to students?	
5)	How is the scaling of the upgraded aquaculture curriculum relevance to industry	
Coherence		
EQ2. How are the upgraded curriculum, tools, and online training platform consistent with the human resources need of the private sector?		
6)	Do you believe that the projects objectives/plans to the upgraded the curriculum package has so far been achieved?	
7)	Do you believe that the projects objectives/plans of developing the internships specifically tailored to address the needs of the private sector has so far been achieved?	

8)	Do you believe that the projects objectives/plans of linking students to potential employers/private sectors have so been achieved?	
9)	Do you believe that the projects objectives/plans of scaling the upgraded fisheries and aquaculture package for adoption by other TEVET institutes in Zambia has been achieved so far?	
Effectiveness		
EQ3. How successfully were upgrading of aquaculture curriculum, online tools, and online training platforms intervention?		
10)	To what extent has the aquaculture curriculum improved?	
11)	How has the online training been delivered for use so far?	
EQ4. To what extent is practical skills of students through internships specifically tailored to address the needs of the private sector improved since 2018?		
12)	Have you noticed any change in number of students accessing the internship program with private sector actors since 2018?	
EQ5. Are there students that have successfully found employment with companies operating in the aquaculture value chain or have set up their own businesses since 2018?		
13)	What opportunities were created for students?	
EQ6. How has been the objective of scaling the upgraded fisheries and aquaculture curriculum for adoption by other TEVET institutes in Zambia been successful so far		
14)	Are there institutions that have expressed interest in adopting the upgraded fisheries and aquaculture curriculum?	

Efficiency		
EQ7. In your opinion, how cost-effective is the implementation of AQ TEVET? Were the resources used in the best possible way?		
15)	Where do you feel savings could have been made?	
16)	Do you think the project was appropriately staffed?	
17)	How would you view the speed of progress made by the project so far?	
18)	What alternatives do you think should have been considered, and how do they compare to the way in which this project has so far implemented?	
Gender Equity		
EQ8. How has been the change in women and youth participation in aquaculture since 2018?		
19)	How have the needs of women and female youth been incorporated into the upgraded curriculum?	
20)	How do the training tools like manuals and reference materials incorporate the needs of women and female youth?	
21)	How does the online training platform incorporate the needs of women and female youth?	
EQ9. How has the internship program ensured that men and women students from NRDC equally participate in gaining practical skills through internships specifically tailored to address the needs of the private sector		

22)	How have the needs of women and female youth been incorporated into the internship program?	
EQ10. How have the needs of women and female youth been incorporated in the plans to link students who wish to set their own aquaculture related businesses to financial institutions?		
23)	Have any female students been linked? If not, why?	
Visibility		
EQ11. To what extent has the Project strengthened partnerships between WorldFish and partners?		
24)	What have you done to make the project known to the public?	
25)	Are the public and other TVET institutions know about the project activities going on at NRDC?	
26)	To what extent has the Project strengthened partnerships between WorldFish and partners?	
Recommendations and lessons learnt		
EQ12. What key lessons did you learn from project implementation of AQ TEVET? What worked well and not?		
27)	What key lessons did you learn from project implementation of AQ TEVET?	
28)	What aspects of project design and implementation do you think could have been done differently for the Project?	
29)	Any other questions or comments?	

5.1.2 Key Informant interview guide – Component 2

Target stakeholders: WorldFish, Musika, private sector companies and smallholder commercial fish farmers

Dear Respondent,

We are conducting a midterm evaluation of the AQ TEVET project to understand the progress that the project has made and make recommendations for the remaining periods as well as the design of the future projects. You have been shortlisted to provide information regarding activities around linking smallholder commercial fish farmers in Northern and Luapula Provinces to input and output markets. To help us gain this understanding, I am going to ask you questions on the following topics; 1) identifying and organising smallholder fish farmers, 2) assessment of market actors; 3) early stage investment support with market actors; 4) increasing the capacities of private actors to deliver extension services; 4) Technology demonstration and testing; and 5) NRDC student internship opportunities with private companies collaborating with the project under this activity

Background Information	
	Date of Interview…….
	Name of Interviewer……. Respondent No…….
	Full name of the respondent……
	Sex……Organisation……Position…….
	Have you been involved in any activities that WorldFish has carried out under AQ TEVET project? Yes/No

	If Yes, what activities were you involved in? When was that? ……..	
Relevance		
EQ1 In your opinion, how well has been the linking of farmers to the private sector (input and output markets) met the needs of the following? i) Smallholder commercial farmers ii) Aquaculture industry		
Coherence		
EQ2 Do you believe that the project's objective/plan to link smallholder farmers to the markets/private sector has so far been achieved?		
Effectiveness		
EQ3 In your opinion, to what extent was the linking of small holder farmers to input and output market as well as extension services provided by private sector achieved or likely to be achieved?		
1)	Has the smallholder census that you conducted helped you to engage the private sector companies that can invest in the smallholder aquaculture in Luapula and Northern province? If yes, how?	
2)	Are the private sector companies that you have engaged so far (Aller Aqua, Triple blessings, Hopeways, Kasakalabwe, and Zhongkai) going to meet the	

	project objective of organizing and training at least 1000 farmers, and provide these farmers with various extension services (such as demo ponds, better management practices, farmer field days) within this project period? What has been achieved by each private actor? What have been the challenges?	
3)	Do you think that the farmers (441 farmers) that have been linked to the private sector have so far improved the following? If not, why? What has been the challenge? (i) knowledge in aquaculture better management practices (ii) increased productivity and profitability (iii) more women and youth have joined farming and/or there any change in gender/youth representation	
4)	With all these interventions, do we have farmers that we can say are now lead farmers because of the market linkages that the project has so far created in Luapula and Northern Province?	
Efficiency		
EQ4 What evidence is there to indicate that the project activities of linking of small holder farmers to input and output market as well as extension services provided by private sector was implemented with due efficiency under the given circumstances?		
5)	How are project activities with smallholder farmers in the Northern and Luapula linked to other projects within WorldFish	

6)	What have you done to enhance efficiency with WorldFish teams?	
7)	What can you point at as in WorldFish professionalism in working partners Musika, BluePlanet and NRDC? What can be improved in the remaining period and future projects?	
8)	Are you satisfied with the role or how your project partners have worked with you so far on this project?	
Gender Equity		
EQ5 What has the project achieved so far in terms of encouraging women and youth participation in aquaculture?		
9)	What is the proportion of women/youth smallholder commercial fish farmers that have received project support such as linkage to input and output market as well as extension services provided by private sector? Why	
10)	What has the project done to enhance women/youth participation in smallholder aquaculture? What other measures can be taken to further improve female participation in the fish industry?	
11)	How were the various extension services (such as demo ponds, better management practices, farmer field days) and trainings	

	conducted by the private sector actors sensitive to the needs of vulnerable groups like women and youth? How many women and youth participated in these activities? What was the biggest challenge faced by women and youth?	
Visibility		
EQ6 To what extent has the Project strengthened partnerships between WorldFish and partners?		
12)	What have you done to make the project known to the public? Can we say people know about AQ TEVET; do they know about WorldFish's work?	
13)	What marketing activities have you done to ensure that smallholder farmers know or hear the presence of the private sector companies that are working with smallholder farmers in the region (e.g. do farmers know that there is Aller Aqua shop outlet for feed in Kasama?	
14)	Are the maps showing smallholder landscape distributed to the private sector, and if yes what response did you get after sharing the maps? How about the smallholder population findings, has this been disseminated?	
15)	What other partner organizations are working with smallholders in Northern and Luapula, and do they know about your work and outputs such as the farmer census? How has this strengthened your visibility/relationship?	

Recommendations and lessons learnt		
EQ7 What key lessons did you learn from project implementation of AQ TEVET? What worked well and not?		
16)	What are some of your key lessons from the process of linking private sector actors along the aquaculture value chain to farmers for the following activities? What worked well and what did not? What could have done differently? i) Input markets for seed and feed ii) Output market for produce iii) Increasing the capacity of private actors to deliver outreach, farmer training and extension services iv) Strengthening capacity development of value chain intermediaries and private sector actors to provide services	
17)	Any other questions or comments?	

5.1.3 Farmer Focus Group Discussion guide

Target Population: Smallholder commercial fish farmers

Dear Respondent,

We are conducting a midterm evaluation of the AQ TEVET project to understand the progress that the project has made and make recommendations for the remaining periods as well as the design of the future projects. You have been shortlisted to provide information regarding activities around linking smallholder commercial fish farmers in your community to input and output markets. To help us gain this understanding, I am going to ask you questions about how well the activities of enhancing the knowledge of smallholder fish farmers and linking them to opportunities via private sector are working.

Moderator: discuss the following research logistics to set respondent at ease.

Welcome, value of respondents' views, Confidentiality, anonymity, no right or wrong answers, feel free, need for openness, Switching off cell phones, Audio-recording.

PART A: Introduction

FGD Code:	District:	Camp:	Date:
Facilitator:	Cooperative:	Private actor(s) linked to:	Start time: End time:
Participants			
	Gender	Age range	Residential area
Participant 1			
Participant 2			
Participant 3			
Participant 4			
Participant 5			
Participant 6			
Participant 7			
Participant 8			
Participant 9			
Participant 10			

PART B: Questions

Q1. Please share with us what you know about the Musika/WorldFish project in your area? *Probe: How did you hear about it? When?*
Q2. Please explain, what services have you received from the private sector company [insert actual name of the actor] and/or Musika/WorldFish project? *Probe: Ask about trainings, field days, demo ponds, radio programs, access to market for their fish*
Q3. Have the services you have received from private sector company [insert actual name of the actor] and/or Musika/WorldFish project changed your knowledge in aquaculture? If so how?
Q4. Have the services you have received from private sector company [insert actual name of the actor] and/or Musika/WorldFish project changed your level of fish production and income? How?
Q5. How has the project affected how you access seed? *Probe: Is there a change in the quality of the seed/fingerlings that you are using? Is there change in the price of seed/fingerlings? How much do you buy seed/fingerlings? Is there a change in the distance you travel to buy the seed?*
Q6. How has the project affected how you access feed? *Probe: Is there a change in the quality of feed you are using? Is there change in the price of feed? How much do you buy feed? Is there a change in the distance you travel to buy the feed?*
Q7. How has the project affected how and where you sell your fish? *Probe: Is there a change in the price your sale the fish per kg? Is there a change in the distance you have to travel to sell the fish? Is there a change in the quantity of fish you are selling?*
Q8. What trainings have you received from private sector company [insert actual name of the actor] and/or Musika/WorldFish project? *Probe for pond constructions, biosecurity, fish health, better management practices, fish marketing as well as records management. What topics were covered? What was the delivery mode? How long was the training?*
Q9. How has been the participation of women and youth in these trainings? *Probe: Is the participation adequate? What are some of the barriers to women and youth participating in training? What can be done different to encourage more women and youth participation?*
Q10. From the training you have received, what actions related to your fish farming have you taken at individual level? *Probe: Is it easy for women to take the action mentioned? What the barriers to taking action? Are the barriers the same for women?*
Q11. How happy are you with the trainings that you received from private sector company [insert actual name of the actor] and/or Musika/WorldFish project? *Probe: What could be done different in your opinion?*

Q12. How often have you heard of aquaculture radio programs in the last 12 months? *Probe: Which organization was presenting the program? What did you learn?*
Q13. How happy are you with the management of your cooperative? *Probe: What governance structure is in place? Sharing of proceeds? How are decisions made? How are conflicts resolved? How do women participate in governance? Are there women in decision making positions?*
Q14: Have you listened to any radio programs talking about fish farming? *Probe: How long ago? Which organization presented the program? What did they talk about on the program?*
Q15: Please share recommendations and anything else you would want us to know about activities of the private sector company [insert actual name of the actor] and/or Musika/WorldFish project?

1.1.1 Student Questionnaire

You have been shortlisted to provide information regarding activities around upgrading the fisheries/aquaculture curriculum (long- and short-term courses), training tools, online training platforms, and internship programs of TEVET institutions in Zambia. We are conducting a midterm evaluation of the AQ TEVET project to understand what is working well, and what can be improved and what lessons can be drawn and how they will shape the current and future aquaculture projects. To help us gain this understanding we are going to ask you questions on: 1) upgrading the fisheries science curriculum (long- and short-term courses), 2) training tools, 3) online training platforms, 4) internship programs and 5) scaling the upgraded NRDC fisheries and aquaculture curriculum to other institutions offering fisheries science training in Zambia

#	Question	Response
	Demographics	
1	Gender	1. Male 2. Female
2	Age	
3	Province	1. Northern 2. Luapula 3. Lusaka 4. Muchinga 5. Eastern

		6. Southern 7. Western 8. North Western 9. Central 10. Copperbelt
4	Institutions	1. NRDC
5	Year of study	1. First year 2. Second year 3. Third year
	Internship/attachments	
6	Have you undertaken an internship/attachment as part of your training?	1. Yes 2. No
6a	If yes, where did you do your internship	
7	How would you rate your internship experience	1. Very helpful 2. Somewhat helpful 3. Not helpful
8	What aspects of the internship/attachment did you find helpful?	
9	What aspects of the internship/attachment did you find NOT helpful?	
10	Did you receive any assessment/feedback on your internship?	1. Yes 2. No
11a	If yes, who conducted your assessment?	

12	In what way can the internship/attachment program be improved?	
	Online platform	
13	Have you been introduced to the fisheries and aquaculture online training platform at your school?	1. Yes 2. No
13a	If yes, what course/module/lesson was delivered and do you feel this was appropriate	1. Fish biology 2. Fish welfare 3. Fish processing hygiene 66. Other, specify
14	Were you formally trained on how to use the online platform?	1. Yes 2. No
14a	If yes, what form of training did you receive?	1. Tutorial from lecturer 2. Tutorial from peer 3. Live demo from lecturer 4. Live demonstration from peer 5. Self-taught using user guide 66. Other, specify
15	Do you have access to technical assistance on how to use the online platform?	1. Yes 2. No
15a	If yes, who provides the support	1. Lecturer 2. Peer 66. Other, specify
16	How prepared do you feel to use the online platform?	1. Very prepared 2. A little prepared 3. Not prepared
17	What could be done to better prepare you?	

18	How relevant is the online platform to your training	1. Very relevant 2. Somewhat relevant 3. Not relevant
19	Have you faced challenges with using/access the online platform	1. Yes 2. No
19a	If yes, what is the main challenge? -	1. Internet not available 2. Lessons not clear 3. Lessons not appropriate for our context 4. No access to computers 5. Inadequate number of computers 6. Computers not functional 99. I don't know how to navigate the platform Other, specify
20	What can be done to improve the online training platform?	
	Practical skills training	
21	Have you received any practical learning as part of your training?	1. Yes 2. No
21a	If yes, where (or how?)	1. Organized by NRDC with a private company 2. Self-organized with private company 66. Other, specify
22	Do you believe an aquaculture skills training centre at NRDC is a relevant component of your training?	1. Yes 2. No

23	In what ways can the aquaculture skills training centre improve your skills?	
24	In your opinion, how can the aquaculture skills training centre be made to be sustainable?	
25	How relevant are the practical skills you have received to your training and career	1. Yes, very relevant 2. Somewhat relevant 3. Not relevant
26	How adequate are the practical skills you received for your training and career	1. Very adequate 2. Somewhat adequate 3. Not adequate
27	How else could the practical skills training be improved?	
	Future career plans	
28	What do you plan to do after graduating from this program?	1. Start an aquaculture business 2. Find employment in aquaculture related company 3. Pursue further aquaculture related studies 66. Other, specify
28a	If you intend to set up an aquaculture related enterprise, have you been linked to any financial service providers through NRDC?	1. Yes 2. No
29	Do you feel the training you are receiving is preparing well for a formal career in aquaculture?	1. Yes 2. No

29a	If yes, which aspects of the training?	
30	Do you feel the training you are receiving is preparing well to start an aquaculture business?	1. Yes 2. No
30a	If yes, which aspects of the training?	
31	Are you aware of aquaculture relate work opportunities available to you after completing this training?	1. Yes 2. No
31a	If yes, please list some of these aquaculture and fisheries related work opportunities	1. Working in an aquaculture related private company 2. Working in aquaculture related government department 3. Running an aquaculture related business 4. Others, specify
32	Have you been trained in business planning?	1. Yes 2. No
32a	If yes, how relevant was the business training to your future plans?	1. Very relevant, am able to design a business plan 2. Somewhat relevant 3. Not relevant
33	What can be done to improve your training?	

5.1.4 Farmer Questionnaire

You have been shortlisted to provide information regarding activities around 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. We are conducting a midterm

evaluation of the AQ TEVET project to understand what is working well, and what can be improved and what lessons can be drawn and how they will shape the current and future aquaculture projects. To help us gain this understanding, I am going to ask you questions in order to help us understand how well the activities of enhancing the knowledge of smallholder fish farmers and linking them to opportunities via private sector are working.

Question	Response
DEMOGRAPHICS	
1. Gender	1. Male 2. Female
2. Age	
3. Province	1. Northern 2. Luapula
4. District	**1.** Mansa **2.** Mbala **3.** Kasama 4. Mungwi 5. Luwingu
5. Camp	
6. Name of cooperative affiliated to	
7. Name of private actor /agro dealer affiliated to	
8. How many fish ponds do you have?	
9. What is the size of your pond in meter squares (Separate entry by commas)	
10. When did you construct these ponds?	

Support from WorldFish	
11. Have you received support from WorldFish (or its partners like Musika and others including Triple Blessing, Luwingu, Aller Aqua, Kasama and Lusaka, HopeWays General Dealers, Mansa, Kasakalabwe Multipurpose Cooperative, Kasama, Adsek Enterprises Ltd, Mule-staus Agro-dealers, Mansa, Eva-Muta Enterprises Ltd, Mungwi)	1. Yes 2. No
11a. If yes, what kind of support?	1. Training/extension services 2. Linkage to input markets 3. Linkage to output markets 66. Other, specify
12. Do you believe the support you have received have been relevant to you as a small-scale commercial fish farmer?	1. Yes, relevant 2. Yes, somewhat relevant 3. No, not relevant
12a. If yes, in what way has the support been relevant	1. I have access to input like fingerlings/seed 2. I have access to feed 3. I have access to markets for my produce 4. My yield has improved 5. My skills and knowledge about fish farming have improved 66. Other, specify
Support from other organisations/partners	

13. Have you received support from any other organizations other than those mentioned above?	1. Yes 2. No
13a. If yes, what kind of support?	1. Training/extension services 2. Linkage to input markets 3. Linkage to output markets 66. Other, specify
14. What is the name of the organization?	
15. In what other ways would you like to be supported in your fish farming?	
Outcomes of private sector extension services	
16. Has there been a difference in where/how you access input?	1. Yes 2. No
16a. If yes, what has been the difference?	1. Distance has reduced 2. Sex reversed fingerlings are always available 3. Only mixed sex fingerlings are available 4. Other, specify
17. Has there been a difference in where/how you access feed?	1. Yes 2. No
17a. If yes, what has been the difference?	1. Distance has reduced 2. Commercial feed is readily available 3. Commercial feed is readily accessible 4. Other, specify
18. Has there been a difference in where you sell your fish?	3. Yes 4. No

18a. If yes, what has been the difference?	1. Market is readily available 2. The quantity has increased 3. The price has improved 4. The distance I travel to sell is shorter 5. Other, Specify
19. Has there been a difference in support/extension services you receive	1. Yes 2. No
19a. If yes, what has been the difference?	1. My knowledge on fish farming has improved 2. Extension officers from the private sector visit my farm more often 3. I learn about fish farming on the radio more often 4. Other, specify
20. How much do you buy fingerlings?	
21. Please indicate much you buy the following types of feed?	
21a. Starter 25kg	
21b. Grower 40kg	
21c. Finisher 40kg	
22. Have you harvested any fish from your pond in the last 12 months?	
22a. If yes, how many kgs?	
22b. What did you do with the fish you harvested?	1. I sold all of it

	2. I sold some and ate some 3. I ate all of it
22c. If you sold your fish, how much were you selling per kg?	
22d. How much did you make from your last harvest sales?	
22e. Is there difference in this amount compared to before you started receiving project support/linked to the market	1. Yes 2. No
23. I am satisfied with the support I have received through private sector extension service	1. Yes, very satisfied 2. Yes, some what satisfied 3. Not satisfied
24. The WorldFish/Musika project has improved my aquaculture (fish farming) practices	1. Yes 2. No
Training	
Training in pond construction	
25. Have you received any training on pond construction in the last 12 months?	1. Yes 2. No
25a. If yes, who conducted this training?	1. Kasakalabwe 2. Hope ways 3. Triple blessings 4. Aller Aqua 5. Other, specify
26. How long ago did you receive this training	
27. Based on the training you received on pond construction, state whether you	

agree or disagree with the following statement	
27a. Pond size determines the number of fish you can stock in the pond	1. Yes 2. No
27b. The walls of the fish pond should be raised to avoid pond from collapsing in case of flooding	1. Yes 2. No
27c. A fish pond should have both inlet and outlet for water	1. Yes 2. No
28. How relevant was the training on pond construction you received to you?	1. Very relevant 2. Somewhat relevant 3. Not relevant
29. What actions have you taken following the training on pond construction?	
Training on Quality seed	
30. Have you received any training on better management practices such as quality fingerlings?	1. Yes 2. No
30a. If yes, who conducted this training?	1. Private actors 2. Other organization 3. Other
31. How long ago did you receive this training	
32. Based on the training you received on better management practices, state whether you agree or disagree with the following statement	
32a. Recycled fingerling can cause stunted growth	1. Yes 2. No

32b. Sex reversed fingerling grow very well	1. Yes 2. No
32c. I have to get my fingerlings from hatchery	1. Yes 2. No
32d. I should not buy fingerlings from my fellow fish farmers	1. Yes 2. No
33. How relevant was the training on pond construction you received to you?	1. Very relevant 2. Somewhat relevant 3. Not relevant
34. What actions have you taken following the training on quality seed?	
Training on farm management as a business	
35. Have you received any training on managing a farm as a business e.g. how to keep records better management practices, fish marketing as well as records management?	1. Yes 2. No
35a.If yes, who conducted this training?	
36. How long ago did you receive this training	
37. Based on the training you received on fish farm management, state whether you agree or disagree with the following statement	
37a. I have to manage my farm like a business	1. Yes 2. No
37b. I have to market my fish	1. Yes 2. No

37c. I have to keep record of my income and expenditure	1. Yes 2. No
37d. I should keep record of my production e.g number of fingerlings stocked vs the fish harvested	1. Yes 2. No
37e. I should not consume all my fish meant for business	1. Yes 2. No
38. How relevant was the training on managing a farm as a business you received to you?	1. Very relevant 2. Somewhat relevant 3. Not relevant
39. What actions have you taken following the training on managing a farm as a business?	
Training on biosecurity/fish heallth	
40. Have you received any training on biosecurity?	1. Yes 2. No
40a. If yes, who conducted this training?	
41. How long ago did you receive this training	
42. Based on the training you received on biosecurity, state whether you agree or disagree with the following statement	
42a. I should track a record of visitors to my farm	1. Yes 2. No
42b. I should have a hand washing facility at the entry of my farm	1. Yes 2. No
42c. I should call a specialist if there are signs of disease with my fish	1. Yes 2. No

42d. How relevant was the training on biosecurity to you received to you?	1. Very relevant 2. Somewhat relevant 3. Not relevant
42e. What actions have you taken following the training on biosecurity?	
43. What other trainings would you want to receive?	
Communication/visibility	
44. Have you heard a radio program where aquaculture related issues were discussed in the past 6 months?	1. Yes 2. No
44a. If yes, who was running the program?	

5.2 Statistical Tables

5.2.1 Farmer

Q01: Gender

Variables	Count	Percentage
Male	29.00	80.56
Female	7.00	19.44
Total	36.00	100.00

Q02: Age

Statistic	Value
Count	36.00
Average	47.50
Minimum	21.00
Maximum	70.00

Q08: How many fish ponds do you have?

Statistic	Value
Count	36.00
Average	4.00
Minimum	1.00
Maximum	20.00

Q11: Have you received support from WorldFish (or its partners like Musika and other

Variables	Count	Percentage
No	2.00	5.56
Yes	34.00	94.44
Total	36.00	100.00

Q11A: If yes, what kind of support?

Variables	Count	Percentage
Training/extension services	28.00	82.35
Linkage to input markets	22.00	64.71
Linkage to output markets	16.00	47.06

Other	12.00	35.29
Total	34.00	100.00

Q12: Do you believe the support you have received have been relevant to you as a smal

Variables	Count	Percentage
Yes, relevant	28.00	77.78
Yes, somewhat relevant	3.00	8.33
No, not relevant	5.00	13.89
Total	36.00	100.00

Q12A: If yes, in what way has the support been relevant

Variables	Count	Percentage
I have access to input like fingerlings/seed	23.00	74.19
I have access to feed	29.00	93.55
I have access to markets for my produce	19.00	61.29
My yield has improved	8.00	25.81
My skills and knowledge about fish farming have improved	13.00	41.94
Other	5.00	16.13
Total	31.00	100.00

Q13: Have you received support from any other organizations other than those mentioned

Variables	Count	Percentage
No	32.00	88.89
Yes	4.00	11.11
Total	36.00	100.00

Q13A: If yes, what kind of support?

Variables	Count	Percentage
Training/extension services	3.00	75.00
Linkage to input markets	1.00	25.00
Other	1.00	25.00
Total	4.00	100.00

Q16: Has there been a difference in where/how you access input?

Variables	Count	Percentage
No	15.00	41.67
Yes	21.00	58.33
Total	36.00	100.00

Q16A: If yes, what has been the difference?

Variables	Count	Percentage
Distance has reduced (Making own)	19.00	90.48
Commercial feed is readily available	10.00	47.62
Commercial feed is readily accessible	2.00	9.52
Other	2.00	9.52
Total	21.00	100.00

Q17: Has there been a difference in where/how you access feed?

Variables	Count	Percentage
No	16.00	44.44
Yes	20.00	55.56
Total	36.00	100.00

Q17A: If yes, what has been the difference?

Variables	Count	Percentage
Distance has reduced	15.00	75.00
Commercial feed is readily available	14.00	70.00
Commercial feed is readily accessible	5.00	25.00
Other	3.00	15.00
Total	20.00	100.00

Q18: Has there been a difference in where you sell your fish?

Variables	Count	Percentage
No	14.00	38.89
Yes	22.00	61.11
Total	36.00	100.00

Q18A: If yes, what has been the difference?

Variables	Count	Percentage
Market is readily available	21.00	95.45

The quantity has increased	8.00	36.36
The price has improved	11.00	50.00
The distance I travel to sell is shorter	11.00	50.00
Other	0.00	0.00
Total	22.00	100.00

Q19: Has there been a difference in support/extension services you receive

Variables	Count	Percentage
No	12.00	33.33
Yes	24.00	66.67
Total	36.00	100.00

Q19A: If yes, what has been the difference?

Variables	Count	Percentage
My knowledge on fish farming has improved	22.00	91.67
Extension officers from the private sector visit my farm more often	18.00	75.00
I learn about fish farming on the radio more often	8.00	33.33
Other	1.00	4.17
Total	24.00	100.00

Q20BUY: Did you purchase Fingerlings?

Variables	Count	Percentage
No	7.00	19.44
Yes	29.00	80.56
Total	36.00	100.00

Q20: How much do you buy fingerlings?

Statistic	Value
Count	29.00
Average	1.00
Minimum	0.00
Maximum	1.00

Q21ABUY: Did you buy starter feed?

Variables	Count	Percentage
No	19.00	52.78

Yes	17.00	47.22
Total	36.00	100.00

Q21APPKG: Please indicate much you buy Starter? (K/Kg)

Statistic	Value
Count	17.00
Average	11.40
Minimum	7.80
Maximum	28.00

Q21BBUY: Did you buy grower feed?

Variables	Count	Percentage
No	15.00	41.67
Yes	21.00	58.33
Total	36.00	100.00

Q21BPPKG: Please indicate much you buy Grower? (K/Kg)

Statistic	Value
Count	21.00
Average	10.80
Minimum	9.52
Maximum	25.50

Q21CBUY: Did you buy finisher feed?

Variables	Count	Percentage
No	23.00	63.89
Yes	13.00	36.11
Total	36.00	100.00

Q21CPPKG: Please indicate much you buy Finisher? (K/Kg)

Statistic	Value
Count	13.00
Average	9.04
Minimum	4.90
Maximum	19.50

Q22: Have you harvested any fish from your pond in the last 12 months?

Variables	Count	Percentage
No	9.00	25.00
Yes	27.00	75.00
Total	36.00	100.00

Q22A: If yes, how many kgs?

Statistic	Value
Count	27.00
Average	50.00
Minimum	15.00
Maximum	1,000.00

Q22B: What did you do with the fish you harvested?

Variables	Count	Percentage
I sold all of it	8.00	22.22
I sold some and ate some	21.00	58.33
I ate all of it	7.00	19.44
Total	36.00	100.00

Q22C: If you sold your fish, how much were you selling per kg?

Statistic	Value
Count	29.00
Average	35.00
Minimum	17.00
Maximum	40.00

Q22D: How much did you make from your last harvest sales?

Statistic	Value
Count	28.00
Average	5716.00
Minimum	210.00
Maximum	35,000.00

Q22E: Is there difference in this amount compared to before you started receiving proj

Variables	Count	Percentage
No	21.00	58.33
Yes	15.00	41.67
Total	36.00	100.00

Q23: I am satisfied with the support I have received through private sector extension

Variables	Count	Percentage
Yes, very satisfied	19.00	52.78
Yes, somewhat satisfied	9.00	25.00
Not satisfied	8.00	22.22
Total	36.00	100.00

Q24: The WorldFish/Musika project has improved my aquaculture (fish farming) practice

Variables	Count	Percentage
No	11.00	30.56
Yes	25.00	69.44
Total	36.00	100.00

Q25: Have you received any training on pond construction in the last 12 months?

Variables	Count	Percentage
No	10.00	27.78
Yes	26.00	72.22
Total	36.00	100.00

Q25A: If yes, who conducted this training?

Variables	Count	Percentage
Hope ways	8.00	30.77
Triple blessings	11.00	42.31
Other	3.00	11.54
WorldFish	6.00	23.08
Musika	2.00	7.69
Triple Blessings	0.00	0.00
Total	26.00	100.00

Q27A: Pond size determines the number of fish you can stock in the pond

Variables	Count	Percentage
Yes	26.00	100.00
Total	26.00	100.00

Q27B: The walls of the fish pond should be raised to avoid pond from collapsing in cas

Variables	Count	Percentage
Yes	26.00	100.00
Total	26.00	100.00

Q27C: A fish pond should have both inlet and outlet for water

Variables	Count	Percentage
Yes	26.00	100.00
Total	26.00	100.00

Q28: How relevant was the training on pond construction you received to you?

Variables	Count	Percentage
Very relevant	25.00	96.15
Somewhat relevant	1.00	3.85
Total	26.00	100.00

Q26MONTHS: How long ago did you receive this training? (months)

Statistic	Value
Count	26.00
Average	2.50
Minimum	0.50
Maximum	156.00

Q29: What actions have you taken following the training on pond construction?

Variables	Count	Percentage
Constructed new ponds	19.00	73.08
Cleaned ponds and surroundings	4.00	15.38

Trained other farmers in pond construction	2.00	7.69
Improved existing ponds	5.00	19.23
None	1.00	3.85
Total	26.00	100.00

Q30: Have you received any training on better management practices such as quality fingerlings

Variables	Count	Percentage
No	12.00	33.33
Yes	24.00	66.67
Total	36.00	100.00

Q30A: If yes, who conducted this training?

Variables	Count	Percentage
Private actors	11.00	45.83
Other	10.00	41.67
Triple blessings	5.00	20.83
Total	24.00	100.00

Q32A: Recycled fingerling can cause stunted growth

Variables	Count	Percentage
No	1.00	4.17
Yes	23.00	95.83
Total	24.00	100.00

Q32B: Sex reversed fingerling grow very well

Variables	Count	Percentage
No	1.00	4.17
Yes	23.00	95.83
Total	24.00	100.00

Q32C: I have to get my fingerlings from hatchery

Variables	Count	Percentage
No	2.00	8.33
Yes	22.00	91.67
Total	24.00	100.00

Q32D: I should not buy fingerlings from my fellow fish farmers

Variables	Count	Percentage
No	14.00	58.33
Yes	10.00	41.67
Total	24.00	100.00

Q33: How relevant was the training on pond construction you received to you?

Variables	Count	Percentage
Very relevant	22.00	91.67
Somewhat relevant	2.00	8.33
Total	24.00	100.00

Q34: What actions have you taken following the training on quality seed?

Variables	Count	Percentage
No action taken	6.00	25.00
Purchased / planning to purchase sex reversed fingerlings	9.00	37.50
Trained other farmers	2.00	8.33
Used commercial feed	6.00	25.00
Purchased / planning to purchase seed	2.00	8.33
Produce own fingerlings	2.00	8.33
Total	24.00	100.00

Q35: Have you received any training on managing a farm as a business?

Variables	Count	Percentage
No	22.00	61.11
Yes	14.00	38.89
Total	36.00	100.00

Q37A: I have to manage my farm like a business

Variables	Count	Percentage
Yes	14.00	100.00
Total	14.00	100.00

Q37B: I have to market my fish

Variables	Count	Percentage

Yes	14.00	100.00
Total	14.00	100.00

Q37C: I have to keep record of my income and expenditure

Variables	Count	Percentage
Yes	14.00	100.00
Total	14.00	100.00

Q37D: I should keep record of my production e.g. number of fingerlings stocked vs the f

Variables	Count	Percentage
Yes	14.00	100.00
Total	14.00	100.00

Q37E: I should not consume all my fish meant for business

Variables	Count	Percentage
No	11.00	78.57
Yes	3.00	21.43
Total	14.00	100.00

Q38: How relevant was the training on managing a farm as a business you received to y

Variables	Count	Percentage
Very relevant	13.00	92.86
Somewhat relevant	1.00	7.14
Total	14.00	100.00

Q40: Have you received any training on biosecurity?

Variables	Count	Percentage
No	23.00	63.89
Yes	13.00	36.11
Total	36.00	100.00

Q42A: I should track a record of visitors to my farm

Variables	Count	Percentage

Yes	13.00	100.00
Total	13.00	100.00

Q42B: I should have a hand washing facility at the entry of my farm

Variables	Count	Percentage
No	3.00	23.08
Yes	10.00	76.92
Total	13.00	100.00

Q42C: I should call a specialist if there are signs of disease with my fish

Variables	Count	Percentage
No	1.00	7.69
Yes	12.00	92.31
Total	13.00	100.00

Q42D: How relevant was the training on biosecurity to you received to you?

Variables	Count	Percentage
Very relevant	12.00	92.31
Somewhat relevant	1.00	7.69
Total	13.00	100.00

Q42E: What actions have you taken following the training on biosecurity

Variables	Count	Percentage
None	3.00	23.08
Cleaned pond and surroundings	4.00	30.77
Changed colour of water to keep fish safe from predators	2.00	15.38
Developed Visitors' Book	1.00	7.69
Hand washing station	1.00	7.69
Moved Gardens Downstream	1.00	7.69
Watched out for diseases in fish	3.00	23.08
Added ash to pond	1.00	7.69
Total	13.00	100.00

Q42EBIOSEC: Performed at least one biosecurity measure after the training

Variables	Count	Percentage
No	3.00	23.08
Yes	10.00	76.92

Total	13.00	100.00

Q43: What other trainings would you want to receive?

Variables	Count	Percentage
How to make feed locally	15.00	41.67
Sex reversed fingerlings	12.00	33.33
Fish pond Construction	2.00	5.56
fingerlings production	2.00	5.56
Fish breeding	5.00	13.89
Fish feeding	3.00	8.33
Fish health	4.00	11.11
Farm visits	1.00	2.78
Fih security	1.00	2.78
Total	36.00	100.00

Q44: Have you heard a radio program where aquaculture related issues were discussed i

Variables	Count	Percentage
No	9.00	25.00
Yes	27.00	75.00
Total	36.00	100.00

Q44A: If yes, who was running the program?

Variables	Count	Percentage
Triple Blessing	8.00	29.63
WorldFish	6.00	22.22
Livestock and Fisheries	1.00	3.70
Musika	4.00	14.81
Hopeways	5.00	18.52
Adesek	2.00	7.41
Not sure who runs the program	5.00	18.52
Total	27.00	100.00

OT: What other forms of training have you received?

Variables	Count	Percentage
Use of quality seed	13.00	36.11
Fish health	3.00	8.33
Total	36.00	100.00

Q09: What is the size of your pond in meter squares (Separate entry by commas)

Statistic	Value
Count	137.00
Average	270.00
Minimum	20.00
Maximum	1,250.00

Q09A: Length of the pond in meters

Statistic	Value
Count	137.00
Average	20.00
Minimum	10.00
Maximum	50.00

Q09B: Width of the pond in meters

Statistic	Value
Count	137.00
Average	15.00
Minimum	3.00
Maximum	40.00

Q10: When did you construct these ponds? (Year)

Statistic	Value
Count	137
Average	2018
Minimum	2000
Maximum	2020

Q10A: What type of fish did you stock in this pond?

Variables	Count	Percentage
Tilapia rendalli (Mpende)	83.00	60.58
Oreochromis macrochir (Nkamba)	41.00	29.93
Oreochromis niloticus (Nile tilapia)	5.00	3.65
Tilapia sparrmanii (Matuku)	8.00	5.84
Total	137.00	100.00

Q02: Age

Statistic	Value
Count	47.00
Average	22.00
Minimum	19.00
Maximum	38.00

Q03: Province

Variables	Count	Percentage
Lusaka	36.00	76.60
Eastern	4.00	8.51
Southern	3.00	6.38
Western	1.00	2.13
North Western	3.00	6.38
Total	47.00	100.00

Q04: Institutions

Variables	Count	Percentage
NRDC	47.00	100.00
Total	47.00	100.00

Q05: Year of study

Variables	Count	Percentage
Second year	34.00	72.34
Third year	13.00	27.66
Total	47.00	100.00

Q06: Have you undertaken an internship/attachment as part of your training?

Variables	Count	Percentage
No	33.00	70.21
Yes	14.00	29.79
Total	47.00	100.00

Q18: How relevant is the online platform to your training

Variables	Count	Percentage
Very relevant	16.00	76.19
Somewhat relevant	3.00	14.29
Not relevant	2.00	9.52
Total	21.00	100.00

Q19: Have you faced challenges with using/access the online platform

Variables	Count	Percentage
No	7.00	33.33
Yes	14.00	66.67
Total	21.00	100.00

Q19A: If yes, what is the main challenge?

Variables	Count	Percentage
Internet not available	9.00	64.29
No access to computers	1.00	7.14
Other, specify	4.00	28.57
Total	14.00	100.00

5.2.2 Student

Q01: Gender

Variables	Count	Percentage
Male	29.00	61.70
Female	18.00	38.30
Total	47.00	100.00

Q07: How would you rate your internship experience

Variables	Count	Percentage
Very helpful	7.00	46.67
Somewhat helpful	7.00	46.67
Not helpful	1.00	6.67
Total	15.00	100.00

Q10: Did you receive any assessment/feedback on your internship?

Variables	Count	Percentage
No	9.00	60.00
Yes	6.00	40.00
Total	15.00	100.00

Q13: Have you been introduced to the fisheries and aquaculture online training platform

Variables	Count	Percentage
No	28.00	59.57
Yes	19.00	40.43
Total	47.00	100.00

Q13A: If yes, what course/module/lesson was delivered and do you feel this was appropriate to your program

Variables	Count	Percentage
Fish biology	11.00	57.89
Fish welfare	3.00	15.79
Fish processing hygiene	3.00	15.79
Other, specify	6.00	31.58
Fish Taxonomy	5.00	26.32
Intruduction to Aquaculture	5.00	26.32

Fishing Technology	4.00	21.05
Aquatic Environment	6.00	31.58
Environmental diseases	3.00	15.79
Total	19.00	100.00

Q14: Were you formally trained on how to use the online platform?

Variables	Count	Percentage
No	3.00	14.29
Yes	18.00	85.71
Total	21.00	100.00

Q14A: If yes, what form of training did you receive?

Variables	Count	Percentage
Tutorial from lecturer	14.00	77.78
Tutorial from peer	3.00	16.67
Live demo from lecturer	5.00	27.78
Self-taught using user guide	8.00	44.44
Other	1.00	5.56
Total	18.00	100.00

Q15: Do you have access to technical assistance on how to use the online platform?

Variables	Count	Percentage
No	6.00	28.57
Yes	15.00	71.43
Total	21.00	100.00

Q15A: If yes, who provides the support

Variables	Count	Percentage
Lecturer	12.00	80.00
Peer	6.00	40.00
Total	15.00	100.00

Q16: How prepared do you feel to use the online platform?

Variables	Count	Percentage
Very prepared	13.00	61.90
A little prepared	7.00	33.33

Not prepared	1.00	4.76
Total	21.00	100.00

Q21: Have you received any practical learning as part of your training?

Variables	Count	Percentage
No	4.00	8.51
Yes	43.00	91.49
Total	47.00	100.00

Q21A: If yes, where (or how?)

Variables	Count	Percentage
Organized by NRDC with a private company	6.00	13.95
Other, specify	28.00	65.12
Organized NRDC alone	9.00	20.93
Total	43.00	100.00

Q22: Do you believe an aquaculture skills training centre at NRDC is a relevant compo

Variables	Count	Percentage
Yes	47.00	100.00
Total	47.00	100.00

Q25: How relevant are the practical skills you have received to your training and car

Variables	Count	Percentage
Yes, very relevant	34.00	72.34
Somewhat relevant	11.00	23.40
Not relevant	2.00	4.26
Total	47.00	100.00

Q26: How adequate are the practical skills you received for your training and career

Variables	Count	Percentage
Very adequate	19.00	40.43
Somewhat adequate	24.00	51.06
Not adequate	4.00	8.51

Total	47.00	100.00

Q28: What do you plan to do after graduating from this program?

Variables	Count	Percentage
Start an aquaculture business	36.00	76.60
Find employment in aquaculture related company	28.00	59.57
Pursue further aquaculture related studies	6.00	12.77
Other	2.00	4.26
Total	47.00	100.00

Q28_A: If you intend to set up an aquaculture related enterprise, have you been linked

Variables	Count	Percentage
No	36.00	94.74
Yes	2.00	5.26
Total	38.00	100.00

Q29: Do you feel the training you are receiving is preparing well for a formal career

Variables	Count	Percentage
No	8.00	17.02
Yes	39.00	82.98
Total	47.00	100.00

Q30: Do you feel the training you are receiving is preparing well to start an aquacultural business?

Variables	Count	Percentage
No	4.00	8.51
Yes	43.00	91.49
Total	47.00	100.00

Q31: Are you aware of aquaculture relate work opportunities available to you after complete the program?

Variables	Count	Percentage
No	15.00	31.91
Yes	32.00	68.09

Total	47.00	100.00

Q31A: If yes, please list some of these aquaculture and fisheries related work opportunities

Variables	Count	Percentage
Working in an aquaculture related private company	23.00	71.88
Working in aquaculture related government department	17.00	53.13
Running an aquaculture related business	9.00	28.13
Others, specify	17.00	53.13
Total	32.00	100.00

Q32: Have you been trained in business planning?

Variables	Count	Percentage
No	28.00	59.57
Yes	19.00	40.43
Total	47.00	100.00

Q32A: If yes, how relevant was the business training to your future plans?

Variables	Count	Percentage
Very relevant, am able to design a business plan	14.00	73.68
Somewhat relevant	5.00	26.32
Total	19.00	100.00