

Final Report
End Term Evaluation of
Sustainable Transformation of Egypt's Aquaculture market System (STREAMS)

Implemented by

WorldFish in Partnership with CARE International

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List of Abbreviations

AHRI	Animal Health Research Institute
BMP	Best Management Practice
CAPMAS	Central Agency for Public Mobilization and Statistics
CARE	Cooperative for Assistance and Relief Everywhere
CGIAR	Consultative Group of international Agriculture Research
CHF	Swiss Francs
CLAR	Central Laboratory for Aquaculture Research
CO ₂	Carbon Dioxide
CUEWR	Cooperative Union of Egyptian Water Resources
DAC	Development Assistance Committee
ECDC	Egyptian Countryside Development Company
EC	European Commission
EEAA	Egyptian Environmental Affairs Agency
EGP	Egyptian Pound*
FCR	Feed Conversion Ratio
FGD	Focus Group Discussions
FTE	Full Time Employment
g	gram(s)
GAFRD	General Authority for Fish Resources Development
GDP	Growth Domestic Product
GHG	Green House Gas Emissions
GOVS	General Organization for Veterinary Services
ha	hectare(s); 1 feddan = 0.42 ha
HDI	Human Development Index
HH	Household
IDH	IDI (Integrated Diagnostics Holdings) Sustainable Trade Initiative
IDI	In-Depth Interviews
IEIDEAS	Improving Employment and Incomes through the Development of Egypt's Aquaculture sector
IMF	International Monetary Fund
IPRS	Intensive Pond Raceway Systems

KEF	Knowledge Economic Foundation (Bashaier)
kg	Kilogram(s)
MoALR	Ministry of Agriculture and Land Reclamation
OIC	Office of International cooperation – Embassy of Switzerland
PO	Producers Organizations
SDC	Swiss Agency for Development and Cooperation
SDS-2030	Sustainable Development Strategy 2030
STREAMS	Sustainable Transformation of Egypt’s Aquaculture market Systems
t	metric ton(s)
UNDP	United Nations Development Program
USD	United States Dollar(s)*
USSEC	US Soya Export Council
VC	Value Chain
VSLA	Village Savings and Loan Associations

* Exchange rates:

USD 1 = Approx. EGP 8 (October 2016) to EGP 17 (May 2019)

Executive Summary

The Sustainable Transformation of Egypt’s Aquaculture Market System (STREAMS) project was designed with the overall goal to increase production of inexpensive, nutritious and safe fish from sustainable aquaculture systems to help improve the health and nutrition of Egypt’s resource-poor while creating employment and increasing incomes along the aquaculture value chain. The project was funded by SDC, under domain 2 “Economic Growth” and managed and implemented by WorldFish in partnership with CARE as a sub-contractor and in cooperation with the Ministry of Agriculture and Land Reclamation in five governorates namely: Kafr-El-Sheikh, Fayoum, Behera, Sharkia and Menia. STREAMS was implemented over a period of almost 41 months from December 1, 2015 to April 15, 2019 with a total approved funding level of CHF 1,999,573. It is worth noting that the Egyptian Pound was valued at USD equal EGP 8 up to November 2016 and is currently equal EGP 17.

The end project evaluation identifies and assesses results achieved by WorldFish and partners during the project life at outcome and output levels and draws lessons learned and recommendations for WorldFish, the Donor, project stakeholders and partners. The evaluation was based on both secondary data and use of quantitative and qualitative tools to solicit primary data. The EC developed grading system was used to come up with achievement scores related to relevance, effectiveness, efficiency and sustainability. The evaluation team derived an overall grade per criterion: (i) very good; (ii) good; (iii) with problems; and (iv) serious deficiencies as follows:

DAC Criteria	Scoring	Comments
Relevance	Very Good	The project was relevant to national strategies, farmers and retailers need. Further, improvement needed in addressing large farmers need.
Effectiveness	Good	Outcomes 1, 2 and 3 were satisfactory achieved. However, there is room for improvement in quality of training and, capacity building. Future Initiatives should consider giving more emphasis on promoting industrial processing.
Efficiency	With Problems	Unsatisfactory management structure, limited coordination between project components and weak monitoring.
Sustainability	Good	Achieved benefits are sustainable for large, integrated farms and retailers. Capacity building of CDs is satisfactory while for POs sustainability is limited.

Relevance: The design of the project was relevant and in line with the country’s strategy particularly Aquaculture sector expansion, pro-poor source of nutrition, job creation and establishment of integrated farms as a means to improve use water efficiency. STREAMS were comparatively more relevant to the needs of integrated farms and retailers than big aquaculture farms. BMP training was needed for agriculture farms to become integrated farms. BMP training to large fish farms, although needed, the provided training was not exactly relevant to the specific needs of the large farms. The VSLA provided a needed financial liquidity to Women retailers, generally a poor and vulnerable group. Provided post-harvest handling training to women retailers was very relevant to increase the retailer income.

Effectiveness: Outcome 1 - 4000 fish farms in existing fish farming zones adopt productive, efficient and climate-smart aquaculture production practice. STREAMS served 4,297 big fish farms and was effective in:

- Increasing average production by 16% (7.18 tons/hectare in 2016 to 8.37 tons/ hectare in 2018);
- Increasing annual net profit **per farm** by 56% from EGP 224,340 in 2016 to 349,596 in 2018;

- Increasing net profit for 4,297 fish farms (between 2016 and 2018), due to extra production by LE 538 billion equivalent to USD 67.8 million (exchange rate 8)/USD 31.6 million (exchange rate 17);
- Decreasing Feed Conversion Ratio (FCR) from 1.8:1 in 2016 to 1.4:1 in 2018;
- Reducing water consumption (through reducing water pump usage) by 37%;
- Reducing Green House Gases (GHG) emissions by 22%; and
- Building the capacity of 2 CDAs (Shakshouk and El Riyadh) as well as the retailers' committees.

STREAMS had limited effectiveness/was not effective in:

- Creating new jobs at the farm level but effective in retaining 20,625 jobs;
- Creating an estimated 3,407 new jobs (less than planned) along the fish value chain
- Building the capacity of Producers Organizations (POs); and
- Promoting FishNet as an effective source of information

Effectiveness: Outcome 2 - Technical and regulatory barriers are overcome in order to foster the adoption of equitable, productive aquaculture production systems by the poor and vulnerable¹

STREAMS was effective in:

- Establishing 544 fish ponds in agriculture farms with average size of 0.23 hectares;
- Achieving a net profit of EGP 4.4 million (USD 259,572 at exchange rate EGP 17/USD 551,702 at exchange rate EGP 8) in 2018 for 41% of small-scale fish farms who sell their fish (233 farms). The remaining 59% consumed their production;
- Increasing households consumption of fish to 8 times per month;
- Retaining 1,186 jobs at the farms level.
- Initiating policy change related to integrated farms (GAFRD decree acknowledging integrated farms as a form of agriculture activities); and
- Developing and applying a health management strategy at WorldFish Abbassa facility and initiating policy dialogue with GAFRD in order to adopt the strategy at a national level.

STREAMS had limited effectiveness/was not effective in: Creating new jobs at the farm level

Effectiveness: Outcome 3 - More efficient and safer aquaculture market practices adopted by wholesalers and retailers resulting in greater benefits for market actors and consumers.

STREAMS was highly effective in:

- Economically empowering 2000 women retailers through increased income, establishing social/psychological support mechanism and building communication channels between women retailers and other agencies as well establishing elected representation committees;
- Increasing shelf life of fish in a customer acceptable condition (for 37% of the surveyed retailers) to 2.46 days. 63% of the surveyed retailers were successful in selling their fish on the same day;
- Achieving an average net profit per day per retailer of EGP 205 equivalent to \$12/day (using \$1 = EGP 17 exchange rate) which is much higher than the planned net profit of \$2. The impact of the increased profit on the retailers' livelihood was most felt in their ability to provide better educational opportunities to their children; and
- Training 1998 women on best practices and on simple processing.

STREAMS had limited effectiveness/was not effective in:

- Making fish available three days/ week in key villages. All villages, except Shakshouk, have a one day/week market. Yet, retailers worked on average 5.75 days/week in peak and 4.6 in off season by selling fish in several markets;

¹ Aquaculture production in small integrated fish farms is not intended for profit but to improve agriculture through the use of the ponds fertilized water for irrigation.

- Creating new jobs but succeeded in retaining jobs. 82% of the retailers were actively working at the time of the evaluation while the remaining had stopped due to personnel reasons; and
- Supporting fish processing operations through product development, training and business mentoring. Only 2 food processing companies started fish processing and 55 women were trained as TOTs on simple processing operations.

Efficiency: STREAMS was efficient in

- Adhering to the approved amended (March 2019) budget line items.
- Building strong working relationship with MoALR and with Research Institutes and building good relationships with the Cooperative Union of Egyptian Water Resources (CUEWR), 3 POs and 2 CDAs (through CARE).

STREAMS had limited efficiency in the following

- Total Operating Expenses (HR, Operations, Overhead) represented 70% of the budget
- The management structure lacked field workers to ensure efficient implementation of the project;
- Minimal coordination between the different initiatives and among the implementing partners; and
- Monitoring mechanism with no monitoring at output and outcome levels.

STREAMS design was not efficient in the following:

- Estimating ambitious expected results particularly with respect to jobs creation;
- Targeting more than 5000 beneficiaries with extremely limited field staff; thus risking quality;
- Overlooking linkages between project outcomes or components
- Setting no impact level indicators; and
- Using indicators that are beyond the control of the project such as health management strategy in place, increase in farms licensing and increase in fish consumption.

Sustainability: STREAMS achieved benefits are sustainable:

- For the trained farmers who enjoyed production and profitability increase and accordingly will continue to implement acquired practices.
- For women retailers since VSLA groups are sustainable by nature as well as post-harvest, marketing and processing skills that were gained and resulted in increasing their income.
- For the CDA partners who have an improved capacity.

STREAMS achieved benefits are not sustainable in the following:

- The POs as they require further capacity building in order to play a role in serving their members attract aquaculture farms to become members and accordingly act as a pillar of sustainability.

Lessons Learnt and Recommendations:

- Project design should consider realistic number of target beneficiaries that is compatible with the project's life time, budget, implementing organization's capacity and project staffing.
- Project indicators should be within the project's potential and should have impact indicators.
- Internet portals like FishNet should be assessed in terms of its relevance and effectiveness;
- Implementing agencies' field presence is essential;
- Projects that focus on training should consider providing technical support services and follow-up;
- Coordination between project components and implementing parties is essential;
- Well-designed monitoring and evaluation tools based on outcomes and outputs are essential for measuring actual achievements, quality and impact; and
- Maintained and updated database of beneficiaries is important for the effective and efficient monitoring of project results.

I. Context and Objectives

A. STREAMS

A.1 Goal and Objectives

Within the framework and outcomes of the Swiss Programme in Egypt, in particular domain two, the Sustainable Transformation of Egypt's Aquaculture Market System (STREAMS) project was designed with the **overall goal to increase production of inexpensive, nutritious and safe fish from sustainable aquaculture systems to help improve the health and nutrition of Egypt's resource-poor while creating employment and increasing incomes along the aquaculture value chain.** STREAMS, was managed and implemented by WorldFish in partnership with CARE as a sub-contractor and in cooperation with the Ministry of Agriculture and Land Reclamation in five governorates namely: Kafr-El-Sheikh, Fayoum, Behera, Sharkia and Menia during the period December 1, 2015 to April 15, 2019 with a total approved funding level of CHF 1,999,573.

A.2 Organizational Structure

WorldFish was primarily responsible for the direct implementation of Outcomes 1 *"4000 fish farms in existing fish farming zones adopt productive, efficient and climate-smart aquaculture production practices"*; and Outcome 2 *"Technical and regulatory barriers are overcome in order to foster the adoption of equitable, productive aquaculture production systems by the poor and vulnerable"*.

CARE was leading the activities implemented under Outcome 3 *"More efficient and safer aquaculture market practices adopted by wholesalers and retailers resulting in greater benefits for market actors and consumers"*. WorldFish worked in partnership with GAFARD and MOALR while CARE worked in partnership with the CUEWR, 3 POs (Menia, Kafr-El-Sheikh and Fayoum) and two CDAs (Kafr-El-Sheikh and Fayoum). CARE was responsible for capacity building interventions of partner organizations.

B. Technical Approach, Methodology and Sampling

B.1 Methodology

The methodology employed in this evaluation included both review of secondary data and using quantitative and qualitative tools and techniques to solicit primary data. Primary data expressed the surveyed sample perception of the project.

In order to have consistent and meaningful data, the evaluation tools were developed in line with the IEIDEAS final assessment and the midterm review. The tools were adapted to collect data that reflects the outcomes and outputs levels.

The evaluation had two types of tools namely: quantitative and qualitative tools. The quantitative tools included a questionnaire for the large and small integrated farms and another for the retailers. The tools were programmed on the KoBo toolbox. Data were collected using KoBoCollect based on face-to-face basis with respondents, except for small integrated farms in Sharkia (26 farms) and Menia (42 farms) where data collection was done by phone. In order to increase the efficiency of the fieldwork, with the help of WorldFish and CARE, the target interviewees fish farms were accessed through the STREAMS trainers while retailers were accessed through CARE ex-field coordinators of the project. The surveyed respondents for the quantitative technique were randomly selected from the project database. Analysis of the collected data was done through SPSS and Excel, in addition to Kobo Toolbox.

The team adopted two main qualitative tools: In Depth Interviews (IDI) and Focus Group Discussions (FGD). The target interviewees and FGD participants for the qualitative techniques and the respondents of the quantitative technique **were mutually exclusive**. The selected large farmers for individual interviews were mainly the larger farms who would have a greater impact on the sector while the selected

retailers were representatives of all beneficiaries including those who joined the VSLA groups, received training and/or grants. Two focus group discussions were conducted with women retailers in Fayoum and Kafr-El-Sheikh and 28 IDIs (12 with large fish farms, 6 with retailers, 4 with GAFRD officials, 5 with POs and the CUEWR and 1 with wholesaler. The evaluation team was able to identify 2 case studies/success stories. The evaluation did not, however, include comparison with control group due to time and budget constraints. The evaluation findings are related to direct beneficiaries from the project. The evaluation scope, however, did not include review of any indirect beneficiaries for the provided BMP training or any other services.

Scoring criteria were used to come up with achievement scores related to relevance, effectiveness, efficiency and sustainability. The evaluation team derived an overall grade per criterion: (i) very good; (ii) good; (iii) with problems; and (iv) serious deficiencies based on EC's grading system presented in Table 1.² The scoring system provides a quick overview of the main conclusions. It is not designed for statistical purposes.

Table 1: Grading reference table for evaluation criteria

Qualitative	Grading reference for evaluation criteria
Good/very good	The situation is considered satisfactory, but there may be room for improvement. Recommendations are useful, but not vital to the project or programme.
With problems	There are issues which need to be addressed, otherwise the global performance of the project or programme may be negatively affected. Necessary improvements do not however require a major revision of the intervention logic and implementation arrangements.
With serious deficiencies	There are deficiencies which are so serious that, if not addressed, they may lead to failure of the project or programme. Major adjustments and revision of the intervention logic and/or implementation arrangements are necessary

B.2 Sampling

For the quantitative technique, the end-term evaluation sampling was based on a random sample with a 95% confidence interval and 7% error margin. Given the small population size in some categories, the sample size was adjusted to be statistically acceptable. Accordingly, a random sample of **441** beneficiaries in the five targeted governorates were selected using the project databases. An additional 15% margin were identified in order to compensate for the beneficiaries that will not be accessible to the evaluation team during the field work.

Given the limitations and challenges that were faced by the evaluation team in the field, as explained below, the achieved sample size for the quantitative techniques reached 414 beneficiaries representing 94% of the original target. Another limitation was the absence of a control group.

B.3 Evaluation Challenges

The agreed upon level of effort of the evaluation team members as well as the timeframe required to complete the evaluation was very limited compared to the required sample size and the number of governorates to be covered. In addition, the month of Ramadan started on May 6, 2019 which limited the ability of the team to perform any field work since accessibility to the beneficiaries during the fasting month is not possible. The developed tools were very extensive and ideally should have been tested in

² Directorate General for International Cooperation and Development, *Results Oriented Monitoring Handbook*, version 5, October 2018, p. 39, https://ec.europa.eu/europeaid/sites/devco/files/rom-handbook-20181025_en.pdf.

the field before the actual field work, but due to time limitations no testing was done; however, the evaluation team exerted every effort to cover the required sample and the villages.

On the other hand, the fact that the project was already completed, affected the ability of the evaluation team to reach some of the beneficiaries especially that the contact information in the database were in some cases not up to date. This was a major challenge. With the help of WorldFish and CARE Egypt, the evaluation team used the Best Management Practices trainers and CARE two ex-field coordinators to reach the beneficiaries.

In Kafr-El-Sheikh in particular, the BMP trainers and the ex-field personnel were unable to gather the originally provided list of beneficiaries and accordingly gathered the beneficiaries who they were able to reach. In addition, in Kafr-El-Sheikh's women retailers refused to show-up unless they were compensated for the transportation cost, which DBA did.

It is worth noting that while analyzing the data particularly production and sales figures, the evaluation team detected that figures were usually understated or not provided by the respondents due to cultural reasons and out of concern that their income would be provided to the tax authorities. Due to the significance of the inconsistencies in Sharkia data, the evaluation team had to verify some of these data by phone calls to fish farm beneficiaries who were found most irregular. However, given the time limitation the evaluation team was not able to verify the data for all of the sampled beneficiaries.

II. End Line Evaluation Findings

Based on the desk review of secondary data sources, meetings, surveys, focus groups and the in-depth individual interviews, the evaluation team deducted their findings, recommendations and lessons learnt as well as an overall score. *It is worth noting that the field data reflects the perception of the surveyed beneficiaries related to the benefits of the project rather than actual benefits.*

A. Relevance

Overall Relevance Score= Very Good based on the following findings:

- ✓ **Interventions relevant to country's strategies including aquaculture expansion, job creation and pro-poor nutrition**
- ✓ **BMP training relevant to agriculture farms to become integrated farms**
- ✓ **VSLA provided financial liquidity relevant to Women retailers' needs**
- ✓ **Post harvest handling and processing training to women retailers needed to increase income**
- ✗ **BMP training to large fish farms, although needed, the provided training was not exactly relevant to their perception of specific needs which was mainly new technologies**

STREAMS overall goal of "improved nutrition and economic opportunities for poor Egyptians resulting from sustainable expansion of Aquaculture sector" was **in line with the country's short- and long-term strategies** and needs. Creation of job opportunities is a national need given the size of the Egyptian population and demographic characteristics which includes 63% of the population in the productive age (between 15 – 64).

The First International Conference on Aquaculture in Egypt was held in November 2017 and organized jointly by WorldFish and CLAR. This conference was in alignment with the government's interest in supporting aquaculture sector and the opening of the national aquaculture project (Berkit Ghalioun). The conference led to several national workshops with GOVS, AHRI, GAFRD and MoALR. In June 2018, a

delegate from The Egypt Countryside Development Company visited WorldFish in order to establish cooperation targeted at the development of 1.5 million-feddan project.

The geographically **targeted governorates represent the most relevant** to achieve aquaculture advancement as they are the main aquaculture producers: Kafr-El-Sheikh (71%), Sharkia (15%) and Behera (11%), the three governorates represented the main concentrations of aquaculture fish production.³

Provided **standard BMP training** to large farms under outcome 1 did **not correspond** to their perception of exact needs for more advanced/tailored training as most of them have an average experience of 18 years in business. It is worth noting that there were other sources of technical support and training available in the sector especially the feed industry, which by default has a vested interested in training and providing technical support to the farmers to ensure their success. Interviewed big farmers expressed need for training on new technologies such as intensive cultivation and ways to deal with diseases. Nonetheless, under effectiveness, many farms expressed gained benefits from the provided BMP training especially related to increased harvest and feed practices.

Interventions under outcome 2 related to integrated agriculture-aquaculture farms were very relevant to the country's strategy to maximize the use of water resources. Menia was targeted for this particular output due to the expansion in desert land reclamation, which was an opportunity to test and promote, integrated pilot farms. These farms had almost no experience in the aquaculture; hence, they had the biggest need for BMP training.

WorldFish continued to test the new water efficient and intensive production system called Intensive Pond Raceway Systems (IPRS). The IPRS allowed for sustainable intensification (triple productivity of aquaculture ponds) and results in reduced water usage. Interest in systems that leads to increased productivity was expressed by the fish farmers in the interviews. A demonstration 'in pond raceway' was constructed at WorldFish research facility at Abbassa, with support from US Soya Export Council (USSEC).

Fish retailers, on the other hand, mostly women, are a poor and vulnerable group. STREAMS worked with this group to fulfill their needs for financial liquidity through the VSLA groups to purchase fish on cash basis. The VSLA also supported the retailers to fulfill their household responsibilities as in case of marriage, sickness ...etc. STREAMS' interventions with female retailers matched the need to empower women to achieve gender equity. On the other hand, post handling and processing training provided to retailers allowed them to increase their income through increasing the fish shelf life and simple processing.

³ Egyptian Center for Economic Studies (ECES) roundtable discussion on "Aquaculture and Fish Industry in Egypt", Cairo January 31, 2018.

B. Effectiveness

Overall effectiveness Score= Very Good/Good based on the following findings:

- ✓ Effective in increasing production in large farms by 16%
- ✓ Effective in increasing large farms and women retailers net profits
- ✓ Effective in reducing GHG emission due to decrease in FCR and water consumption
- ✓ Effective in establishing 544 fish ponds in agriculture farms (integrated/small farms).
- ✓ Effective in policy making related to integrated farms
- ✓ Highly effective in the women retailers' economic and social/psychological empowerment
- ✓ Effective in the Capacity Building of 2 CDAs particularly Shakshouk
- ✓ Effective in the retention of 22,860 jobs among the 3 target groups of which 34% are women
- ✗ Not effective in creating the planned new jobs at the farm level (only 3,407 new jobs were created along the value chain).
- ✗ STREAMS BMP training effectiveness was limited. Feeding practices, water management and fish health were the most effective topics. In general, the training lacked follow-up on practice
- ✗ Limited effect in the Capacity Building of POs
- ✗ Not effective in terms of promoting industrial processing but women retailers were trained on simple processing
- ✗ FishNet was not effective as it was not promoted enough

B.1 Outcome 1

The project worked with 4,297 large farms (107% of original target) predominantly concentrated in Kafr-El-Sheikh Governorate. The project design was based on providing BMP training and new Abbassa strain generation that have faster growth rate. But, due to the spread of Tilapia Lake Virus (TiLV), in mid-2016, WorldFish decided to halt the release of any improved strain from Abbassa. However, the Abbassa strain generation 9 was marketed by hatcheries, who received no supervision to ensure the Abbassa strain was not cross-fertilized with other strains.

The findings are based on a quantitative survey of 189 fish farms, of which 129 of the respondents (68%) received only BMP training, while 57 respondents received both training and Abbassa strain; in addition to 12 IDIs with owners/operators of large farms in 4 governorates and 5 IDIs with PO's.

Indicators: Planned vs Actual

Table 2: Planned Outcome One indicators and achievements (based on field collected data)

Indicators	Baseline	Planned Target	Achieved Target	Comments	score	Score explanation
4000 fish farms in existing fish farming zones adopt productive, efficient and climate-smart aquaculture production practices						
Net income (profits) in 4000 target fish farms increased by \$116 million due to extra production from improved strain and BMP training: (\$44 million/yr) and increased profitability from BMP training: (\$72 million/yr).	\$53 million	\$170 million	<ul style="list-style-type: none"> USD 31.7 million increase in net profit from 2016 to 2018 using exchange rate of EGP17 or USD 67.3 million increase in net profit from 2016 to 2018 using the prevailing exchange rate when the project was designed of EGP8* 	<ul style="list-style-type: none"> Achieved net profit in 2018 for the farms was USD 88 million using EGP 17/1USD) or USD 187 million (EGP 8/USD) Average production per hectare increased from 7.18 in 2016 (based on surveyed respondents) to 8.37 tons in 2018, 16.6% increase; resulting in increase in average net profit per hectare from LE 19,458 in 2016 to LE 30,634/h in 2018, 57.7 % increase. The increase in profit cannot be segregated in terms of cause to the improved strain and BMP training 	3	USD 67.3 million achieved increase compared to the USD 116 planned increase
Improved access to fish for low-income consumers.	20 kg/person/yr	21 kg/person/yr	22.72 (GAFRD 2017 consumption figures are at the national level).	<ul style="list-style-type: none"> This indicator cannot be attributed to the project. All retailers indicated that their fish sales are small size (4-5 fish/ Kg) which represents the type of consumption by the poor. 	1	Plan achieved
GHG emissions reduced by 20% in 4000 target fish farms	3 t CO2 equiv/ton	2.4 t CO2 equiv/ton	2.35 equiv/ton (21.7 % reduction in GHG emissions)	<ul style="list-style-type: none"> GHG reduction is the result of reduction in FCR and water consumption 	1	Plan achieved
10,248 jobs (representing 10,248 households/58,000 family members) created in fish farms and along the value chain as a result of production increases from 4,000 project-supported	0	10,248 jobs created	3,407 new jobs created along the value chain as a result of production increases from 4,297 fish farms (representing 20,410 family members)	<ul style="list-style-type: none"> Based on the updated job assessment survey estimating that every 100 tons of fish produced generates 19 FTE across the aquaculture value chain. No jobs were created at the farm level An estimated 20,625 jobs were retained in the target farms 	4	Estimated 3,407 jobs created compared to 10,248 planned new jobs
Sub-total score (outcome 1))				•	2	

* The Egyptian pound was devaluated in November 2016 from \$1=EGP 8 to \$1=EGP 18; current exchange rate \$1=EGP 17

Table 3: Planned outputs indicators and achievements

Indicators	Baseline	Planned Target	Achieved Target	Comments	score	Score explanation
Output 1.1: Sustainable intensification of production systems in existing freshwater aquaculture zones						
<ul style="list-style-type: none"> • 20% production increase in among 4000 target producers • 20% decrease in food conversion ratio (FCR) in 4000 target producers and • 50% decrease in water consumption among 2000 target producers 	<ul style="list-style-type: none"> • Production: 8 t/ha/yr • FCR: 1.8:1 • Water consumption: 750 m3/ha/day 	<ul style="list-style-type: none"> • Production: 9.6 t/ha/yr • FCR: 1.44:1 • Water consumption: 325 m3/ha/day 	<ul style="list-style-type: none"> • Increase in production from 2016 to 2019 per Hectare was 16.6 % • FCR: 1.41:1 • Water consumption: 473 m3/ha/day (pumping hours was used as a proxy indicator) 37% reduction 	<ul style="list-style-type: none"> • Production: 8.37 t/ha/yr in 2018 compared to 7.18 t/h in 2016 based on field collected data. • The baseline production figure of 8t/ha/yr is overestimated according to the team; so it was not used in calculating the increase 	1 1 2	Achieved vs planned
Output 1.2: Improved governance of existing aquaculture systems						
Health management strategy in place (Goal: Ministry of Agriculture develop and implement fish health management framework.	None	Currently none in place	<ul style="list-style-type: none"> • Health management strategy developed and applied in Abbassa. 	<ul style="list-style-type: none"> • Discussion related to health management strategy was initiated with MoALR. • This indicator was not realistic as it cannot be directly attributed to the project 	5	Steps taken
Increased PO capacity, PO membership & regulatory compliance	40% of target farms licensed	80% of target farms licensed	Evaluation could not calculate % of licensed target due to absence of a national level database.	There is no comprehensive database for fish farms. Accordingly, the increase in fish farm licensing could not be verified.	N/A-	Excluded due to lack of evidence
Sub-total score					2	

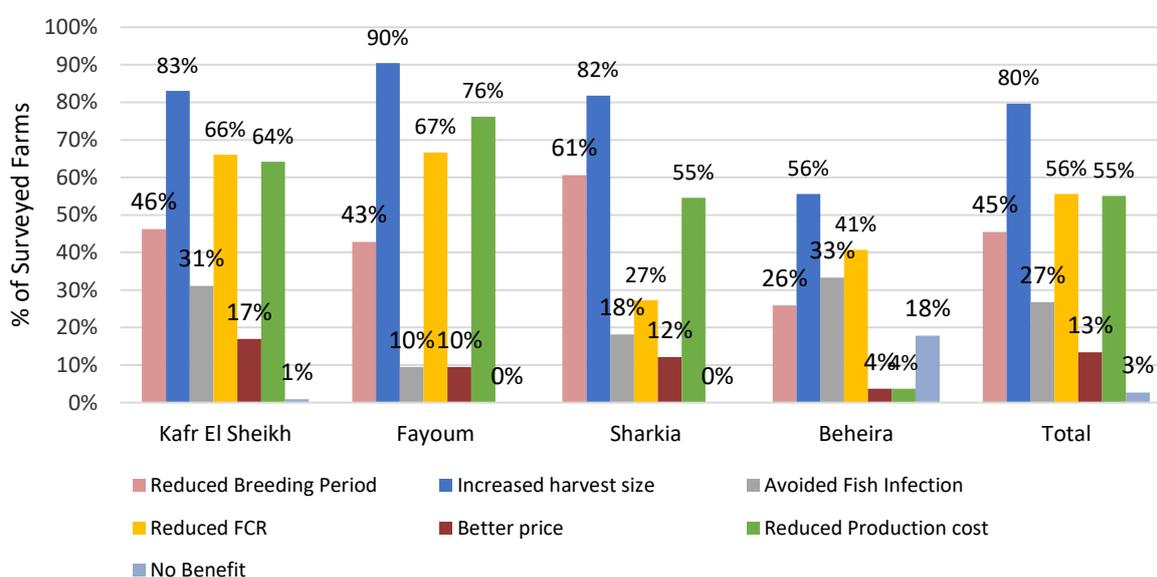
RESULTS ANALYSIS:

❖ Production/Productivity & Profitability

In order to achieve an increase in net annual profit/income, revenues need to increase through an increase in quantities produced and sold and/or, efficient utilization of production inputs to minimize cost with the assumption that the selling price will be the same or higher than in a previous year. Data obtained reveals that the overall average farm area was 12.19 Hectares and the average aquaculture dedicated areas was 11.28 hectares (90%) of total available area.

Figure 1, shows the fish farms perception of the benefits of BMP. Respondents were allowed to select as many benefits as they deemed appropriate. Increased harvest size was cited as the highest benefit, especially in Fayoum, followed by feeding practices, while better price was the least benefit as it relates to market factors.

Figure 1: Large Fish farms perception of BMP training benefits



BMP training aimed at providing the fish farm owner/operator with knowledge related to the efficient use of production inputs: feed, water, seeds, fertilization, and management of fish health problems, thus reducing expenses and mortality rates and increased productivity.

Table 4: Average fish farm net profit per year calculated from selling price per kg in 2018 vs 2016

Governorate	Fish Farm Area (ha)	Selling Price EGP/kg	Cost EGP/kg	Net Profit EGP/kg	Production ton/ha	Total farm production ton	Net profit EGP/farm 2018	Net profit EGP/farm 2016
Kafr El Skeikh	9.79	22.96	19.78	3.18	8.86	87.45	277,859	202,584
Fayoum	6.98	25.62	18.57	7.05	6.29	43.90	309,424	159,479
Sharkia	20.39	21.83	17.25	4.58	7.69	173.04	793,080	391,305
Behera	9.47	20.81	18.54	2.28	9.22	87.25	198,851	136,345
Total	11.28	22.79	19.13	3.66	8.37	95.52	349,595	224,340

In terms of total production of farmed fish in large farms, data indicated that average production increased from 7.18 tons per hectare in 2016 to 8.37 tons per hectare in 2018, 16% increase, which contributed to increase in average net profit from LE 19,458 per hectare in 2016 to LE 30,634/h in 2018, 57.7 % increase.

Sharkia and Fayoum witnessed a 31.7% and 29.7% respective increase in production. Since, Sharkia and Fayoum starting points were very low 5.84 tons/hectare and 4.85 tons per hectare respectively. The achieved production increases were the highest, yet the absolute production figures for Fayoum and Sharkia remained low compared to other governorates. The low productivity in Fayoum was due to the poor financial capacities of the fish farmers that led to buying less fish feed. In addition, Wadi El Rayan suffered from shortage of water.

Data showed that cost of production increased 33% from EGP 14.36/ KG in 2016 to EGP 19.13/Kg in 2018, mostly attributed to approximately 125% Egyptian pound devaluation against USD in November 2016 . The fact that the increase in cost is much less than the devaluation could be attributed to decrease in use of inputs as a result of BMP training. On the other hand, the average selling price per kg also increased by 33.5% in 2018 (compared to 2016) reaching EGP 22.79 per kg; hence ultimately the consumer carried the burden of increase in cost.

Calculation of achieved net profits by the target beneficiaries is usually quite a challenge. Cultural and social habits and norms have their impact on the willingness of the beneficiaries to reveal their real profits in fear of the evil eye and the taxation authorities. Accordingly, profits were calculated using selling price minus cost per kg per year multiplied by average farm production per year in kg.

Annual net profit per farm (average size of aquaculture farm was 11.28 hectares) increased from EGP 224,340 in 2016 to 349,596 in 2018 representing a 56% growth in net profit. In US dollars terms, total achieved net profit per farm in 2018 is equivalent to USD 20,565 (at exchange rate of EGP 17) or USD 43,700 (using exchange rate EGP8). Farms in Sharkia reveal the highest increase in profitability (102%) compared to 2016, Fayoum (94%), Behera (46%) and finally Kafr-El-Sheikh with a low of (37%). Kafr-El-Sheikh showed, the lowest increase in profitability as they were relatively experienced fish farmers and their production was relatively high from the start. Accordingly, the marginal increase in their production, and by default the rate of increase in profitability, was lower than areas with relatively new experienced aquaculture farms. Also, in absolute terms, profit per farm in Kafr-El-Sheikh is much less than Sharkia due to the smaller size of the farms in Kafr-El-Sheikh (on average 9.79 ha) compared to Sharkia (on average 20.39 ha).

With respect to the improved Abbassa strain impact on production. It was extremely difficult to detect as Abbassa has stopped distributing improved strains since the beginning of the project. Hatcheries, in the meantime could have cross fertilized the strain. In addition, not all farmers knew what strain they were buying. However, based on IDIs with large farms, four of the interviewed farmers (33% of the qualitative sample), indicated that the use of Abbassa strain resulted in an increase in production ranging between 15 to 25%, while 6 farmers reported that using the Abbassa strain did not result in production increase. Two of the farmers did not use the strain at all.

❖ **Employment**

Estimated jobs created along the value chain was calculated based on the average increase in fish production per hectare from an achieved average of 8.37 tons/hectare per year in 2018 compared to the **baseline level** of 8 tons per hectare per year. Accordingly, the average production increase was 0.37 tons/hectare per year among the project beneficiaries. Considering that the average aquaculture fish farm area is 11.28 hectares and a total number of beneficiaries reaching 4,297 farms, the total achieved increase in production among the target project beneficiaries amounted to 17,934 tons. Based on the updated job assessment survey undertaken by WorldFish in April 2018 estimating that every 100 tons of fish produced generates 19 FTE across the aquaculture value chain and in transportation service, the

total increase in production for the 4,297 beneficiaries is estimated to have created an additional **3,407 new jobs**.

Employment at the farm level showed no increase in full time jobs created. However, 20,625 jobs were retained, of which 33% were females (4.8 workers per farm). Only in Kafr-El-Sheikh and Behera did women work in farms. Seasonal workers work on average 11.4 days per farm. No seasonal women employed

❖ *Pro-Poor Access to Fish*

Based on secondary data, fish production in Egypt witnessed a considerable increase over the past few years. Total production from aquaculture farms increased from 595,000 tons in 2007 (SDG-2030) to 1 million ton in 2014, 1,36 million tons in 2016 and 1.44 million tons in 2017. The rate of increase in aquaculture production surpassed the rate of increase in population. This means that the per capita share of the produced fish farms increased.

This was confirmed in GAFRD Fish Statistic which states that the average annual per capita share of fish available for local consumption (after deducting exports) in 2017 was 22.72 kg compared to 21.64 in 2016. Surveyed and interviewed retailers indicated that almost all their sold fish is of the 200-250 grams per fish reflects the consumption patterns of the poor. Nonetheless, this cannot be contributed to the project.

❖ *GHG Emissions*

Green House Gases (GHG) come mostly from feed. Improved efficiency of feed usage had direct impact on pollution of surrounding water bodies through nutrient-enriched discharges and its greenhouse gas emissions. Total average FCR in 2018 was (1.41:1) compared to (1.8:1) in baseline, representing 22% decrease in use of feed. Accordingly, it was estimated that there was a reduction in the CO2 equivalent/ton from 3 t CO2 equiv/ton of product at baseline to 2.35 t CO2 equiv/ton, representing a 22% reduction in the emission levels. The GHG emission is a factor of feed and water consumption.

❖ *Water Use*

Usage of irrigation pump was used as proxy indicator to calculate the trend in water consumption levels. 45% of sample reduced irrigation pump usage hours by 37% on average.

In Fayoum and Behera the reported reduction was very limited, which may be due that most farms in Rayan in Fayoum use flood irrigation which originally require no pumping, while in Behera very bad water quality lead to low water consumption.

❖ *Health Management Policy*

A health management strategy was developed for Abbassa and was implemented in WorldFish facility. WorldFish initiated a policy dialogue with MoALR, FAO, CLAR, AHRI and GOVS related to the strategy. Advanced training was provided during November 2018 to professional veterinarian specialist from the competent authorities.

WorldFish upgraded its capacity to adopt bio-security protocol and undertake fish health analyses and begun to perform regular checks on viral disease. Several bio-security workshops and meetings were organized during the year as part of the international conference and separate events. Bio-security training delivered to Abbassa staff and through BMP to fish farmers.

The project worked with GOVS to set the standard of using antibiotic in fish farms as step toward the resumption of exporting fish to Gulf Countries. The government worked with farmers who had received Fish Quality certificate through STREAMS and IDH in the previous year. The project also contributed to the upgrading of the fish health analyses facilities of the Government of Egypt to do regular check analyses for Tilapia Lake Virus locally.

The evaluation findings indicated that the average fish mortality rate among the beneficiaries reached 20.6% with the highest rate (22.3%) in Kafr-El-Sheikh.

❖ **FishNet portal:**

Bashaier (KEF) and GAFRD signed a MOU in the presence of Vice Minister of Agriculture, Livestock and Fisheries on the 3rd of June 2018, whereby GARARD will provide the aquaculture BMP, news and information and advice to be published on the Fishnet, the first Egyptian aquaculture internet platform. The MOU stipulates that Bashaier (KEF) will provide an application to GAFRD to be able to respond to any questions by Farmers. The effectiveness of this platform seems limited due to its outreach, on average 375 visitors per day. Further assessment of FishNet portal is required.

Conclusions:

- *STREAMS was effective in increasing the net profit per hectare from LE 19,458 in 2016 to LE 30,634/h in 2018, 57.7 % increase. Extrapolating from the sample, the project managed to increase net profits for the total farm beneficiaries (4,297 fish farms) to reach USD 88 million/yr (exchange rate of EGP 17) or USD 187 million/year (exchange rate EGP 8). Two factors contributed to this increase: 1) the increase in average production per hectare from 7.18 in 2016 to 8.37 tons in 2018, 16.6% increase and 2) the average increase in net profit of kg of fish from EGP 2.71 /Kg in 2016 to EGP 3.66/ kg in 2018, by 35%. It is worth noting that as a result of the effectiveness of the BMP training which resulted in reduced consumption of feed and water, The cost of production per KG of fish increased by 33% from EGP 14.36/KG in 2016 to EGP 19.13/Kg in 2018, less than the inflation rate. The average selling price per kg, on the other hand increased by 33.5% from EGP 17.07 in 2016 to EGP 22.79 per kg in 2018, indicating that total increase in cost of production was covered by the consumer.*
- *Taking into consideration the status of the Egyptian economy over the past few years, STREAMS was effective in the retention of 20,625 jobs in the target farms. The increase in production, though, was not enough to generate additional direct employment in the target fish farms. However, it is enough to generate additional employment, estimated at 3,407 jobs, along the value chain.*
- *STREAMS was effective in reducing FCR, and water consumption by large farms leading to reduction in GHG.*

B.2 Outcome 2:

STREAMS targeted 544 small farms under outcome 2. The evaluation team conducted a quantitative survey on a sample of 74 small fish farms in 3 governorates namely, Sharkia, Menia and Fayoum. Except for Fayoum, all collected information was completed through phone calls. Qualitative information, on the other hand, was based on the surveyors' informal discussions with the interviewees.

INDICATORS: PLANNED VS ACTUAL

Outcome Indicators	Baseline	Planned Target	Achieved Target	Comments	score	explanation
Technical and regulatory barriers are overcome in order to foster the adoption of equitable, productive aquaculture production systems by the poor and vulnerable						
200 jobs (50% women) created in small-holder fish farms	0	200 (50% women)	No newly created jobs	On average 2.18 jobs were retained per farm with a total of 1,186 jobs in all farms, none of them is women	6	No achievements
Net profits from small-holder fish farms of \$162k	0	\$162 k	41% only of the farms were selling fish; their estimated net profit is \$259.6 k (exchange rate EGP 17); Or \$551.7 k (exchange rate EGP 8)	Extrapolating total potential profit for the 544 farms is EGP 10,766,304. But actually this potential profit is in the form of fish consumption. 59% of the Small farms reported eating fish 8 times a month.	1	Exceeded target
Inclusive (pro-poor) aquaculture policy framework in place	policies only allow aquaculture in designated zones, excluding small-holder aquaculture	policies encourage small-holder farmers to develop integrated aquaculture-agriculture systems	GAFRD decree No. 999/2018 recognized the integration of agriculture and aquaculture activities.		1	achieved
Sub-total score (outcome 2)					3	Good

Table 5: Planned Outcome Two Indicators and achievements (based on field collected data)

Table 6: Planned output indicators and achievements

Indicators	Baseline	Planned Target	Achieved Target	Comments	score	explanation
Output 2.1: Small-holder aquaculture production systems tested, demonstrated on-station and on-farm						
500 smallholder farms established creating 200 jobs	0	200 (100 jobs for women and 100 jobs for men)	No new jobs were created	<ul style="list-style-type: none"> On average small farms employ 2.18FTE and 4.6 Seasonal Employment 1,186 jobs were retained (544 farms) 	6	
Dietary diversity and income improved in 500 smallholder households	0	<ul style="list-style-type: none"> fish farming households eat fish 2 times per month net profits of \$324 per farm/yr 	<ul style="list-style-type: none"> fish farming households eat fish 8 times per month Estimated annual net profit per farm increased from EGP 12,036 (2017) to EGP 19,791 (2018). In USD terms, total achieved net profit per farm in 2018 is equivalent to USD 1,164 (at exchange rate of EGP 17) or USD 2,474 (using exchange rate of EGP8). 	<p>Estimated net profit per farm per year is based on 41% of the surveyed sample who sell their production.</p>	1 1	Exceed target
Output 2.2: Small-holder aquaculture production systems promoted as a diversification option for poor farmers						
Small-scale, integrated aquaculture-agriculture systems actively promoted as a livelihood option for small-holder	None		Expert consultation workshop on integrated aquaculture and agriculture held June 2018 attended by Vice Minister of Agriculture.		2	

Indicators	Baseline	Planned Target	Achieved Target	Comments	score	explanation
farmers by extension services and NGOs in target areas.						
Sub total score					3	

RESULTS ANALYSIS:

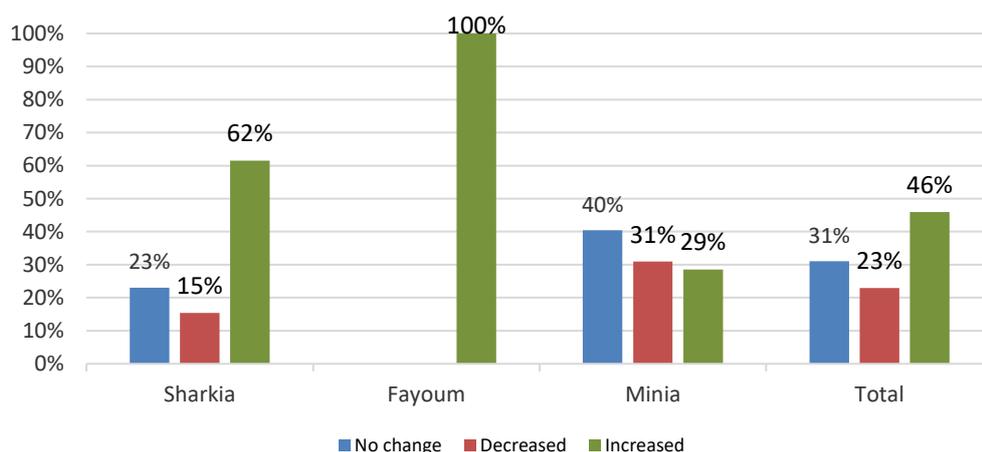
❖ *Production/productivity and Profitability*

Small holder fish farmers are relatively new farms that are based in agriculture farms. Small fish farms usually represent a very small percentage of the total farms' areas. Based on collected data, the average fish farm area was 0.23 hectare representing less than 1.5% of the average total farm areas. The integrated approach aims at maximizing benefits through complementing farming of crops with aquaculture. Fish becomes a source of natural fertilizers as well as generating additional income for the farmers (directly through sales or indirectly through family consumption of the produced fish).

59% of the respondents received BMP training while 28.4% received both BMP and Abbassa Tilapia strain. 89% of the respondents joined the project in 2016/2017. Accordingly, the expected benefits from the project interventions should be witnessed. Only 8% joined the project in 2018.

The beneficiaries' perception related to the benefits reaped from the interventions of the project indicates that reduction in production cost was cited as the highest benefit (66%) followed by increased harvest size (45%) and reduced breeding period 36%. In Menia, avoiding fish infections was reported by 52% of the respondents, higher than increased harvest size. Reduced FCR was only reported by 4%.

Figure 2: Small-scale fish farms respondents' views on farm revenue from aquaculture ponds after participating in project



Aquaculture production in small scale fish farm is not intended for profit. The main goal of fish farming for most of the small-scale fish is to fertilize water with fish waste and use it in irrigating agriculture land. Collected data indicated that only **41% of small-scale fish farms sell their fish**; 15% in Sharkia, 50% in Fayoum and 55% in Menia. The majority of fish farm tends to mostly consume the fish and distribute it to relatives and friends. 15 small farms (20%) reported stopping the activities due to losses and fish mortality, of which 5 reported 100% mortality rate. The farmers attributed this high mortality rate to negligence on their side. This confirms the need for technical support to small farms who are predominantly inexperienced aquaculture farms (average experience in aquaculture is 3.4 years).

Table 7 - Average small fish farm net profit per year

(Calculated from selling price per kg in 2018 based on the 41% that sold their fish production)

Governorate	Aqua-culture Fish Farm Area (ha)	Total farm production Ton 2017	Total farm production Ton 2018	Cost EGP/kg 2018	Selling Price EGP/kg 2018	Net Profit EGP/kg	Net profit EGP/farm 2017	Net profit EGP/farm 2018
Sharkia	0.08	425	450	14.40	22.50	8.10	2,338	3,645
Fayoum	0.09	4,688	5,588	12.25	21.67	9.42	26,953	52,615
Menia	0.34	3,180	4,408	19.91	21.36	1.45	3,521	6,382
Total	0.23	3,213	4,285	17.00	21.62	4.62	12,036	19,791

Production in Fayoum is highest though aquaculture area is less than Menia as 67% of the respondents used feed purchased from companies compared to 45% in Menia and 23% in Sharkia. Total average production increased by 33% from 3,213 kg in 2017 to 4,285 kg in 2018.

In 2018, cost of production of 1 kg increased to EGP 17 per kg (52% increase from to 2016) and also average selling price per kg., increased from EGP 14.25(2016) to EGP 21.62 (2018), an average increase of 52%. As with the big fish farms, the producers were able to push all of the production cost increase to the consumers and accordingly net profits per farm increase is attributed to increase in production.

The evaluation team calculated the potential average net profit per year (EGP/farm/yr) for 2017 and 2018 using selling price per kg minus cost of one kg per year multiplied by average farm production per year in kg. Based on this calculation, annual net profit per farm increased from EGP 12,036 (2017) to EGP 19,791 (2018) representing a 64.4% growth in net profit. In USD terms, total achieved net profit per farm in 2018 is equivalent to USD 1,164 (at exchange rate of EGP 17) or USD 2,474 (using exchange rate of EGP8). Farms in Fayoum reveal the highest increase in profitability (95%) in 2018 relative to the previous year.

❖ **Employment**

The project served 544 fish farms which exceeds the planned target. In terms of employment, there were no newly created jobs. The survey showed an average of 2.18 full time people employed per small scale fish farm both before and after the project; in addition to 4.56 seasonal people for an average of 1.89 days giving an average total number of 9 working days per farm. There were no full-time women employed within the sampled farms. Women are employed on a seasonal basis. Thus, the survey does not indicate any increase in labor but rather jobs retained. It is the evaluation team opinion that those working in the aqua farm are the same labor working in the agriculture land. The fact that the target small fish farms were able to retain their personnel whether full time or seasonal works is a positive result in itself.

In terms of potential jobs along the value chain, the average increase in production per farm between 2017 and 2018) was 1,072 kg which resulted in a total increase in production for the 544 fish farms valued at 583,168 kg i.e. 583 tons. Using the previous calculation of 19 FTE per 100 tons, results in an estimated figure of 111 jobs along the value chain.

❖ **Inclusive Policies**

Over the last few years, the government showed increased interest in aquaculture in general. Recently, however, due to concerns related to water conservation and efficient utilization, the political will and interest increased in favor of integrated small aquaculture farms as well. As an outcome of the WorldFish

organized “Expert consultation workshop” on integration of aquaculture and agriculture dated 20-21 June 2018, GAFRD issued Decree 999/2018 which stipulated that aquaculture activities and aquaculture farms are considered an important agriculture activity that produces fish that is needed to provide a protein source of nutrition. Also integrated aquaculture farms (farms that cultivate fish and crops) are one of the important agriculture activities and a source of irrigation to agriculture crops necessary to maintain water resources and reduce the use of fertilizer for agriculture land. This was a significant step in support of the integrated approach and allows small fish farms to be licensed.

WorldFish had a long and effective cooperation with the MoALR and Aquatic institutions in Egypt. Following are the different interventions undertaken in support of developing an inclusive aquaculture policy framework as follows:

- WorldFish signed MOU with the Egyptian Countryside Development Company (ECDC), Cairo to promote sustainable aquaculture expansion as a means of developing un-reclaimed lands in Egypt.
- The SDC-funded STREAMS project and GIZ-funded AquaLINC project, supported survey activities to: 1) increase supply of more affordable and more nutritious fish to poor consumers; and 2) to test sustainable aquaculture practices that meet the ‘bottom of the pyramid’ demand for tilapia in Egypt. A report was drafted summarizing the findings from a mixed-methods survey of intra-household fish preferences and consumption conducted in 2017.
- Egyptian Aquaculture Innovation Platform two-days workshop discussed how to scale up the production of small size tilapia among fish farms. The Innovation Platform Workshop closed by establishing groups to follow the new innovative solutions with Giza systems and KEF, as well as the investment opportunities in the aquaculture sector.
- The CUEWR with the assistance of CARE organized a workshop on November 15, 2019 attended by MoALR vice Minister and 180 participants to discuss the sector problems.

❖ *Dietary Diversity*

The survey showed that average monthly family consumption of fish was 22kg, for an average size of 5.19 persons, the share of each family member would be 4.2 kg per month, which would be sufficient for 8 times meals per month with an average of 500 g per person per meal. 42% of sample reported increase in family consumption of fish.

Conclusions:

- STREAMS was effective in establishing 544 integrated farms, of which 41% of the farms who sold their fish (223 farms) in 2018 achieved total profit of EGP 4,413,393. Extrapolating total potential profit for the 544 farms, is EGP 10,766,304.
- 1,186 jobs were retained in 544 established aquaculture small farms within agriculture farms, none of which were female. No new jobs created at the farm level.
- STREAMS influenced the issuance of GAFRD decree No. 999/2018 recognizing the integration of agriculture and aquaculture activities.
- Small farms’ families eat fish 8 times a month, with an average of 500 g per person per meal.

B.3 Outcome 3

STREAMS targeted 2000 retailer in two governorates namely Fayoum and Kafr-El-Sheikh under outcome 3. The evaluation team conducted a quantitative survey on a sample of 151 retailers. Qualitative tools conducted included two focus group discussions, 6 IDIs with retailers and 2 IDIs with CDAs’ field officers.

INDICATORS: PLANNED VS ACTUAL

Table 8: Planned Outcome Three Indicators and achievements (based on field survey)

Indicator	Baseline	Planned	Actual	Comments	score	Explanation
Improved quality of fish markets; systems in place to extend effective shelf life	1 day	3 days shelf life	2.46 days shelf life	The planned shelf life of 3 days was not achieved due to consumer preference of fresh fish.	2	Achieved vs planned
Access to fish improved through wider distribution	1 day/week	Farmed fish available 3 days/week in key villages	<ul style="list-style-type: none"> • Most villages have one 1 day/week market. • Shakshouk village in Fayoum has a permanent market that was established under IDIDEAS • Some villages do not have a market. 	On average retailers work 5.75 day/week as they sell in different markets and sometimes in the streets	5	5 mkts, only one operating full time
Improved livelihood indicators and profitability for informal retailers	\$1/day*	\$2 /day	EGP 204/ day equivalent to \$12 / day (exchange rate \$1=EGP 17)	<p>Evaluation team found the \$1/ day baseline highly underestimated, while IEIDEAS Impact Assessment study indicated a net profit of 10 US\$/day.</p> <p>Based on FGS & IDIs, daily income increased from approx. EGP 125/day in 2016 to the current level</p>	1	Exceeded target
Sub-total (outcome 3)					3	

Table 9: Planned output indicators and the achievements (based on the quantitative data)

Indicators	Baseline	Planned Target	Achieved Target	Comments	score	explanation
Output 3.1: Aquaculture market system upgraded resulting in improved fish quality at point of sale and economic empowerment of poor informal retailers						
- jobs retained in fish retailing - jobs created in fish processing	0	- 1000 women (5,700 HH members) - 100 (70 women, 30 men, total 570 HH members)	1050 jobs retained in fish retail (100% females according to CARE reports) 109 job opportunities were created. as reported by CARE	- Evaluation team was unable to verify number of retained jobs as a result of STREAMS. - 39% of the surveyed women retailers reported that the project supported them in retaining their jobs. Only 19 of the 150 (13%) of surveyed women were not selling fish at the time of the evaluation.	2 5	82% of surveyed retailers were actively working. 13% of sample new jobs
retailers and wholesalers trained and using best practices	0	2,000 retailers 50 Wholesalers	1998 women trained as reported by CARE. 75 wholesalers in Kafr-El-Sheikh and Fayoum attended two seminars discussing the role of wholesalers in the VC and the challenges they face.	- Retailers received training on post-harvest handling and simple processing which they were actually practicing. Some also received TOT related to women empowerment issue - The seminars conducted for wholesalers were not training.	1 6	All surveyed retailers received some form of training Wholesalers did not receive training
Farmed fish promotion campaign launched	0	1	1	Egyptian Tilapia marketing campaign took place on March 28, 2017 to build brand for tilapia and improve aquaculture marketing methods.	1	achieved
Output 3.2: Opportunities created for increasing fish sales, for improved distribution systems and value addition through processing						

Indicators	Baseline	Planned Target	Achieved Target	Comments	score	explanation
Fish processing operations supported through product development, training and business mentoring	0	20	<ul style="list-style-type: none"> - 2 food processing companies started fish processing as reported by CARE - 2 fish processing companies under establishment as reported by CARE - 55 Women trained on simple processing operations 	Evaluation team understood processing to mean industrial operations, which was not achieved	6	No industrial processing
Sub- total score			-		3	

RESULTS ANALYSIS

❖ Quality of Fish

The climate in Egypt is relatively hot especially during the summer, accordingly, the retailers face difficulty in maintaining the fish in good condition during the market time and overnight. 54% of the surveyed working retailers used ice to maintain the quality of the fish during the day while 31% kept it alive in water and 27.4% used iceboxes with ice.

The project implemented several interventions with the aim of increasing the shelf life of the fish, which in turn means additional income for the retailers. STREAMS provided almost 2000 VSLA members with post-harvest best handling practices as well as provided 115 retailers with iceboxes to help them maintain the fish.

Based on IDIs and FGDs, women retailers stated that after receiving training on fish handling post-harvest, many of them practiced changing the water for the fish every hour, adding salt and ice to the water, and putting fish immediately in icebox with crushed ice when it dies. In addition, women were trained on how to properly freeze the unsold fish.

The quantitative survey, however, indicated that 63% of those who are currently working do not keep fish overnight. This reflects a better management and marketing capacity by the retailers. As for the remaining 37% who kept their fish for days, respondents indicated that on average they were able to maintain the fish in a customer acceptable condition for 2.46 days.

Women interviewed through the IDIs and FGDs stated that most of them have freezers in their homes or in their shops and they freeze any fish that is not sold same day after cleaning. Hence, they can sell it frozen for a long period in a good condition to certain clients particularly working women but still at lower price than the fresh.

Other than the collected data from the retailers, the evaluation did not do a specific study of the quality of fish in the markets. A separate "Market quality assessment" was supposed to be conducted as one of the project outputs.

❖ Access to Fish

Markets Abu Mostafa, El Hasafa and EL Riyad , Kafr-El-Sheikh, are only open for one day in, while there is no market in Maazoor and retailers had to travel to other nearby villages to sell their fish. As for Fayoum, Shakshouk market, which was established by CARE through the previously implemented IEIDEAS project, was open all week. In addition, as a result of lobbying efforts done by the retailers, the minibus terminal was moved to be nearby the Shakshouk market which facilitated commuting for both the retailers and the clients. However, there were no markets in Abu El Aish and Soliman villages. Retailers in Shakshouk appreciated having a permanent market.

Most of the retailers (87%) sold their fish in markets whether inside their own village (if available) or outside, of which 29% sold their fish in only one market, and the remaining (58%) sold their fish in more than one market (2 to 7 markets) while 13% do not sell their fish in markets. On the other hand, data indicates that retailers worked on average 5.75 days per week in peak and 4.6 in off season.

It is worth mentioning that the project managed to have an agreement with the Local authority in Kafr-El-Sheikh's to upgrade fish markets to improve working condition of retailers.

One of objectives of establishing FishNET portal was to provide market online where fish buyers and sellers can be directly in touch. FishNet platform daily visitors are on average 375 visitors, 11,250 visitors per month and on average 136,875 per year. The effectiveness of this portal is limited due lack of promotion as most surveyed sample of large and small farms and retailers did not know about it. FishNet will also promote small projects in the field of aquaculture.

❖ **Profit and Improved livelihood**

Table 10: Average profit EGP/kg (Selling price – Buying price) in peak season

	Tilapia		Mullet		Mackerel		Other	
	Total Profit EGP/KG	%						
Kafr-El-Sheikh	4.6	20%	5.6	16%	4.0	12%	4.4	19%
Fayoum	2.4	9%	3.9	11%	2.5	10%	4.9	11%
Total	3.5	14%	4.9	14%	3.1	11%	4.8	12%

Based on data available for the average buying and selling prices, achieved profit for the last working day and for peak season for the frequently sold species were calculated. On average, the retailer made between 3 to 5 EGP per kilo in profit.

Table 11: Average gross profit per retailer per day

	Tilapia	Mullet	Mackerel	Other	
Average quantity purchased per retailer per day (EGP)	46.2	15.5	4.5	7.0	
Average profit per kg	3.5	4.9	3.1	4.8	
Total Profit per retailer per day (EGP)	162.2	75.3	14.1	33.7	285

Daily profitability was significantly higher for Kafr-El-Sheikh retailers than for Fayoum retailers. Taking the tilapia which was the highest fish traded in both governorates, quantities sold in Kafr-El-Sheikh were relatively higher and at a lower cost compared to Fayoum retailers. Retailers in Fayoum purchased live fish from traders coming from other Governorates at a higher price. Furthermore, Fayoum is often cited as one of the poorest governorates in Egypt and accordingly the living standards are probably lower than in Kafr-El-Sheikh which affects the profit margin that the retailers can apply. Data indicated that margin of profit for tilapia was 13% and 14% for mullet and marcel. On average, gross profit/retailer/day was calculated at EGP 285, equivalent to 16.6 US\$ (EGP17 Exchange Rate).

In order to come up with the net profit and since the survey did not provide data on expenses, the evaluation team used the calculated average operating cost for women retailers provided in the Impact Assessment of IEIDEAS project, which indicated that the operating cost on average for retailers was estimated at 28% of their daily earnings. Accordingly, net profit per day was estimated at EGP 205 equivalent to \$12/day (using \$1 = EGP 17 exchange rate) which is much higher than the planned net profit of \$2. The evaluation team is of the opinion that the net profit of \$1/day/retailer used in the baseline was highly underestimated.

Two important reservations related to daily profit values are:

1. Women retailers usually receive help from a family member, thus the achieved average profit per day was most likely for the retailer and other family member
2. Retailers usually underestimate the quantities sold and profitability per kg for cultural reasons.

Out of the 124 retailers in business, 105 retailers (65 in Kafr-El-Sheikh and 40 in Fayoum), representing 85%, indicated that the project improved their family income. The following factors were instrumental to their increased income:

- VSLA provided retailers access to financial liquidity with no paper work or difficult procedures, which helped them, increase their profits due to expansion and /or purchasing the fish on cash basis at lower prices.
- The provision of fish related equipment such as ice box, scale, cutting and cleaning tools, and grills to women as grant with only 25% beneficiary contribution had a significant impact. The iceboxes increased the shelf life of the fish and retailers were able to avoid reduction in the fish price at the end of the day. The scales saved the retailers any loss due to inaccurate measurements, loss of customer due to time delays to borrow a scale from neighboring retailer, and extra expenses due to renting a scale from other retailers. The tools for cleaning, cutting and grilling resulted in added value due to processing. For example, the retailer gained an extra EGP 5 per kg when grilled.
- Received training allowed the retailers to keep the fish fresh and in good condition for longer hours, thus avoiding price reductions due to fish perceived deterioration.
- Training on marketing skills and communication with the client helped them in retaining their clients.
- 60 retailers out of the 124 surveyed retailers in business, representing 48%, indicated that they had other income generating activities that provided them with a source of income other than selling fish. Raising chicken and ducks appeared to be the most common activity that they do. According to the project reports prepared by CARE, the project provided 9000 ducks to 318 beneficiaries, 28 ducklings on average. Providing ducklings and feed was cited by the retailers as the one of the most desirable project interventions, especially that they used the residuals of the fish to prepare feeds for their ducks. On average profit per duck is EGP 10 after 45days – two months of breeding, (refer to the success story of Doaa Sayed from Fayoum).

The most significant impact of the increased profit is the ability to spend on private lessons and provide better educational chances to the children as stated by most women. Some said that they improved their diet either due to increase in fish or duck consumption. Several women stated that they were able to buy the necessary items for their girls' marriage and others were able to deal with sudden illnesses in the family. Indirectly, STREAMS built strong linkages/partnerships between the fish retailers, while before the VSLA they only considered themselves competitors. It is worth noting that most of the women fish retailers in Shakshouk and nearby villages supported their families while their husbands traveled to Aswan for fishing due to the limited fishing in Lake Qaroun.

❖ **Employment**

Evaluation team did not track new jobs created. 39%, of the surveyed sample pointed out that the project allowed them to continue working; thus retaining their jobs.

According to the surveyed sample, 82% were actively working as retailers at the time of the survey while the remaining had stopped. For the 27 retailers who stopped working, most of them stopped for other personal reasons related to sickness of the retailer or a family member or raising children, while 8 retailers stopped for the increased price of fish. 14 of them showed interest to return to retailing business.

The project provided 84 retailers, representing 68% of the sample, with some tools that helped them retain their business and increase income such as ice boxes, cleaning and preparation tools, fishing uniform, oven and digital scale. Out of the 124 retailers still working in the retailing only 1 case in Kafr-El-Sheikh indicated considering dropping out of the fish retailing business due to her old age and sickness, this reflects the interest of the retailers to retain their jobs and that they are satisfied with the business.

65 women retailers (52.5%) of the surveyed sample received help in selling their fish from 91 persons (45 women and 46 men) usually family members, which were considered retained jobs.

No new Jobs created from processing operations were detected among retailers rather fish processing impacted income increase as mentioned earlier.

❖ **Using Best Practices**

The survey indicated that 82 retailers (61 in Kafr-El-Sheikh and 21 in Fayoum) out of the 151 representing 54% of total retailer sample received training on best practices.

CARE indicated that fish wholesalers were a difficult target group to address due to their busy schedule. Two seminars were conducted in Kafr-El-Sheikh and Fayoum close to the end of the project attended by 75 wholesaler. The seminars included focus group discussions on the role of traders in the fish VC and recommended improvements. The seminars were useful in studying the role of wholesalers for future interventions but could not be considered training. The evaluation team succeeded to meet one of the wholesalers who attended the seminar and his feedback was that the seminar addressed general issues related to the aquaculture sector.

❖ **Processing**

Fish retailers were trained on using different cooking methods, especially for tilapia through the Egyptian Chefs Association. However, the table shows slight increase in other form of sale to end consumer and accordingly increased the profit of the retailers.

Table 12 – Percentage of Retailers Sales by Type of Processing

	Fresh	Gutted	Fillet	Frozen	Cooked	Fumigated	Other
Before the project	92.60	3.24	0.00	0.89	1.73	0.00	1.53
After the project	90.18	4.48	0.00	1.25	2.22	0.00	1.88

Conclusions:

- *STREAMS was effective in increasing net profit of retailers from selling fish to reach EGP 205/day as a result of: 1) access to liquidity through VSLA to pay in cash for purchased fish, 2) post-harvest handling training resulting in increased shelf life, 3) improved marketing capabilities due to training and project distributed items such as iceboxes, cutting and cleaning tools and grills, and simple processing such as gutting and cooking fish as a result of training. In addition, the project helped some retailers to breed ducks as a second source of income. Improved income mainly led to access to private lessons and medical services for their children.*
- *STREAMS supported retailers in retaining their jobs. 82% of the surveyed sample were working at the time of the evaluation and those who stopped were due to medical reasons or lack of finance. 39% of the surveyed women retailers attributed retaining their jobs to the project.*
- *Post-harvest handling practices training would probably lead to improved quality of fish; however the evaluation did not assess this issue.*

B.4 Cross Cutting Themes

❖ **Capacity Building of Partner Organizations**

STREAMS intended to focus on sustainable intensification and improved management of the existing fish farming sector through supporting capacity building of producer organizations and key government organizations such as GAFRD and GOVS.

WorldFish delivered training on Best Management Practices (BMPs) of fish feeding and pond water quality to General Authority for Fisheries Resources Development (GAFRD) extension officers in GAFRD office in Cairo in June 2017.

CARE International, as the sub-contractor to WorldFish, signed an agreement with the Cooperative Union of Egyptian Water Resources and through which they worked with 3 POs in accordance with the CUEWR's proposal. The POs agreed that the project provided some of the needs of the sector but that there is much more needed such as encouraging investors to enter into the fish processing industry, providing large refrigerators in the wholesale markets, and treatment of drainage water.

Kafr-El-Sheikh PO membership increased from 296 to 636 members as a result of the cooperation with CARE International under STREAMS project. In Fayoum, Rayan area, the project deepened the water-path serving fish farms. 15 farms stopped working due to lack of water prior to the deepening.

Behera PO presented to CARE International a request for cooperation to establish a water analysis unit with a total cost of LE 40,000 to serve farms in Behera, however the request was rejected. Fayoum PO complained that they agreed with CARE International to establish a pumping station but it was not implemented.

19 farmers out of 189 surveyed large farms are members of Producers Organization, 10 of which (8 in Kafr-El-Sheikh and 2 in Behera) received services from the PO. Only four of the interviewed large farms, two from Fayoum and two from Behera reported being members in their relevant POs. For small farms only 2 in Menia were members of the PO. However, they all added that they benefited nothing from this membership. The evaluation team finds this an indicator of lack of coordination between CARE implemented work under outcome 3 and WorldFish work under outcome 1.

Implementation of outcome three was in partnership with two CDAs, one in Kafr-El-Sheikh "El Riyad" and one in Fayoum "Shakshouk". Both STREAMS and IEIDEAS helped El Riyad and Shakshouk CDAs build strong linkages with a significant portion of their communities namely fish retailers. This was evident in all of the field work related to the fish retailers, all of which was conducted in the CDAs premises. When asked, many of the women retailers did not know these CDAs prior to the project and the formation of VSLA groups.

❖ **Women Empowerment**

The project encouraged the formation of partnerships among women retailers. Kafr-El-Sheikh women retailer focus group participants mentioned that if four women joined forces together, the project provided them with an oven, gas bottle, scale and ducks and each mobile unit was given to 3 women retailers. For example, 4 women from El Riyad, two of which were introduced to selling fish through the project came together and formed partnership and each contributed EGP 3000 which they each got as loans from the VSLA group. They used the capital to rent and equip a shop and the project provided them with an oven, gas bottle and scale with 25% contribution from the women. They are currently working together, are selling fish in a better environment, and are able to sell the fish in different forms: fresh, iced, frozen, salted, grilled and cooked. Two other women from Raghama joined forces and are currently buying and selling the fish together, which gives them the advantage of being in more than one place and can exchange information on the sales volumes and prices. It is worth noting that this reflects on the gender empowerment theme.

Improved communication channels between women retailers and government and non-government officials and among the retailers. Through the project, two retailers committees were established under the two partner CDAs with mandate of resolving the retailers problems. The committees' board members are all women and elected by the retailers. The committee's elections was an educational process in good governance. Both committees lobbied with the city councils to stop them from bothering retailers in the streets as the council used to prevent retailers from selling in the streets. Also, the committees started buying plastic bags and selling it to retailers for packaging at lower prices than what they used to pay. Fayoum retailers committee requested from the city council the establishment of markets in villages that

does not have markets like Soliman village and is currently assisting in issuing IDs for the retailers. Even though not all retailers were aware of the committee and its role, yet it is a significant step in organizing retailers, forming a lobbying power with various entities and creating a mechanism for resolving their internal problems.

All women who received any form of grants: iceboxes, scales, ovens, grills, mobile units, swimming suits and ducks had to pay 25 percent contribution, which was reflected in their sense of responsibility and ownership. Women retailers' recipient of these grants expressed great appreciation of what they received. STREAMS as well as IEIDEAS were able to identify the real needs of the retailers.

C. Efficiency

Overall Efficiency Score= With Problems based on the following findings:

- ✓ **STREAMS total final expenses were in line with the approved amended budget in March 2019.**
- ✗ **STREAMS management structure was not efficient as it lacked field level personnel**
- ✗ **STREAMS had limited coordination between the different project components.**
- ✗ **STREAMS monitoring system had no monitoring at the output and outcome levels.**

C.1 Financial Efficiency

The total approved budget for the project, as stated in the signed agreement (last modification March 2019) was a total of CHF 1,999,573 of which CARE's share was CHF 469,044. The approved budget versus actual expenditures as April 2019 shows no major deviations from the approved budget as follows:

The agreement between WorldFish and CARE was adjusted to reflect a reduction of CHF 35,000 as per the last signed agreement between WorldFish and OIC. Final project expenditures indicates that CARE final expenditures amounted to CHF 432,877 representing 86% of the originally approved budget.

Total final expenses by budget line item were in line with the amended approved budget. Accordingly, there were no major deviations in the line items. However, based on the estimated budget, total personnel cost (both WorldFish and CARE) combined with the operation and overhead cost amounted to CHF1.4 million representing 70% of the approved total project budget. This is a relatively high percentage considering that there were very limited field monitoring personnel.

In terms of project achievements, CARE was primarily responsible for the implementation of the interventions planned under Outcome 3 while its share in the final project expenses was 22%. With this funding level, Outcome 3 achievements related to the fish retailers was significant and highly appreciated by the women retailers as explained before. Other than this note, financial reporting on the project and the provided budget is very broad to allow for any analysis of the cost effectiveness and efficiency related to the project outcomes and outputs. As such, the evaluation team was not able to draw any further conclusions.

C.2 Project Management/Organizational Structure

In spite of the extensive planned activities and number of target beneficiaries, the project was implemented with very **limited field personnel**. BMP training was provided through the selection of trainers who received training of trainers and were then used to provide the training to the different target group and provide WorldFish with feedback. The beneficiaries were not visited regularly to ensure that the training topics were sufficiently apprehended and applied. There was no sense of partnership created in the field between the project and the target beneficiaries. Actually, the name of the project

and WorldFish were not known to the benefiting fish retailers. Since there was very limited follow-up, arising problems facing the beneficiaries in the field were not addressed. CARE, on the other hand had two field coordinators as well as worked through two CDAs, one in Kafr-El-Sheikh and one in Fayoum which helped in strengthening the field presence. Nonetheless, most retailers identify the project with the name of their VSLA groups.

WorldFish developed strong working relationship with MoALR through the Vice Minister. At the beginning of STREAMS the relationship between WorldFish and MoALR witnessed some challenges after WorldFish and partners published a paper about presence of Tilapia Lake Virus in Egypt. However, throughout the project, the relationship improved significantly and WorldFish team met frequently with Dr. Mona Mehrez, the Vice Minister for Livestock, Fisheries and Poultry to strengthen the relation in research and development activity for benefit the sector. The continuous discussions between WorldFish and relevant government agencies combined with the current political leadership interest in development of fisheries resources as tools to meet the growing demand of animal protein, resulted in the development of policies that helped enhance the aquaculture sector.

C.3 Communication/Coordination

WorldFish worked on having a strong relationship with MoALR and research institutes. On the other hand, CARE built good relationships with the CUEWR, 3 POs and 2 CDAs. However, these relationships were not shared with WorldFish.

The evaluation team observed that coordination between the different activities as well as between the two implementing parties namely WorldFish and CARE was very limited. CARE built the capacity of 3 POs but due to lack of coordination with WorldFish, the project large and small farm beneficiaries did not join the POs, thus limiting the effectiveness of the capacity building. Furthermore, there was no attempt to link the fish retailers to wholesalers even in discussions, though both were target beneficiaries for CARE activities. Beneficiaries in the different governorates did not exchange any experiences to maximize benefits.

Fish Net was not linked to any of the beneficiaries whether large or small farms and the application was not even tested among the project beneficiaries. Furthermore the CUEWR was not familiar with the application neither were the POs.

Research on “Promoting Intensive Pond Raceway Systems” (IPRS) was only shared in the harvest day.

C.4 Monitoring

STREAMS monitored activities rather than results and indicators and partially, that was a result of the project design focus on activities. In addition, STREAMS did not have an M&E officer from the beginning of the project but as a result of mid-term evaluation recommendation, an institutional M&E Officer was posted to Egypt. No monitoring was done on productivity, profitability, job creation and beneficiaries’ satisfaction.

The BMP leader provided overall guidance on the type of training, number of trainings provided, as well as, number and type of trainees (whether farmers or students) and quality check. However, the evaluation team observed that the trainers did the selection of the farm trainees arbitrarily. Furthermore, data collected on beneficiaries was done once and not updated regularly. Monitoring did not address quality of training content, trainers’ methodology, training duration and place..etc. Trainers had self-interest in providing positive results. The CDAs kept better data on the retailers due to the VSLA MIS.

As for the project impact, there was no planned impact indicators.

D. Sustainability

Overall Sustainability = Good based on the following findings:

- ✓ **STREAMS achieved benefits are sustainable as farmers who enjoyed production and profitability increase will continue to practice acquired practices**
- ✓ **STREAMS achieved benefits for women retailers are sustainable since VSLA groups are sustainable by nature as well as post harvest, marketing and processing skills.**
- ✓ **STREAMS's CDA partners particularly Shakshouk built its capacity to sustain its linkages and services to women retailers**
- ✗ **STREAMS capacity building of the POs requires further work in order to allow them to play a role in serving their members and act as a pillar of sustainability**

The project sustainability was based on the capacity building of institutions mainly the CUEWR, POs and CDAs; as well as elected retailers committees, which was CARE's responsibility.

WorldFish provided BMP training to GAFRD personnel and students who are the future aquaculture experts. In addition, twenty-five percent of trainers were board members of fish producers associations and twenty percent of them are working in fish feed companies, which was an added factor for the sustainability. It is, however, the evaluation team's recommendations that for future initiatives, trainers should be evaluated to allow for the selection of the best.

The project impact on policy changes has a sustainable impact on the aquaculture sector as a whole, particularly GAFRD Decree 999/2018. The decree stipulated that aquaculture activities and aquaculture farms be considered an important agriculture activity that produces fish that is needed to provide a protein source of nutrition, a source of irrigation to agriculture crops necessary to maintain water resources and reduce the use of fertilizer for agriculture land.

CARE worked extensively with 3 POs in Kafr-El-Sheikh, Fayoum and Menia and Kafr El Sheik PO in particular reported benefiting highly from the cooperation, PO in Sharkia and Behera were not targeted, which affected sustainability in the latter two governorates. The fact that the project failed to link the targeted large and small farms to the POs reduced the intended sustainability impact. Very few farmers reported being members of the POs and even those ones indicated that they received no benefits.

Shakshouk CDA in Fayoum received extensive capacity building from CARE through IEIDEAS and STREAMS as well other donors; thus it has built a strong relationship with its community. It is worth noting that Shakshouk CDA easily accessed all retailers who were selected for the survey and that VSLA group supervisors are still doing their role and compensated by the VSLA groups themselves. It is the evaluation team opinion that Rayad CDA still needs further coaching to play a stronger role.

The retailers committees constituted of elected 15 -17 female retailers that represent retailers from different areas. The committee's mandate is to help resolve retailers' problems and defend their rights. Both Fayoum and Kafr-El-Sheikh committees were effective particularly in dealing with police harassment of street retailers, resolving problems among the retailers and buying plastic bags in bulk to resell it cheaper to retailers. Interviewed women retailers in FGs and IDIs were proud of their committees. The continuation of these committees with the support of the 2 CDAS represent a form of sustainability of benefits to retailers.

The VSLA groups are sustainable based on its nature as self-organized groups. Furthermore, most members of the groups were satisfied from the VSLA and expressed that it fulfilled their need for funding to continue or expand their work and to meet some of their family obligations. Also, the VSLA groups

provided women with needed psychological and social support, hence, a source of empowerment, which is a sustainable impact at the gender level.

The MOU between Bashaier (KEF) and GAFRD supports the sustainability of FishNet. However, the relationship between KEF and WorldFish whereby WorldFish provided news and information on the sector as well as BMP beyond STREAMs is not determined, which requires further study of the issue.

III. Lessons Learnt and Recommendations

A. Donors and Implementing Agencies

- Project design should consider realistic number of target beneficiaries that is compatible with the project's life time, budget, implementing organization's capacity and project staffing. Projects' targeting beneficiaries beyond their limits most likely fail in achieving planned results and/or jeopardize quality of activities and services and sustainability of benefits. For example, STREAMs target for BMP training was 4500 large and small scale integrated farms, hence trainers visited each beneficiary once; thus limiting the impact of the training.
- Logical framework indicators should be within the project's potential. For example, STREAMs indicators "*Health management strategy in place*" and "*Access to fish for low-income consumers increased from 20kg/person/yr to 21 kg/person/yr,*" are indicators beyond the project potentials. Also, the logical framework should have impact indicators.
- Internet portals like FishNet are a big investment and its results and sustainability need to be restudied in terms of its appropriateness to the beneficiaries and return on investment.

B. Implementing Agencies

- Implementing agencies' field presence is essential to create communication channels between beneficiaries and the project, ensure beneficiaries' satisfaction, build beneficiaries' sense of ownership toward project activities and amend project upon need.
- Projects that focus on training should consider providing technical support services and follow-up to ensure that the provided training leads to a change in practice.
- Training projects should focus on the selection of trainers and ensure that the material of training reflects new technological trends and that trainers are aware of participatory training methods;
- Coordinating between project components and activities maximizes benefits;
- Coordinating between different implementing parties is essential to create project coherence, and common vision, thus ensuring results achievement and maximization of benefits;
- Well-designed monitoring and evaluation tools based on outcomes and outputs are essential for measuring actual achievements, quality and impact;
- Maintaining an updated database of beneficiaries is important for the effective and efficient monitoring of project results; and
- Ensuring that researches and consultations results are disseminated not only to scholars but to a wider audience of sector stakeholders and using research results in applied interventions.

IV. Sector Problems and Recommendations for Future Initiatives:

A. Government

- *Bad quality and shortage of water.* Government should attend to issues related to water conservation, water quality and environmentally safe water disposal systems. Donors and

implementing agencies should cooperate with relevant government agencies to play their role in resolving these problems either through policies or improved infra-structure;

- *Diseases that lead to high mortality rates in fish.* Government research institutions conduct research on the problem of fish diseases (its causes, prevention and treatment methods) and establish a nation fish health management policy and operational plan. Promote the use of Probiotic bacteria to avoid disease;
- *Lack of extension services.* The government should work on disseminating the research information to the farmers via suitable channels be it public campaigns, POs, GAFRD extension services... etc.; as well as ensuring the availability of veterinarian supervision and services to fish farms;
- *Restrictive legislations and procedures* that does not attract new investors to the sector should be revised:
 - According to Law No 124/1983, to establish a fish farm a license must be obtained from the Ministry of Agriculture, which is issued after obtaining authorization of the Ministry of Water Resources and Irrigation. The license must indicate the quantity of water permitted for water use, its source, inlet size and the method of drainage, as well as the authorization obtained from the Ministry of Water Resources and Irrigation;
 - According to law No 124/1983, water supply to fish farms is restricted to water from lakes and drains, and the use of fresh (i.e. irrigation) water is prohibited, although hatcheries established by the government are exempted from this rule.
 - Law No 4/1994 concerning the environment and its executive regulations consider fisheries projects part of the grey list, which requires fish farmers to prepare an EIA which scope is defined by the EEAA. However, fish farms situated in ecologically sensitive areas such as protected areas, or in urban areas, may be considered black listed projects and require a full-fledged EIA study.
 - GAFRD leasing period for fish farm land is only five years.
 - Integrated farms (that are mainly for agriculture purposes but use stored water for fish cultivation) are requested to receive a license from GAFRD for their fish ponds and they also prohibited to construct ponds close to irrigation and drainage canals.
- *Lack of wholesale market (Bursa).* Government should consider establishing wholesale markets.

B. Cooperative Union of Egyptian Water Resources and POS

- *High input prices particularly feed* followed by rent and gasoline. POs can work on collective buying of feed.
- *Lack of extension services* which is supposed to be provided by POs. POs should have trained extension officers who can provide their services for a fee.

C. Donors and Implementing Agencies

- *Lack of information on intensive fish farming.* Promoting Intensive Pond Raceway Systems. (IPRS) and providing technical assistance to fish farms to implement the new technology of re-circulating water system in order to intensify productivity and reduce water usage through the use of airlift and paddle wheels.
- *Absence of model farms.* Working with existing large and small farms through a comprehensive approach that deals with the fish farms' needs in order to establish model farms. Model farms should be geographically distributed within the target governorates in order to act as an example of an "ideal Big Fish Farm" and an "ideal small Fish Farm". Loans and cost sharing financial mechanisms can be designed to help the beneficiaries in the target area replicate those interventions.

- *POs capacities are limited.* Assisting POs to become more efficient and effective in providing services such as bulk purchase of inputs, extension services, funding mechanisms, implementing prototypes, introducing new farming technologies ...etc. to their members;
- *Lack of finance for the farmers and retailers* result on dependence on wholesalers. Donors and implementing agencies have to create linkages between financial institutions and farmers and /or build appropriate business funding mechanisms.
- *Lack of export standards.* Assisting farms to achieve export standards and certifying them.
- *Limited number of processing operations* within the fish value chain. Studying business and economic models for industrial fish processing and promoting it among investors; and ensuring steady production of required fish types needed for processing through technical support to farms and hatcheries.
- *Lack of retail markets or village markets.* Encourage the establishment of retail markets through CDAs or POs.
- *Lack of logistics in wholesale markets.* Improving wholesale market logistics through encouraging investments to buy large freezers and cooling transportation for the whole sale markets.
- *Short leasing period.* Lobbying to extend the leasing period from 5 years to 25; thus allowing investors to adopt new technologies and expand their investments.

V. Success Stories

Abdel Basset Abdalla Ahmed

Abdel Basset is a 51 years old man, with 17 years of experience in fish farming. He has a large Fish Farm leased from GAFRD in West Kanatara, Ismailia. The farm consists of 154 feddans divided into 20 ponds, of which 8 are for nursery. Abdel Basset's main problem is shortage of water especially in July and August, which combined with the hot weather and the shortage of oxygen in the water, lead to high fish mortality rate. This problem led him to consider leaving the farm.

In 2017, he received BMP training. His highest benefit was learning how to increase the oxygen level in the ponds through the use of irrigation pumps to pull the water and re-pump in the ponds as an alternative to the paddle wheels. According to him, the results were amazing as his production increased from 39 tons in 2016 to 65 tons in 2019, 66.7 percent increase by using pelleted feed. By keeping the farm working through the received BMP training, Abdel Basset was able to retain 15 full time jobs and 15 seasonal jobs.

Abdel Basset was only cultivating Mullet, Tobarra and Seheli due to the high water and soil salinity level. However, with the improvement of the water quality and decrease in soil salinity, he started cultivating Tilapia for the first time this year with small quantities.

Abdel Basset is one of the very few farmers who is aware of the FishNet and is using it for farming information, though his level of education is only literacy certificate. He also expressed the need for future initiatives that provide aeration equipment and provide training on semi-intensive farming.

Takwa Mohamed Ahmed

Takwa is 33 years old married woman with 3 girls and a boy. Takwa works as a fish retailer in El Riyad, Kafr-El-Sheikh. Takwa started working as a fish retailer in the markets and the street five years ago after she got married. Prior to her marriage, she used to sell fruits but that consumed the whole day which was not suitable for her after marriage. Accordingly, she changed to selling fish. She receives help from her husband who started helping her when she started fish retailing. Her husband is a daily laborer and accordingly his work is seasonal. Two years ago, due to financial constraints, Takwa stopped working.

Takwa joined a VSLA group which allowed her to receive a loan for EGP 1000, to be repaid over a three months period. She used the loan to buy two boxes of fish (50 kg) to trade in on daily basis in front of her house. She sold all the fish fresh. After repaying the loan, she took another loan worth EGP 2000 and in partnership with her husband and sister was able to rent a shop for EGP 300 per month. This allowed her to double her sales as well as starting some additional processing operations such as gutting and grilling. The cost of the gutting service is EGP 1/kg while grilling is for EGP 5/kg. Through the shop, her daily sales increased to almost 2 boxes (50 kg.) of fresh fish in addition to varying quantities of grilled fish ranging from 10 to 20 kg/day.

Takwa is very ambitious women and her dreams are high. Through the project, she succeeded in receiving a mobile unit 5 months ago. Takwa, her husband and her sister contributed EGP 4000 in the price of the unit which cost EGP 16,000 (25% contribution). The mobile unit consists of a place for displaying the fresh fish and a place for cleaning the fish with a source of water and a grill. The mobile unit reduced her running expenses as there is no rent. The mobility of the unit allowed her to park it in front of the school, which is an attractive marketing place.

The problems she confronts; however, are the complaints of the neighbors from grilling fumes and the risk that the mobile unit would be stolen when she leaves it overnight.

Over the past two years, Takwa increased her daily profit from EGP 50 to approximately EGP 200 for her and her husband. From this increase in household income, Takwa and her husband were able to cover the children's private lessons and medical needs. It is worth noting that the project created a full time job for Takwa's husband who was not fully employed as a daily laborer. Actually, the employment of the job does not only have an economic benefit but also reduces the household stress. To show how important work is for her, Takwa said "After 15 days only from delivering my child, I went back to work. Alhamdulillah."