



Do aquaculture interventions improve productivity, income, nutrition and women's empowerment in low- and middle-income countries?

Nearly half of all global fish production relies on aquaculture (the farming of aquatic organisms in inland and coastal areas) and is carried out primarily by small-scale farmers in developing countries. Aquaculture has great potential to advance several interrelated UN Sustainable Development Goals: as an economic activity, it can provide income for people in low- and middle-income countries while helping to improve gender equality in accessing and benefiting from these earnings. It can also increase the availability and consumption of nutritious food. While there is still limited rigorous evidence on the effectiveness of aquaculture interventions, synthesising existing studies is increasingly relevant for decision makers to understand and advance aquaculture as a development alternative.

In light of this, 3ie has conducted a systematic review, supported by the Bill & Melinda Gates Foundation, to assess whether aquaculture interventions increase productivity, income, nutrition and women's empowerment in low- and middle-income countries. The review also aims to identify barriers and facilitators that could impact the effectiveness of such interventions, and their cost-effectiveness. This brief summarises the findings and implications of the review.

Highlights

- On average, aquaculture interventions had small and statistically significant effects on important measures of productivity, income and nutrition.
- The relatively small number of included studies provided insufficient data to analyse the impact of aquaculture on women's empowerment measures.
- To the extent that budget and sustainability limitations allow, future aquaculture programmes could benefit from designing interventions with high levels of support.
- Despite the large number of aquaculture programmes in developing countries, they are generally not evaluated rigorously.
- The use of rigorous evaluation frameworks, reporting standards and collection, and publication of cost data would enable the comparison of impacts across aquaculture programmes.

Main findings

The review identified 21 evaluations assessing the impact of 13 aquaculture programmes in low- and lower middle-income countries on four outcome pathways: productivity, income, nutrition and women's empowerment.

The productivity and income pathways had the most comparable evidence. From the 13 included programmes, up to 10 reported comparable outcomes related to productivity and income, allowing for quantitative synthesis of two thirds of these measures. The synthesis showed a small but statistically significant effect of aquaculture interventions on production value, representing an average increase of approximately USD53 in the yearly production value of participating farmers (measured in 2021 prices). We also identified a small but significant positive effect of aquaculture programmes on an aggregate livelihood measure, as well as on individual measures of household income and total expenditures. The positive impact was equivalent to a USD67 increase in yearly individual household income and a USD26 average increase in purchases (both measured in 2021 prices).

There is less rigorous evidence to inform the nutrition pathway. Up to six of the included programmes reported outcomes related to nutrition, and we were able to synthesise just over half of these measures. The limited nature of this evidence points to the relatively recent interest in rigorous evaluation of the links between aquaculture – and agriculture more generally – and nutrition. Aquaculture interventions have had a positive and significant effect on fish consumption, corresponding to approximately 200 additional grams in monthly household fish consumption. Not enough evidence was available to synthesise other nutrition outcomes, such as food security or diet quality. However, we identified a few studies reporting anthropometric measures, including women's and men's body mass index, and height-for-age amongst children aged 0–5 years. In line with the aquaculture and nutrition literature, we did not find a significant effect of aquaculture programmes on these anthropometric measures.

The women's empowerment pathway needs more comparable evidence. Only up to three of the included programmes reported indicators of women's empowerment. However, the indicators used were not easily comparable, and the empowerment pathway could only be synthesised descriptively rather than quantitatively. Primary studies highlighted contextual and implementation aspects of aquaculture programmes – such as gender norms and whether intervention participants were individuals or groups – to explain the presence or absence of effects on women's empowerment measures. Given that rigorous evaluations around aquaculture and women's empowerment are relatively new, and that the studies we identified are state of the art, it is not surprising that these data are less comparable than others.

There was insufficient data to analyse impacts further. Given the small number of studies included in the review and their substantial heterogeneity and potential for risk of bias, review findings must be interpreted with caution. Moreover, there were insufficient data to assess spillover effects or determine whether the impact of aquaculture interventions varies by sex.

The review's findings have several implications for future research, policy and practice in the aquaculture sector.





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Implications

Policy and practice

There is a dearth of rigorous impact evaluations of aquaculture programmes. We identified a wealth of interventions in developing countries that were excluded, as they were not rigorously evaluated. Organisations that fund, design, implement and evaluate aquaculture interventions would benefit from aligning their programming investment with evaluation frameworks that inform what works, for whom, why and at what cost.

Constant support to beneficiaries may be key to the implementation of aquaculture interventions. There is suggestive evidence that increased frequency, quality and regularity of support from aquaculture interventions could affect participants' motivation to maintain their involvement. To the extent that budget and sustainability limitations allow, future aquaculture programmes could benefit from the inclusion of high levels of support, which could be paired with a participation monitoring component and included in the programme's evaluation design.

Research

More studies, with a wider scope, are needed in the aquaculture sector. The sector would benefit by encouraging the production of more rigorous impact evaluations to assess the effectiveness of aquaculture interventions. To better inform interventions, these studies should measure a range of outcomes, including those that require more evidence: namely, intermediate and main nutrition outcomes, as well as indicators of women's empowerment in the short and long term. Additionally, half of the programmes included in the review took place in Bangladesh. Conducting impact evaluations in other low- and middle-income countries would further benefit the sector.

Standardised reporting of interventions and evaluations can enable better synthesis. Overall, the evidence identified in the review is of low quality, as we were unable to establish that the evaluations adequately addressed key confounding issues in the majority of cases.

In order to facilitate a substantive comparison across programmes and build a better-quality body of evidence, studies could standardise the reporting of key intervention characteristics as well as evaluation designs and findings. Reporting standards that could be adapted to intervention components and evaluation findings in aquaculture include the [CONSORT-SPI](#), [TIDieR](#) and [STROBE](#) guidelines.

Collecting and reporting cost data would enable cost-effectiveness analyses. Cost-effectiveness analyses can reveal whether an intervention was worth carrying out, whether it should be extended and whether it can be implemented in other contexts. However, we found insufficient data to draw full cost-effectiveness comparisons across programmes. Costing is an intensive process that should be an integral component of impact analyses, and aquaculture programmes could benefit from the inclusion of cost-effectiveness analyses in their evaluation frameworks and reports.



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What is a systematic review?

3ie systematic reviews use rigorous and transparent methods to identify all of the studies that qualify for analysis and synthesis to address a specific research question. Reviewers identify published and unpublished studies and use theory-based, mixed methods to analyse and synthesise the evidence from the included studies. The result is an unbiased assessment of what works, for whom, why and at what cost.

About this review

The findings in this brief are based on the published report [Aquaculture for improving productivity, income, nutrition and women's empowerment in low- and middle-income countries: a systematic review and meta-analysis](#), by Constanza Gonzalez Parrao and colleagues (2021).

About this brief

This brief was authored by Constanza Gonzalez Parrao, who is solely responsible for all content, errors and omissions. If you would like more information about this systematic review, please contact Constanza at cgonzalez@3ieimpact.org. Content has been designed and produced by Akarsh Gupta and Tanvi Lal.

Endnotes

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