

QUANTIFYING ENVIRONMENTAL IMPACT OF AQUACULTURE THROUGH CERTIFICATION-FACILITATED IN-SITU FARM DATA COLLECTION

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INTRODUCTION

The Aquaculture Stewardship Council (ASC) is one of the leading certification schemes for farmed seafood, certifying a wide range of species including marine and freshwater fish, molluscs, crustaceans and seaweed. Currently, 61 unique species are in production by ASC certified farms across 53 countries operating a variety of production systems.

One of the distinguishing features of ASC's Farm standards is the measurable nature of a variety of requirements herein that each producer needs to conform to, to become or remain certified. Based on our challenges and learnings from the past 10 years, we have developed a uniform, systematic data collection procedure and improved data use capabilities. Here we outline:

- 1) how farm in-situ data submissions are incentivized by ASC's Farm standard and technically facilitated by ASC using online tools,
- 2) various in-situ variables that are collected on pressures, states and impacts associated to farming seafood,
- 3) how by this extensive and standardized data collection, ASC is enabled to quantify region, production system and species-specific impacts of aquaculture and the effect of certification.

METHODS

As part of their ASC certification, producers record and submit farm level production data, key environmental and social data to ASC, associated with the ASC Farm standard requirements.

Data submission is facilitated by an enclosed online portal and data is stored in a relational database from where it can be used for impact assessments. However, it serves many other predefined purposes related to assurance, transparency, traceability, standard improvements, and research (Figure 1).

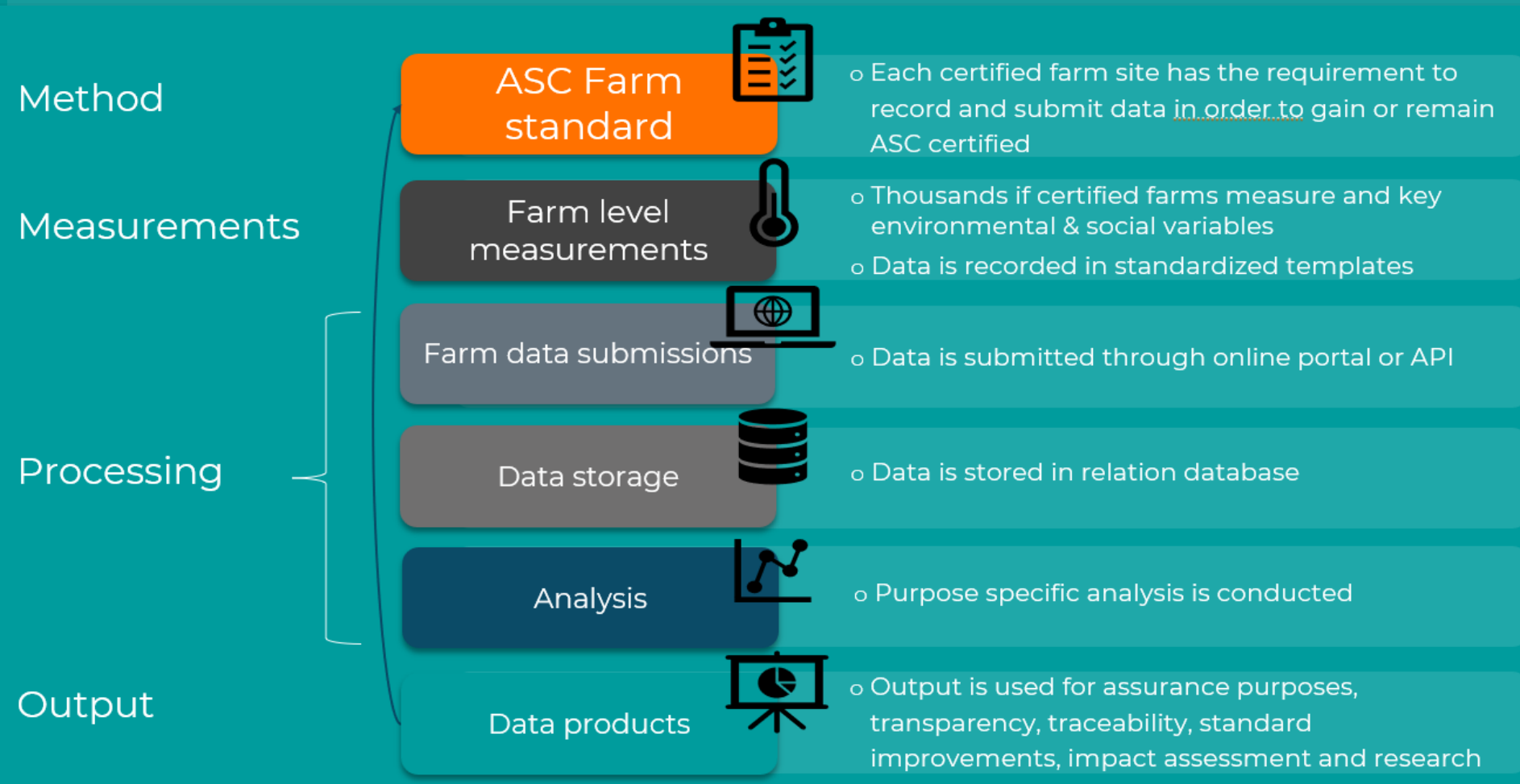


Fig 1. Overview of ASC's data collection procedure, data processing and delivery of output.

The data allows the quantification of the various ways the environment is affected (*pressure*) by aquaculture, the condition of the environment (*state*) or the effect on biota, ecosystems and society (*impact*) (Figure 2). The wide variety in production systems used, the diversity in species produced and global distribution of ASC certified producers offers the unique opportunity to assemble an extensive database on data associated with the environmental and social impact of aquaculture operations.

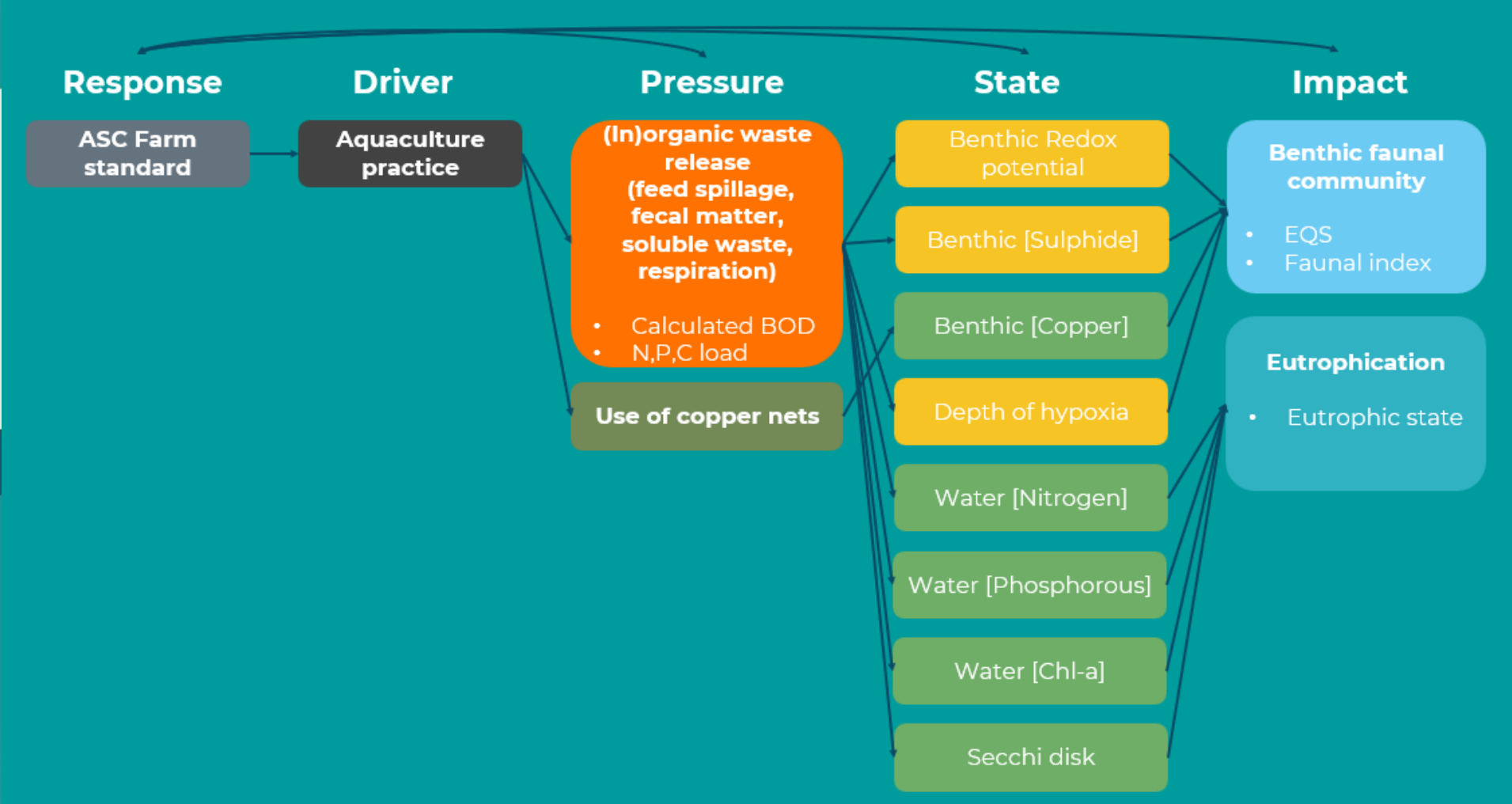


Fig 2. A Drivers-Pressures-State-Impacts-Responses (DPSIR) framework applied to the impact of aquaculture on the benthic faunal community. The impact of aquaculture practice is measured at different levels: from quantification of the way (eco)systems are disturbed (pressure), to changes in environmental conditions (state) and the actual effect on biota, ecosystems or society (impact). The ASC Farm standard (response) addresses/limits the pressures from aquaculture practices that are influencing impacts.

CASE STUDY

Particulate and soluble (in)organic matter released to the environment as a result from farming seafood impose severe negative impacts on benthic organisms. Associated to the ASC Farm standard requirements, producers regularly record and are audited on the various components that drive and evaluate the impact of their practices on the benthic environment.

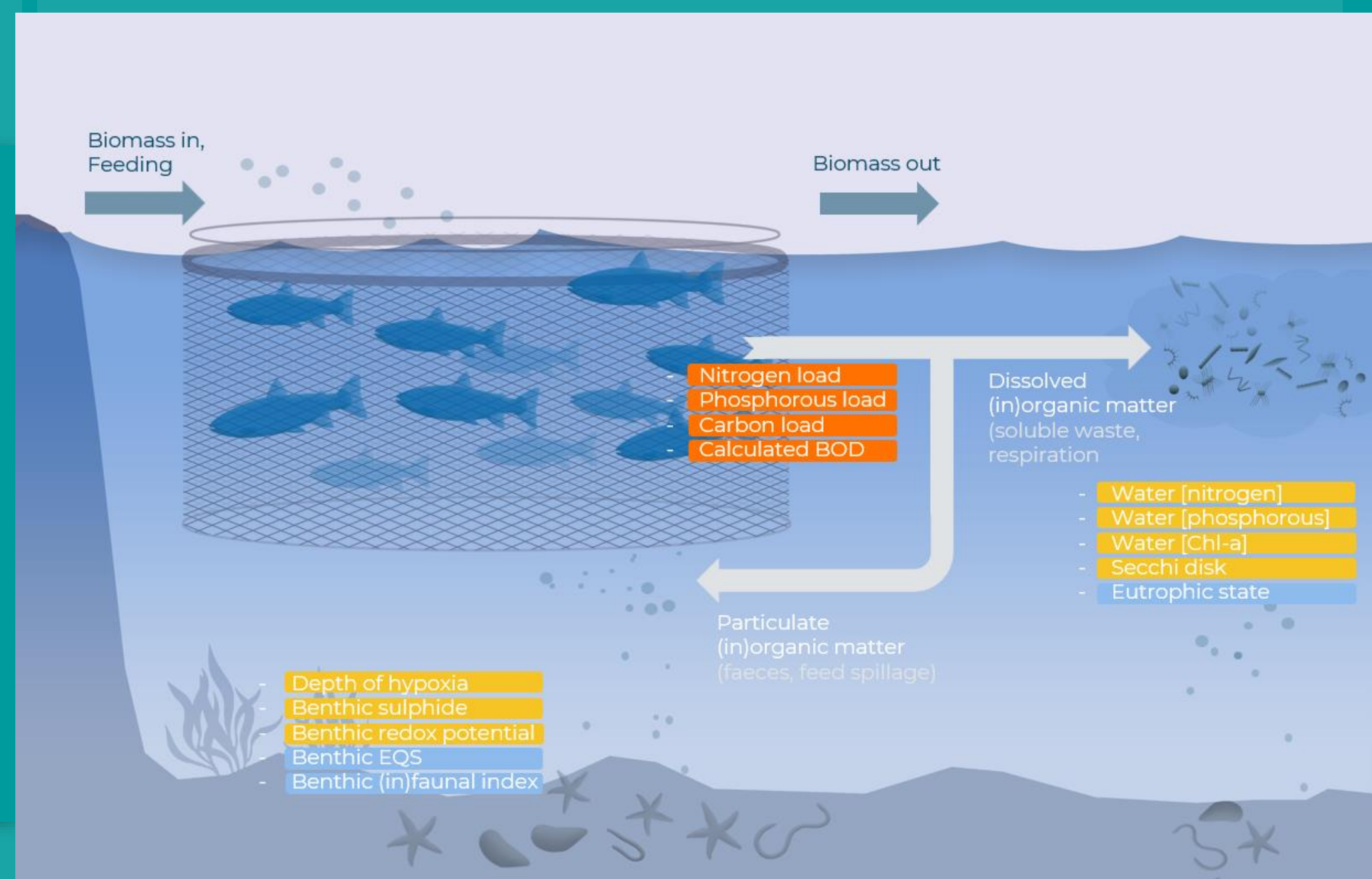


Fig 3. The flow of nutrients in cage culture and pressures, states and impacts associated with benthic impacts that are measured and reported to ASC. Particulate and dissolved (in)organic nutrients are released through respiration, excretion, fecal matter and feed spillage. These influence the state (benthic state and water quality).

In cage culture, the pressure from (in)organic waste is measured by various variables, including the nitrogen and phosphorous load released to the environment during production. At farm level, these can be estimated based on feed use, feed properties, stocking and harvest of biomass (Figure 3) and provide input for a global assessment (Figure 4).

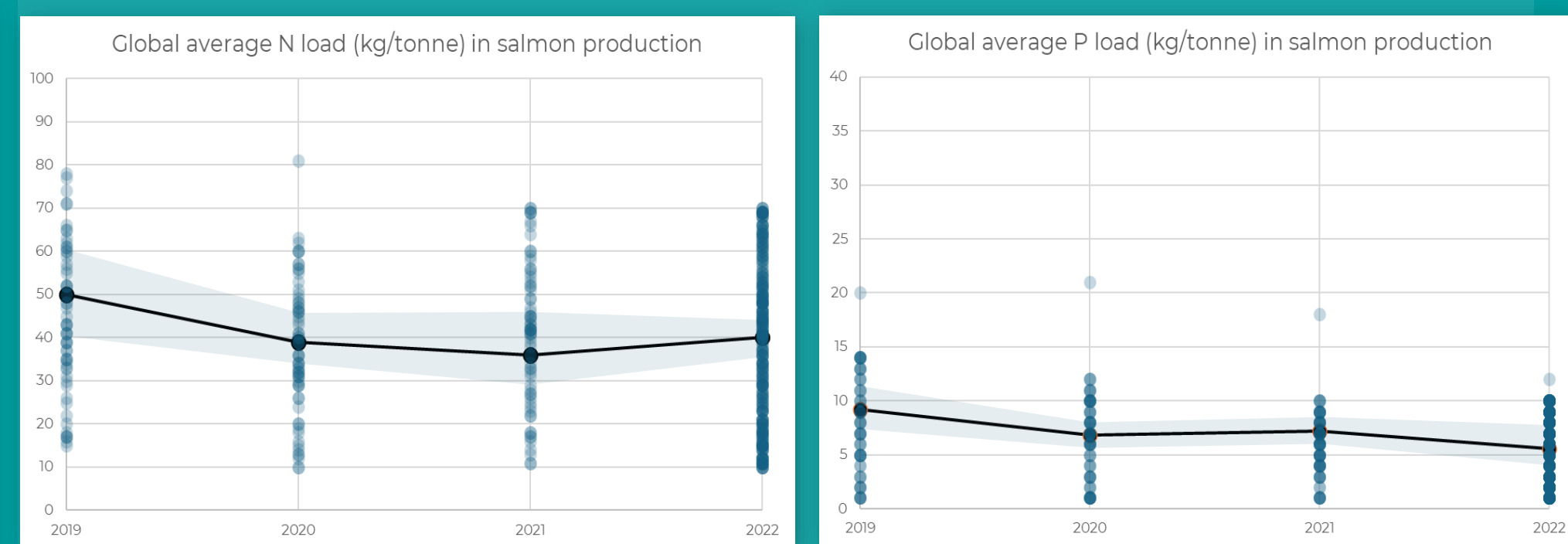


Fig 4. Global assessment of nitrogen and phosphorous load associated with salmon production using aggregated data submitted by ASC certified farms (note: this is a dummy data set for demonstration purposes only).

SO WHAT?

Data informed assessment of pressures, states and impacts of aquaculture allows ASC to address species, region or production system specific impact of the production of seafood and deliver a relevant and realistic Standard on best practices in aquaculture.

