

An aerial photograph of a large-scale aquaculture operation in a deep blue lake. The farm consists of numerous circular pens connected by a network of wooden walkways. A small red-roofed structure is situated on the walkway. The surrounding landscape features lush green hills and mountains in the background. A semi-transparent blue box with white text is overlaid on the upper right portion of the image.

# Aquaculture Improvement Projects (AIPs): a global review

MAY 2016



## Report Roadmap

This report summarizes the findings from CEA's four-month investigation during early 2016 of aquaculture improvement projects (AIPs). The goal of our investigation was to understand how AIPs are currently implemented globally, and to distill what insights and lessons might be gleaned from the approach.

AIPs are emergent conservation interventions that aim to reduce environmental impacts and improve the efficiency of aquaculture production. We have identified more than two dozen globally, most of which are located in Asia, with a few in the Americas and Africa. These projects presently cover a relatively small volume of global aquaculture production, but are becoming more common for shrimp, salmon, tilapia, and other species being sold to European, U.S., or Japanese markets.

Over the course of this investigation, we conducted six site visits and over fifty interviews globally. The project team traveled to Chile, China, Vietnam, and Indonesia to visit AIPs and speak to AIP implementers, farmers, processors, government representatives, and other stakeholders. Site visits included tilapia, salmon, and shrimp farming operations; extensive and intensive production systems;<sup>1</sup> and efforts run by NGOs, industry groups, and private companies.

In this report we summarize our reflections from expert interviews and site visits, and highlight perceived strengths and challenges of aquaculture improvement projects. We hope that this summary will provide an overview of the contemporary AIP landscape, call out some opportunities that lay ahead, and serve as a baseline for future reflection on the model's growth and eventual impact.

## About the Report

California Environmental Associates served as the principal investigator for this project. The project was led by Max Levine (Senior Associate), who also coordinated CEA's global investigation of fishery improvement projects in 2015, available at <http://tinyurl.com/jlbnz7a>. He was supported by Alex Dolginow (Associate), Mark Michelin (Director), and Matt Elliott (Principal), with help from Vincent Caruso (Research Associate) and Emily Peterson (Associate). The investigation was commissioned by the Gordon and Betty Moore Foundation. Questions or comments about this report can be directed to Max Levine at [max@ceaconsulting.com](mailto:max@ceaconsulting.com).

Report design by Sylvia Weir of Weirdesign.

This report would not have been possible without the time and generosity of our site visit hosts, interviewees, and reviewers. The findings and conclusions in this report represent the interpretations of California Environmental Associates and do not necessarily reflect the views of the study's funders or expert stakeholders.

<sup>1</sup> Extensive production requires less capital, few feed inputs, and often occurs over a large area, whereas intensive production generally occurs in a more concentrated area and uses added feed.

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## Executive Summary

Global aquaculture production has experienced strong and consistent growth over the last several decades, with farmed seafood (seaweeds excluded) soon expected to surpass wild landings. This growth, which shows little sign of slowing, also contributes to concerns about the potential environmental and social impacts of aquaculture. Consumers in Western markets are, increasingly, demanding responsibly-produced seafood. Growth of new ecolabels like the Aquaculture Stewardship Council, Global Aquaculture Alliances' Best Aquaculture Practices, and GlobalG.A.P. is an indication of this demand, as is the recent development of "aquaculture improvement projects."

Aquaculture improvement projects (AIPs) are a fledgling conservation intervention. They have emerged in the wake of fishery improvement projects' (FIPs) burgeoning popularity as a mechanism to improve production systems that are performing below the level at which they could achieve certification. At present, there is no commonly held definition for what constitutes an AIP, so the moniker encompasses a variety of interventions implemented by a diverse set of organizations. Each implementer has unique expectations for its projects and the eventual impact of the AIP movement. Despite this diversity, there are a number of commonalities among the AIPs we examined through our research.

In general, AIPs focus on developing and deploying better management practices among engaged farmers by seeking to first and foremost increase productivity, as well as reduce harmful discharges into local waters and mitigate the risk of disease transmission. Often, an AIP mobilizes a suite of tools and services—including educational workshops and regular farm visits—to aid farmers' adoption of these better practices.

Beyond this, AIPs differ widely in form: for example, some projects commission impact assessments or related ecosystem-based studies to understand the relative impact of aquaculture on a given area. Others focus on promoting, supporting, and improving traditional extensive systems that compete in the market with more intensive forms of aquaculture. These examples reflect only a sample of the AIPs currently operating and the variety of differing approaches will likely grow as the number of implementers and projects increase over time.

There are also a number of common challenges affecting the AIPs. At this stage, there is limited market recognition for AIP-engaged seafood. Out of necessity, many existing AIPs projects are simultaneously trying to cultivate buyer interest and engage stakeholders on the ground. Without greater supply chain engagement, AIPs are likely to struggle to generate and maintain substantive management change. Such has been the experience with those FIPs that lack substantive supply chain engagement. Like FIPs, AIPs are best positioned to help participating farmers make changes to internal (farm or boat-level) management, but can have difficulty making changes beyond the reach of those stakeholders.

The comparison between AIPs and FIPs is clear, but only goes so far. Compared to FIPs, there may be greater opportunity for AIPs to create near-term change, as fish farmers generally have greater control over their ponds and pens relative to an individual fisher’s ability to control fisheries management. Fish farmers also benefit directly from improvements in their farm (e.g., production efficiencies), while the benefits of rebuilding a wild stock are shared widely. As a result, most fish farmers are more motivated and better-equipped to make improvements than a fisher in an unmanaged fishery. This is not universally true: some farms are particularly vulnerable to disease or pollution from nearby farms, and must work with neighbors to improve the collective management of water resources. Still, given producers’ control over most aspects of the production system and aquaculture’s short production cycles, AIPs should generally be expected to drive change more quickly than FIPs. Given the dynamics of aquaculture, many AIPs ought to be better-positioned to improve livelihoods than FIPs.

Thus far, these expectations for change are largely unproven. AIPs are in the early stages of development: implementers are in the process of codifying their organizational approaches; pilot projects are seeking to demonstrate potential for the replicability of the conservation intervention; and market partners are contemplating how to best support responsible aquaculture. Some early results are promising, but the movement is still developing.

#### Sites visited as part of this study

AIP NAME	COUNTRY	IMPLEMENTER	INITIATED	PRODUCTION SYSTEM	FARMERS
<a href="#">Hainan Tilapia</a>	China	Hainan Tilapia Sustainability Alliance*	2011	Pond & reservoir, semi-intensive to intensive	35
<a href="#">Ca Mau Shrimp</a>	Vietnam	BlueYou, Inc.	~2014	Extensive ponds	1140
<a href="#">East Java Shrimp</a>	Indonesia	Shrimp Club*	2011	Extensive to intensive ponds	450
<a href="#">Tarakan Shrimp</a>	Indonesia	WWF	~2008	Extensive ponds	11
<a href="#">Sidaorjo Shrimp</a>	Indonesia	WWF	2015	Extensive ponds	31
<a href="#">Chilean Salmon</a>	Chile	WWF	2015	Intensive net pen	unknown

\*Projects initiated by SFP

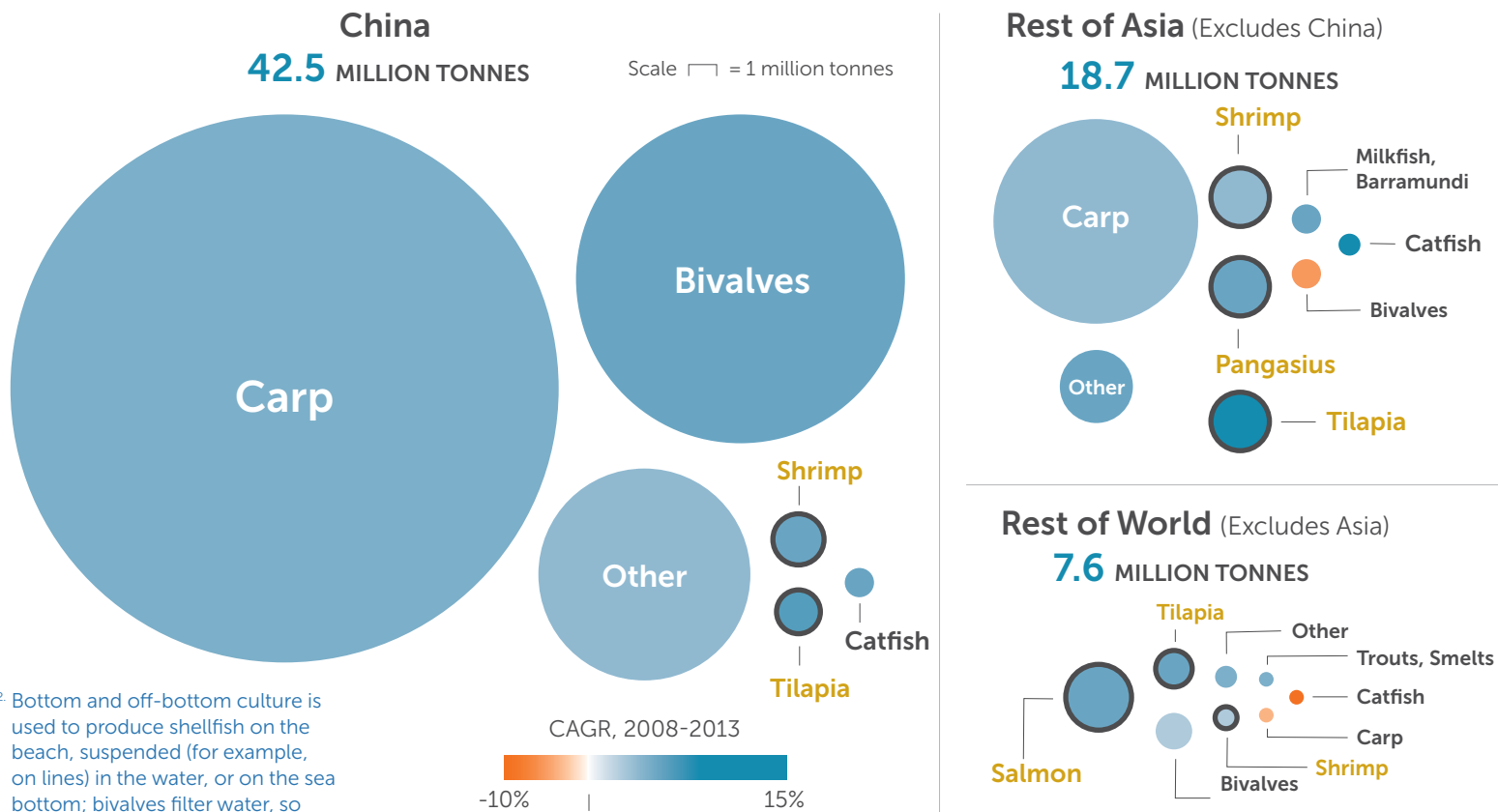
## AIP Basics

### Context

Global aquaculture production grew ten-fold from 1980 to 2009 and shows no sign of slowing. More than half of the world's aquaculture by volume is produced in fresh and brackish water ponds, with large quantities also produced in nearshore net pens, cages, and in bottom and off-bottom culture.<sup>2</sup> Coastal Asia, and particularly China, accounts for the vast majority of production, and consumes much of what it produces. To generalize, there are four farmed species groups that are most important as imported aquaculture commodities to Western markets – shrimp, salmon, tilapia, and pangasius. Collectively, they comprise less than 20% of globally-produced farmed seafood.

### Global aquaculture production and growth

Top Species by Aquaculture Production (2013) & Compound Annual Growth Rate (2008 – 2013)



<sup>2</sup> Bottom and off-bottom culture is used to produce shellfish on the beach, suspended (for example, on lines) in the water, or on the sea bottom; bivalves filter water, so generally are considered a low-impact form of production.

Black borders and gold text indicate highly-traded commodities exported primarily to markets with strong sustainable and responsible seafood commitments. North American and European markets currently have the greatest demand for responsible products, including, potentially, products from AIPs. A few Japanese buyers are also looking for responsibly-produced products, particularly from extensive shrimp systems.

FAO, 2016, Fishery and Aquaculture Statistics, Global aquaculture production 1950-2013 (FishStatJ); Trade Maps, International Trade Centre, 2016, [www.trademap.org](http://www.trademap.org)

Like any form of agriculture, aquaculture practices impact surrounding ecosystems in several ways. At times, aquaculture has been criticized for converting habitat (such as mangrove forests) into ponds, overusing and polluting water, consuming large amounts of wild fish as feed, and releasing non-native species and diseases into the environment. Aquaculture improvement projects aim to reduce these environmental impacts and improve the efficiency of aquaculture production.

In this study, we identified approximately two dozen AIPs. Most of these projects are located in Asia, with a few in the Americas and Africa. Collectively, these projects cover a very small volume of global production, but it appears that AIPs are becoming more common for shrimp, salmon, tilapia, and other species being sold to European, North American, and Japanese markets.

### What is an AIP?

In general, AIPs are goal-driven, transparent, market-incentivized efforts to improve aquaculture production. They represent an emergent tool closely related to fishery improvement projects: fundamentally, both AIPs and FIPs attempt to improve the environmental footprint of seafood production through projects incentivized by buyer demand or the possibility of market access.

The term aquaculture improvement project likely originated with Sustainable Fisheries Partnership (SFP) in 2007, but there is no standard definition for what constitutes an AIP.<sup>3</sup> Implementers remain divided on what the ultimate goal of AIPs should be and how progress should be measured. Some organizations see AIPs as a stepping stone to certifications such as Global Aquaculture Alliance’s (GAA) Best Aquaculture Practice (BAP), Aquaculture Stewardship Council (ASC), GlobalG.A.P., or organic certification. Others think that AIPs are not necessarily a transitional strategy to certification, but can incorporate a variety of goals, such as reducing regional risk of disease spread or improving management among producers whose practices are far from certification. As we have interpreted it, organizations that could be considered to be implementing AIPs currently include: SFP, World Wildlife Fund (WWF), BlueYou, Solidaridad, Stichting Nederlandse Vrijwilligers (SNV), World Fish Center, National Fish and Seafood, GlobalG.A.P., New England Aquarium, and the Global Aquaculture Alliance.

### Primary aquaculture certifications and associated transition programs

Certification	Transition Program
Global Aquaculture Alliance B.A.P.	iBAP
Aquaculture Stewardship Council	WWF implements comprehensive AIPs
GlobalG.A.P.	LocalG.A.P.

<sup>3</sup> WWF was already working on aquaculture across a number of sites before 2007, but did not yet label them AIPs or link those projects to major buyer partnerships.

**We propose that an aquaculture improvement project should meet three criteria:**

1. **A clearly stated goal or goals for the project** that involve substantive improvements to existing economic, social, and/or environmental conditions.
2. **Transparent and measurable reporting** that allows progress to be tracked against the project's goal(s). These should be reported publically.
3. **Improvements are motivated by market incentives** either in terms of profit or market access. In tangible terms, this means that the AIP is supported by supply chain companies (e.g., processor, importer, end buyer), or that the AIP participants hope to gain access to new buyers. This market link is critical as it provides additional incentives to catalyze performance improvements.

In theory, an AIP should meet all three of these criteria; however, only two of the six projects that we visited arguably satisfy all three conditions. A number of projects meet one or two criteria but fall short of this definition because, for example, there is not yet transparent reporting. As a consequence, recognizing that others may have more inclusive notions of AIPs, this report reflects on nearly all projects that self-identify as AIPs, not just those that meet the definition above.

The sorts of changes proposed by AIPs often help producers increase returns in the near-term. When more responsible practices have economic benefits they are likely to be more durable and effective. However, in our opinion, projects driven by economic efficiencies but lacking a goal, transparency, and market incentives are not AIPs. That does not mean that they cannot be effective interventions in their own right.

As AIPs develop further, it is likely that the conservation community and/or buyers will look to establish a commonly agreed-upon definition. Such a definition may be process-oriented, like the definition we have proposed above, or it may be more stringent in setting out specific minimum benchmarks for issues addressed or progress attained. An outcome-oriented definition would be valuable, but (to state the obvious) would require that the community come to an agreement on the desired outcomes. Until that point, we believe that a process-oriented definition is more appropriate.

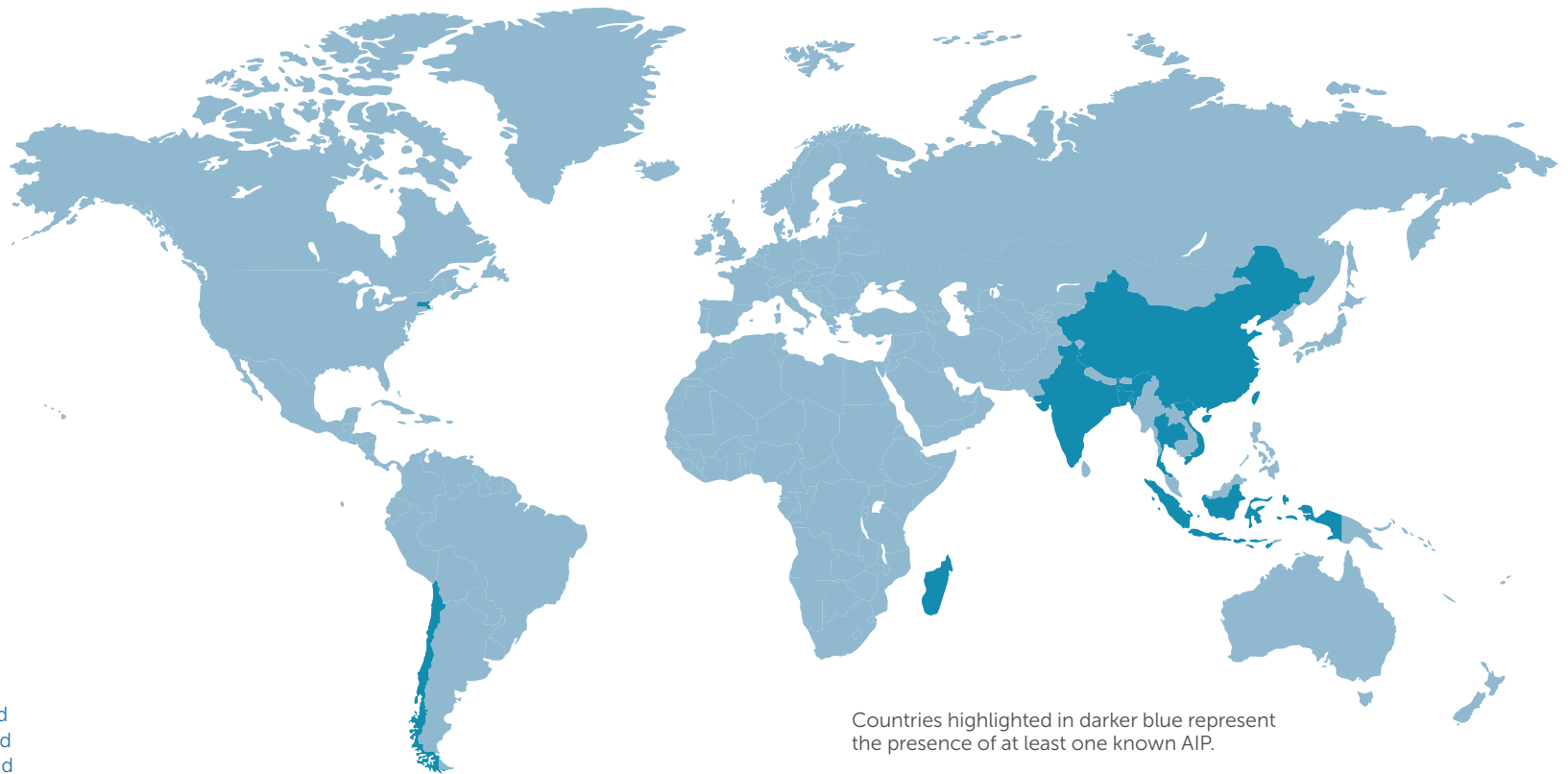
<sup>3</sup> Surveyed implementers included WWF, SFP, BlueYou, World Fish Center, and Solidaridad, as well as projects from SNV. Estimate excludes sites in certification transition programs such as iBAP.



## Scope and scale of AIPs

In general, an AIP involves dozens to hundreds of farmers within a geographic region. According to a survey of AIP implementers, there are more than 35 distinct sites where AIPs are operating.<sup>4</sup> Almost all of these projects have emerged within the past five years.

In terms of the number of sites and volume engaged, WWF, SFP, and Global Aquaculture Alliance's iBAP program represent the largest AIP implementers, with each engaging hundreds to thousands of farmers. Shrimp appears to account for the majority of AIP volume, with active shrimp AIP sites in India, Bangladesh, Thailand, Vietnam, and Indonesia. Tilapia, salmon, barrumundi, and seaweed make up most of the remainder. The combined annual production volume of the six AIP sites that we visited totaled about 85,000 tonnes. Extrapolating, we assume that the total volume of seafood within AIPs globally is less than 1% of global aquaculture production by volume, excluding certification transition programs.



<sup>4</sup> Surveyed implementers included WWF, SFP, BlueYou, New England Aquarium, World Fish Center, and Solidaridad, as well as projects from SNV. This estimate excludes sites in certification transition programs such as iBAP.

## Reflections on AIPs in practice

### Understanding the differences among AIPs

Though it remains difficult to make generalizations about AIPs given the infancy of the model and variations across sites, we identified three basic sets of characteristics that help distinguish AIPs from one another. AIPs rarely fit these binary categories cleanly, but these characteristics still provide a useful framework for understanding differences between projects.

<b>AIP Goal</b>	<b>Farm-level improvement</b> The AIP explicitly seeks farm-level improvements, usually aiming for certification, whether at the farm- or group-level.	<b>Zonal improvement</b> The AIP targets all farms within a region, often to prevent spread of disease or to achieve other goals across a region.
<b>AIP Implementer</b>	<b>Third-party led</b> Dedicated NGO staff implements the AIP.	<b>Industry led</b> Stakeholders implement their own AIP; NGOs may provide strategic advice in these cases.
<b>Supply-chain engagement</b>	<b>Top-down</b> Major buyers express a desire for changes and motivate AIP engagement through supply chain leverage.	<b>Bottom-up</b> “Grassroots” projects are started by the producers or local supply chain, and pursue changes as a way to obtain eventual market benefits.

**AIP goal** describes the aim of the project, in particular whether it seeks to transition individual farms to certification (e.g., WWF) or tries to achieve “zonal” improvements that improve the production of an entire region, sometimes beginning with a handful of pilot farms (e.g., SFP). The WWF Tarakan Shrimp AIP is an example of the former: it is primarily seeking to transition individual farms to ASC certification. In contrast, the Hainan Tilapia Sustainability Alliance’s zonal AIP, which is working with tilapia farms across three counties to improve regional farming practices and reduce disease risks area-wide, is a good example of a mature zonal AIP.

Though the farm-level and zonal dichotomy is clear at the conceptual level, it is sometimes fuzzier on the ground. For example, one zonal AIP focuses mainly on a scattering of farms in a region, with relatively minor engagement from other producers in the area. Meanwhile, some farm level-oriented AIP implementers seem to work beyond just the farm level, measuring water quality in receiving bodies, changing processor practices, and pushing policy change. The main difference is that zonal AIP implementers view the integrated zonal approach, including area management and policy engagement, as a mandatory part of an AIP; whereas farm-level AIP implementers see zonal and policy engagement as valuable, but distinct from the AIP itself.

Ultimately, the “farm-level” versus “zonal” dichotomy seems to manifest mostly in terms of scale. Generally, there is a trade-off between the support for individual farmers and the scope of engagement: most projects engage a small number of pilot farmers (i.e., 10-50 farmers) more intensively, to supply a buyer and possibly serve as a model for neighbors. Alternatively, some zonal projects engage a greater number of farms (i.e., 100-1,000) through large workshops, occasional farm visits, and support for water quality labs or assessments that might influence regional policy. The largest project claims to reach 30,000 extensive shrimp farmers in Bangladesh, helping to improve management practices, make supply chains more transparent, and find premium markets for their product.

**AIP implementer** describes, quite simply, whether the AIP is being run by a third party (e.g., NGO) or a supply chain company engaged in the project. WWF Sidoarjo Shrimp AIP is an example of a third-party run AIP; it is a new project started and facilitated by WWF and a co-implementing NGO, KOIN. In contrast, the Hainan Tilapia AIP (though initiated by the SFP) is now run by the Hainan Tilapia Sustainability Alliance, an industry association comprised of six private supply chain companies that support two full-time staff to run the project. In some cases, such as when AIPs are part of transitional certification programs, an AIP may be run by an NGO that has relatively little direct involvement.

**Supply chain engagement** describes the current animating force behind the AIP. Bottom-up projects are those that focus on improving production in the hopes of either securing market premiums from current buyers or opening up access to new buyers. For example, the Shrimp Club’s East Java Shrimp AIP has active engagement from local producers association and government and is working to identify international supply chain partners. Comparatively, top-down AIPs are motivated when major buyers attempt to force improvements through the supply chain. For example, in response to buyer demand for certified shrimp, National Fish and Seafood is partnering with a major processing company in Vietnam to certify over 800 farms against the BAP standard through the iBAP in transition program, using farms that have been participating in BlueYou or SNV AIPs.

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## iBAP

In 2015, GAA launched a transition program called iBAP to help onboard farms into BAP certification. Farms or groups of farms complete a self-assessment and develop an improvement plan, then have up to one year to complete the necessary steps to apply for full BAP certification. iBAP farms and facilities that do not transition to full certification within the allocated year will be banned from participating in iBAP or BAP certification for two years. Participants commit to half of the BAP audit fee when starting the program, and the remainder at the end of the year, at the time of audit. Progress is tracked through quarterly progress updates. iBAP participants receive market recognition for being part of BAP’s in-transition program, but remain separate from fully certified products.

Compared to most other types of AIPs, iBAP provides less staff or technical support to participating farms, instead counting on farm managers.

As of April 1st, the iBAP program had 900 farms and 15 facilities participating in the program. GAA anticipates engaging between 1,600-1,900 farms by the end of 2016.

Source: <http://bap.gaalliance.org/bap-certification/ibap/>



### Example AIP: Hainan Tilapia (China)

Current characteristics: Zonal project; industry-led; bottom-up

China produces one-third (1.6 mmt) of the world's tilapia, with the southern island of Hainan providing about a quarter of Chinese production. In Hainan, there is little local demand for tilapia; 95% of the product is exported overseas, with about 40% destined for the U.S.

The Hainan tilapia AIP was developed by SFP starting in 2011 and has recently transitioned to the local leadership of the Hainan Tilapia Sustainability Alliance, which has two full-time staff. The project is actively supported by US importer Fishin'Co. The AIP provides a Code of Good Practices (which it developed with a Chinese research institute) and technical support to about 35 participating farmers (mostly small-scale), with the hope of scaling to help improve production across the entire region. The Code of Good Practice works to, (1) help farmers transition to a more productive feed regime (e.g., feeding 4 times a day instead of 2), (2) manage water quality based on weekly indicator tests, and (3) use appropriate polycultures with bighead carp. The AIP intends to increase aquaculture sustainability across the region through education, and to ultimately build a premium regional brand for Hainan tilapia that is recognized in international markets. A number of farms also hope to secure GAA zonal certification in the coming year.



The Alliance coordinates closely with research institutes and with a variety of supply chain companies to advance the science of sustainable management and to ensure that farmers are adopting best management practices. Companies join and pay yearly membership dues in order to improve the quality of product received and improve market access. Participation has grown to six partner companies, including middlemen, feed companies, and vertically integrated processors. Farmers join for access to technical support and market information like tilapia pricing data and trends in buyer demand.

Company-employed technicians are one of the primary mechanisms for farmer education in the region. With Alliance support, these technicians volunteer part of their time to support farmers. They conduct weekly water quality testing and participate in an ongoing dialogue with participating farmers in support of the Code of Good Practices. The water quality testing, which occurs through test kits and is calibrated through occasional lab testing, is also shared with participating research institutes. These research institutions are in the process of refining technical recommendations for best practices depending on soil type, intensity, and other local factors, as well as recording these data for trend analyses over time.



## Perspectives from the field: what do AIPs do?

In most cases, AIPs aim to promote a set of better management practices among a specific group of farmers. These practices often include water quality testing, feed management, appropriate use of inputs, and documentation, all in service to improved yields and reduced disease. Many AIPs also include measures to support workers, communities, and livelihoods by ensuring farmers are subject to basic work protections, helping them increase income through better production management or value-added activities, and, in some cases, promising them a premium for AIP product. Many of these changes have environmental benefits. AIPs may also target activities that are purely environmental in nature, such as planting or conserving mangroves, or protecting local fauna.

AIPs support adoption of these better production practices through an array of activities.

- In almost all cases, AIP implementers work directly with farmers on these issues through workshops or one-on-one education, or mobilize supply chain members, private technicians, NGOs, academic institutions, or government extension agents to help educate and support farmers.
- AIP implementers may help research, develop, and apply codes of best practices, as in the case of Hainan tilapia.
- AIPs can also engage on research or regional policy, whether through helping refine local codes of best practice or pushing for carrying capacity assessments that inform government approaches to zoning in the region, as has occurred with East Java shrimp.
- In some cases, AIPs may work to directly engage buyers, as with BlueYou's Ca Mau Shrimp and Solidaridad's work in Bangladesh.

To a certain extent, AIP approaches vary depending on whether the target producers practice intensive or extensive production. Extensive production tends to be less resource-efficient, but have relatively simple production systems with few local impacts apart from land conversion. The primary gaps targeted by AIPs are around biosecurity and documentation. Intensive aquaculture production, much like intensive livestock production, is more resource efficient in terms of output for a given quantity of land, energy, or other inputs, but feed use, effluent generation, and disease can pose challenges. These issues may be targets of AIPs improvement efforts.

For additional examples of what AIPs do, see the Hainan Tilapia AIP, the Tarakan Shrimp AIP, and the GAA iBAP program call-out boxes.

## Better management practices in AIPs, and strategies to encourage adoption

### Practices

#### Improve productivity and reduce disease

- Source and handle broodstock better
- Employ more productive feeding regimes
- Test water quality regularly to allow for management adjustment and to prevent disease
- Use appropriate polycultures
- Coordinate release of water to avoid disease
- Implement post-harvest pond treatments
- Dispose of sick, dead stock appropriately
- Report disease to neighboring farms

#### Encourage traceability

- Develop log books systems
- Separate AIP product from other product (Chain of Custody)

#### Reduce environmental impacts

- Cut use of pesticides, antibiotics, chemicals, and other additives
- Construct settling basins for effluent
- Test water quality of receiving water bodies
- Encourage efficient use of more sustainable compound feed
- Conserve or reforest critical habitats, like mangroves

#### Support workers and communities

- Encourage the creation of cooperatives
- Require contracts and fair pay
- Prevent forced, bonded, and slave labor

### Strategies to encourage adoption

- Farmer training and workshops
- Organize farmer groups and cooperatives
- Develop codes of good practice for productivity, reduced disease, and reduced environmental impacts
- Train farmers on value-added production activities
- Develop audit systems to ensure and document compliance
- Partner with research institutions
- Provide and/or advocate for improved technical assistance or extension services
- Conduct or support regional assessments (disease, carrying capacity, environmental impact, social)
- Influence aquaculture policy, including government incentives and siting rules
- Encourage farmer and implementer exchanges
- Provide a premium for AIP product

### Example AIP: Tarakan Shrimp (Indonesia)

Current characteristics: seeking ASC certification; NGO-led; bottom up

Formed in 2008, the WWF-Indonesia black tiger shrimp AIP in Tarakan, North Kalimantan engages silvo-fisheries nestled in a remote mangrove-forested delta. The AIP, which has one dedicated staff and two temporary staff as field facilitators, partners with a major local shrimp processor and 11 large, extensive shrimp farmers in its supply chain. Two of these farms hope to achieve ASC certification within the next year. As with other WWF AIPs, this project is explicitly targeting eventual ASC certification, and the work plan is designed around ASC's key principles.



Historically, the project has focused on mangrove reforestation, but in recent years the AIP implementers have worked directly with farmers to keep log books for greater transparency and traceability, implement water quality testing, develop contracts with workers, and eliminate use of illegal chemicals and inorganic pesticides. The region as a whole has struggled with the long-term effects of pesticide use, which allow for temporary increases in production but cause decreases in pond productivity over the course of a decade. Now, only 60% of the farms in the region are operational. This decline has helped make farmers in the region more receptive to the idea of eliminating inorganic pesticides.

Processor PT Mustika Minanusa Aurora (PT MMA), Tarakan's biggest processor and exporter of black tiger shrimp, is the key supply chain partner. PT MMA's buyers also play important roles. The primary buyer of PT MMA helps pay for mangrove reforestation on farms and supports other improvements needed to comply with ASC requirements. They sell to Aeon, a Japanese retailer publically committed to selling ASC- and MSC-certified product. (The WWF network attempts to engage on both the buyer and production sides: WWF-Japan builds work-engagement with the Japanese market on demands for ASC, while WWF-ID works with the producers to implement improvements.) WWF-ID AIP staff has worked with PT MMA to improve waste water management in the processing facility. Moving forward, they hope to improve farm documentation and broodstock traceability and to develop environmental and participatory impact assessments needed for farms to get ASC certified.

WWF is also focusing at the local and national policy level to try to resolve jurisdictional discrepancies in land zoning which affect the legality of the shrimp ponds in North Kalimantan. Furthermore, WWF's work in Tarakan and other AIP locations helps inform their national level policy work to develop an ecosystem approach to aquaculture, revise Indonesia's Good Aquaculture Practices (IndoGAP or CBIB) requirements, and protect wild tiger shrimp populations used to supply aquaculture broodstock.

## Obstacles to AIPs

In practice, AIPs have not yet deeply engaged international supply chains or Western buyers, particularly in those cases where the AIP is not a stepping stone to certification. Demand for AIPs from buyers may be low because available certified volume has been sufficient to meet existing demand for responsible product, because it remains relatively easy to certify additional product, or because of a lack of familiarity with the concept. In contrast, for wild capture species, FIPs proliferated when there was insufficient certified volume to meet growing market demand from sustainable seafood commitments.



AIPs may also struggle to drive change in areas where mariculture production is so dense that it causes disease or pollution problems. Reducing capacity is not economically attractive for any given operation and is likely to prove challenging for AIPs.

In some cases, the goals of the conservation community and AIP implementers may diverge. AIPs mostly focus on farm-level management. Yet often the most destructive environmental impacts of aquaculture occurs when ecosystems are converted to create the production system or where a new species is introduced. Take Southern Chile: many conservationists are advocating for a moratorium on aquaculture in the southern-most region, yet AIPs alone are unlikely to prevent this development. Similarly, AIPs are often poorly positioned to address mangrove deforestation, either because they are not located in the regions where this conversion is actively occurring or because industry or government may have limited appetite and capacity to limit expansion.

Many aquaculture production systems use compound feed that is made with fishmeal and fish oil, which can be derived from environmentally or socially irresponsible fisheries. Aquaculture improvement projects can help direct farmers or feed companies to more sustainable alternatives, particularly in cases where the AIP is moving towards a certification which requires IFFO Responsible Supply, MSC-certified, or other “sustainable” feed ingredients. In certain geographies, however, farmers may be limited in terms of what sustainable feed is available, despite AIP demand.

Finally, in many cases, AIPs face structural challenges such as illiteracy, which impairs record keeping and traceability, and widely distributed production, which increases the numbers of farmers that must be engaged and the associated complexity.



## AIPs and FIPs

AIPs and FIPs share similar origins, structures, implementers, and target markets, and explicitly comparing the two interventions provides an opportunity for the community to better understand the growing AIP movement. This section is intended especially for readers already familiar with FIPs.

In general, FIPs and AIPs both use supply chain pressure to improve fishing/farming practices and produce more sustainable seafood. Both projects effectively promote change amongst participating producers and struggle to effect change more broadly (e.g., at the policy level).

Both the similarities and differences are outlined further below.

- **Inception and growth of the approach:** SFP and WWF implemented their first FIPs in the early 2000s, which started a rapidly growing movement that now includes over a dozen different implementers. Now, a number of traditional marine conservation organizations are tailoring their approaches to engage corporate partners to become FIP implementers themselves (or at least more FIP-like). Comparatively, AIPs emerged more recently, with SFP and WWF implementing the first AIP pilots within the last decade.<sup>5</sup> AIPs are newer and less numerous.
- **International market engagement:** Market engagement is now a well-established pathway for change in wild-capture fisheries. Major North American and Northern European buyers of seafood demand responsible products from their suppliers, which in turn demand them from their suppliers. This eventually manifests as production-level improvement programs such as certifications or FIPs.

In aquaculture, the end-buyer community relies primarily on certifications (e.g., ASC, GAA, GlobalG.A.P. in the E.U.) or ratings (e.g., Monterey Bay Aquarium's Seafood Watch) to satisfy its sourcing needs. AIPs are less common. As pioneers of the intervention, SFP and WWF have been trying to simultaneously cultivate both the market demand for and supply of AIP-engaged seafood. They have seen mixed success. Outside of major buyers partnered with SFP and WWF, there appears to be little demand or awareness of AIP-engaged seafood. Without such supply chain engagement, AIPs lack a key driver for change. Still, the current lack of engagement is not unexpected; only now, after more than a decade of implementing history, are FIPs being widely included in sustainability commitment language and buying decisions.

<sup>5</sup> It is worth highlighting that market recognition for farm-level improvements has existed for years, if not already for a decade, in the form of programs seeking to transition production systems to meet organic aquaculture standards, like Naturland. These projects did not identify with the term AIP and it is not clear whether they received any market recognition prior to organic certification, but they still were improvement efforts motivated by the promise of market benefits and might be considered the first projects of their kind.

- **Influence:** In general, both FIPs and AIPs are effective at guiding engaged stakeholders to make changes in their own practices. In most cases, improvement projects are only engaging a fraction of all producers, which creates a real challenge when trying to reform an entire fishery or region.

Yet farmed production systems are not insulated from other actors' abuses of shared resources, as fish farming almost always uses shared water systems. These shared water systems can spread disease and pollution that harm productivity. Better management practices and greater communication among farmers using the same water can help reduce these risks.

Though still early, we are unaware of any regulations or regional management plans that AIPs have influenced or successfully promoted into adoption—though three may be in the process of doing so—and suspect that changing resource governance policy will prove to be as difficult for AIPs as it has been for FIPs.

- **Engagement with local industry:** AIPs appear to be better positioned to engage local industry (e.g., processors, middlemen, feed companies) in a meaningful way than FIPs. Whereas short-term total catch reductions may be needed to recover fisheries stocks, the entire supply chain can benefit from many AIPs' efforts to reduce disease and improve production. The possible exception is cases where stocking density should be reduced, e.g., Chilean salmon, which might require decreases in total production.
- **Anticipated rate of progress:** In addition to potentially engaging local industry more effectively, AIPs should also expect changes more quickly than FIPs. Fish farmers often have multiple production cycles per year, depending on the species, whereas wild capture fisheries generally take years for stocks to recover in response to changes in management. A number of experts suggested that AIPs preparing farms for certification should expect results in one to two years, except for species with particularly long production cycles, like salmon, yellowtail, and other marine finfish. The Global Aquaculture Alliance's AIP program, iBAP, has an explicit 12-month time horizon, after which point farms are expected to submit for full GAA BAP certification. Zonal AIPs focusing on wide-spread improvements will take longer and may more closely mirror FIPs' rate of progress than those AIPs seeking farm-level certification.

## Future of AIPs

AIPs will likely continue to increase in number and volume. The iBAP program in particular seems to be scaling rapidly. We expect NGOs and companies to launch new AIPs in the coming years. We also expect that development- or conservation-oriented aquaculture projects may increasingly adopt AIP characteristics if Western markets start explicitly requesting AIP-engaged seafood products.

### Possible future direction

In general, we see three primary rationales for pursuing AIPs:

#### **Rationale 1: Help bring aquaculture to certification:**

*AIPs can help farms that are close to certification make the leap. Market access through an AIP can provide a bridge that makes certification more feasible. Transition and de facto transition programs, like WWF and iBAP AIPs, explicitly focus on bringing farms to certification.*

AIPs can continue to grow as a stepping stone to certification. In most aquaculture production systems, certifiability is far more achievable than it is in an unmanaged fishery, because changes are typically within the control of a farmer (though they may still be beset by water quality and disease issues beyond the farmer's control). Already, two of the three most popular aquaculture program offer integrated in-transition programs that resemble AIPs (GAA, GlobalG.A.P.), and in the case of the third (ASC), WWF implements AIPs where the goal is farm-level certification. In these cases where AIPs explicitly aim towards certification, it may make sense to establish time limits for reaching certification, as GAA does. Such transition programs are common in other commodities; for example, in the responsible forestry space, the Forest Stewardship Council was a mature certification that added a multipart transition program in 2014.



Photo: Wee Teck Hian

**Rationale 2: Encourage policy change and regional improvement:** *AIPs can help to foster good regional and government policy, by addressing issues such as disease spread, siting density, and government funding to aquaculture industry.*

In theory, AIPs have the potential to influence both local and national policy in unique ways. For example, one AIP implementer helped to convince local government to develop a carrying capacity assessment for a region, and the local planning agency may adjust zoning laws in response. This sort of engagement could be particularly valuable in major production regions, such as Chilean salmon, Vietnamese pangasius, or Chinese tilapia, especially in high density areas. Learning from the FIP example, AIPs might be most effective when supporting other policy engagement strategies and organizations, instead of being relied upon as an independent driver of policy change.

**Rationale 3: Engage smallholders and farms far from certification:**

*AIPs can help to improve smallholder and aquaculture systems that are far from certification, who have traditionally had few certification options (though this is changing). A challenge is that there is unlikely to be strong market demand for relatively low-performing, AIP-engaged seafood.*

AIPs may be particularly well-suited to engaging smallholders. Historically, smallholders have not been well-positioned to obtain certifications, though emergent group or zonal certifications are seeking to address this. AIPs are well-suited to working with smallholders in part because they can assist farmers in organizing into groups or cooperatives and because the costs of verification may be lower for an AIP than for formal certification. (Total costs may not be lower, but more funding may go towards improvement rather than verification.)




In a similar vein, AIPs may be useful in helping regions or farmers that are far from certification. AIPs can serve as a transition program that helps less sophisticated producers perform better in terms of chemical use, disease, feed, traceability, or environmental management, even if this shift is only from low to moderate performance. This may be important in places where there are structural obstacles to reaching certifiability, e.g., lack of organic broodstock, unclear land tenure, or a supply chain that makes maintaining chain of custody challenging. However, retail demand for AIP products is low and without strong market support, these types of engagements are likely better suited for traditional agriculture and aquaculture extension service providers, like the World Fish Center.

An example of an AIP-like approach targeted towards those who might not be able to access certification is the Southeast Asian Shrimp Aquaculture Improvement Protocol (ASEAN SEASAIP), which is currently under development. SEASAIP's hope is to develop a guide to good shrimp production practices that leads to a performance equivalent to Monterey Bay Aquarium's Seafood Watch Good Alternative (yellow rated). Though it is not a certification program, technicians will help support and verify improvements on participating farms.



## Measuring the success of AIPs

Without a clearer understanding of the role AIPs will play in the future, it is difficult to prescribe a system for measuring success at this stage. For now, projects or implementing organizations identify their own goals and target metrics for success. They track or plan to track a range of indicators, including those listed below.

<b>Process indicators</b>	<ul style="list-style-type: none"><li>• Value and volume of seafood engaged</li><li>• Number of farms engaged, farmers engaged</li><li>• Workshops conducted</li><li>• Quality of BMP guides developed and deployed</li><li>• Studies conducted</li><li>• Stage reporting system akin to FIPs</li></ul>	
<b>Production system impact indicators</b>	<ul style="list-style-type: none"><li>• Water quality improvements over time</li><li>• Improved resource efficiency (per unit of production)</li><li>• Disease outbreaks, versus comparable non-AIP sites or historical outbreaks</li><li>• Farmer income</li><li>• Policy changes stemming from AIP engagement</li></ul>	
<b>Environmental indicators</b>	<ul style="list-style-type: none"><li>• Water quality in receiving water bodies</li><li>• Benthic quality</li><li>• Biodiversity indicators</li><li>• Escapees</li><li>• Disease spread to wild species</li><li>• Wild-caught feed inclusion rates</li><li>• Land/sea conversion</li></ul>	 <p>Photo: Rovinnovator</p>

Some indicators track the process of implementing AIPs, such as the number of workshops conducted or farmers engaged, while others track outcomes in terms of production efficiencies, such as increased volumes or disease reduction. Finally, environmental and social indicators track elements like water quality in receiving bodies (rather than farms themselves), biodiversity, and farmer incomes. Because outcomes can be influenced by factors outside of AIP control, it is important to track both process- and outcome-based indicators in order to better determine what impact an AIP may have had. Ultimately, the goal is to avoid unnecessary monitoring burdens while providing an acceptable level of transparency.

A stage reporting system that combines a number of indicators might offer a useful yardstick, though creating this sort of stage system has proved challenging for FIPs. As important as the specific indicators are the regularity and transparency with which they are reported upon. Centralizing reporting in a single location, such as the FIP database that is currently being developed by the Conservation Alliance for Seafood Solutions, could be a useful first step.

Looking forward, leading AIP implementers might, in conjunction with certification and rating standards, jointly develop an AIP guideline and tracking tool for the AIP community akin to the MSC benchmarking tool. Such a tool need not necessarily cover all AIPs: for example, they might only apply to AIPs working at the farm level. It also need not comprehensively cover all indicators and could instead focus on key indicator categories.

### Supporting the AIP movement

Site-specific support for AIPs can help demonstrate the viability of the AIP model. Support can help NGOs or companies pursue site-based work and create tools which can be used across multiple sites or projects. Where the market already demands AIPs, such as where they can serve as a transition program to certification, additional support may be less necessary but stakeholders can still provide feedback to ensure strong standards and effective implementation.

Nearly all AIP implementers suggested that market engagement is vital to success. Yet for most projects there is little to no engagement by the international supply chain. One of the best ways to support the fledgling AIP movement would be to cultivate buyer understanding and demand for AIP-derived seafood, to include AIPs in major buyer commitments, to support greater participation in supplier round tables, and to directly engage supply chain companies in AIPs. Numerous AIP implementers expressed a wish that buyers would pay more for better-quality, responsibly-produced product, highlighting the continued importance of supporting buyer and end-consumer demand for sustainability.

AIPs can also benefit from more coordination among projects, as well as between AIPs and other conservation efforts. AIP practitioners should continue to build dialogue with each other to establish cross-links and share information. Similarly, because AIPs and FIPs share many similarities, AIP and FIP practitioners should be in communication with each other. AIPs can share and build off of FIP-oriented tools, such as web platforms and capacity-building workshops.

AIPs are most likely to be effective as one component in the conservation toolkit, including efforts to prevent development of natural areas, improve aquaculture management by national governments, and develop buyer demand for sustainable seafood. AIPs should coordinate with these efforts in parallel.

## Conclusion


AIPs are an increasingly-popular tool to improve the production efficiency and reduce the environmental footprint of aquaculture. Through their market-engagement, they provide the possibility of durable change. Through their flexibility, they offer the potential to engage policy and smallholders. The practices that they support are often the same practices that benefit the producers' bottom line, so it is unsurprising that many AIPs show characteristics common to industry groups or extension services.

Notably, AIPs provide a mechanism to support livelihood improvements for smallholders that might otherwise be excluded from globalizing food markets. Producer empowerment, cooperative and association formation, and community development are well within the potential mandate of these projects and would contribute to the success of the model.

However, the AIP model needs to organize further if it hopes to achieve notable impact across geographies. The implementing community should define what AIPs are, what they seek to accomplish, and how they will measure progress and define impact. Providing clear answers to these basic questions will make it possible to cultivate the market demand necessary to support these projects beyond the current landscape of one-off company relationships.

Despite many similarities between projects on the ground, there remains a conceptual schism between "farm-level" and "zonal" AIPs. Advocates of the farm-level approach see minimum, measurable benchmarks for progress and impact as critical elements of an AIP and are inclined towards certification as an end goal. They see zonal or policy work as helpful but ancillary. Advocates of the zonal AIP approach argue that focusing on farm-level improvements and certifications does not fully address disease exposure or other regional risks impacting shared water resources. They compare farm-level certification to obtaining vessel-level certifications without appropriate fisheries management in place. For them, AIPs ought to improve production across an entire region through industry coordination and policy reform.

The zonal AIP model faces an additional challenge in that end buyers' desire certified product or product on a path to certification, which is not necessarily the goal of zonal AIPs. Individual end buyers will sooner support zonal AIPs where they can secure preferential rights to product, but getting multiple buying companies to cooperatively support improvement may be difficult unless the reliability of product supply is crucial. Zonal AIPs may have more success recruiting local feed suppliers, middlemen, and processing companies to support zonal improvements, like with Hainan tilapia, since these actors directly benefit from stable production within a region.

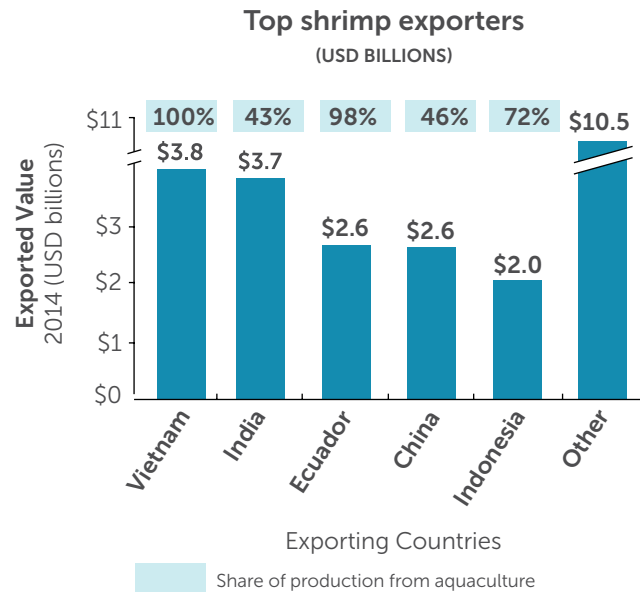


An improvement effort driven by local industry but without strong ties to end buyers does not fit our proposed definition for AIPs as being motivated by market-incentives. However, it is a good example of how aquaculture improvements may be propelled by economic efficiencies. Whether these efficiency-driven interventions are considered AIPs or not, they can still drive resource-conservation benefits. Such interventions may be best supported by industry, extension services, and multilaterals, though the conservation community might also consider coordinating this type of private sector reform leverage with other conservation initiatives.

Going forward, it will be important for the conservation community to be both thoughtful and purposeful when trying to engage and address aquaculture's challenges. With the exception of mangrove deforestation and land conversion, aquaculture's environmental impacts tend to be more indirect. Conservation-oriented actors should identify what exactly they hope to address and what the optimal approach is. AIPs, which encompass a variety of approaches and are capable of addressing a range of challenges, can potentially play a valuable role.

## Appendix

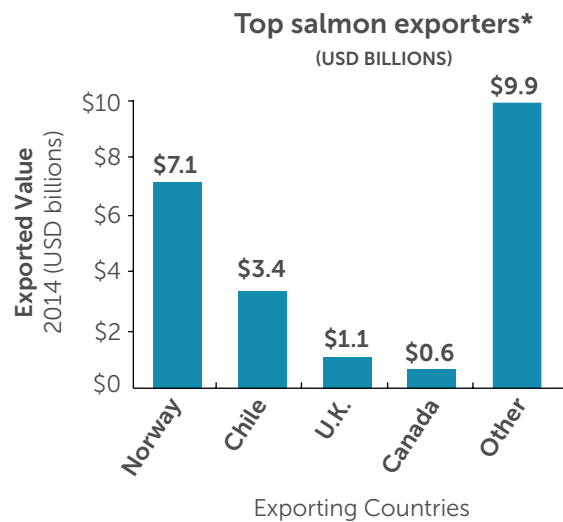
### Global aquaculture import and export of top species



**Top shrimp importers**  
(USD MILLIONS; PERCENT OF GLOBAL VALUE)

1. United States	\$6,704	28%
2. Japan	\$2,773	12%
3. Vietnam <sup>†</sup>	\$1,508	6%
4. Spain	\$1,260	5%
5. France	\$1,022	4%

<sup>†</sup>Primarily for processing and re-export



**Top salmon importers**  
(USD MILLIONS; PERCENT OF GLOBAL VALUE)

1. Sweden <sup>†</sup>	\$3,477	16%
2. United States	\$2,917	14%
3. Germany	\$1,630	8%
4. Japan	\$1,359	6%
5. France	\$1,322	6%

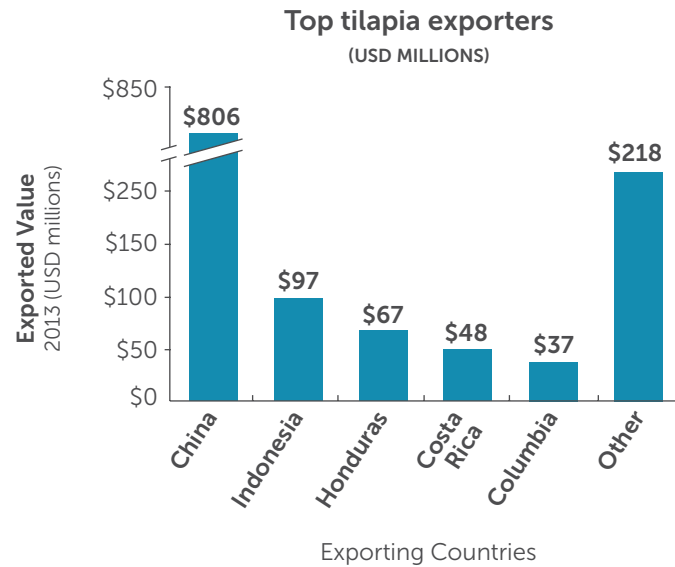
<sup>†</sup>Primarily for processing and re-export

\*Excludes major wild-capture producers (e.g. USA, Russia) and processing countries (e.g. China, Denmark, Sweden, Poland)

FAO, 2016, Fishery and Aquaculture Statistics, Global aquaculture production 1950-2013 (FishStatJ); Trade Maps, International Trade Centre, 2016, [www.trademap.org](http://www.trademap.org).

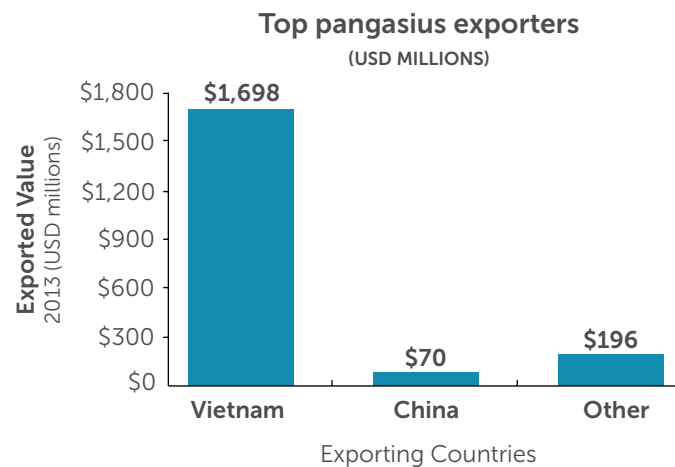


## Global aquaculture import and export of top species



### Top tilapia importers (USD MILLIONS; PERCENT OF GLOBAL VALUE)

1. United States	\$1,036	63%
2. Mexico	\$145	9%
3. Canada	\$47	3%
4. Israel	\$46	3%
5. Iran	\$46	3%



### Top pangasius importers (USD MILLIONS; PERCENT OF GLOBAL VALUE)

1. United States	\$382	27%
2. Mexico	\$99	7%
3. Spain	\$78	5%
4. Netherlands	\$59	4%
5. Germany	\$58	4%

FAO, 2016, Fishery and Aquaculture Statistics, Global aquaculture production 1950-2013 (FishStatJ); Trade Maps, International Trade Centre, 2016, [www.trademap.org](http://www.trademap.org).