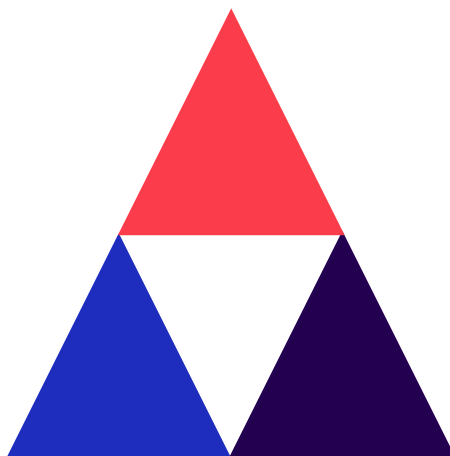




# ► The future of work in aquaculture in the context of the rural economy

Background document for discussion at the technical meeting on  
the future of work in aquaculture in the context of the rural economy  
(Geneva, 2021)



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*The future of work in aquaculture in the context of the rural economy*, Background document for discussion at the technical meeting on the future of work in aquaculture in the context of the rural economy (Geneva, 2021), International Labour Office, Sectoral Policies Department, Geneva, ILO, 2021.

ISBN 978-92-2-034045-5 (print)  
ISBN 978-92-2-034046-2 (Web pdf)

Also available in French: *L'avenir du travail dans l'aquaculture dans le cadre de l'économie rurale*, Document d'information élaboré pour discussion à la Réunion technique sur l'avenir du travail dans l'aquaculture dans le cadre de l'économie rurale (Genève, 2021)], ISBN 978-92-2-034052-3 (print), ISBN 978-92-2-034053-0 (Web pdf) Geneva, 2021, and in Spanish: *El futuro del trabajo en la acuicultura en el contexto de la economía rural*, Documento de referencia para su discusión en la Reunión técnica sobre el futuro del trabajo en la acuicultura en el contexto de la economía rural (Ginebra, de 2021), ISBN 978-92-2-034054-7 (print), ISBN 978-92-2-034055-4 (Web pdf), Geneva, 2021.

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# The future of work in aquaculture in the context of the rural economy

Background document for discussion at the technical meeting on the future of work in aquaculture in the context of the rural economy  
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## ► Introduction

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1. Aquaculture, defined as the cultivation of aquatic organisms in controlled aquatic environments involving interventions in the rearing process to enhance production, is an important source of income and livelihoods for many rural communities, both coastal and inland.
2. The sector has grown dramatically over the past five decades and now accounts for half of the world's fish food supply. It provides direct employment to more than 20 million people, with many more people employed along the supply chain. Today, aquaculture is one of the fastest growing agri-food sectors globally – a phenomenon coined as “the Blue Revolution” following an article published in *The Economist* in 2003.<sup>1</sup>
3. With the growing world population and environmental pressures, aquaculture is increasingly recognized as holding potential for sustainably addressing the challenges of food and nutrition security. In view of aquaculture's important contribution to alleviating rural poverty in a number of developing countries, there is also growing appreciation of its role in enterprise development, job creation and livelihood diversification, especially for the rural poor. In order to promote the sustainability and growth of the aquaculture sector and harness its potential to advance sustainable development, inclusive growth and decent work, there needs to be a stronger focus on addressing employment and labour challenges facing the sector.
4. The report outlines economic and employment trends and developments in aquaculture and the key decent work issues affecting the sector in various countries. It also examines the impact on the sector of the evolving megatrends such as demographic transition, globalization, technological advancement and environmental degradation and climate change, all of which are key drivers of change in the world of work.

## ► Trends in aquaculture production

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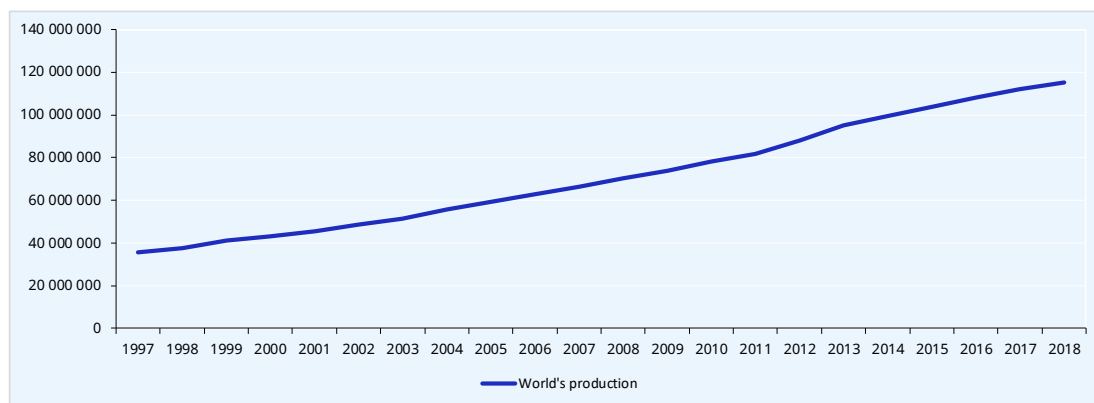
5. Over the past three decades, the sector has experienced an average annual growth rate of 8.8 per cent. Although the sector's expansion has slowed down in recent years, constituting

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<sup>1</sup> “The promise of a blue revolution: How aquaculture might meet most of the world's demand for fish without ruining the environment”, *The Economist*, special report, 7 August 2003.

5.3 per cent in 2010–18,<sup>2</sup> it remained significant in a number of individual countries. This robust growth has also allowed for a marked increase in global fish consumption, which has more than doubled in the past six decades, from 10 kg per capita per year in 1960 to an estimated 20.9 kg in 2019.<sup>3</sup> With an increasing world population, and a growing middle class and purchasing power, the demand for seafood is set to continue rising. Given that the total global capture fisheries production has remained nearly static over the past 30 years, at approximately 90 million metric tonnes, and has been facing sustainability-related challenges stemming from overfishing, poor governance, climate change, environmental variability, habitat degradation and pollution,<sup>4</sup> aquaculture will play a key role in meeting the future demand for seafood.

► **Figure 1. World's aquaculture production, 1997–2018 (tonnes)**



Source: ILO, based on FishStatJ (Software for Fishery and Aquaculture Statistical Time Series) of the Food and Agriculture Organization (FAO).<sup>5</sup>

6. Hosting 11 out of the 15 largest aquaculture producers, Asia accounts for 90.24 per cent of total production (figure 2). According to 2018 estimates, it also has the most diversified production, with 327 (out of 622) species items produced over the years, compared to 128 farmed in Africa, 201 in the Americas and 209 in Europe.<sup>6</sup> Despite the wide number of species, only a small number dominate global production. Finfish farming, the most diverse subsector, includes 27 species and species groups, which accounted for over 90 per cent of the total output in 2018.<sup>7</sup>

<sup>2</sup> ILO, based on statistics from the United Nations Food and Agriculture Organization (FAO).

<sup>3</sup> Statista, "Estimated fish consumption per capita worldwide in 2019, by region (in kilograms per capita)", 26 July 2019.

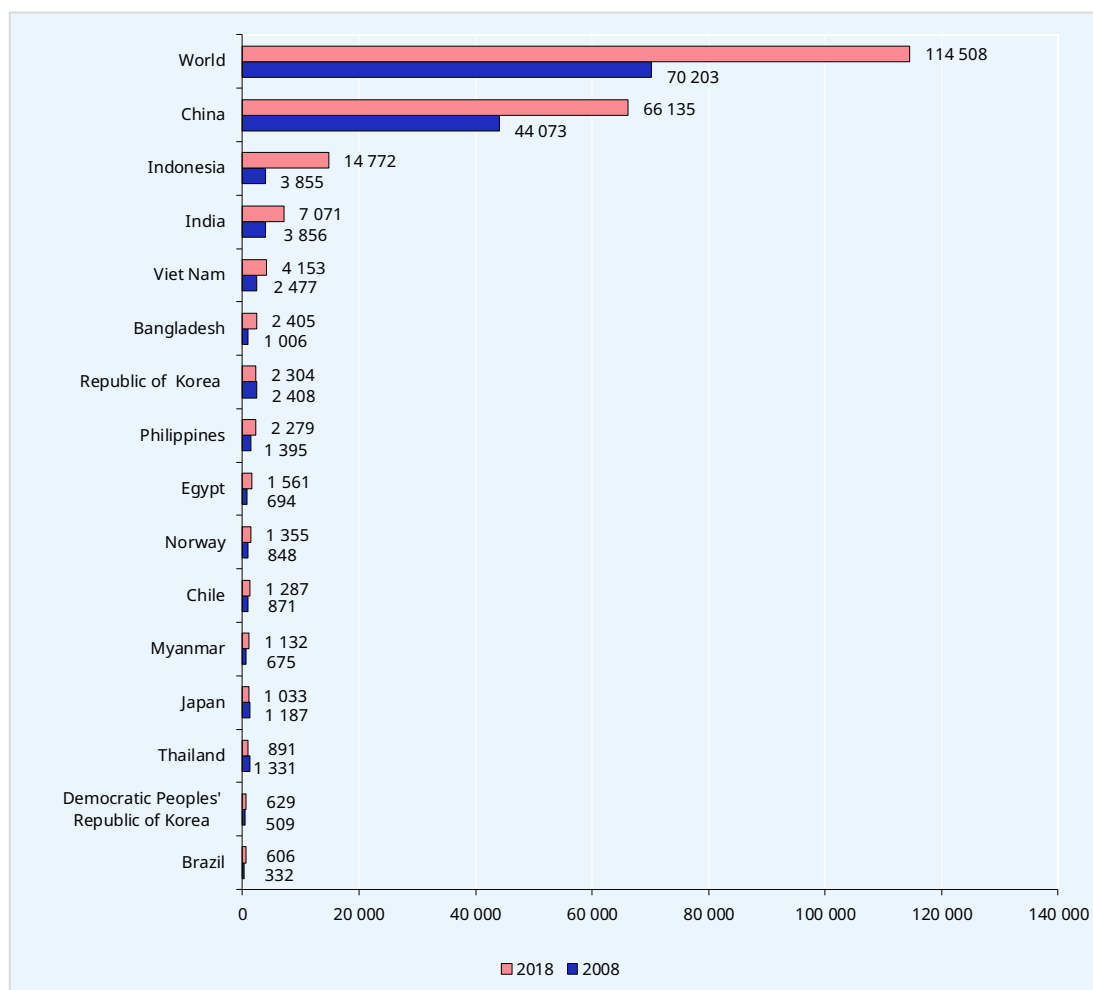
<sup>4</sup> Christopher Costello et al., *The Future of Food from the Sea* (World Resources Institute, 2019).

<sup>5</sup> ILO, based on the FAO's Fisheries and Aquaculture statistics. "Global Aquaculture Production (Quantities and values) 1950–2018" (FishStatJ), updated 2020.

<sup>6</sup> ILO, based on the FAO's Fisheries and Aquaculture statistics. "Global Aquaculture Production ...".

<sup>7</sup> FAO, *The State of World Fisheries and Aquaculture 2020: Sustainability in action*, 2020, 29.

► **Figure 2. Aquaculture production globally and in the top 15 producing countries in 2008 and 2018 (tonnes/thousands)**

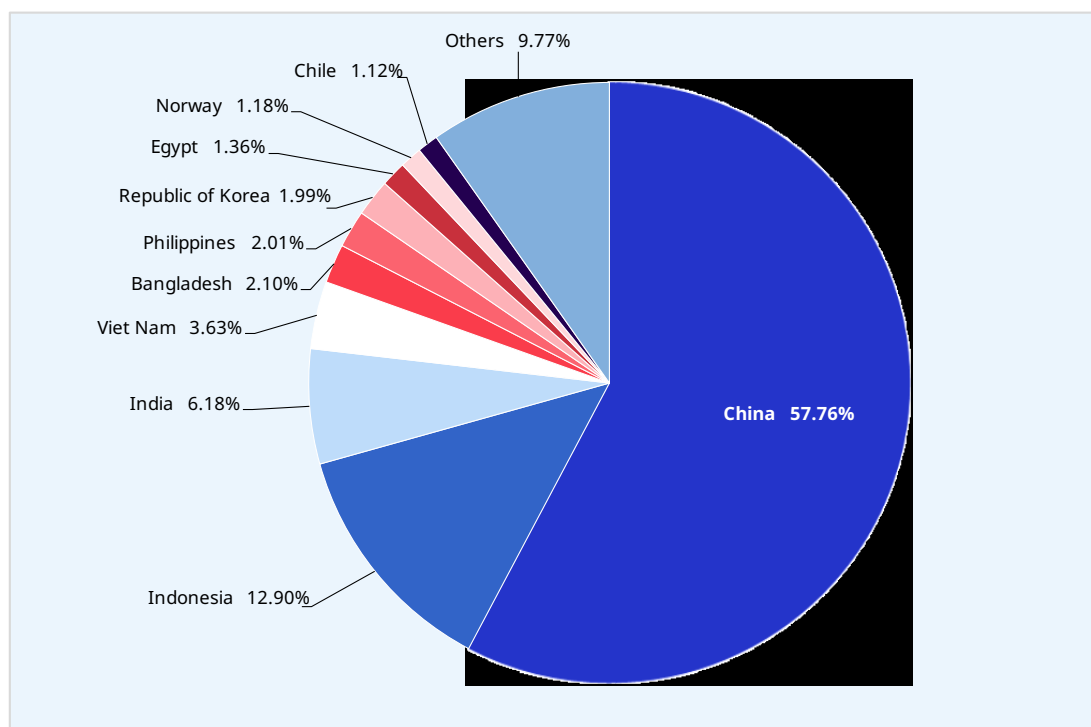


Source: ILO, based on FAO FishStatj. <sup>8</sup>

7. As demonstrated in figure 3, depicting share of production of the ten largest producers, China alone accounts for 57.76 per cent of the global output. Indonesia, India, Viet Nam and Bangladesh complete the top five, contributing 12.9 per cent, 6.18 per cent, 3.63 per cent and 2.1 per cent respectively to the world's aquaculture production. Egypt is the only African country among the top ten producers (1.36 per cent), while Europe is represented by Norway (1.18 per cent), and Latin America by Chile (1.12 per cent).

<sup>8</sup> ILO, based on the FAO's Fisheries and Aquaculture statistics. "Global Aquaculture Production ...".

► **Figure 3. Share of production in the top ten producing countries contributing to total global production 2018**



Source: ILO, based on FAO FishStatJ.<sup>9</sup>

8. According to FAO estimates, in 2018 global fish production was 179 million tonnes, with aquaculture accounting for 46 per cent of the total production and 52 per cent of fish destined for human consumption. In the same year, the value of global fish exports stood at US\$164 billion, while a total first-sale value of global fish production was estimated at US\$401 billion, of which US\$250 billion came from aquaculture production.<sup>10</sup> According to the Organisation for Economic Co-operation and Development (OECD) and FAO projections, aquaculture production will continue to expand and in 2024 will surpass capture fisheries as the main source of fish supply.<sup>11</sup> According to these projections, which do not take into consideration the impact of the COVID-19 pandemic, aquaculture will see an average annual growth of 2.3 per cent during this decade. The projected slowdown in growth, as compared to the previous decade, will mainly be due to lower productivity gains and more stringent environmental regulations, particularly because China's new policies focus on promoting the sustainability and modernization of the sector.<sup>12</sup> According to the World Bank's projections extending to 2030, the sector will continue growing, albeit at a gradually declining rate, falling to below 2 per cent by 2030.<sup>13</sup>

<sup>9</sup> ILO, based on the FAO's Fisheries and Aquaculture statistics. "Global Aquaculture Production ...".

<sup>10</sup> FAO, *The State of World Fisheries and Aquaculture 2020*, 2020, 2.

<sup>11</sup> OECD and FAO, *OECD-FAO Agricultural Outlook 2020-2029*, 2020.

<sup>12</sup> OECD and FAO, *OECD-FAO Agricultural Outlook 2020-2029*.

<sup>13</sup> World Bank, *Fish to 2030: Prospects for Fisheries and Aquaculture*, 2013, 40.

## ► Employment in the aquaculture sector

9. The aquaculture sector provides an important source of employment, income and livelihoods, especially in rural communities, both coastal and inland, for developing countries. Women constitute a significant proportion of the aquaculture workforce, especially in processing. Global data specific to the aquaculture supply chain is difficult to ascertain. The reason for this is simple: downstream from production, in core activities such as processing and wholesale trade, aquaculture is often combined with capture fisheries, although the two sectors may be entirely different in terms of market price exposures, environmental impacts and governance mechanisms.<sup>14</sup> Informality, which often characterizes small-scale aquaculture production in many developing countries, is another reason.<sup>15</sup>
10. The aquaculture sector recorded an average annual increase in direct employment of 4.29 per cent from 1995 to 2018. Globally, aquaculture today provides direct work for an estimated 20.5 million people, accounting for approximately one third of all workers engaged in fisheries and aquaculture. While the number of those engaged in these two industries has increased from 36.2 million in 1995 to 59.7 in 2018, there has been a shift towards aquaculture production away from capture fisheries, which originally represented 80 per cent of total employment.<sup>16</sup> According to available data, women constitute only 14 per cent of those employed in primary production in both fisheries and aquaculture. However, when both primary and secondary activities in fisheries and aquaculture are considered, many sources maintain that women constitute 50 per cent of the workforce.<sup>17</sup>
11. While no up-to-date data on indirect employment generated through aquaculture-related activities is available, it is estimated that for each person employed in primary production in aquaculture and capture fisheries, about three to four related jobs may be involved in secondary activities, including the processing, marketing and service industries.<sup>18</sup> Indirect aquaculture-related employment may be in ancillary activities such as the building of infrastructure (for example, ponds, cages and tanks); production and provision of inputs (feed and seed); manufacturing of fish processing equipment; packaging; and marketing and distribution.<sup>19</sup> A recent FAO study estimated that aquaculture-related activities were a source of employment and livelihoods for some 27.7 to 56.7 million people, who were engaged in them both formally and informally, on a full- or part-time basis. This estimate was based on data from nine countries,<sup>20</sup> where an estimated 11.4 million people were employed in the sector. This included 8.3 million engaged in upstream – hatchery and grow-out – activities and 3.1 million in other segments of the supply chain.<sup>21</sup> The share of workers engaged in farm-level work was much higher in small-scale aquaculture (81.5 per cent) than

<sup>14</sup> Ulf Johansen et al., “The Norwegian seafood industry – Importance for the national economy”, *Marine Policy* 110 (2019).

<sup>15</sup> Data on the size of informality in the sector is not available.

<sup>16</sup> FAO, *FAO Yearbook. Fishery and Aquaculture Statistics 2017/FAO annuaire. Statistiques des pêches et de l'aquaculture 2017/FAO anuario. Estadísticas de pesca y acuicultura 2017*, 2019.

<sup>17</sup> FAO, *The State of World Fisheries and Aquaculture 2020*.

<sup>18</sup> FAO, *Improving governance of aquaculture employment: A global assessment*, 2014.

<sup>19</sup> Diego Valderrama, Nathanael Hishamunda, and Xiaowei Zhou, “Estimating Employment in World Aquaculture”, *FAO Aquaculture Newsletter* 45 (2010): 24–25.

<sup>20</sup> Bangladesh, Chile, Ecuador, Egypt, Indonesia, Mexico, Thailand, Viet Nam, Zambia.

<sup>21</sup> FAO and WorldFish, *Aquaculture Big Numbers*, 2016.



that of those engaged in medium- and large-scale production (59 per cent), which are reported to be characterized by higher labour productivity.<sup>22</sup>

12. While employment trends in aquaculture vary across the regions, given that most production takes place in Asia, estimated at more than 105 million tonnes in 2018,<sup>23</sup> this continent hosts the overwhelming majority of workers (96 per cent) in the sector (table 1).

► **Table 1. Employment in aquaculture in the world and in selected geographical areas, 2010–18 (in thousands)**

	2010	2015	2018
World total	18 625	20 390	20 532
Asia	17 910	19 533	19 617
Americas	336	377	388
Africa	255	355	386
Europe	118	115	129
Oceania	6	10	12

Source: ILO, based on FAO statistics, 2020.

13. According to data provided by Member States to the FAO, the number of workers engaged in the sector in China, which is responsible for the lion's share of aquaculture production, is only slightly higher than the aquaculture workforce in Indonesia and India, which are the second and third-largest producing countries respectively (table 2). Overall, the top 15 producing countries accounted for 93 per cent of global aquaculture employment in 2018. However, ILO research suggests that the number of aquaculture workforce in some countries may be significantly higher. For example, according to a recent ILO study, Viet Nam's seafood sector generates over 4 million jobs. In particular, seafood processing and exporting are a source of some 300,000 jobs. Women represent 85 per cent of the workforce in seafood processing.<sup>24</sup>

► **Table 2. Employment in aquaculture in the top 15 producing countries, 2018 (in thousands)**

Country	2018
1 China	4 743
2 India	4 284
3 Indonesia	4 206
4 Bangladesh	3 080
5 Viet Nam	1 600

<sup>22</sup> FAO and WorldFish, *Aquaculture Big Numbers*.

<sup>23</sup> ILO, based on the FAO's Fisheries and Aquaculture statistics. "Global Aquaculture Production ...".

<sup>24</sup> A study conducted in Viet Nam as part of the EU-ILO-OECD "Responsible Supply Chains in Asia programme", report forthcoming.

	Country	2018
6	Thailand	521
7	Philippines	350
8	Myanmar	148
9	Egypt	54
10	Brazil	41
11	Japan	40
12	Republic of Korea	22
13	Chile	19
14	Norway	8.5
15	Democratic People's Republic of Korea	7.4

Source: ILO, based on FAO statistics, 2020.

14. Most of future jobs in the sector are also expected to be in Asia. For example, Bangladesh, China, India, Indonesia, Pakistan, the Philippines and Viet Nam are projected to account for approximately 89 per cent of employment in industrial marine aquaculture, excluding artisanal activities, by 2030. Asian countries will also provide most jobs in industrial fish processing.<sup>25</sup>
15. With a booming population and an increasing number of people engaged in agricultural activities, Africa, too, is expected to see significant increases in employment in aquaculture, both in production and processing.<sup>26</sup> The African region has seen the highest average annual growth rate of aquaculture production over the past two decades. While it remains a relatively nascent sector in Africa, currently contributing about 18 per cent of the continent's total fish production, it is projected to expand by at least 61 per cent by 2030,<sup>27</sup> making an important contribution to ensuring food security. A number of African countries have formulated strategies, plans and programmes to support the development of the sector. For example, in Equatorial Guinea the ILO has partnered with the African Development Bank in a project that supports government efforts to develop the fishing and aquaculture sector in an economically, socially and environmentally sustainable manner so as to generate employment, especially for women and young people, and meet local demand for fish.<sup>28</sup>
16. Other continents such as North America and Europe have recorded proportional decreases in the number of people engaged in both fisheries and aquaculture in recent years. The sector in these countries is characterized by high labour productivity and low demand for manual labour.<sup>29</sup> Nonetheless, a number of individual countries in these regions are also expected to expand their national productions. For example, in Norway, an international

<sup>25</sup> OECD, *The Ocean Economy in 2030*, 2016, 210.

<sup>26</sup> OECD, *The Ocean Economy in 2030*, 209–210; FAO, *The State of World Fisheries and Aquaculture: Meeting the Sustainable Development Goals*, 2018.

<sup>27</sup> "Africans push for sustainable aquaculture", The Fish Site, 1 October 2018.

<sup>28</sup> ILO, "Partenariat BAD-BIT : Projet d'Appui au développement des chaînes de valeurs du Secteur de la Pêche et de l'Aquaculture (PASPA) en République de Guinée Équatoriale", ILO support project, 2019.

<sup>29</sup> Valderrama, Hishamunda and Zhou, "Estimating Employment in World Aquaculture", 24.

leader in marine aquaculture and the world's second largest exporter of fish and seafood, aquaculture's contribution to the gross national product more than tripled in the last 15 years, while its export value constituted 7.9 per cent of the total export revenue in 2017.<sup>30</sup> The sector, which also makes an important contribution in terms of value creation and employment in coastal rural areas, is expected not only to continue its expansion in the future but also to improve the utilization of residual raw materials.<sup>31</sup>

## Industry structure

17. The aquaculture supply chain includes a wide range of activities – from the production and supply of inputs to farming, harvesting, processing, marketing and distribution; in many developing and emerging economies, it is often characterized by the prevalence of informality, underemployment, and casual and seasonal work, which renders the task of establishing accurate estimates of global employment in the sector difficult. Aquaculture production can be categorized by different types of cultured environments (namely salt, brackish or fresh water); cultured species (for example, freshwater fishes, diadromous fishes, crustaceans, molluscs and aquatic plants); culture technologies (extensive, semi-intensive and intensive aquaculture); value (high or low); destination (domestic versus export); and scale of operations. Aquaculture enterprises range from family ponds producing for subsistence or domestic consumption to specialized commercial small and medium-sized enterprises, as well as large-scale, integrated enterprises, including multinational enterprises producing mainly for international markets.<sup>32</sup> The data on the structure of the industry by type and size of enterprises and by geographical distribution are therefore not readily available. Their various characteristics have, however, implications for income and employment generation as well as for the type of jobs created.<sup>33</sup>
18. Limited information on the number and type of aquaculture enterprises is available for selected countries. For example, in Indonesia, the world's second largest aquaculture producer, in particular of shrimp, the production is dominated by small-scale operations. In 2014, there were 95,400 shrimp farms, of which 76,300 were traditional or extensive, 19,000 intensive and less than 100 were super-intensive farms.<sup>34</sup> About 55 per cent of the households engaged in aquaculture had less than two hectares, while only 6 per cent had more than ten hectares of land.<sup>35</sup>
19. In another major aquaculture producer, Thailand, according to its Department of Fisheries, between 1995 and 2015 the number of freshwater aquaculture farms increased from around 131,000 to more than 540,000 farms, with the area they covered expanding from 58,000 hectares to approximately 128,000 hectares during the same period. The number of farms engaged in coastal aquaculture production in 2015 was 37,790, which is only 5,090 farms more than two decades ago.<sup>36</sup> In recent decades, the sector has experienced

<sup>30</sup> Johansen et al., "The Norwegian seafood industry – ...".

<sup>31</sup> Johansen et al., "The Norwegian seafood industry – ...".

<sup>32</sup> FAO, *Scoping study on decent work and employment in fisheries and aquaculture: Issues and actions for discussion and programming*, 2016.

<sup>33</sup> FAO, *Scoping study on decent work and employment in fisheries and aquaculture: ...*

<sup>34</sup> Ipsos Business Consulting, *Indonesia's Aquaculture Industry: Key Sectors for Future Growth*, 2016.

<sup>35</sup> FAO and WorldFish, *Aquaculture Big Numbers*.

<sup>36</sup> Tiptiwa Sampantamit et al., "Aquaculture Production and its Environmental Sustainability in Thailand: Challenges and Potential Solutions", *Sustainability* 12, No. 5 (2020).

increased consolidation, with large farms taking over small farms. Many of the smaller farms are now contractually linked to larger farms or processing plants.<sup>37</sup>

20. In Viet Nam's catfish supply chain, which is the country's key aquaculture product, large-scale processing and export companies have been developing their own larger-scale production operations, largely at the expense of small-scale and family-based operators, who dominated production for many years.<sup>38</sup>
21. In Europe's top aquaculture exporting country, Norway, the sector hosts more than 900 enterprises, offering services and products in various, often multiple, segments of the supply chain, which include technical solutions, biotechnology, production, processing and distribution. For example, the technical solutions segment, the largest enterprises of which specialize in the provision of services and products specific to aquaculture (for example barges, wellboats, feeding systems, cages, mooring systems, sea lice treatments and software), is dominated by small and medium-sized enterprises representing 80 per cent and 20 per cent respectively.<sup>39</sup> The production segment, which entails operations associated with the fish's entire life cycle, in other words from the breeding and fertilization of eggs to harvesting, has been the main driver of job and value creation in the sector. While the majority of enterprises in this segment are small (60 per cent) followed by medium-sized enterprises (35 per cent), large enterprises, which constitute only 5 per cent of all enterprises in this segment, account for 62 per cent of total revenue. Small enterprises also dominate the processing segment (74 per cent), which includes secondary processing and packaging, but account for only 15 per cent of revenues. Large enterprises represent 3 per cent of the total number of enterprises and 38 per cent of revenues in this segment, while medium-sized enterprises represent 23 per cent in numbers and 47 per cent in revenues.<sup>40</sup> In recent years, Norway's salmon production, which is the most significant aquaculture subsector, has seen a rise in large, vertically integrated enterprises with direct ownership of and control over most supply chain activities.<sup>41</sup> The salmon feed industry has also seen increased consolidation, with three enterprises being responsible for most salmon feed production since 2008.<sup>42</sup>
22. Mergers and acquisitions have been a common feature of salmon production globally. For example, in recent years, North America's Atlantic salmon production has experienced consolidation by a number of European enterprises.<sup>43</sup> Similarly, in South America, the world's second largest salmon producer after Norway, Chile has also increasingly seen fewer but larger enterprises, including multinationals, dominating the sector.<sup>44</sup> The country hosts six out of the world's 20 largest salmon producing companies.<sup>45</sup> While Africa's aquaculture sector is characterized by the prevalence of small-scale and subsistence

<sup>37</sup> FAO and WorldFish, *Aquaculture Big Numbers*.

<sup>38</sup> FAO and WorldFish, *Aquaculture Big Numbers*.

<sup>39</sup> Ernst & Young, *The Norwegian Aquaculture Analysis 2019*, 2019. Company size is defined by revenues: large companies with revenue above 1 billion Norwegian krone; medium-size companies with revenue between 100 million and 1 billion Norwegian krone; and small companies with revenue below 100 million Norwegian krone.

<sup>40</sup> Ernst & Young, *The Norwegian Aquaculture Analysis 2019*.

<sup>41</sup> Gudrun Olafsdottir et al., "Governance of the farmed salmon value chain from Norway to the EU", *Aquaculture Europe* 44, No. 2 (2019).

<sup>42</sup> Olafsdottir et al., "Governance of the farmed salmon value chain from Norway to the EU".

<sup>43</sup> FAO, *Regional review on status and trends in aquaculture development in North America – 2015*, 2017.

<sup>44</sup> Exequiel Gonzalez Poblete et al., "The impact of trade and markets on Chilean Atlantic salmon farming", *Aquaculture International* 27 (2019): 1465–1483.

<sup>45</sup> Olafsdottir et al., "Governance of the farmed salmon value chain from Norway to the EU".

farmers, in Egypt, which is the eighth largest producer in the world, the sector is dominated by large-scale producers.<sup>46</sup>

## ► Opportunities and challenges for the promotion of decent work in the aquaculture sector

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### Addressing decent work challenges in the aquaculture sector

23. Despite its growing contribution to employment, rural livelihoods, economic development, food security and nutrition in many countries, aquaculture faces significant decent work deficits alongside other important social and environmental challenges. As demonstrated in the sections below, decent work deficits that often characterize the sector, especially in many developing and emerging economies, include: the prevalence of informality and discrimination; the presence of child and forced labour, primarily in the informal economy; a lack of organization and social dialogue; low and insecure wages and incomes; low levels of skills; low productivity; poor working conditions and occupational safety and health (OSH) practices; limited social protection; and lack of stable and formal contracts.<sup>47</sup> The seasonality in the production of certain aquaculture species affects livelihoods and jobs not only of those engaged in upstream activities, but also in processing. Employment in aquaculture may be dependent on domestic and international market demand, as has been demonstrated by the impact that the COVID-19 pandemic has had on the sector.<sup>48</sup> Addressing these deficits will be key to ensuring the future sustainability of the sector and of the economies to which it contributes.
24. While there are a number of international labour standards that are of direct relevance to the sector, their application is often limited, as some workers may not be covered by labour legislation due to the nature of their work, absence of an employment relationship or their legal status in the country of employment, as is often the case with migrant workers. Furthermore, in rural economies of developing countries, law enforcement, labour inspection and compliance are often lacking or ineffective.<sup>49</sup> Limited organization and opportunities for voices to be heard among aquaculture workers prevent them from exercising their rights and influencing decision-making processes that affect their working and living conditions.<sup>50</sup>
25. The following section provides an analysis of the salient employment and labour issues facing the sector. While in describing these issues examples refer to individual countries, these challenges are common across most developing countries engaged in aquaculture production.

<sup>46</sup> FAO and Worldfish, *Aquaculture Big Numbers*, 14–15.

<sup>47</sup> FAO, *Scoping study on decent work and employment in fisheries and aquaculture ...*; FAO, *The State of World Fisheries and Aquaculture 2020*, 118; and ILO studies conducted as part of the EU–ILO–OECD Responsible Supply Chains in Asia programme, report forthcoming. For examples on specific decent work deficits, please also see various parts of this section.

<sup>48</sup> Papop Siamhan and Rapatsa Trirath, *Impacts of the COVID-19 pandemic on small-scale producers and workers: Perspectives from Thailand's seafood supply chain* (Oxfam International, 2020); a study conducted in Myanmar as part of the EU–ILO–OECD Responsible Supply Chains in Asia programme, report forthcoming.

<sup>49</sup> ILO, *Giving a voice to rural workers*, ILC.104/III/1B, 2015.

<sup>50</sup> FAO, *Scoping study on decent work and employment in fisheries and aquaculture ...*

## Promoting decent employment creation, skills and enterprise development

26. In many countries, the aquaculture sector is characterized by the increasing casualization of waged labour and outsourcing practices. Although most countries have relevant legislation regarding casual work, workers are often engaged long term on a casual basis with limited or no entitlement to annual, personal or paternity leave, notice of termination or redundancy pay.<sup>51</sup> In some countries, women are disproportionately represented in casual and informal jobs in the sector.<sup>52</sup> Low literacy and skill levels, limited knowledge about rights and responsibilities and low levels of local organization hinder improvements in skills, productivity and incomes.<sup>53</sup>
27. In countries where, despite its potential, aquaculture is still in its infancy, the sector's development is often constrained by a lack of people with the technical skills in fish farming. Skills and workforce shortages are also among key concerns in countries where the sector is in advanced stages of development.<sup>54</sup> In addition to the challenge of finding highly skilled talent with the necessary technical training and knowledge required in operations using advanced technologies, enterprises often struggle to attract and retain a general workforce due to the declining population in rural areas, where most aquaculture activities take place, and the laborious nature of the work. For example, in Canada, the sector suffers tens of millions of lost sales annually due to labour shortages, which hamper the sector's expansion.<sup>55</sup> In some countries, the demand for low-skilled workers is addressed through labour migration. Attracting young women and men into the sector is particularly challenging and will require targeted interventions, including through modernization of the sector, increased use of modern technology, better wages and raising its status as a source of decent jobs.<sup>56</sup>
28. In many developing countries, the challenge is compounded by an inadequate enabling environment for the development of sustainable enterprises and limited access to financial services, modern technology and infrastructure. Creating conditions for sustainable enterprise development, which, inter alia, encourage investment, entrepreneurship, workers' rights and social dialogue;<sup>57</sup> improving access to financial services, technical or entrepreneurship skill development opportunities, in particular for women and young

<sup>51</sup> Ropesta Sitorus, "Kasus Buruh Pengalengan Ikan, Maya Muncar Dipanggil Menakertrans", *bisnis.com*, 3 June 2016; Jorge Katz, "Public Goods, Regulation and the Expansion of the Natural Resource Exploitation Frontier: The Future of Salmon Farming in Chile", *Chile's Salmon Industry: Policy Challenges in Managing Public Goods*, eds Akio Hosono, Michiko Lizuka and Jorge Katz (Tokyo: Springer, 2016), 175–193; FAO and WorldFish, *Women's empowerment in aquaculture: Two case studies from Bangladesh*, 2017; FAO and WorldFish, *Women's empowerment in aquaculture: Two case studies from Indonesia*, 2017.

<sup>52</sup> Natalia Briceño-Lagos and Marie Christine Monfort, "Why using a gender lens to analyse COVID-19 impacts on the seafood industry?" (International Organisation for Women in the Seafood Industry, 2020); G. Dhanya, "Status of women employed in seafood pre-processing units of Alapuzha, Kerala", *Fishing Chimes* 33, No. 7 (2013).

<sup>53</sup> FAO, *Scoping study on decent work and employment in fisheries and aquaculture ...*

<sup>54</sup> Lynn Fantom, "Skills shortage challenge growing in RAS sector", *Aquaculture North America*, 13 May 2020; Mesut Yilmaz and Serpil Yilmaz, "Employment and Problems in Turkish Aquaculture", *Agro-knowledge Journal* 17, No. 4 (2016): 371–380.

<sup>55</sup> Liza Mayer, "How Canada's aquaculture sector could miss out on growth", *Aquaculture North America*, 15 November 2019; Canadian Aquaculture Industry Alliance, "Labour Shortage Holds Back Canada's Aquaculture Industry", newsletter, 2017.

<sup>56</sup> Matt Jones, "Employers need to go the extra mile to attract the young", *Aquaculture North America*, 13 June 2017.

<sup>57</sup> ILO, *Conclusions concerning the promotion of sustainable enterprises*, International Labour Conference, 96th Session, 2007.



people; and enhancing agriculture extension services will contribute to improved sector productivity, performance and growth.

## Improving social protection coverage and occupational safety and health in the aquaculture sector

29. A growing diversification in work arrangements is increasingly making social protection less accessible to agriculture workers, including those in the aquaculture sector. Informality and lack of infrastructure and services in rural areas have traditionally posed significant barriers to rural workers' access to social protection services, even when they are legally mandated. In view of the prevalence of informal, casual and migrant workers in the sector, aquaculture workers' access to social protection remains a challenge in many countries.
30. In Chile, for example, due to the increased use of subcontracting and casual labour, a significant number of salmon farm workers are not adequately covered by national social security legislation.<sup>58</sup> Studies on the working conditions of shrimp processing workers in Kerala, most of whom are women employed as daily wage workers through contractors, found that the majority of them were not provided with state-mandated social security benefits. For instance, only 15.71 per cent of surveyed workers had Employees' Provident Fund accounts.<sup>59</sup> While migrant workers in Thailand have the same right to access social security, including healthcare and paid sick leave, as local workers in reality many, including those in the aquaculture sector, lack coverage as they are employed informally. In recent years, the Government has been tackling this challenge through the regularization of undocumented migrant workers.<sup>60</sup>
31. Aquaculture production is labour intensive and, as most agricultural activities, by its nature physically demanding, and those engaged in it are exposed to multiple OSH hazards with short- and long-term consequences. Aquaculture-specific OSH data is sparse, as it is often considered within the broader agricultural sector. In most aquaculture-producing countries, the focus of policies and regulations has mainly been on product quality, food safety and environmental risks, but less on worker safety and health.<sup>61</sup>
32. Scoping studies on OSH in aquaculture have categorized these hazards as safety, physical, chemical, biological, ergonomic and psychosocial. The hazards can vary significantly depending on the type of aquaculture operation, the specific work process involved, the species that are being cultivated and the scale of operation/production.<sup>62</sup> For example, OSH hazards in industrial aquaculture are considerably different from those prevalent in small-scale commercial aquaculture or subsistence fish farming. Developing and emerging economies may face different OSH challenges from those experienced in developed countries and may therefore require different approaches to tackle them. Underdeveloped OSH management systems and weaker regulatory frameworks and enforcement systems,

<sup>58</sup> Katz, "Public Goods, Regulation and the Expansion of the Natural Resource Exploitation Frontier ...".

<sup>59</sup> Dhanya, "Status of women employed in seafood pre-processing units of Alapuzha, Kerala" ...; Naveen Sathyan, V.V. Afsal and Joice V. Thomas, "The present status of sea food pre-processing facilities in Kerala with reference to Allepey district", *International Journal of Research in Fisheries and Aquaculture* 4, No. 1 (2014): 39–46.

<sup>60</sup> ILO, *Social protection for migrant workers in ASEAN: Developments, challenges, and prospects*, 2018; GB.329/INS/20/6.

<sup>61</sup> Lissandra Cavalli et al., "Scoping Global Aquaculture Occupational Safety and Health", *Agromedicine* 24, No. 4 (2019): 391–404; Mohamed Jeebhay and Dorothy Ngajilo, "Sub-Saharan Africa (SSA) – Focus on Aquaculture OSH profile for South Africa and Ghana" (unpublished); Andrew Watterson, "Asian profile on Aquaculture OSH", University of Stirling (unpublished).

<sup>62</sup> Dorothy Ngajilo and Mohamad Jeebhay, "Occupational injuries and diseases in aquaculture – A review of literature", *Aquaculture* 507 (2019): 40–55; Cavalli et al., "Scoping Global Aquaculture Occupational Safety and Health".

in particular in the informal economy, in most developing countries exacerbate the challenge.<sup>63</sup>

33. In recent years, a number of leading aquaculture-producing countries, the majority of which are in Asia, have taken important steps in establishing stronger legal frameworks on OSH and other issues pertinent to the sector. For example, Indonesia, the Philippines, Thailand and Viet Nam ratified the Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187).<sup>64</sup> Countries such as Indonesia and Thailand have developed a substantial body of laws, regulations and measures on OSH, some of which are of direct relevance to the sector. In 2015, Viet Nam enacted a law on OSH that covers the informal economy. However, there is little or no information regarding the extent to which these laws and regulations have been implemented, especially in aquaculture, exemplified by a dearth of data on sectoral OSH issues from government sources. While several countries are considering strengthening their legal frameworks, starting with the ratification of the relevant ILO instruments, none of the major producers in Asia, or other continents, have ratified the Safety and Health in Agriculture Convention, 2001 (No. 184); only Egypt and Norway have ratified the Labour Inspection (Agriculture) Convention, 1969 (No. 129), which is one of the four ILO governance (priority) Conventions; and, only a few have ratified instruments related to workers' compensation.<sup>65</sup>
34. While the attention paid to the safety and health of workers has increased in a number of countries of the region, such as China, Indonesia and Thailand, challenges persist. For example, a number of reports described the environmental impacts of aquaculture production in China, including chemical hazards such as pollution and contamination of water, with risks to both consumers and fish farm workers. In recent years, the Government of China has taken targeted measures to address ecological and other issues impacting the sector, such as the use of antibiotics, through the enhanced enforcement of sector-related environmental and regulatory laws.<sup>66</sup> A recent ILO study described the general improvements in working conditions in the fisheries and seafood sectors in Thailand that have occurred in the past few years. At the same time, however, it noted that seafood workers often experienced slips, trips and falls, muscle strains, crashes and collisions, cuts and lacerations, and almost half of the interviewed workers said that they regularly suffered from illnesses related to extreme heat or cold in the factories.<sup>67</sup> Indonesia has 42 measures specifically on OSH, not all of which may apply to the aquaculture sector or be enforced effectively across the country's large territory and workforce.<sup>68</sup> Another ILO study highlighted the OSH hazards experienced by workers in Viet Nam's seafood processing industry, in particular those caused by working in a standing position for long hours in cold and wet environments. Such conditions characterize most seafood processing worksites.
35. Various studies described adequate working conditions in formal and export-oriented seafood production sites in India, but these were often in stark contrast to the working

<sup>63</sup> Cavalli et al., "Scoping Global Aquaculture Occupational Safety and Health"; Watterson, "Asian profile on Aquaculture OSH".

<sup>64</sup> China and the Republic of Korea ratified the Occupational Safety and Health Convention, 1981 (No. 155).

<sup>65</sup> The Workmen's Compensation (Agriculture) Convention, 1921 (No. 12) was ratified only by Brazil, Chile, and Norway; the Equality of Treatment (Accident Compensation) Convention, 1925 (No. 19) was ratified by Brazil, Chile, China, Egypt, Japan, Myanmar, Norway, Philippines, Republic of Korea and Thailand.

<sup>66</sup> Mark Godfrey, "China's government debates aquaculture policy shift as investments pour into premium operations", SeafoodSource, 21 May 2020; Mark Godfrey, "Massive shift underway in China's aquaculture, fisheries sectors", SeafoodSource, 16 June 2019.

<sup>67</sup> ILO, *Endline research findings on fishers and seafood workers in Thailand*, 2020.

<sup>68</sup> Watterson, "Asian profile on Aquaculture OSH".



conditions in pre-processing or informal production. A study on working conditions in select fish processing units in India's Tamil Nadu found that women workers, who constituted the majority of the workforce in this activity, were at risk of repeated injuries from unsafe cutting knives, the high pace of work and slippery and cluttered floors. Despite the fact that most of the workers were aware of the potential health hazards, the majority did not use gloves and some worked barefoot.<sup>69</sup>

36. Employers have an essential role to play in promoting OSH principles by setting and effectively implementing OSH policies specific to their enterprises and in line with national laws and regulations, periodically conducting hazard identification and risk assessments, planning and implementing controls and safety training, and providing free personal protective equipment to all workers. This should also entail the active participation of workers and their representatives in all elements of the OSH management system, including through the establishment of enterprise-level OSH committees, in line with the Occupational Safety and Health Recommendation, 1981 (No. 164) and Convention No. 184. According to recent research, strong trade union representation plays a key role in ensuring workplace safety and health.<sup>70</sup> Integrating OSH aspects into collective bargaining agreements is also an effective way of promoting OSH in specific sectors and enterprises.

## Promoting gender equality and women's empowerment

37. While aquaculture represents an important source of employment and income-generating opportunities in different segments of the supply chain, women and men are not always able to participate in, and benefit from, the sector in the same way.<sup>71</sup> Women are particularly active in post-harvest activities in many countries and assume important roles in integrated and household-based aquaculture such as feeding, managing ponds and marketing products. For example, the employment of women in the aquaculture sector in Indonesia, Viet Nam and Zambia was found to range between 40 and 80 per cent.<sup>72</sup> According to earlier reports, in China, they accounted for one third of the aquaculture workforce.<sup>73</sup> Women form an overwhelming majority of the workforce in the Thai fish processing sector, where as many as 90 per cent of workers are immigrants from neighbouring countries.<sup>74</sup> The expansion of the aquaculture sector in Chile has been accompanied by the rapid integration of women into the sector's workforce.<sup>75</sup> In Africa, women's participation in commercial aquaculture is limited. However, when it comes to small-scale fish farming, they are often engaged in all production processes alongside men and in many countries, such as Egypt, Ghana and Zambia, they play a key role in fish trade and retail.<sup>76</sup> However, sex-disaggregated data is only available for a limited number of

<sup>69</sup> T. Amaravathi and P. Parimalam, "Reality of Women Employed in Small Scale Seafood Processing Units", *Trends in Biosciences* 11, No. 22 (2018): 3035–3039.

<sup>70</sup> Cavalli et al., "Scoping Global Aquaculture Occupational Safety and Health".

<sup>71</sup> Froukje Kruijsen et al., "Gender and aquaculture value chains: A review of key issues and implications for research", *Aquaculture* 493 (2018): 328–337.

<sup>72</sup> FAO and Worldfish, *Aquaculture Big Numbers*, 28.

<sup>73</sup> Kyoko Kusakabe, "Women's involvement in small-scale aquaculture in Northeast Thailand", *Development in Practice* 13, No. 4 (2003): 333–345.

<sup>74</sup> Humanity United, *Exploitative Labor Practices in the Global Shrimp Industry* (prepared by Accenture, 2013), 28; Terre des Hommes International Federation, *Migrant Child Labour in the Thai Shrimp Industry*, 2015, 17.

<sup>75</sup> Eduardo Ramirez and Rued Ruben, "Gender systems and Women's Labor Force Participation in the Salmon Industry in Chiloé, Chile", *World Development* 73 (2015): 96–104.

<sup>76</sup> FAO and Worldfish, *Aquaculture Big Numbers*, 32; Ahmed Nasr-Allah et al., *Employment generation in the Egyptian aquaculture value chain* (WorldFish, 2019).

countries and, according to the latest FAO estimates based on reports from countries, women represent 14 per cent of the global labour force in the fisheries and aquaculture sectors. In aquaculture specifically, women represent 19 per cent of the workforce.<sup>77</sup>

38. The globalization of agri-food systems has created entry points for women on commercial, non-family fish farms and along the supply chain, providing important employment opportunities in the production, processing and distribution of aquaculture products. In Bangladesh, for example, the development of commercial shrimp farming has reportedly narrowed down employment opportunities for men due to lower demand for on-farm labour compared with traditional agricultural activities such as rice production, which aquaculture replaced. But it gave rise to employment opportunities for rural women, thereby offering real prospects for their economic and social empowerment. Having been hitherto engaged primarily in traditional agriculture and household duties, these women were now entering off-farm ancillary activities, namely shrimp fry and feed collection, storage and processing, which included beheading, grading and packaging. This development has particularly benefited destitute rural women and saved many poor and landless families from starvation and hunger. The prevalence of low-paid and arduous jobs in the sector, notwithstanding recent improvements in working conditions, meant that many of the workers engaged in aquaculture on a wage basis, including women, continued to struggle to meet their needs.<sup>78</sup>
39. Thus, the advent of commercial aquaculture in many developing countries has proved to be a double-edged sword as, on the one hand, it has contributed to decreasing gender labour force participation gaps but, on the other, these jobs are often time- and labour-intensive, marked by gender-based norms and discrimination, informal arrangements and poor levels of remuneration, with little or no access to social protection.
40. Studies and reports on working conditions in the aquaculture sector in different countries bring to light harsh working conditions and inequalities, including the gender pay gap and division of labour, that are often endured by women workers. For example, Chile's salmon industry, while providing important opportunities for women in wage employment, continues to be characterized by gender-based wage discrimination, as women reportedly receive lower pay than men for the same work.<sup>79</sup> The gender pay gap is also an issue in other countries. In Myanmar, for example, women workers have traditionally been treated as physically weaker than male workers and paid less.<sup>80</sup> In Indonesia, women in seaweed production are generally engaged on an informal basis as daily, casual workers and reportedly receive low wages, despite demanding daily targets.<sup>81</sup> According to various reports, low pay, high daily targets, long working hours and compulsory pre-employment

<sup>77</sup> ILO, based on FAO latest estimates from Member State reporting, 2020.

<sup>78</sup> M. Akhter Hamid and Mohammad Alauddin, "Coming out of their homesteads? Employment for rural women in shrimp aquaculture in coastal Bangladesh", *International Journal of Social Economics* 25, Nos 2/3/4 (1998): 314–337. A number of studies of Bangladesh's shrimp industry note the prevalence of gender-based discrimination in the sector, especially in processing plants, where women comprise 60 to 80 per cent of the workforce but reportedly receive the equivalent of 60 per cent of men's earnings; Loni Hensler, *A sustainable future for shrimp production in Bangladesh? An ethical perspective on the conventional and organic supply chain of shrimp aquaculture in Bangladesh* (Sustaining Ethical Aquaculture Trade (SEAT) project, 2012); The Solidarity Center and Social Activities for Environment (SAFE), *The plight of shrimp-processing workers of southwestern Bangladesh*, 2012.

<sup>79</sup> Ramirez and Ruben, "Gender systems and Women's Labor Force Participation in the Salmon Industry in Chiloé, Chile".

<sup>80</sup> A study conducted as part of the EU–ILO–OECD Responsible Supply Chains in Asia programme, report forthcoming.

<sup>81</sup> Chaerul Umam, "Eksplorasi Perempuan Pekerja Budidaya Rumput Laut", Bina Desa, 29 November 2019.

pregnancy tests, which is a discriminatory practice that should be prohibited, may also characterize working conditions in some shrimp processing factories in Indonesia.<sup>82</sup>

41. Poor working conditions have also been reported in other major shrimp-producing countries, such as Bangladesh, Thailand and Viet Nam. Some 80 per cent of women working at Bangladesh's shrimp processing factories are casual labourers while, owing to constraining gender norms, only 1 per cent of women hold management positions.<sup>83</sup> In addition to limited participation in decision-making processes that have an impact on their working and living conditions, women face more barriers than men to participating in unions. Women engaged in Viet Nam's seafood processing sector, where they account for 85 per cent of the workforce, are often in more vulnerable situations than men as a result of low education levels, lack of access to information and gender-based discrimination. Many are engaged as daily workers, often without a written contract, and receive piece-rate wages.<sup>84</sup>
42. As is the case in many other sectors, women are susceptible to violence and harassment in the aquaculture sector. For example, women engaged in fry collection in Bangladesh were reportedly subjected to sexual harassment.<sup>85</sup> They also experienced exclusion from community activities, as their work was considered demeaning. In this context, the ratification and effective implementation of the Violence and Harassment Convention, 2019 (No. 190), which recognizes the right of everyone to a world of work free from violence and harassment, including gender-based violence and harassment, and its accompanying Recommendation (No. 206), warrant particular attention.
43. In small-scale aquaculture, women often face various challenges in accessing key assets and resources to effectively engage in this activity. These challenges include: low levels of land ownership, limited access to capital for inputs and operations, limited access to markets, lack of necessary skills and technology, and restricted control over the profits made.<sup>86</sup> The important contribution made by women to family-based enterprises often goes unnoticed. Considerable variations exist across geographical regions, especially when social and cultural dynamics change the narrative.<sup>87</sup>

<sup>82</sup> Vincent Fabian Thomas, "Kiara Sebut Hak Buruh Perempuan di Pengolahan Perikanan Diabaikan", *Tirto*, 30 April 2019; Chris Hufstader, "Workers behind the seafood in our markets", *Oxfam*, 21 June 2018.

<sup>83</sup> FAO and WorldFish, *Women's empowerment in aquaculture: Two case studies from Bangladesh*; FAO and WorldFish, *Women's empowerment in aquaculture: Two case studies from Indonesia*.

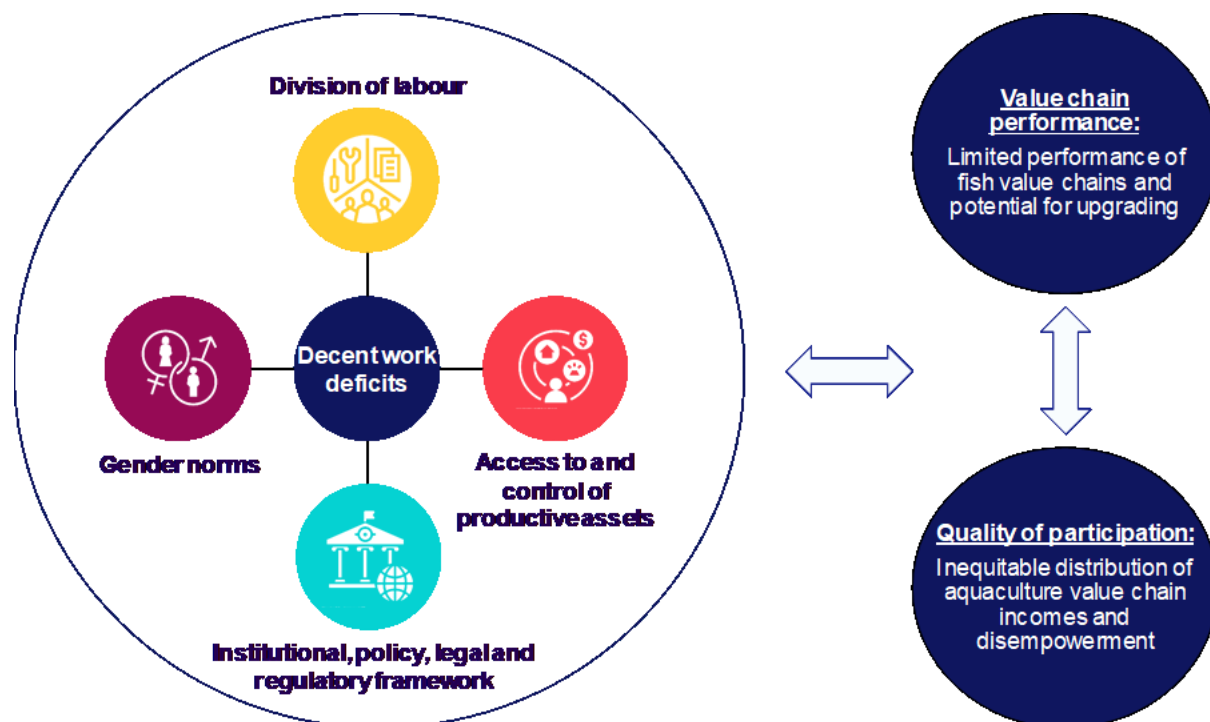
<sup>84</sup> A study conducted as part of the EU-ILO-OECD Responsible Supply Chains in Asia programme, report forthcoming.

<sup>85</sup> Humanity United, *Exploitative Labor Practices in the Global Shrimp Industry*.

<sup>86</sup> Humanity United, *Exploitative Labor Practices in the Global Shrimp Industry*; Justus Rutaisire et al., "Lake Victoria Basin: Gender Issues in Fish Farming", 2010; Khondker Murshed-e-Jahan et al., *Aquaculture technologies in Bangladesh: An assessment of technical and economic performance and producer behaviour* (WorldFish, 2015).

<sup>87</sup> Miranda Morgan et al., "Socio-cultural dynamics shaping the potential of aquaculture to deliver development outcomes", *Reviews in Aquaculture* 9, No. 4 (2016).

► **Figure 4. Factors shaping inequitable gender relations in, and outcomes for, aquaculture value chains**



44. In short, while the sector has provided important employment opportunities for women, including as entrepreneurs, and in particular those from rural areas, the development of aquaculture was not always accompanied by the creation of conditions conducive to the elimination of all forms of discrimination and exploitation and the creation of effective equality of opportunity and treatment for women and men workers.
45. Various studies and projects have demonstrated the importance of policies and strategies aiming specifically at the empowerment of women engaged in the sector, starting with the recognition of the crucial role they play in aquaculture production in many countries, alongside other economic sectors, and addressing the specific decent work deficits they face, including wage gaps, OSH, maternity protection and other labour rights. Investment in the development of skills, including basic numeracy and literacy, has shown to be particularly important in improving the productivity and incomes of women engaged in aquaculture. Raising awareness of the benefits of women's empowerment; creating gender-equitable work environments with real prospects for women to advance into leadership roles;<sup>88</sup> and identifying viable entrepreneurial and employment opportunities for women in the aquaculture sector are among the measures that would help enhance not only women's social status and gender equality in countries with persistent gender stereotypes, but also their contribution to the sector and economies at large.<sup>89</sup>

<sup>88</sup> For examples of good practices for addressing gender issues in the workplace see ILO, *Gender diversity journey: Company good practices*, 2017; ILO, *Breaking barriers: Unconscious gender bias in the workplace* (ILO ACT/EMP Research note, 2017).

<sup>89</sup> FAO and WorldFish, *Women's empowerment in aquaculture: Two case studies from Bangladesh*; FAO and WorldFish, *Women's empowerment in aquaculture: Two case studies from Indonesia*.

46. All of these aspects have been emphasized in the Santiago de Compostela Declaration for Equal Opportunities in the Fisheries and Aquaculture Sectors,<sup>90</sup> adopted by the First International Conference of Women in Fisheries held from 5 to 7 November 2018. The Declaration highlighted the importance of integrating the gender perspective into the formulation and implementation of sector-specific policies and strategies to ensure that the specific impact of the challenges faced by women, as well as their interests, in the sector are taken into account. It also called for the establishment of mechanisms that ensure women's participation in decision-making processes; improvement in the collection of sex-disaggregated data for the sector, which would contribute to highlighting the important contribution of women in fisheries and aquaculture; improvement in the working conditions of women, including through formalization, social protection coverage and equal remuneration for women and men workers for work of equal value; the promotion of women entrepreneurship and business initiatives, access to training and to productive access; the establishment of regulatory frameworks that safeguard equal treatment and non-discrimination and mechanisms for their implementation; and the formation of women's associations and other structures to improve organization and representation of women engaged in the sector, increase opportunities for their voices to be heard and safeguard their rights.

## Promoting international labour standards and fundamental principles and rights at work in the aquaculture sector

### Ensuring non-discrimination

47. The general acceptance of the principles of non-discrimination with respect to employment and occupation is reflected in high rates of ratification of the Discrimination (Employment and Occupation) Convention, 1958 (No. 111) and the Equal Remuneration Convention, 1951 (No. 100), including among major aquaculture-producing countries. Among the top 15 producers, the exceptions are: Myanmar, which has ratified neither of the two Conventions; Japan, which has yet to ratify Convention No. 111; and the Democratic People's Republic of Korea, which is not a Member of the ILO. This issue warrants particular attention, as the sector is an important source of jobs, both actual and potential, for the groups of workers that are often exposed to socio-economic vulnerability. These groups include, but may not be limited to, women, migrant workers, informal economy workers, young people and indigenous peoples.<sup>91</sup> In some countries, certain groups of workers may not be effectively protected under national legislation. This is often the case with migrant workers. In other countries, even where relevant legislation is in force, workers may continue facing discrimination on various grounds. As described in the section on gender equality and women's empowerment, in a number of countries gaps remain in ensuring respect for the principle of equal opportunity and treatment between women and men, especially with regard to equal remuneration for men and women workers for work of equal value. Ratification and effective implementation of the fundamental ILO Conventions and other relevant standards such as, for example, the Migration for Employment Convention (Revised), 1949 (No. 97), and the Migrant Workers (Supplementary Provisions) Convention, 1975 (No. 143), should help address these gaps, thereby ensuring the ability of all workers

<sup>90</sup> International Association for Women in the Seafood Industry, [Santiago de Compostela Declaration for Equal Opportunities in the Fisheries and Aquaculture Sectors](#), 2018.

<sup>91</sup> OECD, [Linking Indigenous Communities with Regional Development](#), 2019.

to exercise their rights and to make an effective contribution to the sector and to economies and societies at large.

## Eradicating child labour

48. There is no global data on the incidence of child labour in aquaculture, while national-level statistics are only available for a limited number of countries. The dearth of data is due to the fact that labour and child labour surveys tend to capture aquaculture within the larger agricultural sector. The extent to which the child labour challenge affects aquaculture specifically can therefore only be inferred from the information on its prevalence in the agricultural sector of aquaculture-producing countries, as well as from individual case studies.
49. Of the 152 million children engaged in child labour worldwide, 108 million, or 71 per cent, are found in rural areas, mostly in agriculture, which includes farming, fisheries, aquaculture, livestock and forestry.<sup>92</sup> The majority of these children (67.5 per cent) work as unpaid labourers on their family farms. The same appears to be true for aquaculture, where in particular in informal, small-scale operations children can be found performing a wide range of activities. These may include: collecting fish fry and seeds; building, cleaning or maintaining gear or facilities; feeding and harvesting fish; applying fertilizers; processing and packaging; loading and unloading fish for transport and shovelling ice; and guarding premises.
50. Poverty and social inequalities, the absence of decent work for adults and young people of working age and the vulnerability to socio-economic shocks are among the main causes of child labour in any sector. The absence of adequate education infrastructure and lack of access to free, quality compulsory education are important contributing factors. Such factors as the education level of parents and their literacy rates, as well as traditional values and norms regarding the education of children and their participation in economic activities and household work, which can be particularly strong in remote rural communities, often also influence children's engagement in child labour.<sup>93</sup> Coupled with the fact that in many developing countries law enforcement and compliance are often lacking or ineffective in the rural economy and that informality rates are high, all these factors have an impact on the incidence of child labour.
51. While important achievements in the fight against child labour continue to be made in many developing countries, including in those with large aquaculture sectors, many children are still unable to enjoy the fundamental right to be free from child labour. For example, in Bangladesh, according to the 2013 National Child Labour Survey, 1.2 million children were trapped in the worst forms of child labour in various economic sectors. Despite the Government's ban, thousands of people, including small children, continue to be involved in shrimp post-larvae collection from wild sources.<sup>94</sup> Children are engaged in various activities in the trading channels.<sup>95</sup> They may reportedly also be found on formal shrimp processing sites.<sup>96</sup> At the same time, however, it has been observed that the advent of

<sup>92</sup> ILO, *Global estimates of child labour: Results and trends 2012–2016*, 2017, 12.

<sup>93</sup> ILO and FAO, *Guidance on addressing child labour in fisheries and aquaculture*, 2013.

<sup>94</sup> Kamrul Islam, "Children of Sharankhola collecting shrimp fry for survival", *Dhaka Tribune*, 12 June 2018; Rashad Ahamad, "Poverty drives Bangladesh coastal children to toil in shrimp industry", *New Age Bangladesh*, 28 May 2018.

<sup>95</sup> Basanta Barmon, Muntasir Chaudhury and Saiyeeda Munim, "Value Chain and Marketing Channels of Shrimp/Prawn Sector of Gher Farming System in Bangladesh," *World Review of Business Research* 1, No. 1 (2011): 10–24.

<sup>96</sup> "Unremitting child labour", *The Financial Express*, 2 September 2018. For example, 96 per cent of the 700 workers, both permanent and contract, interviewed as part of a study on working conditions in shrimp processing, said that



commercial aquaculture has contributed to the fight against child labour by facilitating the development of local infrastructure such as roads, markets and schools, as more farmers were now able to afford the cost of tuition.<sup>97</sup>

52. Child labour remains a challenge in Myanmar. According to the 2015 Labour Force Survey, over 1 million children (aged 5–17 years) – or 9.3 per cent of the children population – are engaged in child labour. Over half of child labourers are in hazardous work, many of them in agriculture. Some 60.5 per cent of child labour is found in agriculture,<sup>98</sup> including along the fish supply chain.<sup>99</sup>
53. Thailand has in recent years made significant strides in eliminating child labour and especially its worst forms. Despite progress, children, particularly migrants from the Greater Mekong subregion, are still reported to be active in the shrimp and seafood processing industries,<sup>100</sup> complex structure of which and the diversity of the operators involved pose challenges to effective regulation. An ILO study found that migrant children engaged in aquaculture were more frequently exposed to occupational hazards than children engaged in other sectors and were twice as likely to suffer workplace injuries. Many of them lacked access to personal protective equipment and worked excessive hours, above the legally permitted limit.<sup>101</sup>
54. Indonesia and Viet Nam are reported to have made substantive progress in eradicating child labour. However, challenges persist. For example, in Indonesia, the second largest aquaculture producer after China, children are sometimes engaged informally in seaweed production, such as handling and repairing nets, attaching seaweed to ropes, sorting seaweed.<sup>102</sup> In Viet Nam, the fourth largest aquaculture producer, it remains an area of concern in aquaculture and some other sectors of the economy.<sup>103</sup>
55. In East Africa, according to research conducted with ILO support, children's engagement in the fisheries and aquaculture sector exceeded 40 per cent of the sector participating labour force.<sup>104</sup> In Africa in general, child labour is reported to be widely dispersed in small-scale and family-owned enterprises, which dominate the continent's aquaculture sector, with the exception of a few countries. As such enterprises tend to rely on family members for a significant share of farm labour, children there are engaged as contributing family workers

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there were children aged 14–18 working in the sector. SAFE, *The plight of shrimp-processing workers of southwestern Bangladesh*, 6.

<sup>97</sup> Hensler, *A sustainable future for shrimp production in Bangladesh?*, 12.

<sup>98</sup> ILO and the Myanmar Ministry of Labour, Employment and Social Security and Central Statistical Organization, *Myanmar labour force, child labour and school to work transition survey 2015*, 2016.

<sup>99</sup> ILO, *Agricultural Sub-Sector Child Labour Surveys: Children working in the cultivation and processing of Inland Fishing Stocks, Sugarcane, and Beans and Pulses in Myanmar*, 2017.

<sup>100</sup> The Asia Foundation and the ILO, *Migrant and Child Labor in Thailand's Shrimp and Other Seafood Supply Chains: Labor Conditions and the Decision to Study or Work*, 2015; Terre Des Hommes International Federation, *Migrant Child Labour in the Thai Shrimp Industry*; Labour Rights Promotion Network, *A Report on Migrant Children & Child Labourers and Seafood Processing in Thailand's Fishing Industry*, 2015; Jon Fernquest, "Education of migrant children: Fighting child labour in Thailand", *Bangkok Post*, 14 June 2017.

<sup>101</sup> The Asia Foundation and the ILO, *Migrant and Child Labor in Thailand's Shrimp and Other Seafood Supply Chains*.

<sup>102</sup> Dedeh Wulandar, *Pekerja anak pada sektor perikanan di kecamatan pekalongan utara, kota pekalongan, provinsi Jawa Tengah* (Institute Pertanian Bogor (IPB) 2006).

<sup>103</sup> Jorge Valero, "Parliament to approve EU–Vietnam trade deal despite human rights 'concerns'", Euractiv, 11 February 2020. According to the 2012 National Child Labour Survey, there were 1.75 million children engaged in child labour, with more than 100,000 working specifically in aquaculture. ILO and the Ministry of Labour, Invalids and Social Affairs, General Statistics Office of Viet Nam, *Viet Nam National Child Labour Survey 2012: Main findings*, 2014.

<sup>104</sup> FAO, *Report of the FAO workshop on child labour in fisheries and aquaculture in cooperation with ILO: Rome, 14–16 April 2010*, 2010.

in a broad range of farming activities. Child labour can also be found in small-scale and artisanal processing, especially in the informal economy. For example, children are found to be participating in aquaculture activities on Lake Victoria.<sup>105</sup> Thousands of children are engaged in the fish supply chain activities on Lake Volta, Ghana. Many of those engaged in fishing have been traded by their parents from other parts of the country, or neighbouring Togo, in return for much-needed cash or a promise that their children will be sent to school or learn a trade. In reality, they are trafficked into forced labour and often endure inhumane working conditions.<sup>106</sup> According to global estimates, more than 4.4 million children below the age of 18 are in forced labour, representing 18 per cent of all forced labour victims worldwide, whose number was estimated at 24.9 million.<sup>107</sup> In order to combat child labour in the fish supply chain in Ghana, the ILO partnered with the General Agricultural Workers' Union of Ghana and the Inland Canoe Fishers' Association in implementing a successful programme in the Torkor community using an integrated area-based approach. The programme placed a strong emphasis on empowering rights holders in the rural and informal economies through building their capacity to organize themselves to improve OSH practices, productivity and access to public services.<sup>108</sup>

56. At the global level, the International Partnership for Cooperation on Child Labour in Agriculture (IPPCCLA), which was established in 2007, brings together the ILO, the FAO, the International Fund for Agricultural Development and the International Union of Food, Agricultural, Hotel, Restaurant, Catering, Tobacco and Allied Workers' Associations to promote cooperation and programme and policy coherence on child labour. In cooperation with agricultural producers' organizations, the IPPCCLA supports innovative pilot approaches to eliminating child labour in a number of countries.<sup>109</sup>
57. With the universal ratification of the Worst Forms of Child Labour Convention, 1999 (No. 182) and a significant number of ratifications of the Minimum Age Convention, 1973 (No. 138), the overwhelming majority of children in the world should be covered by relevant legislation. Ensuring that all children are able to enjoy this fundamental right in practice requires not only translating relevant international legal instruments into national legislation but also ensuring adequate implementation and enforcement.

## Eliminating forced labour

58. Given its labour-intensive nature, especially in processing for some seafood products such as shrimps, in many developing countries aquaculture production relies on the availability of low-cost (and unskilled) labour. This, however, increases the risks of labour standards violations, which are not uncommon in aquaculture and fisheries, and creates legal and reputational risks for the industry.<sup>110</sup> The issue of illegal, unreported and unregulated fishing in capture fisheries, which is closely linked to labour abuse, including child and

<sup>105</sup> M. Medard et al., "Women and gender participation in the fisheries sector in Lake Victoria", Global Symposium on Women in Fisheries, 2002.

<sup>106</sup> Kayla Stewart, "Stolen Childhoods: The girls of Ghana's Lake Volta", PassBlue, 12 February 2020; ILO, *Child labour in the fish supply chain on Lake Volta, Ghana: The Torkor model*, 2016; International Justice Mission, *Child Trafficking into Forced Labor on Lake Volta, Ghana*, 2016.

<sup>107</sup> ILO and Walk Free Foundation, *Global estimates of modern slavery: Forced labour and forced marriage*, 2017.

<sup>108</sup> ILO, *Child labour in the fish supply chain on Lake Volta, Ghana*.

<sup>109</sup> More information available at the [International Partnership for Cooperation on Child Labour in Agriculture website](#).

<sup>110</sup> Jessica Grant, "Slavery in the Seafood Industry", Sustainalytics, 14 March 2019.



forced labour, and which affects many aquaculture-producing countries, also deserves attention, given that wild fish is often used as feed in aquaculture.

59. In recent years, the Thai Government and the industry have pledged to address human trafficking, forced labour and other pertinent labour issues in the sector. Such efforts included the regularization of irregular migrants by granting them valid work permits and extending social protection; inspection of seafood processing factories by multidisciplinary inspection teams and related law enforcement agencies; and close collaboration with the countries of origin to address the use of brokers and recruitment agencies.<sup>111</sup> The large number of human trafficking victims uncovered by the Thai authorities in 2019 demonstrated its strong commitment to fighting human trafficking and forced labour.<sup>112</sup> It also, however, confirmed that the challenge persists.
60. A number of studies and reports have documented decent work deficits, including exploitative labour practices and poor working conditions in Thailand's shrimp industry, which relies heavily on migrant workers from neighbouring countries. Migrant workers are engaged in all stages of processing, including pre-processing. The pre-processing stage, which entails a labour-intensive process of peeling by hand, mostly takes place in small unregistered and/or underregulated sheds. Peeled shrimps are then taken for further processing to factories, the majority of which are registered with the authorities and relevant industry associations. Workers in pre-processing are particularly exposed to risks of experiencing decent work deficits, including long working hours, lack of protection, the withholding of documents (for example passports and work permits), low wages and physical violence.<sup>113</sup> Peeling sheds, mostly operating informally, can easily be relocated, which makes it difficult to investigate and address issues relating to working conditions. Migrant workers, particularly those who work informally or are illegally employed, often fall into debt bondage as a consequence of various deductions from already poor wages (for example for room and board, for protective clothing or as penalties for damaged goods or repayment of a hiring fee).<sup>114</sup> A number of sources have also asserted that the withholding of wages was another issue commonly experienced by migrant workers engaged in shrimp peeling.<sup>115</sup> The deceptive and coercive ways that are reportedly used to recruit migrant workers, as well as Thai nationals, often internal migrants, for Thailand's seafood industry, where they may find themselves working in exploitative conditions, constituted trafficking into forced labour. The inability of migrant workers in Thailand to exercise in full the right to freedom of association makes them particularly vulnerable to exploitation.<sup>116</sup>
61. Exploitative labour practices are reported to occur in other aquaculture-producing countries such as, for example, Bangladesh and India, despite government efforts to tackle challenges facing their aquaculture sectors. For instance, there have been a number of reports bringing to light harsh working conditions, tantamount to forced labour, that are

<sup>111</sup> GB.329/INS/20/6.

<sup>112</sup> "Thailand hit by record number of human trafficking cases", *Reuters* and *The Guardian*, 7 January 2020; John le Fevre, "Trump's GSP seafood cut gives Thailand 2020 GDP an early whack", *AEC News Today*, 27 October 2019.

<sup>113</sup> Humanity United, *Exploitative Labor Practices in the Global Shrimp Industry*, 7, 21 and 48–50.

<sup>114</sup> Terre Des Hommes International Federation, *Migrant Child Labour in the Thai Shrimp Industry*; Tula Connell, "MWRN: A champion for migrant worker rights in Thailand" (The Solidarity Center, 2019).

<sup>115</sup> Connell, "MWRN: A champion for migrant worker rights in Thailand".

<sup>116</sup> International Labor Rights Forum, *Time for a Sea Change: Why union rights for migrant workers are needed to prevent forced labor in the Thai seafood industry*, 2020.

experienced by some workers engaged in shrimp farms and processing in India.<sup>117</sup> In Bangladesh, exploitative labour practices have been reported to be common in fry collection but may also be present in shrimp farming, with farmers subjected to price manipulation and debt bondage by moneylenders or traders in the chain, as well as to verbal and physical abuse.<sup>118</sup>

62. The negative impact that the COVID-19 pandemic has on livelihoods and businesses may further increase vulnerability to forced labour and trafficking, especially in at-risk communities.
63. With the continuing expansion of the aquaculture sector, driven by increasing global demand for seafood and its labour-intensive nature, ensuring that the sector develops sustainably and contributes to economic, social and environmental upgrading will require increased attention to compliance with international labour standards, with a particular focus on fundamental principles and rights at work.

### Promoting freedom of association, social dialogue and collective bargaining

64. The 1998 ILO Declaration on Fundamental Principles and Rights at Work recognizes freedom of association and the effective recognition of the right to collective bargaining as one of the four categories of fundamental rights that Member States are required to respect and promote, regardless of their economic development. These rights are outlined in the Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87) and the Right to Organise and Collective Bargaining Convention, 1949 (No. 98), which apply to all economic sectors. The right of agricultural and rural workers to establish free and independent organizations is further affirmed in the Right of Association (Agriculture) Convention, 1921 (No. 11) and the Rural Workers' Organisations Convention, 1975 (No. 141). However, in many countries, agriculture and other sectors of the rural economy are often challenged by legislative and implementation gaps. Therefore, the majority of workers in agriculture, including aquaculture, face obstacles in exercising this right. As a result, only a small number of workers in the sector are trade union members compared to the total number of workers in the sector. Women face additional challenges in participating in trade unions. In some countries, agricultural and rural workers are excluded from certain provisions of labour law. For example, in Pakistan, agricultural workers fall outside the purview of the relevant laws that would enable them to organize in unions, the exception being the Sindh province;<sup>119</sup> and in Zambia agriculture does not benefit from the minimum wage set by the Government, unlike most other sectors of its economy.<sup>120</sup> In other countries, it is specific categories of workers such as, for example, casual, daily or migrant workers, who are not able to enjoy this right.
65. Low literacy and education levels, as well as poverty, informality and poor working and living conditions, exacerbate the barriers to access to rights that many rural workers may already face. Limited organization among those engaged in the aquaculture sector, which

<sup>117</sup> Raju Das, *Critical Reflections on Economy and Politics in India: A Class Theory Perspective* (Boston: Brill, 2020); Humanity United, *Exploitative Labor Practices in the Global Shrimp Industry*, 78.

<sup>118</sup> Humanity United, *Exploitative Labor Practices in the Global Shrimp Industry*, 45–47; Barmon, Chaudhury and Munim, "Value Chain and Marketing Channels of Shrimp/Prawn Sector of Gher Farming System in Bangladesh", 10–24.

<sup>119</sup> ILO, *Decent work deficits in the rural economy of Pakistan: An overview*, forthcoming.

<sup>120</sup> ILO, *Background report for the Technical Meeting to Promote an Exchange of Views on the Further Development and Implementation of the Integrated Strategy to Address Decent Work Deficits in the Tobacco Sector*, 2019; "Minimum wage increased", *Zambian Eye*, 8 September 2018.

characterizes not only small-scale and subsistence fish farming but also larger-scale commercial production, prevents them from engaging in social dialogue and influencing legislative and policymaking and decision-making processes that affect their working and living conditions.<sup>121</sup>

66. In many countries, informal, temporary and seasonal agricultural and subcontracted workers are often unable to form or join a union. This is the case in Thailand, where such workers do not have the right to form a union or serve as union committee members.<sup>122</sup> Migrant workers face similar challenges, as they can only engage in collective bargaining and organizing as part of a registered union. Most migrant workers, however, prefer not to become involved for fear of reprisals.<sup>123</sup> While workers may join workplace welfare or employee committees, such bodies have been described as lacking independence and autonomy in the election of its representatives. Their work does not lead to binding collective bargaining agreements.<sup>124</sup> Given that these categories of workers constitute the overwhelming majority of the aquaculture workforce in the country, they are precluded from engaging in social dialogue and defending their interests. While recent ILO research noted improvements in the fishing and seafood processing sectors, including improved recruitment practices and wages, as well as the deployment of an additional 180 newly trained labour inspectors, further efforts to improve the legal framework and ensure its effective implementation are needed to guarantee access to decent work for all in the sector, including freedom of association and collective bargaining.<sup>125</sup>
67. Similar challenges exist in other countries. In Indonesia, for example, rural coastal workers and fish farmers are rarely organized in unions, which weakens their bargaining position in the supply chain.<sup>126</sup> Already in the early stages of the development of commercial aquaculture in Bangladesh, shrimp producers reportedly tended not to hire local workers in order to prevent their organization, which resulted in social imbalance and instability in coastal rural areas.<sup>127</sup> Despite the country's efforts to implement reforms during the 2000s, progress has been limited. Today, unions continue to have a weak presence in the sector, with reports of discrimination, intimidation and even physical violence being used against union members and their leaders.<sup>128</sup>
68. While the union density rate may be fairly high among skilled workers in India's aquaculture sector, it can be assumed that the rate of unionization among unskilled labourers is low.<sup>129</sup> Nonetheless, there have been examples of aquaculture workers exercising their right to freedom of association and the right to strike. In 2015, for example, around 6,000 female

<sup>121</sup> FAO, *The State of World Fisheries and Aquaculture 2020*, 118; FAO, *Scoping study on decent work and employment in fisheries and aquaculture ...*

<sup>122</sup> Seafood Working Group, "[Statement on the U.S. Government Decision to Suspend Thailand's Trade Preferences Due to Worker Rights Issues](#)", Human Rights Watch news website, 10 December 2019.

<sup>123</sup> Thunyalak Weerasombat, "[Unions and labour representation in Thailand: Weakness continued](#)", *Trade unions and labour movements in the Asia-Pacific region*, eds: Byuong-Hoon Lee, Sek-Hong Ng and Russell Lansbury (Abingdon: Routledge, 2020).

<sup>124</sup> International Labor Rights Forum, *Time for a Sea Change: Why union rights for migrant workers are needed ...*; Aaron Orlowski, "[Labor unions emerge as voice for migrant fishermen in Southeast Asia](#)", SeafoodSource, 21 April 2020.

<sup>125</sup> ILO, *Endline research findings on fishers and seafood workers in Thailand*.

<sup>126</sup> Mukti Asikin, *Seaweed Value Chain in Sumba Timur* (ILO, 2016, unpublished).

<sup>127</sup> M. Akhter Hamid and Mohammad Alauddin, "[Coming out of their homesteads? Employment for rural women in shrimp aquaculture in coastal Bangladesh](#)", *International Journal of Social Economics* 25, Nos 2/3/4 (1998): 314–337.

<sup>128</sup> SAFE, *The plight of shrimp-processing workers of southwestern Bangladesh*.

<sup>129</sup> Meenakshi Rajeev and Pranav Nagendran, *Decency of primary occupations in the Indian fishing industry*, International Center for Development and Decent Work, Working Paper No. 21, 2018.

workers from 250 peeling sheds joined in a strike to demand an increase in wages.<sup>130</sup> A year earlier, around 125 processing units in the Alappuzha and Ernakulam districts stopped operating, claiming they did not receive the government-recommended minimum wage.<sup>131</sup>

69. Better wages and working conditions are also among the issues for which the sectoral unions advocate in countries with well-developed systems of industrial relations and a strong tradition of collective bargaining, such as Norway. In recent years, the Norwegian aquaculture sector has witnessed a number of disputes and strikes, mainly over substandard wages paid to migrant workers, working arrangements and calls for a collective bargaining agreement.<sup>132</sup>
70. Despite long-standing traditions of effective, institutionalized cooperation between the tripartite partners on labour and employment issues at home, Norway's aquaculture enterprises operating in Chile, where they own the majority of foreign-owned farms as well as local enterprises, have allegedly resisted unionization efforts in the sector. With a general lack of knowledge among workers about their rights and the importance of collective action, the sector's growth has not been accompanied by the development of a strong union movement and has benefited from exploitative practices and low wages.<sup>133</sup> Increased casualization and outsourcing have further constrained the formation of unions in the sector.<sup>134</sup>
71. In many countries, organizing in the sector has been actively pursued by the employers. For instance, in Canada, the sectoral employers are organized in a large number of associations operating at both national and subnational levels.<sup>135</sup> The Norwegian Seafood Federation represents the interests of almost 700 enterprises operating through the entire seafood value chain in the fisheries and aquaculture sectors. Similar associations exist in many other major aquaculture-producing countries.

## ► The future of work in aquaculture

### Demographic changes

72. Aquaculture has great potential for sustainably feeding the world's growing population. With growing demand for animal protein, the limited scope for expanding capture fisheries, as well as pressures on land and fresh water resources associated with increasing land-based meat production, means that harnessing this potential will be critical. According to a recent study assessing the global potential of aquaculture, if farmed sustainably, a mere

<sup>130</sup> Preetu Nair, "Munnar's women tea workers stir the pot", *The Times of India*, 20 September 2015.

<sup>131</sup> Biju Paul, "Peeling Workers' Stir Hits Seafood Industry in State", *The New Indian Express*, 13 August 2014.

<sup>132</sup> European Federation of Food, Agriculture and Tourism Trade Unions, "Norse Production: On strike for a Collective Bargaining Agreement!", news article, 25 September 2017; "Norway: Sekkingstad and Sund, stop union busting!", launch of campaign, *LabourStart*, 28 June 2018; "Norway food workers union readies strike at 18 fish processing plants over minimum wage", *Seafoodnews.com*, 19 May 2014.

<sup>133</sup> FAO, *Improving governance of aquaculture employment ...*; Stina Oseland, Håvard Haarstad and Arnt Fløysand, "Labor agency and the importance of the national scale: Emergent aquaculture unionism in Chile", *Political Geography*, 31, No. 2 (2012): 94–103; Laura Miller, "The fair way or the Chiloé? Exploring the role of certification in the governance of labour in aquaculture in Chiloé, Chile" (Master of Marine Management thesis, Dalhousie University, Halifax, Nova Scotia, 2016).

<sup>134</sup> FAO, *Improving governance of aquaculture employment ...*

<sup>135</sup> Nathan Young and Ralph Matthews, *The Aquaculture Controversy in Canada: Activism, Policy and Contested Science* (UBC Press, Vancouver, 2010).

0.025 per cent of the world's oceans could satisfy global demand for seafood. Nearly all coastal countries possessed considerable areas of space suitable for marine aquaculture production, which could potentially produce 16.5 billion tonnes of fish per year, which is 100 times more than the global demand for seafood.<sup>136</sup> For example, in many of the import-dependent small island developing countries of the Pacific and Caribbean, the sector holds a strong potential to address employment and food security concerns. Economic and governance-related factors will play a critical role in shaping growth trajectories in these and other countries.<sup>137</sup> However, all of them have an opportunity to develop their aquaculture sectors in ways that are aligned with their economic, environmental and social objectives.<sup>138</sup>

73. As described earlier, increasing aquaculture production could create new and expand existing economic activities in developing countries, where most aquaculture is concentrated, potentially improving the livelihoods of rural coastal communities. A considerable number of studies examined the impact of aquaculture on poverty reduction and food security, highlighting direct and indirect poverty linkages, with potential benefits stemming from improved food supply and/or increased incomes and employment.<sup>139</sup>
74. In Bangladesh, for example, where aquaculture plays a crucial role in the rural economy, approximately 10 per cent of overall poverty reduction from 2000 to 2010 has been attributed to growth in aquaculture. Of the 18 million people who escaped poverty during that period, more than 2 million managed to do so through their engagement in aquaculture.<sup>140</sup> The sector has also provided for increased fish consumption even among the poor, which highlights its potential in meeting rapidly expanding protein demands in countries with high population growth such as India and Kenya.<sup>141</sup> However, while the sector provides important livelihood opportunities for the vulnerable and the poor, productivity is often low and the profits mainly accrue to stakeholders downstream the supply chain, including to foreign buyers, processors and local elites, where productivity levels are generally higher. This is also reflected in the fact that fry collectors, who constitute half of the sector's workforce and are mainly women, only receive 6 per cent of its profits.<sup>142</sup>

<sup>136</sup> Alastair Bland, "Can We Feed the World With Farmed Fish?", National Public Radio, 15 August 2017; Rebecca Gentry et al., "Mapping the global potential for marine aquaculture", *Nature Ecology and Evolution* 1, No. 9 (2017): 1317–1324.

<sup>137</sup> Ian Davies et al., "Governance of marine aquaculture: Pitfalls, potential, and pathways forward", *Marine Policy* 104 (2019): 29–36.

<sup>138</sup> Bland, "Can We Feed the World with Farmed Fish?"; Gentry et al., "Mapping the global potential for marine aquaculture".

<sup>139</sup> Direct income and consumption linkages may be associated with the sale and consumption of fish by fish farmers themselves. Indirect linkages are related to: increased employment in the aquaculture sector for both producers and wage workers, including in downstream segments of the supply chain; elasticity effects associated with rising incomes for those entering aquaculture production; increased supply of fish and lower fish prices, with positive impacts on the ability of the rural and urban poor to access it; increased demand for non-tradable local goods and services outside agriculture. Kazi Toufique and Ben Belton, "Is Aquaculture Pro-Poor? Empirical Evidence of Impacts on Fish Consumption in Bangladesh", *World Development* 64 (2014): 609–620; James Stevenson and Xavier Irz, "Is Aquaculture Development an Effective Tool for Poverty Alleviation? A Review of Theory and Evidence", *Cahiers Agricultures* 18, Nos 2–3 (2009): 292–299; Mahfuzuddin Ahmed and Mylene Lorica, "Improving developing country food security through aquaculture development – lessons from Asia", *Food policy* 27, No. 2 (2002): 125–141; Jharendu Pant et al., "Can aquaculture benefit the extreme poor? A case study of landless and socially marginalized Adivasi (ethnic) communities in Bangladesh", *Aquaculture* 418–419 (2014): 1–10.

<sup>140</sup> Shahidur Rashid, Nicholas Minot and Solomon Lemma, "Welfare and poverty impacts of aquaculture growth", *The making of a blue revolution in Bangladesh: Enablers, impacts, and the path ahead for aquaculture*, eds: Shahidur Rashid and Xiaobo Zhang (Washington, D.C.: International Food Policy Research Institute, 2019).

<sup>141</sup> Davies et al., "Governance of marine aquaculture: Pitfalls, potential, and pathways forward".

<sup>142</sup> Verité, *Research on Indicators of Forced Labor in the Supply Chain of Shrimp in Bangladesh*, 2016.



75. A recent study evaluating the labour and income effects of fish farming in rural communities in Myanmar, which is also among the world's leading aquaculture producers, found that commercial aquaculture here generated much higher returns per acre than agriculture. Compared to crop farming, aquaculture had greater employment linkages, which were effective in reducing poverty and income inequality. The research demonstrated the significant spillover effects that fish farming had on the rural economy, especially on the incomes of landless farm workers. This was particularly evident in the case of smaller commercial fish farms, which tended to hire local labour and use local materials, while large farms often required external inputs and capital and their expansion was shown to be associated with raising inequalities.<sup>143</sup>
76. According to a case study examining the aquaculture sector in Ghana, financially viable small-scale pond aquaculture also had strong indirect poverty linkages and multiplier effects, while small and medium-sized enterprise cage aquaculture had higher growth potential.<sup>144</sup>
77. However, while many studies have demonstrated the important income and employment gains generated through engagement in aquaculture activities, these gains were sometimes rather modest when placed in the context of the overall livelihood portfolio of practising households. For example, a project in Thailand reported that, despite successes in generating production increases using productivity enhancing techniques and improving incomes, some households were abandoning aquaculture in favour of selling their labour in the non-farm economy. In comparison, in Bangladesh their continuous engagement in this activity was explained by more severe rural poverty and the lack of income-generating opportunities beyond the farm.<sup>145</sup>
78. Contrary to popular assumptions, a substantial portion of freshwater aquaculture production enters domestic value chains, thereby contributing to increased fish consumption per capita in producing countries. Aquaculture production plays an important role in alleviating the problem of hidden hunger, in other words micronutrient deficiency, which affects many low-income countries. Although in developing countries fish consumption levels remain lower than in developed economies, fish is responsible for about 29 per cent of animal protein intake in the least developed countries, 19 per cent in other developing countries, and about 18 per cent in low-income food deficit countries, while in developed countries it accounts for 11.7 per cent. By the end of this decade, about 59 per cent of the fish targeted for human consumption is projected to originate from aquaculture production.<sup>146</sup>

<sup>143</sup> The study found that returns from aquaculture were 4.7 times higher than returns from agriculture in fish farming villages. Commercial aquaculture required on an average 94 days of labour per acre per year compared with 24 days for crop farming. Mateusz Filipski and Ben Belton, "Give a Man a Fishpond: Modeling the Impacts of Aquaculture in the Rural Economy", *World Development* 110 (2018): 205–223; Ben Belton et al., "The emerging quiet revolution in Myanmar's aquaculture value chain", *Aquaculture* 493 (2018): 384–394.

<sup>144</sup> Laila Kassam, *Aquaculture and food security, poverty alleviation and nutrition in Ghana: Case study prepared for the Aquaculture for Food Security, Poverty Alleviation and Nutrition project* (WorldFish, 2014).

<sup>145</sup> Gesche Krause and Eirik Mikkelsen, "The Socio-economic Dimensions of Offshore Aquaculture in a Multi-use Setting", *Aquaculture Perspective of Multi-Use Sites in the Open Ocean: The Untapped Potential for Marine Resources in the Anthropocene*, eds: Bela Buck and Richard Langan (Springer, 2017), 172.

<sup>146</sup> FAO, *The State of World Fisheries and Aquaculture 2020*, 68–69.

## Globalization

79. Seafood is one of the most highly traded commodities in the world. In 2018, 38 per cent of all fish caught or farmed worldwide was traded internationally.<sup>147</sup> The globalization of the aquaculture sector that has occurred in recent decades, and has been spurred by, inter alia, trade liberalization, a sharp increase in the international demand for seafood products and advancements in production and logistic technology, created important opportunities for many emerging and developing economies. In these countries, these developments have provided farmers with important market signals to swap traditional crop farming for more profitable aquaculture production. While industrialization and consolidation processes are strong for some products, especially those internationally marketed, they are also having an impact on small-scale producers, a trend exemplified by the existence of complex chains with many small enterprises.<sup>148</sup> Nonetheless, the emergence of multinational corporations and large retailers and food service chains, often operating in multiple countries, meant that the supply chain has become more vertically and horizontally integrated. Geographic segmentation that has increasingly characterized the fish supply chain, with the various economic activities often taking place in multiple countries, adds to its complexity and length.<sup>149</sup> Processing is concentrated in countries with lower labour costs which, together with economies of scale, support lower prices. In combination with strong international marketing campaigns, the expansion of markets and the introduction of new types of products, all these trends contribute to generating competition for domestic producers.<sup>150</sup>
80. Today, fish and fish products account for 11 per cent of agricultural exports in value terms. Over the past few decades, world trade in fish and fish products grew significantly in value terms, with total export value reaching US\$164 billion in 2018.<sup>151</sup> Developing and emerging economies, which are also among major aquaculture producers, play a key role in this trade. China – the top aquaculture producer – is also the key exporter and one of the top three importers of fish and fish products. Table 3 below provides information on the top 15 exporters and importers of aquaculture products.

► **Table 3. Top 15 exporters and importers of aquaculture products in the world, 2008 and 2018 (value in US dollars millions)**

Country	2008	Country	2018
<b>Exports</b>			
1 China	10 357	1 China	21 857
2 Norway	6 994	2 Norway	12 014
3 Thailand	6 548	3 Viet Nam	8 912
4 Denmark	4 620	4 India	6 940
5 Viet Nam	4 559	5 Chile	6 932
6 United States	4 533	6 Thailand	6 077
7 Chile	4 027	7 United States	5 788

<sup>147</sup> FAO, *The State of World Fisheries and Aquaculture 2020*, 73.

<sup>148</sup> John Bostock et al., "Aquaculture: Global Status and Trends", *Philosophical Transactions of the Royal Society B* 365, No. 1554 (2010): 2897–2912.

<sup>149</sup> FAO, *The State of World Fisheries and Aquaculture 2020*, 74.

<sup>150</sup> FAO, *The State of World Fisheries and Aquaculture 2018*, 54.

<sup>151</sup> FAO, *The State of World Fisheries and Aquaculture 2020*, 73.

Country	2008	Country	2018
<b>Exports</b>			
<b>8</b> Canada	3 730	<b>8</b> Netherlands	5 670
<b>9</b> Spain	3 493	<b>9</b> Canada	5 345
<b>10</b> Netherlands	3 414	<b>10</b> Russian Federation	5 302
<b>11</b> Russian Federation	2 632	<b>11</b> Spain	5 117
<b>12</b> Indonesia	2 599	<b>12</b> Denmark	5 067
<b>13</b> Germany	2 497	<b>13</b> Ecuador	4 896
<b>14</b> Peru	2 438	<b>14</b> Sweden	4 839
<b>15</b> Iceland	2 208	<b>15</b> Indonesia	4 703
<b>Imports</b>			
<b>1</b> Japan	15 231	<b>1</b> United States	23 943
<b>2</b> United States	15 104	<b>2</b> Japan	15 714
<b>3</b> Spain	7 126	<b>3</b> China	14 692
<b>4</b> France	5 894	<b>4</b> Spain	8 641
<b>5</b> Italy	5 483	<b>5</b> Italy	7 108
<b>6</b> China	5 256	<b>6</b> France	7 079
<b>7</b> Germany	4 545	<b>7</b> Germany	6 048
<b>8</b> United Kingdom	4 257	<b>8</b> Republic of Korea	5 960
<b>9</b> Denmark	3 219	<b>9</b> Sweden	5 630
<b>10</b> Republic of Korea	2 964	<b>10</b> Netherlands	4 536
<b>11</b> Netherlands	2 941	<b>11</b> United Kingdom	4 421
<b>12</b> Sweden	2 769	<b>12</b> Thailand	4 069
<b>13</b> Thailand	2 448	<b>13</b> Denmark	3 953
<b>14</b> Russian Federation	2 440	<b>14</b> Hong Kong, China	3 880
<b>15</b> Hong Kong, China	2 429	<b>15</b> Canada	3 069

Source: ILO, adapted from the FAO's Fisheries and Aquaculture statistics.

- 81.** An analysis of trading patterns reveals that high-value products such as shrimps, prawns, salmon and tuna tend to be directed towards markets where consumers have higher purchasing power. In contrast, relatively low-value products such as small pelagic fish are primarily sold in developing countries. This trend has, however, been changing in recent years, with emerging economies also importing species of higher value.<sup>152</sup>
- 82.** While the globalization of aquaculture production contributed to poverty reduction and generated important economic benefits for major seafood producing countries, in particular in Asia and Latin America, it has exposed businesses operating in these countries to risks associated with rapid industry growth, low labour costs and weak regulatory environments and enforcement. It has also often aggravated social differentiation and

<sup>152</sup> FAO, Fisheries and Aquaculture statistics. "Global Aquaculture Production (Quantities and values) 1950–2018" (FishStatJ), 2020.



threatened environmental sustainability, thereby increasing the cost of global integration at the local level.<sup>153</sup>

83. Private voluntary compliance schemes that have emerged in recent decades with the objective of ensuring that production systems comply with certain quality standards, which include food safety, environmental and occasionally social issues, now cover a significant share of globally traded aquaculture products, in particular shrimps. While these schemes may have contributed to the improvement of the situation, they did not address all the challenges. The complexity of the aquaculture supply chains, the lack of enforcement mechanisms of certification schemes, as well as their voluntary nature, meant that various gaps persist. This in particular concerns labour standards, inclusion of which in these schemes and enforcement has remained weak. The proliferation of certification schemes has confused consumers and diminished incentives for compliance, leading to corporate buyers seeking simply to tick a “certified” box and to producers competing to lower production costs.<sup>154</sup>
84. Many aquaculture-producing countries have made significant efforts to diminish governance gaps by strengthening labour administration and inspection systems. As it is the duty of States to ensure that the fundamental principles and rights at work and ratified international labour instruments protect and are applied to all workers in this and other industries, the development of effective compliance systems must be a government priority.
85. Businesses have a critical role to play in this regard, given their responsibility to ensure respect for human rights in their operations and business relationships. This can be done by incorporating thorough due diligence mechanisms into their management systems. This allows them to identify, prevent and mitigate their human rights impact.<sup>155</sup> Upholding workers’ right to freedom of association and collective bargaining can contribute to effective industrial relations and social dialogue, which in turn will help ensure all other rights and in supply chains can help reduce social auditing costs.<sup>156</sup>
86. The ILO Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy (the MNE Declaration), the OECD Guidelines for Multinational Enterprises, and the United Nations Guiding Principles on Business and Human Rights are key multilateral frameworks providing guidance to enterprises on social policy and inclusive, responsible and sustainable workplace practices. Furthermore, the OECD–FAO Guidance for Responsible Agricultural Supply Chains (the OECD–FAO Guidance) guides enterprises in the agri-food sector on observing existing standards for responsible business and contributing to sustainable development.<sup>157</sup> In addition to the MNE Declaration, the OECD–FAO Guidance takes into consideration the Principles for Responsible Investment in Agriculture and Food Systems of the Committee on World Food Security. Endorsed in 2014, the

<sup>153</sup> Jonathan Barton and Warwick Murray, “Grounding geographies of economic globalisation: Globalised spaces in Chile’s non-traditional export sector, 1980–2005,” *Tijdschrift voor Economische en Sociale Geografie* 100, No. 1 (2009): 81–100; Ramirez and Ruben, “Gender systems and Women’s Labor Force Participation in the Salmon Industry in Chiloé, Chile”.

<sup>154</sup> Humanity United, *Exploitative Labor Practices in the Global Shrimp Industry*.

<sup>155</sup> OECD, “Promoting sustainable global supply chains: International standards, due diligence and grievance mechanisms”, paper presented at the 2nd Meeting of the G20 Employment Working Group, February 2017; Office of the United Nations High Commissioner for Human Rights, “COVID-19 and its impact on businesses and workers”, statement by Michelle Bachelet, UN High Commissioner for Human Rights, at the International Organisation of Employers Digital Dialogue, 2020.

<sup>156</sup> ILO, *The Labour Principles of the United Nations Global Compact – A Guide for Business*, 2008.

<sup>157</sup> OECD and FAO, *OECD–FAO Guidance for Responsible Agricultural Supply Chains*, 2016.

principles refer to the 1998 ILO Declaration on the Fundamental Principles and Rights at Work as one of the documents on which they are based, while one of the ten principles (Principle 2) covers a number of decent work-related issues. There are also examples of tools developed by different organizations to guide their stakeholders and businesses on issues of relevance to the sector, including social aspects. One such example is a guideline developed by the European Bank for Reconstruction and Development (EBRD) to help its financial intermediaries to understand the nature of environmental and social risks associated with operations in the sector and suggest actions for businesses to manage these risks.<sup>158</sup> Some countries (for example, Thailand and Viet Nam) have initiated a process of developing social standards for their seafood industries that would be complementary to national legislation.<sup>159</sup>

► **Corporate social responsibility think tank to promote decent work in the seafood supply chains in Viet Nam**

The ILO, through the EU-ILO-OECD Responsible Supply Chains in Asia programme and in partnership with the International Collaborating Centre for Aquaculture and Fisheries Sustainability, a non-governmental organization of the Vietnam Fisheries Society, and the Directorate of Fisheries of the Ministry of Agriculture and Rural Development of Viet Nam, established a working group on responsible business conduct in the sector in February 2020, called the Corporate Social Responsibility (CSR) Think Tank. A voluntary and tripartite task force, the CSR Think Tank is composed of 14 experts representing stakeholders in the seafood sector, including government ministries, business associations, workers organizations, enterprises, as well as other United Nations organizations and academic institutions. In addition to discussing labour issues in the sector, the think tank provides technical inputs to guide the policymaking process and promote the implementation of socially responsible labour practices in the sector. In particular, the think tank aims to foster dialogue and enhance linkages between national suppliers and international buyers, and disseminate socially responsible labour practices that strengthen the performance of local producers in the sector. It builds the capacity of local producers for the uptake of corporate social responsibility/responsible business conduct practices in selected seafood supply chains and implements interventions at the grassroots business level. It also sets targets for policy consultation and advocacy so that the goal of promoting corporate social responsibility/responsible business conduct and decent work become an essential content of relevant government policies, business associations and enterprises, with a focus on inclusive and sustainable development of the industry.

## COVID-19 and its impact on the aquaculture sector

87. The COVID-19 pandemic has emerged as an unprecedented challenge not only for public health systems around the globe, but also for the world of work. Measures introduced by governments to contain the spread of the virus, particularly cross-border and domestic restrictions on movement, have affected many sectors of the economy, including agriculture and its various subsectors. The pandemic has affected all nodes in the fish supply chain – from fishing and aquaculture production to processing and retail,<sup>160</sup> inevitably having an impact on business and workers engaged in it.

<sup>158</sup> EBRD, *Sub-sectoral Environmental and Social Guideline: Aquaculture (Marine and Freshwater) – Onshore and Offshore*, 2014.

<sup>159</sup> Aaron McNevin, “Setting a new standard in Thailand’s farmed shrimp trade” The Fish Site, 18 September 2020.

<sup>160</sup> FAO, *Summary of the impacts of the COVID-19 pandemic on the fisheries and aquaculture sector*, addendum to The State of World Fisheries and Aquaculture, June 2020.

88. In most countries, agri-food workers continued to work, thereby helping to ensure availability of and access to food. As work in the sector, especially in food processing, requires workers to be in close proximity for long hours and in low temperatures, and often involves shared housing and transportation, many worksites are associated with a heightened risk of virus transmission. Despite this, additional safety measures may not always have been put in place, exposing these workers and their families to increased risks for virus infection. A number of major COVID-19 outbreaks documented at seafood processing plants around the world corroborate this view.<sup>161</sup> Women, who constitute a majority in the downstream aquaculture chain, especially in processing and trading, and are overrepresented in low-paid jobs, are particularly vulnerable to the impacts of the coronavirus pandemic.<sup>162</sup> With low wages and a lack of job security, social protection and access to healthcare, migrant workers, representing a significant labour force in the sector in many countries, also merit special attention. As many businesses are struggling to stay afloat, reducing employees' work hours or laying them off, the consequences suffered by migrant workers can be particularly dire.<sup>163</sup> Their families in their home countries are affected too, as their sustenance and lives in general are often dependent on remittances.
89. Impacts on aquaculture producers have varied depending on the region and the size, production and financial capacity of enterprises, species produced and other factors. Disruptions in supply chain have often led to higher costs, reduced revenues and increased food waste and loss. For example, farmers who were unable to export their produce due to border closures, or to continue supplying it locally owing to decreased demand from food service businesses (including from restaurants, hotels and schools) had to maintain significant live stocks in production facilities, incurring additional feed and monitoring costs and increasing fish mortality risks.<sup>164</sup> Others experienced disruptions in their production processes, for example because of the inability to access inputs or financial services.
90. Travel restrictions and financial and cash flow issues, which may have resulted in reduced work hours and layoffs, negatively impact production capacity and output, as do worker health issues due to the pandemic.<sup>165</sup> Some enterprises have been affected by changes in demand. In some instances, reduced demand and challenges in reaching markets have led to lower prices and price volatility.<sup>166</sup> However, while the demand for fresh fish products has suffered a drop, the demand for canned, frozen and processed fish has seen an increase, especially during the early stages of the pandemic, as also reflected in the positive trends recorded by the processing industry.<sup>167</sup> In order to adapt to the new realities brought by the pandemic, some businesses specializing in fresh fish have started direct sales and home delivery services.<sup>168</sup> In some places, local fishermen and small-scale

<sup>161</sup> Amanda Moeser, "The most dangerous job in fishing isn't fishing—it's processing fish during a global pandemic", *Union of Concerned Scientists: Science for a healthy planet and safer world* (blog), 11 September 2020.

<sup>162</sup> Briceño-Lagos and Monfort, *Why using a gender lens to analyse COVID-19 impacts on the seafood industry?*

<sup>163</sup> Penchan Charoensuthipan, "Migrants see lives upended by downturn: Lost jobs and benefits failures leave many on the brink", *Bangkok Post*, 4 May 2020.

<sup>164</sup> FAO, "How Is Covid-19 outbreak impacting the fisheries and aquaculture food systems and what can FAO do", Information Paper, FAO Fisheries and Aquaculture Department, April 2020.

<sup>165</sup> FAO, "How is Covid-19 outbreak impacting the fisheries and aquaculture food systems ...".

<sup>166</sup> OECD, *Fisheries, aquaculture and COVID-19: Issues and policy responses*, updated June 2020.

<sup>167</sup> OECD, *Fisheries, aquaculture and COVID-19: Issues and policy responses*.

<sup>168</sup> FAO, *Summary of the impacts of the COVID-19 pandemic on the fisheries and aquaculture sector*.

aquaculture producers have benefited from international trade restrictions, as they led to reduced competition with fish imports.<sup>169</sup>

91. The crisis has once again exposed the frailty of the food system, highlighting the employment and labour challenges facing the agri-food sector, including decent work deficits endured by sector workers in many countries. Addressing these challenges, including through the improvement of workplace safety and health practices and of the protection of labour rights, the extension of social protection and income support, as well as financial relief for businesses, including for employment retention and recovery, will help not only to ensure an effective response to the crisis but also to facilitate longer-term growth and the sustainability of the sector.

## Technological advancements and innovation

92. Technological advancements have played a critical role in the expansion of the sector in recent decades and will continue to constitute a crucial factor in aquaculture's future growth. Technological progress made in aquaculture contributes to increased production and labour efficiency, reduced incidence of diseases and higher product quality for consumers, with a long-term view of protecting the environment and ensuring food security.<sup>170</sup> The methods currently used in the sector explore the genetic improvement of species, health, nutrition and feeds, and production control.<sup>171</sup>
93. The concept of precision fish farming represents a new framework that aims to improve aquaculture production through increased use of emerging technologies and automated systems. In particular, the goal is to improve monitoring and control systems, as well as access to real-time information to ensure reliable decision support and reduce dependence on subjective assessments, which would improve accuracy and repeatability in farming operations. The use of precision fish farming should result in better safety conditions for staff, and improved animal health and welfare, increased productivity, yield and environmental sustainability in commercial intensive aquaculture. The ultimate result will be a knowledge-based, rather than the traditional experienced-based, production regime.<sup>172</sup>
94. Examples of recent innovations benefiting the sector include: hydroacoustic technology, which aims to maximize growth and minimize feed waste by measuring changes in fish behaviour and detecting feeding patterns; a combination of video hardware and data analysis software solutions used for sea lice counting and crowding control, biomass estimation or feed optimization; water quality monitoring and forecasting technology, which can be particularly useful in aquaculture activities taking place in marine environments (mariculture), supporting decision-making in farm management or helping to tackle harmful algal blooms; acoustic telemetry systems that are used for measuring swimming and muscle activity levels, respiration rates and feed intake; and systems

<sup>169</sup> FAO, "How is Covid-19 outbreak impacting the fisheries and aquaculture food systems ...".

<sup>170</sup> FAO, *Aquaculture technology*, FAO Fisheries Division, 2020.

<sup>171</sup> *New technologies in aquaculture: Improving production efficiency, quality and environmental management*, eds: Gavin Burnell and Geoff Allan (Woodhead Publishing, 2009); WorldFish, "Research program: Sustainable aquaculture", 2020. Production control encompasses elements such as water quality, temperature, stock density, feeding and breeding techniques and tanks used. Christoph Meske, *Fish Aquaculture: Technology and Experiments*, edited and translated by Frederick Vogt (Pergamon Press, 2014).

<sup>172</sup> Martin Føre et al., "Precision fish farming: A new framework to improve production in aquaculture", *Biosystems Engineering* 173 (2018): 176–193.

combining sensors, data analytics and applications that help farmers combat some environmental challenges and diseases and address operational challenges.<sup>173</sup>

95. New technological solutions stemming from advances in engineering and bioscience offer promising prospects to address specific challenges within the sector. One such challenge concerns fish feed, which constitutes 50 to 70 per cent of production costs and has a direct impact on fish growth rate. Optimizing feeding practices using new technologies will help to reduce waste and improve productivity. Technological advancements that help address more effectively diseases and parasite-induced impacts – another major challenge, which costs the industry up to US\$10 billion annually – will not only save costs, but also reduce various negative socio-economic and environmental impacts.<sup>174</sup>
96. While various precision fish farming solutions exist today, either as commercial products or research tools that can be converted into innovations, the uptake of new technologies in the sector, particularly in developing and emerging economies, is not yet prominent. This is particularly the case with small-scale producers, which often lack the financial means to invest in, and the skills necessary to adopt, new technology. Nonetheless, many are already benefiting from technological advancements such as mobile internet which, among other information, can provide real-time market prices for fish, and are showing interest in other more advanced technologies. As larger-scale enterprises often have more advantages in terms of their ability to adopt new technologies and practices, there is a risk that small-scale fish farmers may increasingly face barriers in access to wider markets.
97. Advanced technologies such as advanced robotics can help replace laborious, repetitive and dangerous tasks with automated processes. Examples of such innovations include shrimp peeling equipment, which promises to reduce water consumption and increase yields and the quality of the end product.<sup>175</sup> Innovation and new technologies could also help close the labour shortage gap.
98. The utilization of blockchain technology, which can securely and efficiently gather and analyse vast quantities of data, can help document the long and complex seafood production process, thereby promoting transparency, sustainability and traceability in the supply chain.<sup>176</sup> While such technology holds strong potential for the sector, questions related to capturing and communicating information and having control over information may, among other pertinent issues, raise obstacles in efforts to build a consensus among many and diverse stakeholders in the sector on the use of this technology.<sup>177</sup>

## The environment

99. Sustainable food systems are essential to end hunger and protect the environment. The issue of sustainability in agriculture has been the subject of increased attention because significant improvements in agricultural productivity in recent decades have often been associated with negative environmental and social impacts, including rising inequalities and

<sup>173</sup> Martin Føre et al., "Precision fish farming: A new framework to improve production in aquaculture"; James Wright, "Notes from the 15th North Atlantic Seafood Forum", Global Aquaculture Alliance, 9 March 2020; Lauren Kramer, "Farmers deploy new high-tech tools against sea lice", Global Aquaculture Alliance, 18 November 2019; The Yield, "Customer stories: Barilla Bay oysters", 23 May 2018.

<sup>174</sup> Fearghal O'Donncha and Jon Grant, "Precision aquaculture", *IEEE Internet of Things Magazine*, December 2019.

<sup>175</sup> "New technology is transforming shrimp processing", *IntraFish*, 26 march 2020.

<sup>176</sup> Rob Fletcher, "Why aquaculture is becoming big on blockchain", *The Fish Site*, 22 August 2019; Statecraft Tech, "Blockchain in Aquaculture and Fisheries – How Blockchain could sustain the Seafood Industry", 14 February 2019.

<sup>177</sup> Tim Sprinkle, "Is aquaculture ready for the blockchain revolution?", Global Aquaculture Alliance, 3 December 2018.

high levels of poverty and food insecurity in rural areas. Sustainable agricultural development, which enhances productivity, protects the environment and optimizes the use of energy and natural resources, in particular water and soil, and promotes sustainable rural livelihoods, decent work, equity and social well-being, is key to a just transition to environmentally sustainable economies and societies for all.

- 100.** As is the case with all agricultural activities, aquaculture is deeply connected to the climate. Inland aquaculture operations are susceptible to changes in temperature and rainfall patterns, and coastal operations are additionally vulnerable to rising sea levels, wave heights and accelerated land erosion.<sup>178</sup> Temperature fluctuations affect the physiology, growth and metabolism of farmed fish, and the overall warming of the oceans affects the spatial distribution of species.<sup>179</sup> The United Nations Intergovernmental Panel on Climate Change's *Special Report on the Ocean and Cryosphere in a Changing Climate* (2019) found that fisheries, catches and their composition in many regions have already been impacted by ocean warming and its effects on fish stock growth, reproduction and survival. Changes in the spatial distribution and abundance of fish stocks have challenged the management and economic benefits of some fisheries, endangering related livelihoods.<sup>180</sup> In this context, aquaculture provides important opportunities to address some of these problems and contributes significantly to food security, as well as employment and livelihoods in the rural economy.

## Impact of aquaculture on the environment

- 101.** Farmed fish offer an alternative animal protein source that is more efficient than the cultivation of land animals, both with regard to the feed conversion ratio and CO<sub>2</sub> emissions.<sup>181</sup> Sustainable aquaculture is also a resilient way to make productive use of environments that may be unsuitable for other kinds of farming. This provides income stability and employment opportunities, especially for coastal areas.<sup>182</sup> In Indonesia, the depletion of wild river fish stocks had a significant negative impact on local fishers' livelihoods. Through the ILO's Green Livelihood Access for Central Kalimantan's Inclusive Environmental Response to Climate Change (GLACIER) project, fishers received aquaculture training and were able to set up productive operations that replaced their income and improved their working conditions.<sup>183</sup> In Ghana, West African Fish runs a sustainable aquaculture operation that has created 100 direct jobs and positively affected the local economy, providing indirect benefits for up to 400 local families.<sup>184</sup>
- 102.** Aquaculture negatively affects its surrounding environment, in part through the build-up of nutrients and effluents, the organic waste produced by farmed stock.<sup>185</sup> Farms with practices that cause a deterioration in the surrounding environment experience negative

<sup>178</sup> Md Monirul Islam et al., "[Vulnerability of inland and coastal aquaculture to climate change: Evidence from a developing country](#)", *Aquaculture and Fisheries* 4, No. 5 (2019): 183–189.

<sup>179</sup> Bertie Asiedu, Jenyo-Oni Adetola and Isaac Odame Kissi, "[Aquaculture in troubled climate: Farmers' perception of climate change and their adaptation](#)", *Cogent Food & Agriculture* 3, No. 1, 2017.

<sup>180</sup> Intergovernmental Panel on Climate Change, *Special Report on the Ocean and Cryosphere in a Changing Climate*, 2019, Chapter 5.

<sup>181</sup> "[What is the environmental impact of aquaculture?](#)", Global Aquaculture Alliance, 22 April 2019.

<sup>182</sup> FAO, *The State of World Fisheries and Aquaculture 2018*.

<sup>183</sup> ILO, "[When Nua did not have to fish in the Kayahan river of Central Kalimantan](#)", 2013.

<sup>184</sup> Sustainia, "[Green fish farming fosters local growth](#)" 19 June 2018.

<sup>185</sup> Nils Hedberg et al., "[Spatial correlation and potential conflicts between sea-cage farms and coral reefs in South East Asia](#)", *Aquaculture* 448 (2015): 418–426.



feedback effects where poor water quality reduces the farm's productivity.<sup>186</sup> This highlights the importance of technical environmental training to minimize effluent build-up and other negative environmental impacts in order to achieve resilient productivity in aquaculture.

- 103.** Important innovations that contribute to aquaculture's sustainability include farming filter feeders (such as shellfish) in tandem with other species (called polyculture, or integrated multitrophic aquaculture), which can reduce effluent build-up and sequester carbon.<sup>187</sup> Another approach is the combined cultivation of plants and fish, called aquaponics. This can provide economic opportunities where traditional aquaculture and soil-based agriculture are challenging. Workers can be trained with specialized skills to implement this approach and create an industry based on previously unproductive resources.<sup>188</sup>

### Climate-smart approaches

- 104.** Spatial planning is an essential aspect of aquaculture management that must consider the effects of aquaculture production on the surrounding environment. For example, mangrove forests offer good conditions for shrimp cultivation, and so shrimp aquaculture is a significant driver behind the destruction of mangrove forests.<sup>189</sup> However, mangrove ecosystems offer many important services such as carbon sequestration and coastal erosion protection,<sup>190</sup> and restoring these ecosystems in Viet Nam and Mexico benefited thousands of livelihoods in terms of labour and income.<sup>191</sup> An holistic approach is essential for understanding these interdependencies and trade-offs in aquaculture management.
- 105.** Climate-smart agriculture<sup>192</sup> is a key framework for achieving sustainability in all agricultural operations, including aquaculture. The climate-smart approach to aquaculture is built around the concept of an ecosystem approach to fisheries and aquaculture. This is an holistic strategy that integrates ecological, socio-economic and institutional dimensions. It assists in monitoring climate change impacts and coping with them, improving the resilience of aquaculture systems and the livelihoods dependent on them.<sup>193</sup>
- 106.** Climate-smart aquaculture also improves production efficiency.<sup>194</sup> A 2009 study on Norwegian salmon cultivation found that inefficient production exacerbates the negative environmental effects of aquaculture. As the Norwegian industry developed, farmers gained more knowledge, skills and improved technology, which resulted in better environmental outcomes. This suggests that increasing productivity, such as through the

<sup>186</sup> Frank Asche, Kristin Roll and Ragnar Tveterås, "Economic inefficiency and environmental impact: An application to aquaculture production", *Journal of Environmental Economics and Management* 58, No. 1 (2009): 93–105.

<sup>187</sup> "What is the environmental impact of aquaculture?", Global Aquaculture Alliance; FAO, *Climate-Smart Agriculture Sourcebook*, 2013, Module 10, 239–283.

<sup>188</sup> FAO, *Achieving Blue Growth: Building vibrant fisheries and aquaculture communities*, 2018.

<sup>189</sup> Daniel Richards and Daniel Freiss, "Rates and drivers of mangrove deforestation in Southeast Asia, 2000–2012", *Proceedings of the National Academy of Sciences of the United States of America* 113, No. 2 (2016): 344–349.

<sup>190</sup> Daniel Donato et al., "Mangroves among the most carbon-rich forests in the tropics", *Nature Geoscience* 4 (2011): 293–297.

<sup>191</sup> FAO, *Achieving Blue Growth: Building vibrant fisheries and aquaculture communities*.

<sup>192</sup> FAO, *Climate-Smart Agriculture Sourcebook*.

<sup>193</sup> FAO, *The State of World Fisheries and Aquaculture 2018*.

<sup>194</sup> FAO, *Climate-Smart Agriculture Sourcebook*.

promotion of decent work and technical training for farmers, leads to improved environmental outcomes.<sup>195</sup>

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<sup>195</sup> Asche, Roll and Tveterås, "Economic inefficiency and environmental impact: An application to aquaculture production".