

ASSESSMENT OF NON-TARIFF MEASURES AND REGULATORY FRAMEWORKS FOR ENHANCING MARKET



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PURPOSE OF THE ASSIGNMENT

The Zambia Agribusiness and Trade Project II (ZATP II, 2024–2028), supported by the World Bank PROBLUE Multi-Donor Trust Fund, promotes the growth, competitiveness and sustainability of Zambia’s aquaculture sector. Aquaculture is a strategic sector for improving food and nutrition security, creating jobs, diversifying rural livelihoods, increasing domestic fish supply and strengthening regional trade.

The purpose of this assignment was to assess how non-tariff measures (NTMs) and related regulatory requirements affect market access and trade readiness in Zambia’s aquaculture value chain. The study examined the experiences of producers, traders, processors, transporters, wholesalers, retailers, offtakers and institutional stakeholders in relation to sanitary and phytosanitary requirements, certification, licensing, labelling, customs procedures, food safety inspections, laboratory testing and standards compliance.

The report identifies key constraints affecting aquaculture trade competitiveness, including limited awareness of regulatory procedures, high compliance costs, weak inter-agency coordination, inadequate accredited laboratory capacity, long approval processes and limited integration of many producers into formal trade systems. It also recognises that cold chain gaps, transport and logistics constraints and uneven institutional support affect product quality, food safety and compliance readiness.

The report provides practical recommendations to strengthen quality infrastructure, accredited testing services, stakeholder training, institutional coordination, digital regulatory systems, regional harmonisation of standards, and compliance preparedness. These measures are intended to support Zambia’s aquaculture sector as it moves from largely domestic and informal operations toward more competitive regional and international market participation.

The study was conducted by Mr Oliver J. Hasimuna, Consultant, under the supervision of Mr. Jean N. Arlet, Private Sector Specialist, FCI East and Southern Africa, and Yurani Arias Granada, Environmental Economist, ENB East and Southern Africa, who serve as task team leaders for the World Bank PROBLUE Aquaculture Project. Mr. Shane Sela, Senior Trade Facilitation Specialist, FCI, and Mr. Melvin Spreij and Mr. Henry Sichembe also provided valuable technical comments and guidance.

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EXECUTIVE SUMMARY

Zambia's aquaculture sector is expanding rapidly, but this study shows that its future growth and competitiveness will depend less on increasing production alone and more on addressing the infrastructure, institutional, and compliance systems that shape market access. Drawing on evidence from 179 respondents across eight districts, the findings reveal a sector dominated by relatively new entrants, centred on pond culture and Nile tilapia production, and still largely oriented toward domestic rather than export markets. In this context, non-tariff measures (NTMs) such as sanitary and phytosanitary requirements, certification, customs procedures, and laboratory testing do not yet constitute widespread binding constraints for most actors, largely because many producers remain only weakly integrated into formal trade systems and have limited exposure to export-related procedures. However, where NTMs are encountered, they are meaningful and often costly, with certification and labelling requirements, licensing, food safety inspections, and import procedures creating burdens that are amplified by high compliance costs, limited awareness, weak inter-agency coordination, lack of accredited laboratories, and long approval delays. More importantly, the study finds that the most severe constraints on sector performance lie outside regulation narrowly defined: poor cold chain infrastructure, inadequate transport and logistics, uneven market access, and variable institutional support are currently doing more to limit product quality, food safety, post-harvest efficiency, and market participation than trade rules alone. This is especially significant for a sector seeking to move from largely informal, domestic operations toward more competitive regional and international engagement. Respondents were clear that the priority reforms should focus on investment in cold storage, accredited testing laboratories, regional harmonisation of standards, stakeholder training and awareness, and more streamlined and digital regulatory processes. For the World Bank, the implication is clear: Zambia's aquaculture sector is at an early but strategic stage where targeted investments in quality infrastructure, logistics, institutional coordination, and compliance readiness could yield substantial gains in food safety, value chain efficiency, and trade competitiveness. The sector is not yet being held back by deeply entrenched NTMs, but unless current gaps in infrastructure, regulatory preparedness, and institutional capacity are addressed, these weaknesses are likely to become more binding as the sector grows and integrates into regional markets.

1.0 INTRODUCTION

Aquaculture plays a vital role in Zambia's economy and food system, providing income, employment, and nutritional security while supporting regional food systems within the Southern African Development Community (SADC) (Mapfumo, 2013; Hara et al., 2017; Khan et al., 2021; Hasimuna et al., 2025a). In a landlocked country where agricultural productivity is often constrained, fish farming offers an important avenue to address malnutrition and diversify rural livelihoods (Maulu et al., 2024; Hasimuna et al., 2023, 2025b). Despite the sector's steady growth, small- and medium-scale enterprises continue to face challenges in accessing competitive markets. High transaction costs, limited certification and testing facilities, and complex regulatory requirements constrain participation in domestic, regional, and international trade. Globally, rising demand for fish presents new export opportunities; however, much of the regional trade remains focused on low-value products, exposing producers to price volatility and limiting profitability. Moving toward higher-value, standards-compliant products is therefore critical to enhancing competitiveness and resilience (Mapfumo, 2013; Khan et al., 2021).

Meeting non-tariff measures (NTMs), which include Sanitary and Phytosanitary (SPS) standards and Technical Barriers to Trade (TBT), remains a significant challenge for Zambia's aquaculture sector. While these measures are designed to protect consumers, health, and the environment, they often impose complex and costly compliance requirements. In many developing countries, including Zambia, the limited availability of testing facilities, certification services, and technical expertise can transform legitimate NTMs into non-tariff barriers (NTBs) that hinder trade (Oyelami & Zongo, 2022). The challenge is compounded by procedural obstacles such as delays, duplicative documentation, and lack of harmonization of standards across markets (Mabunda et al., 2025). The situation is further complicated by extensive informal cross-border fish trade, particularly among women involved in fish processing and marketing, yet largely operates outside formal regulatory frameworks and remains poorly documented (Tull, 2017; Hara et al., 2017).

There is limited systematic evidence on the nature, costs, and impacts of NTMs and NTBs affecting Zambia's aquaculture sector. This knowledge gap hampers informed policy reform, targeted investment, and capacity development. Key questions remain regarding the regulatory requirements of priority export markets, the extent of alignment with international standards, and the financial and procedural burden of compliance. The World Bank's ProBlue Trust Fund supported this study to provide a comprehensive assessment of Zambia's

aquaculture regulatory and trade environment. The findings have generated actionable insights to improve market access, strengthen institutional and technical capacity, and enhance the sector's contribution to trade, food security, and economic growth.

1.2 OVERALL OBJECTIVE

To identify and assess the impacts and challenges associated with meeting non-tariff measures (NTMs), how these affect the Zambian aquaculture sector and to propose strategies to improve market access.

1.3 SPECIFIC OBJECTIVES

1. To document key NTMs and administrative measures affecting the sale of aquaculture products in Zambia, including licensing/registration, movement permits, inspections, product quality requirements, and packaging/labelling.
2. To assess stakeholder awareness and experiences of regulatory requirements and compliance processes, including costs, delays, laboratory access, and enforcement consistency.
3. To examine the extent to which certification, labelling, hygiene/sanitation and related food safety requirements are perceived as barriers to market participation and competitiveness.
4. To assess the importation landscape for essential aquaculture inputs (feed, seed, pharmaceuticals, and equipment), including reliance on imports, applicable import-related requirements (e.g., import licences, certification, inspection/quarantine), and reported effects on production efficiency.
5. To evaluate perceived institutional support and capacity for implementing and enforcing NTMs, facilitating compliance, and supporting market access (including coordination and licensing processes).
6. To document stakeholder-identified priorities and reforms for improving compliance, trade facilitation, and market access (e.g., cold chain, training, harmonization, digitisation, accredited labs, streamlined licensing).
7. To provide evidence-based recommendations to strengthen market access and reduce practical barriers to domestic and regional trade in aquaculture products.

2.0 RESEARCH APPROACH AND METHODS

2.1 Study Design

This study adopted a mixed-methods design, integrating desk-based analysis, primary fieldwork, and secondary data review to provide a comprehensive assessment of non-tariff measures (NTMs) and associated procedural barriers affecting Zambia's aquaculture trade. The sequential design reflects best practice in applied trade and policy research, beginning with systematic mapping of regulatory measures and procedures, followed by empirical testing in the field (Creswell & Plano Clark, 2017; Yin, 2018). The approach considers both export-related NTMs for fish and fish products and import-related measures for aquaculture inputs, while also addressing formal and informal trade, domestic value chains, and institutional frameworks shaping compliance with sanitary and phytosanitary (SPS) and technical barriers to trade (TBT) requirements (Khan et al., 2021; FAO, 2024).

2.2 Identification of Relevant Non-Tariff Measures (Desk-Based Analysis)

The study began with a systematic desk-based review to identify NTMs applicable to the export of fish and fish products and the import of key aquaculture inputs, including feed, seed, veterinary drugs, and equipment. The review drew on World Trade Organization (WTO) SPS and TBT agreements and notifications, regional trade arrangements under the Southern African Development Community (SADC), the Common Market for Eastern and Southern Africa (COMESA), and the African Continental Free Trade Area (AfCFTA), as well as national regulatory frameworks administered by the Zambia Bureau of Standards, the Zambia Compulsory Standards Agency, and the Ministry of Fisheries and Livestock. In addition, the review explicitly covered domestic NTMs affecting aquaculture production and marketing, including food safety regulations, fish health and biosecurity measures, licensing requirements, and inspection and market surveillance systems. These domestic measures were analysed alongside trade-related NTMs to reflect their central role in shaping compliance, production practices, and market access within Zambia. Official data sources, including the Zambia Statistics Agency (ZAMSTAT) and FAO FishStat, were used to characterise trade flows and establish production baselines. The primary output of this stage was a structured inventory of applicable NTMs, associated procedural requirements, documentation obligations, and indicative compliance costs. This included both export-related and domestic regulatory measures, allowing for a more comprehensive assessment of their relative importance across the value chain. This inventory informed the design of

subsequent field-based data collection instruments and guided the empirical assessment of regulatory impacts (Creswell & Plano Clark, 2017; WTO, 2020).

2.3 Sampling Strategy

A purposive and stratified sampling strategy was employed to capture variation across production systems, enterprise scales, market orientations, and geographic regions. Institutional respondents for key informant interviews were purposively selected to ensure representation of agencies directly involved in regulation, certification, and trade facilitation. The approach aligns with established guidance on purposive and implementation-focused sampling (Palinkas et al., 2015; Patton, 2015).

Eight districts were selected to provide geographic and sectoral diversity: Kabwe, Gwembe, Kasama, Samfya, Solwezi, Kitwe, Kaoma, and Lusaka. Within these districts, respondents included smallholder and commercial fish farmers, hatchery operators, processors, traders, exporters, and input suppliers. The sampling ensured coverage of both high- and low-intensity aquaculture areas, enabling analysis of regulatory impacts across varied contexts.

2.4 Data Collection and Sources

Following the desk review, field instruments were deployed to capture stakeholder experiences with NTMs and quantify compliance costs and procedural delays. Data collection combined primary fieldwork and secondary documentary review to ensure triangulation and robustness of findings.

2.4.1 Primary data were collected using structured questionnaires, semi-structured key informant interviews, and stakeholder consultations. Structured questionnaires were administered to 179 respondents, capturing the types and frequency of NTMs encountered, the time and direct costs associated with compliance, instances where NTMs acted as procedural barriers, and their effects on market access and profitability. Questionnaire design and pre-testing followed established survey principles (Dillman et al., 2014; Field, 2013).

Key informant interviews were conducted with officials and technical experts from the Ministry of Fisheries and Livestock, the Zambia Bureau of Standards, the Zambia Compulsory Standards Agency, the Zambia Development Agency, the Zambia Revenue Authority, relevant local government authorities, and selected academic and training institutions. Interviews explored institutional mandates, capacity constraints, inspection and certification procedures, and interactions between formal regulatory frameworks and informal

trade practices. Stakeholder consultation workshops were held to validate preliminary findings and co-develop policy-relevant recommendations. Qualitative data collection followed established approaches for policy-oriented and case study research (Patton, 2015; Yin, 2018).

2.4.2 Secondary data were reviewed to complement and triangulate field findings. Sources included national policy documents, legislative instruments, project reports (including the Zambia Aquaculture Enterprise Development Project), regional trade reports, SPS and TBT notifications, and peer-reviewed literature on trade barriers and standards compliance. This review situates Zambia's experience within regional and international contexts and supports identification of benchmarks and best practices (FAO, 2024; Khan et al., 2021).

2.5 Market and Species-Specific Assessment

Building on the mapped NTMs and field evidence, the study assessed the influence of regulatory and procedural barriers on aquaculture value chains for selected priority species. Species-specific analyses examined cumulative effects of NTMs at key stages, including production, post-harvest handling, and market entry. This approach provided insights into differences in competitive conditions across species and districts and highlighted how regulatory burdens vary spatially and along the value chain (Mapfumo et al., 2013; Hara et al., 2017).

2.6 Field Surveys and District-Level Mapping

Field surveys in selected high-potential districts documented the incidence, timing, and monetary costs associated with NTMs, including certification fees, inspection-related delays, and reported informal payments. Surveys also examined gender-differentiated effects, particularly within informal cross-border trade activities. District selection and sampling frames were informed by the desk review and consultations with local stakeholders to ensure geographic coverage and representativeness across value chain segments.

2.7 Data Analysis

Data were analysed using a descriptive and thematic approach. Quantitative survey data were summarised using frequencies and percentages to characterise respondent distribution across districts, production systems, stakeholder groups, species cultured, regulatory compliance experiences, infrastructure adequacy, and market access patterns. Qualitative data from open-ended survey responses, key informant interviews, and stakeholder consultations were

analysed thematically to identify recurrent patterns and insights related to regulatory challenges, institutional capacity, procedural bottlenecks, and recommendations for improving compliance and trade. Quantitative and qualitative findings were triangulated to enhance validity and provide a holistic understanding of the constraints and opportunities shaping Zambia’s aquaculture sector, thereby supporting evidence-based policy recommendations (Denzin, 1978; Creswell and Plano Clark, 2017).

3.0 RESULTS

3.1 Geographic distribution of respondents across sampled districts

Out of the eight (8) districts included in the study, a total of 179 respondents were interviewed (**Table 1**). The majority of the respondents are from Samfya District (16.8%), followed by Gwembe (15.1%) and Kaoma (13.4%), reflecting these areas’ central role in aquaculture production and trade. Kasama (10.1%), Solwezi (8.9%), and Kitwe (8.4%) also contributed to a good number of farmers, indicating active, though less concentrated, sectoral participation. The remaining two districts account for less than 2% each, suggesting the regions where aquaculture activity remains nascent. This uneven distribution not only reflects historical investment patterns, access to water resources, and market proximity but also suggests potential spatial constraints in policy reach, extension services, and infrastructure development. Taken together, these data reveal a sector that is simultaneously concentrated in high-potential districts and fragmented across less-developed areas, a duality that has important implications for targeting regulatory.

Table 1. Distribution of Survey Respondents Across the Eight Sampled Districts.

District	Frequency	Percentage (%)
Gwembe	35	19.6
Kabwe	10	5.7
Kaoma	30	16.8
Kasama	21	11.8
Kitwe	18	10.1
Lusaka	18	10.2
Samfya	31	17.4
Solwezi	16	8.9
Total	179	100

3.2 Aquaculture production systems and facility types reported by respondents

The production systems practiced by the farmer are illustrated in **Figure 1**. Among respondents, 69.3% engage in pond culture, making it the dominant aquaculture production system in the study area. Cage culture accounts for 21.8%, while trading and export activities involve 19.0% of respondents (**Table 2**). Processing and hatchery operations represent 14.0% and 13.4%, respectively, whereas tank culture (7.3%) and input supply (1.7%) are comparatively less common. These figures highlight the centrality of pond-based production while also revealing a sector that gradually diversifies along the value chain.

Table 2. Breakdown of aquaculture production systems in use.

Activity	Frequency	%
Pond culture	124	69.3
Cage culture	39	21.8
Trading / Export	34	19
Processing	25	14
Hatchery	24	13.4
Tank culture	13	7.3
Input supply	3	1.7

The presence of cage culture, processing, and hatchery activities indicates emerging specialization and value addition, suggesting opportunities for targeted investment, capacity-building, and policy support to strengthen sectoral integration and market participation.



Figure 1: Types of fish production systems used by farmers: **(a)** earthen pond system; **(b)** dam-lined pond system; **(c)** cage production system operated by Buyantanshi Small-Scale Fish Farmers, Siavonga; and **(d)** cage production system operated by an individual farmer.

3.3 Stakeholder composition across the aquaculture value chain

The majority of respondents are fish producers (64.8%). Government representatives account for 0.6%, while 25.7% belong to other stakeholder categories, including traders, processors, and input suppliers (**Figure 2**). Fish producers naturally constitute the largest group of respondents compared to processors or traders because primary production forms the base of the aquaculture value chain. Every downstream activity, trading, processing, or input supply, depends on the output from farmers, so by definition there are more producers than downstream actors. Additionally, institution and regulatory compliance barriers to entry are lower in primary production than setting up a processing facility or managing export logistics. In contrast, fish processors and traders operate in a narrower segment, often requiring formal registration, specialized equipment, cold storage, and access to markets, which limits their numbers relative to producers. This structural distribution reflects the typical pyramid-shaped composition of agri-food value chains, where the base (producers) is numerically largest, and higher-value, downstream activities become progressively more specialized and fewer in number.

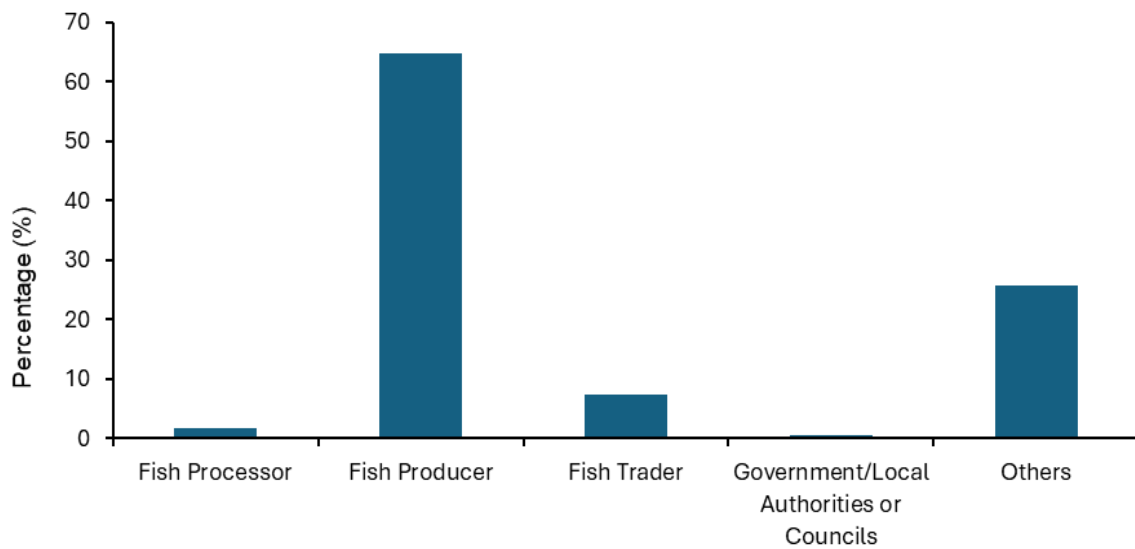


Figure 2: Stakeholder categories represented among survey respondents.

3.4 A relatively young sector: most operators have fewer than 5 years' experience

Most respondents have been operating in the aquaculture sector for 1–5 years (79.3%), reflecting a predominance of relatively new entrants. Operators with 6–10 years of experience account for 15.6%, while those in operation for 11–15 years and over 16 years represent only 2.8% and 2.2%, respectively (**Figure 3**). This distribution highlights the sector's emerging nature and rapid growth, with the majority of participants at the early stages of enterprise development, which may influence adoption of best practices, access to finance, and engagement with regulatory frameworks.

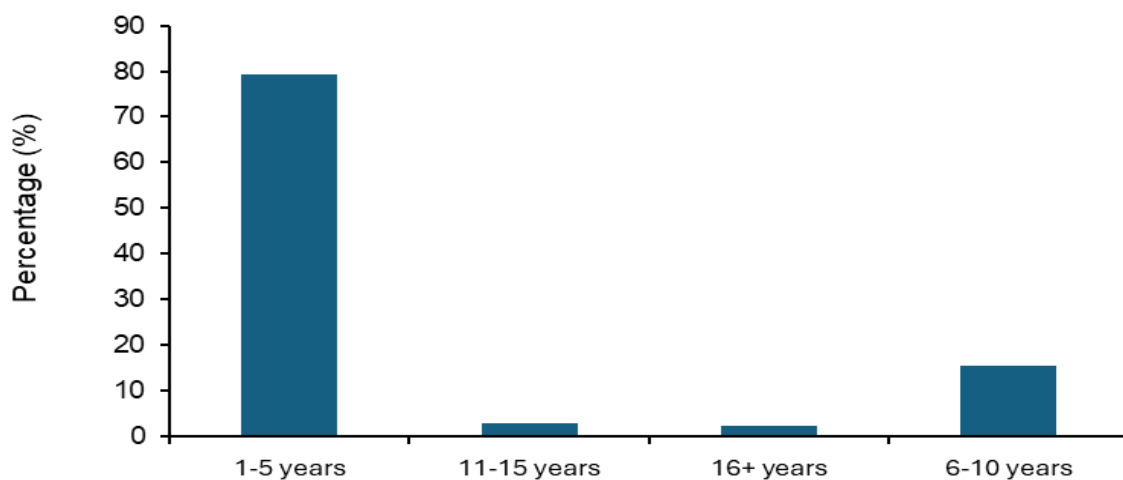


Figure 3: Years of operation for surveyed aquaculture entities.

3.5 The hygiene gap: known rules, uneven practice

The findings on hygiene and sanitation standards are presented in **Table 3** and **Figure 4** and further illustrated in **Figure 5**. Most respondents (88.8%) report that hygiene and sanitation standards are required in aquaculture operations, indicating that such requirements are widely recognised across the sector.

Table 3: Farmer awareness of required hygiene and sanitation standards.

Hygiene and sanitation standard required	Frequency	Percentage (%)
No	20	11.2
Yes	159	88.8
Total	179	100

However, perceptions of effectiveness vary considerably. About 30.2% of respondents rate the standards as average, 27.9% as excellent, and 15.1% as good, while 14.0% rate them as poor or very poor (**Figure 4**). This pattern indicates that although hygiene and sanitation requirements are broadly acknowledged, their practical implementation and performance are inconsistent across operators and locations. The spread in ratings suggests that observed differences are more likely linked to variations in enforcement, infrastructure, and operational capacity than to the absence of formal standards.



Figure 4: Respondents' ratings of the effectiveness of hygiene and sanitation standards.

Field observations further show that in many markets fish is sold under open conditions without refrigeration or temperature control, pointing to gaps between stated hygiene requirements and actual post-harvest handling practices (**Figure 5**).



Figure 5: Hygiene Conditions in Selected Fish Markets in Zambia: (a) Lusaka City Market; (b) Kaoma Market; (c) Soweto fresh fish market section; and (d) Mongu Roadside Market.

3.6 Certification and labelling as market-access constraints: prevalence and severity

Certification and labelling requirements are reported as barriers to selling fish by 48.6% of respondents, while 45.3% indicated that these requirements do not constrain their sales and 6.1% are unsure (**Table 4**). Among respondents who experience such barriers, perceived severity spans a range of levels: 12.8% characterise the impact as moderate and 11.7% as significant, while 8.4% describe it as mild, 7.8% as minor, and 7.8% as severe.

Table 4: Perception of certification and labelling requirements as barriers to fish sales.

Certification or labelling requirements act as barriers to selling fish	Frequency	Percentage (%)
Not sure	11	6.1
No	81	45.3
Yes	87	48.6
Total	179	100

This spread in severity ratings indicates that certification and labelling requirements do not affect all actors uniformly but instead generate differentiated outcomes depending on scale of operation, market orientation, and capacity to comply (**Figure 6**). The findings suggest that while these requirements do not constitute a universal constraint across the sector, they represent a non-trivial impediment for a substantial segment of stakeholders, particularly those facing higher compliance costs or limited access to technical and administrative support.

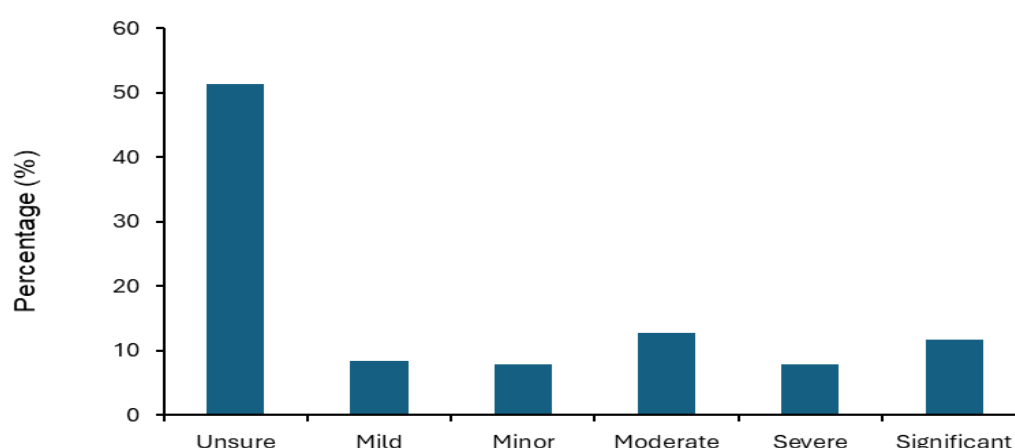


Figure 6: Perceived severity of certification and labelling requirements as barriers to fish sales.

3.7 Species profile of farmed fish reported by producers

Nile tilapia is reported as the primary species farmed by 84.4% of respondents, making it the overwhelmingly dominant species in Zambia's aquaculture sector. Other tilapia species are produced at much lower levels, including red-breasted tilapia (2.2%), three-spotted tilapia (1.7%), and green-headed tilapia (1.1%), while African catfish accounts for 2.2% and carp species for 0.6% of respondents (**Figure 7**). A further 1.7% report involvement in other fish species, 1.7% are engaged in processed or dried fish trading, and 2.2% do not specify a species or are categorised as non-specific. The predominance of Nile tilapia reflects its established biological and economic suitability within Zambia's aquaculture systems. Respondents' production choices align with the species' adaptability to pond and cage culture, relatively fast growth rates, and wide consumer acceptance in domestic markets.

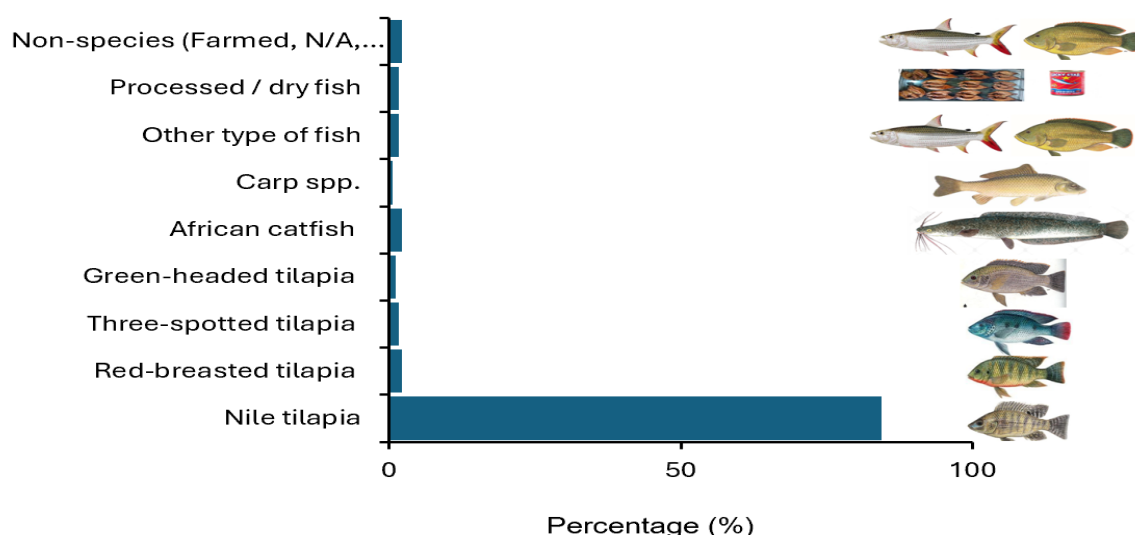


Figure 7: Fish species reported as farmed or traded by respondents.

3.8 Regulatory and administrative measures affecting sales and compliance burden

Respondents report that the sale of aquaculture products is subject to multiple regulatory and administrative measures (**Figure 8**), most notably licensing or registration requirements (43.6%), movement permits (29.1%), and food safety inspections (27.9%). Requirements related to product quality standards (20.1%), sanitary and phytosanitary (SPS) measures (15.6%), and packaging and labelling (14.5%) are also reported, indicating that compliance is shaped by a layered regulatory framework rather than a single dominant constraint. Such regulatory layering is characteristic of agri-food systems, where trade facilitation and public health objectives intersect (WTO, 2020; FAO, 2024).

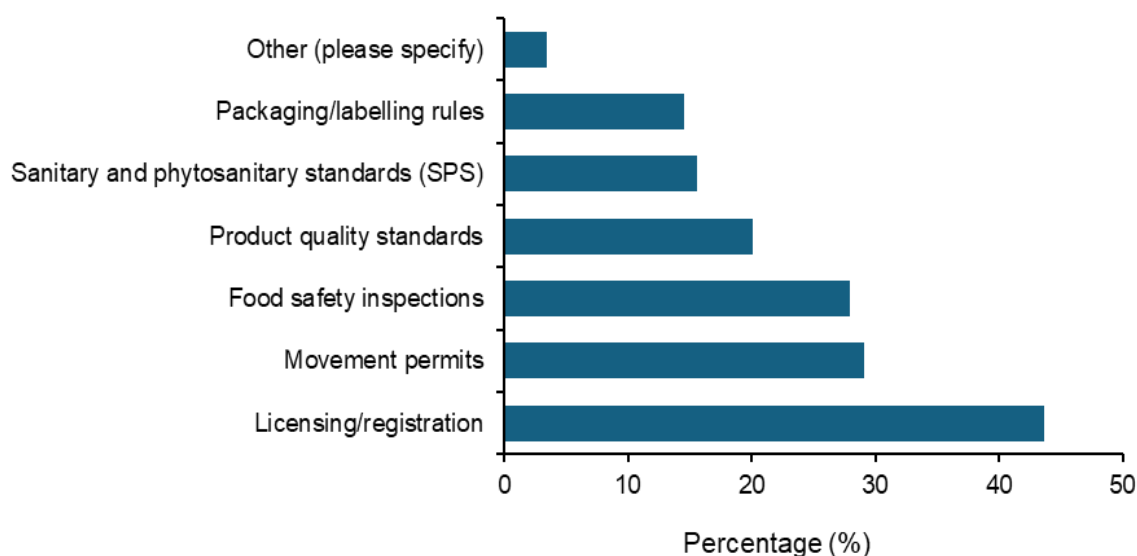


Figure 8: Regulatory and administrative measures affecting sales.

The results further show that compliance with these measures is constrained primarily by procedural and institutional factors (**Table 5**). High compliance costs are most frequently cited (47.5%), reflecting the fixed-cost nature of certification, inspections, and permits, which disproportionately affect small and medium-scale operators (Khan et al., 2021). Limited awareness of regulatory requirements (38.0%) suggests information asymmetries between regulators and producers, a common challenge in developing-country aquaculture systems (FAO, 2022). Additional constraints, including limited access to accredited laboratories (22.9%), delays in approvals or testing (15.6%), and inconsistent enforcement (14.5%), point to capacity limitations within regulatory institutions, which can amplify the trade-restrictive effects of otherwise legitimate measures (Yin, 2018; WTO, 2020). Overall, the findings indicate that regulatory impacts on market access arise not only from the existence of standards, but from the costs, information gaps, and institutional frictions associated with their implementation.

Table 5: Reported challenges associated with regulatory and administrative measures affecting aquaculture sales.

Challenges	Frequency	Percentage (%)
High compliance costs	85	47.5
Limited awareness	68	38.0
Lack of accredited labs	41	22.9
Long approval/testing delays	28	15.6
Inconsistent enforcement	26	14.5
Other (please specify)	4	2.2

3.9 Where the system fails: critical gaps in cold storage and transport

Respondents' assessments point to substantial deficiencies in the infrastructure underpinning aquaculture production and marketing in Zambia, with weaknesses most pronounced along the post-harvest segment of the value chain. Cold storage facilities emerge as the most critical constraints accounting for 55.3% of respondents rating them as very poor and a further 11.2% as poor (**Table 6**). This indicates a severely underdeveloped cold chain, which heightens post-harvest losses, constrains temporal market arbitrage, and limits compliance with food safety

and quality standards, particularly for urban and export markets (FAO, 2022; Hara et al., 2017).

Transport and logistical services are also widely perceived as inadequate, with 28.5% of respondents rating them poor and 22.9% very poor, although an equal proportion (22.9%) rate them as average. This variation suggests spatially uneven infrastructure provision, consistent with documented rural–urban and inter-district disparities in agri-food logistics (Mapfumo et al., 2013). Inadequate transport infrastructure increases transaction costs, exacerbates spoilage risks, and reduces the effective radius of market participation for producers, particularly those operating in remote production zones.

Table 6: Summary ratings of aquaculture support infrastructure (cold storage, transport and logistics, and market access).

Rating	Cold Storage Frequency (%)	Transport & Logistics Frequency (%)	Market Access Frequency (%)
Very poor	99 (55.3)	41 (22.9)	45 (25.1)
Poor	20 (11.2)	51 (28.5)	24 (13.4)
Average	19 (10.6)	41 (22.9)	49 (27.4)
Good	6 (3.4)	17 (9.5)	22 (12.3)
Excellent	18 (10.1)	11 (6.1)	21 (11.7)
Total respondents	179 (100%)	179 (100%)	179 (100%)

Perceptions of market access similarly reflect structural constraints. While some respondents rate access as average (27.4%), a substantial share report very poor (25.1%) or poor (13.4%) access, indicating limited integration of producers into reliable and remunerative markets. Taken together, the findings suggest that infrastructural bottlenecks—especially cold storage and transport—constitute binding constraints on value chain efficiency and competitiveness, with implications for product quality, price realisation, and the capacity of the sector to meet domestic and regional demand (FAO, 2024; Khan et al., 2021).

3.10 Export Footprint: Minimal and Regionally Concentrated

Among respondents engaged in export, the Democratic Republic of Congo (DRC) is the most frequently reported destination (5.0%), followed by South Africa (1.7%) and Tanzania (1.1%) among others (**Figure 9**). Other destinations, including Botswana, Malawi, and Namibia, each account for 0.6% of exports. These results indicate that Zambia’s aquaculture exports remain highly limited in both geographic reach and market penetration, with regional trade concentrated in a small number of neighbouring countries. The predominance of the DRC as

a trading partner reflects both historical trade linkages and relative proximity, consistent with patterns observed in small-scale cross-border aquaculture trade in Southern Africa. Overall, the data suggest that despite growing domestic production, Zambian aquaculture has yet to achieve broader regional market integration, with trade largely constrained to proximate and familiar destination.

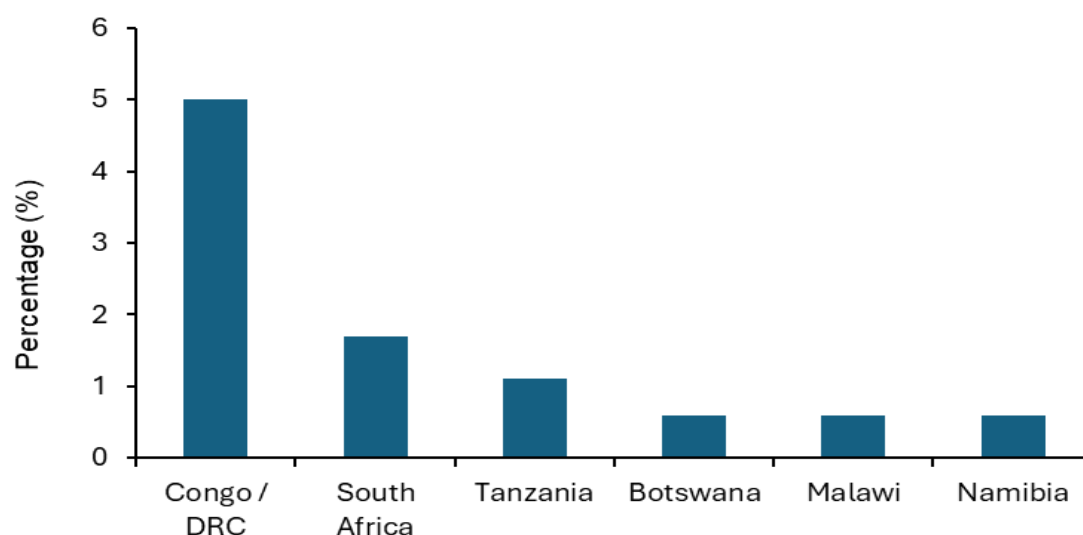


Figure 9: Destination countries for Zambia's aquaculture exports.

3.11 Reliance on imported inputs and perceived effects on production efficiency

The results indicate that aquaculture production is predominantly supported by locally sourced inputs, as most respondents (75.4%) reported no reliance on imported inputs (**Table 7**). This reliance on local resources likely insulates producers from import-related costs, logistical delays, and administrative burdens. Nevertheless, a notable proportion of respondents (24.6%) reported dependence on imported inputs, suggesting that certain essential or specialized inputs remain insufficiently available within domestic markets.

Table 7: Percentage of producers who rely on imported inputs.

Reliance on imported inputs	Frequency	Percentage (%)
No	135	75.4
Yes	44	24.6
Total	179	100

In the same vein, a substantial majority of respondents (78.2%) indicated that import regulations do not affect their production efficiency, reflecting the limited engagement with importation among most producers (**Figure 10**). However, a non-negligible minority reported adverse effects, ranging from minor to severe, with over 19% experiencing moderate to severe impacts. This finding underscores the heightened vulnerability of producers who rely on imported inputs, for whom regulatory constraints may translate into increased costs, delays in input acquisition, and disruptions to production cycles. Overall, the results suggest that while the predominance of locally sourced inputs buffers attracts most producers against the effects of import regulations, such regulations constitute a meaningful constraint for a subset of stakeholders. Addressing these regulatory challenges, or strengthening the local availability of critical inputs, could therefore enhance production efficiency among producers dependent on imports.

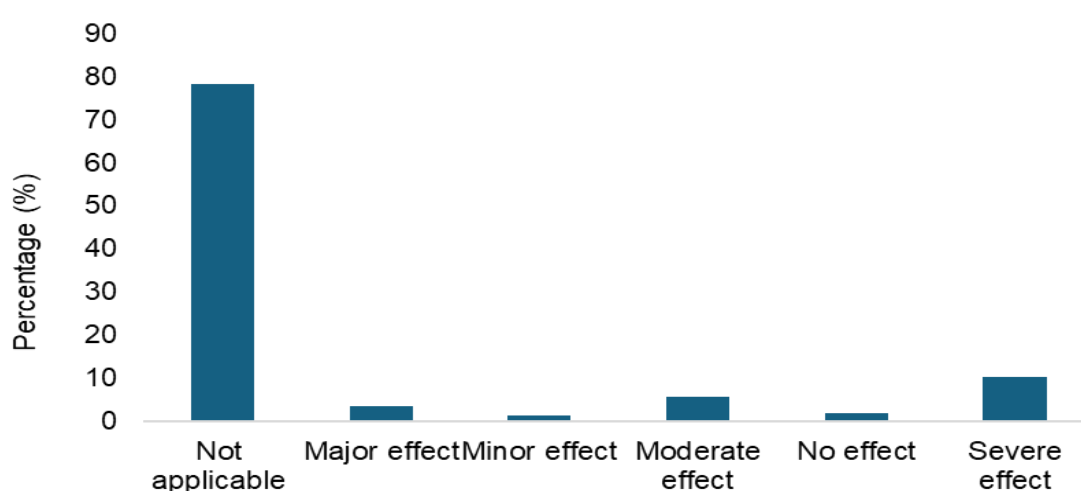


Figure 10: Perceived effects of import regulations on aquaculture production efficiency.

3.12 Imported input categories and exposure to supply risks

Respondents who reported importing aquaculture inputs identified a range of items essential for farm operations (**Figure 11**). The most frequently imported inputs were equipment (15.1%) and feed (13.4%), underscoring their critical role in maintaining production efficiency and supporting optimal growth of cultured species. Pharmaceuticals, including antibiotics and other therapeutic agents, accounted for 8.4% of imported items, reflecting the continuing reliance on specialized veterinary inputs that may not be sufficiently available locally. Fingerlings or seed represented 3.9% of imported inputs, while a small proportion of

respondents (1.1%) reported other unspecified items. These findings indicate that, although the majority of aquaculture inputs are met through local supply chains, certain key inputs particularly critical equipment and feed additives remain dependent on importation. This reliance suggests that disruptions in international supply chains, fluctuations in import costs, or regulatory barriers could disproportionately affect the production efficiency of the segment of producers who depend on these inputs.

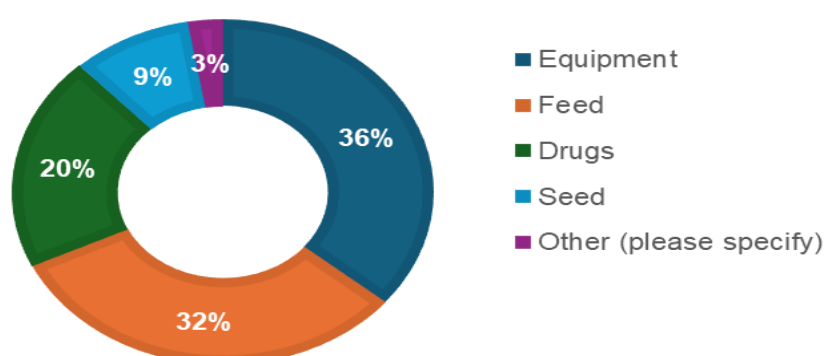


Figure 11: Types of inputs sourced from abroad.

3.13 Non-tariff measures affecting imported aquaculture inputs

The present study reported several non-tariff measures (NTMs) that influence the importation of aquaculture inputs (**Figure 12**). The most commonly cited requirement was an import licence, affecting 36.2% of respondents, highlighting the importance of formal regulatory authorization in facilitating trade. This was followed by quality certification, reported by 29.3% of importers, indicating that compliance with established standards is a critical consideration in the import process. Tariff-rate quotas applied to 20.7% of imported inputs, while quarantine or inspection procedures affected 13.8% of respondents, reflecting additional regulatory checks aimed at protecting domestic production and biosecurity. Collectively, these findings indicate that multiple NTMs shape the importation of aquaculture inputs, with potential implications for import costs, procurement timelines, and the availability of essential equipment, feed, pharmaceuticals, and seed for producers in Zambia. The results underscore the need for streamlined regulatory processes and capacity building to mitigate barriers for producers reliant on imported inputs.

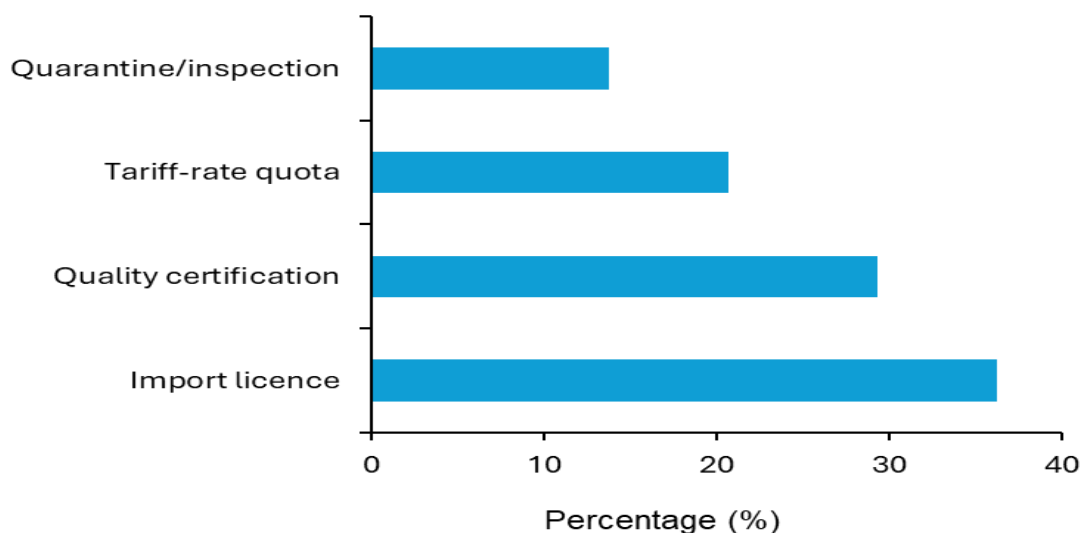


Figure 12: Non-tariff measures reported as affecting importation of aquaculture inputs.

3.14 Non-tariff measures affecting aquaculture exports

In the current study, the respondents were asked to identify non-tariff measures (NTMs) that influence the export of aquaculture products. Only a small share of respondents reported being affected by such measures. Customs and border procedures were cited by 49.0% of respondents, indicating that administrative processes and documentation requirements affect a limited number of exporters (**Figure 13**). Certification and inspection requirements, including compliance with quality or international standards, were reported by 19.3% of exporters, while sanitary and phytosanitary (SPS) measures similarly affected 19.1% of respondents. Packaging and labelling requirements (6.3%) and quality standards (6.3%) were reported infrequently. Overall, the results suggest that NTMs in export markets currently affect a relatively small proportion of aquaculture exporters in Zambia. However, for those engaged in export activities, these measures may still pose practical challenges related to compliance costs, administrative delays, and market access requirements. While NTMs do not appear to constitute a widespread constraint at present, improving awareness of export regulations and strengthening support mechanisms for compliance could facilitate export participation as the sector expands.

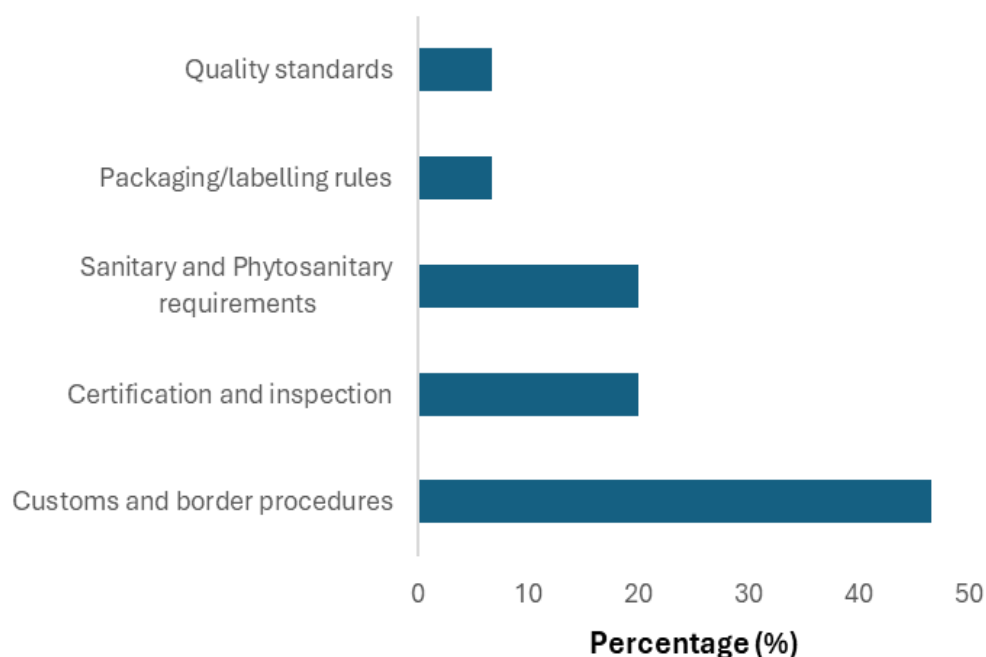


Figure 13: Non-tariff measures reported as affecting export of aquaculture products.

3.15 Perceived institutional capacity to implement and enforce non-tariff measures

Perceptions of institutional capacity to enforce non-tariff measures in the aquaculture sector were mixed, reflecting heterogeneity in stakeholder experiences (**Figure 14**). Although the largest proportion of respondents rated institutional capacity as moderate (40.3%), suggesting that enforcement mechanisms are generally functional, a substantial share expressed concerns regarding institutional effectiveness. Nearly one-third of respondents rated capacity as weak or very weak, indicating perceived limitations in regulatory oversight, enforcement consistency, or institutional resources. These perceptions have important implications for NTM compliance and trade performance. Adequate institutional capacity is essential for ensuring transparent, predictable, and consistent enforcement of NTMs, which in turn facilitates compliance by producers and traders. Where enforcement capacity is perceived as limited, compliance costs may increase due to regulatory uncertainty, delays, or inconsistent application of requirements, potentially discouraging participation in domestic or export markets. Conversely, the proportion of respondents who perceived institutional capacity as strong or very strong suggests that, in some contexts, regulatory institutions are viewed as capable of supporting effective NTM implementation. Overall, the findings indicate that while institutional capacity is sufficient to support NTM enforcement for some stakeholders, persistent perceptions of weakness may constrain broader trade engagement and compliance, particularly as the aquaculture sector seeks to expand its participation in regional and

international markets. Strengthening institutional capacity through improved coordination, resource allocation, and stakeholder engagement may therefore enhance regulatory effectiveness, reduce compliance burdens, and improve trade performance within the aquaculture sector.

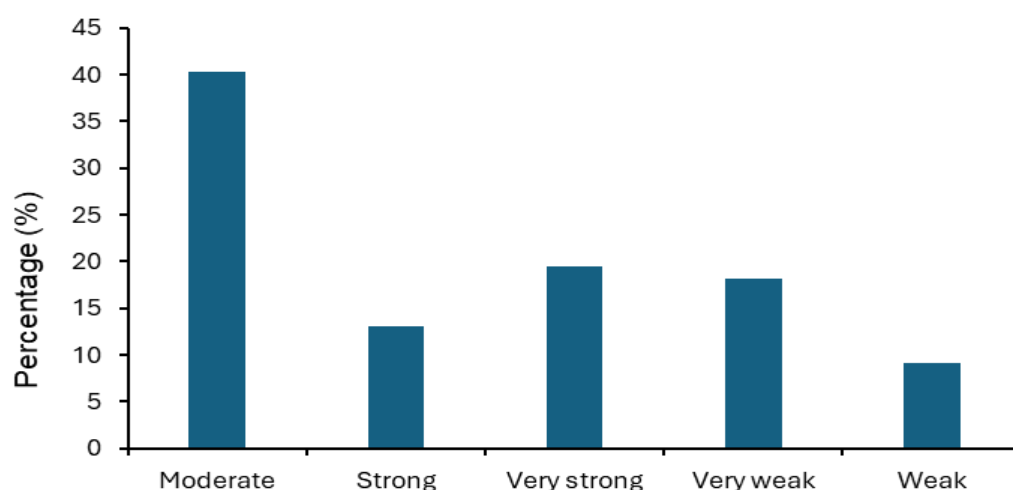


Figure 14: Perceptions of institutional capacity to enforce non-tariff measures in the aquaculture sector.

3.16 Key constraints faced by importers: costs, procedures, and quality assurance gaps

Importers of aquaculture inputs reported several major challenges affecting their operations (**Figure 15**). High import costs were identified as the most prominent constraint, affecting 43.0% of respondents and highlighting the financial burden associated with sourcing aquaculture inputs from international markets. Lengthy customs procedures were also commonly reported, with 30.4% of respondents indicating that administrative delays constitute a significant procedural challenge. Additional constraints included inconsistent quality of imported goods (13.9%) and limited testing capacity (12.7%), reflecting weaknesses in quality assurance and regulatory infrastructure. Overall, the results indicate that importers face a combination of financial, procedural, and quality-related constraints. Elevated costs and prolonged customs processes may impede timely access to essential inputs, while limitations in testing capacity and quality control may increase production risks and undermine confidence in imported products. These challenges underscore the importance of improving trade facilitation, strengthening quality assurance systems, and enhancing institutional capacity to support efficient aquaculture input importation.

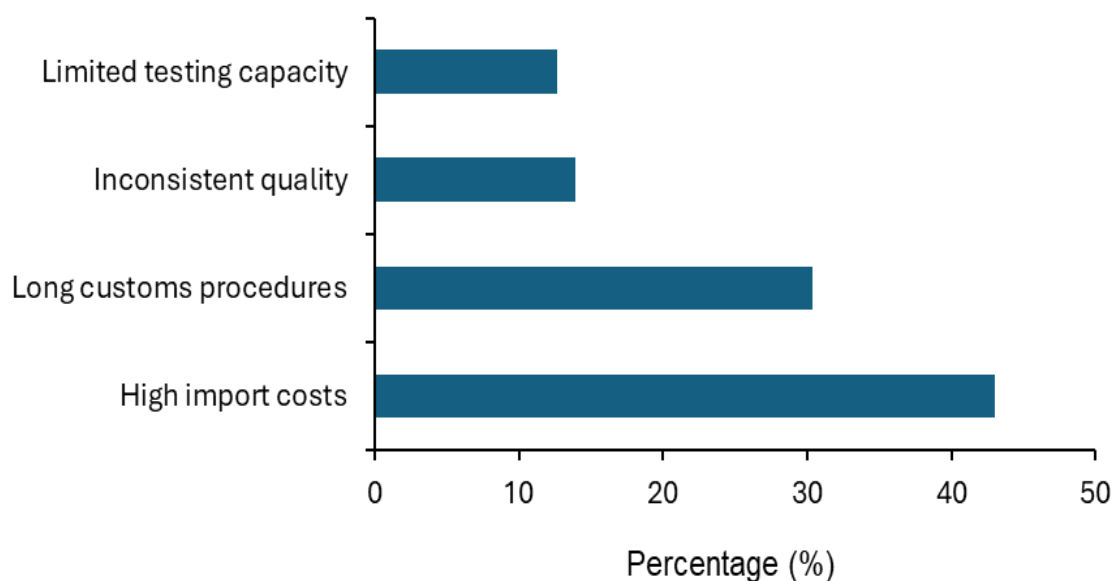


Figure 15: Key operational challenges reported by aquaculture input importers.

3.17 Aquaculture product import participation and sourcing arrangements

Most respondents (93.8%) indicated that they do not directly engage in importation, while a small proportion (6.1%) indicated that they import aquaculture products (**Figure 16**). Among respondents who reported importing, the most common arrangement involves the use of both direct procurement and intermediary channels (54.5%). This is followed by direct importation only (27.3%), while a smaller share relies exclusively on intermediaries (18.2%). The results indicate that aquaculture product importation is limited among respondents. Where import activity occurs, producers and traders tend to employ a combination of sourcing channels, potentially as a strategy to manage logistical constraints, transaction costs, or regulatory requirements. The low prevalence of importation reflects a general reliance on domestic production and limited engagement with international markets within the sector.

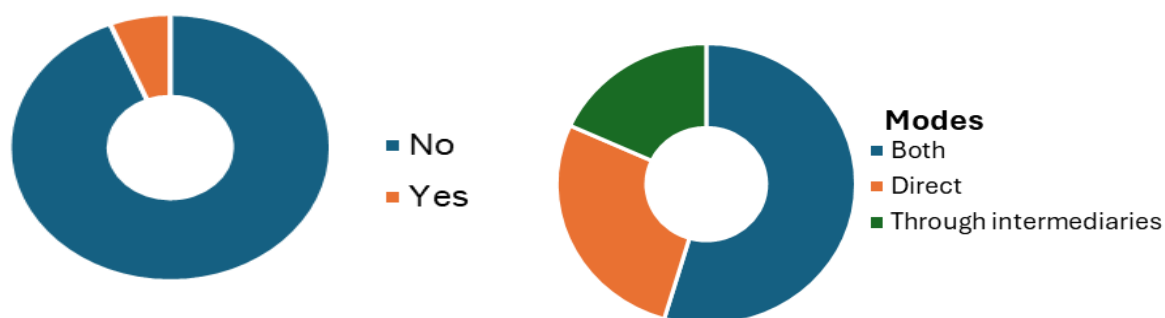


Figure 16: Channels used by the few entities that import aquaculture products.

3.18 Blind Spots: Limited Awareness of Trade Procedures

Respondents report limited impacts of regulatory and procedural requirements on their aquaculture operations, including sanitary and phytosanitary (SPS) requirements, export certification, customs delays, and laboratory testing (**Table 9**). Across all districts, the majority of respondents (92.7% to 94.4%) reported uncertainty regarding any specific effect, suggesting that most operators are not directly exposed to these regulatory processes. This pattern is consistent with the predominantly domestic orientation of Zambia's aquaculture sector, which is largely characterised by small- to medium-scale producers supplying local markets and exhibiting limited engagement in export or cross-border trade despite the potential that exists. However, this finding should not be interpreted as evidence that small-scale producers operate outside regulatory oversight. Rather, it likely reflects limited awareness, weak enforcement, or low direct interaction with formal regulatory procedures, particularly those associated with export markets. Domestic food safety regulations, licensing requirements, and market surveillance systems may still apply, but their visibility and perceived impact among producers appear to be low. This suggests potential gaps in regulatory outreach, implementation, or compliance monitoring at the local level, rather than a complete absence of regulation.

Among the small proportion of respondents who report being affected, the impacts are generally modest. Major effects are reported by only 1.7% to 3.4% of respondents across the different regulatory areas, while moderate and minor effects remain similarly low. These findings suggest that regulatory and procedural requirements currently impose tangible constraints primarily on a narrow segment of producers, particularly those operating at a scale sufficient to engage in export activities or to interact regularly with formal regulatory systems. The low prevalence of reported impacts reflects both the limited scale of export participation and the relatively informal nature of many aquaculture operations in Zambia. While regulatory and procedural requirements do not appear to constitute a widespread constraint at present, their importance is likely to increase as the sector expands, intensifies, and becomes more integrated into regional and international markets. Strengthening regulatory preparedness and institutional support at this stage may therefore help facilitate future sectoral growth while minimising potential trade and compliance barriers.

Table 9: Reported impact levels of sanitary and phytosanitary measures, export certification, customs delays, and laboratory testing.

Impact Level	Sanitary phytosanitary (%)	Export certification (%)	Customs delays (%)	Lab testing (%)
Unsure	94.4	92.7	92.7	93.3
Major effect	1.7	2.3	3.4	2.2
Moderate effect	1.7	2.2	1.7	1.7
Minor effect	0.6	0.6	1.1	1.7
No effect	1.7	1.1	0.6	0.6
Severe effect	-	1.1	0.6	0.6
Total	100	100	100	100

3.19 Border delays and implications for product quality and production continuity

Among those who reported being affected by border delays, the impacts are generally moderately to severe (**Figure 17**). Specifically, 62.5% of affected respondents describe the effect as moderate, 25.0% as severe, and 12.5% as major. This indicates that while the proportion of producers experiencing border delay impacts is limited, the consequences for those engaged in cross-border trade or export-oriented operations can be significant, potentially affecting product freshness, marketability, and value. In aquaculture production, key products such as 17 α -methyltestosterone for sex reversal in tilapia, spawning hormones for catfish and common carp, and critical feed additives must be imported, placing producers under strict regulatory control. Difficulties arise during the importation process due to lengthy approvals, strict customs inspections, and complex documentation requirements. In many cases, regulatory authorities have limited technical understanding of aquaculture-specific hormones and feed additives, leading to misclassification or excessive scrutiny.

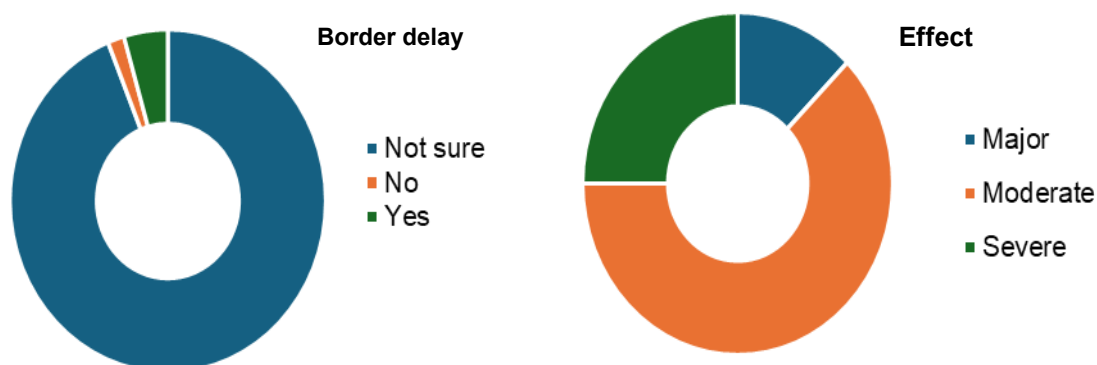


Figure 17: Perceived effects of border delays on aquaculture product quality and value.

These regulatory delays disrupt hatchery operations by preventing timely sex control in tilapia and induced spawning in catfish. Similarly, delays in importing feed ingredients and additives interrupt feed manufacturing schedules and increase production costs. The findings suggest that border delays are not a widespread concern within the sector at present but represent a critical constraint for the subset of stakeholders participating in export or regional trade. As the aquaculture sector in Zambia expands and becomes more integrated into regional markets, addressing border efficiency and trade facilitation could help mitigate these impacts and support the timely delivery and competitiveness of aquaculture products.

3.20 Institutional support for aquaculture market access

The majority of respondents (58.1%) report that their institutions are not engaged in facilitating market access for the aquaculture sector, while 41.9% indicate active involvement (**Figure 18**). This pattern suggests that institutional support for aquaculture trade and market integration exists but is unevenly distributed. Limited engagement by some institutions may constrain producers' ability to navigate regulatory requirements, access export opportunities, or participate effectively in domestic and regional markets. Strengthening institutional coordination and support could enhance market access and promote the growth and competitiveness of Zambia's aquaculture sector.

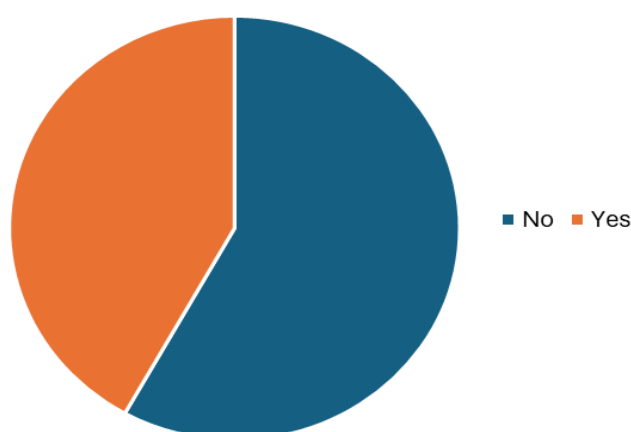


Figure 18: Institutional engagement in facilitating aquaculture market access.

3.21 Perceived effectiveness of existing regulatory frameworks

In this study, respondents gave mixed opinions on the effectiveness of existing regulatory frameworks in the aquaculture sector (**Table 10**). The largest proportion (55.3%) did not provide a rating, suggesting limited engagement with, or awareness of, regulatory

mechanisms. Among those who offer an assessment, 19.6% consider the frameworks effective, while 7.3% rate them as very effective. A further 16.2% adopt a neutral stance, and only a very small proportion perceive the frameworks negatively. These findings indicate that, among stakeholders with direct experience, regulatory frameworks are generally perceived as moderately effective. However, the substantial proportion of respondents who do not provide a rating highlights a knowledge gap or limited interaction with formal oversight, likely reflecting the predominantly domestic focus of Zambia’s aquaculture sector and the relatively low level of engagement in export-oriented or highly regulated activities. Enhancing awareness, accessibility, and enforcement of regulatory frameworks could improve compliance, strengthen institutional oversight, and support sectoral growth as aquaculture becomes more integrated into regional and international markets.

Table 10: Respondents’ Ratings of the Effectiveness of Existing Aquaculture Regulatory Frameworks.

Effectiveness of existing regulation	Frequency	Percentage (%)
Unsure	99	55.3
Effective	35	19.6
Ineffective	1	0.6
Neutral	29	16.2
Very effective	13	7.3
Very ineffective	2	1.1
Total	179	100

3.22 Bottlenecks in licensing and permit issuance

Respondents identify several challenges affecting the issuance of licenses in the aquaculture sector. The most frequently reported constraint is limited awareness of licensing procedures (21.8%), followed closely by poor inter-agency coordination (21.2%) and delays in permit issuance (20.7%), highlighting administrative and communication bottlenecks (**Figure 19**). Lack of accredited laboratories is reported by 19.0% of respondents, reflecting technical limitations in meeting regulatory requirements. Smaller proportions cite non-recognition of Zambian certificates (6.1%) and other unspecified challenges (0.6%). Collectively, these findings indicate that both procedural inefficiencies and technical constraints hinder timely and effective license issuance. Administrative delays and coordination gaps can slow the formalization of aquaculture operations, while limited laboratory capacity may restrict compliance with technical and quality standards. Addressing these challenges through

improved inter-agency coordination, enhanced awareness of licensing requirements, and investment in accredited testing facilities could facilitate more efficient licensing processes and strengthen regulatory oversight in Zambia’s aquaculture sector.

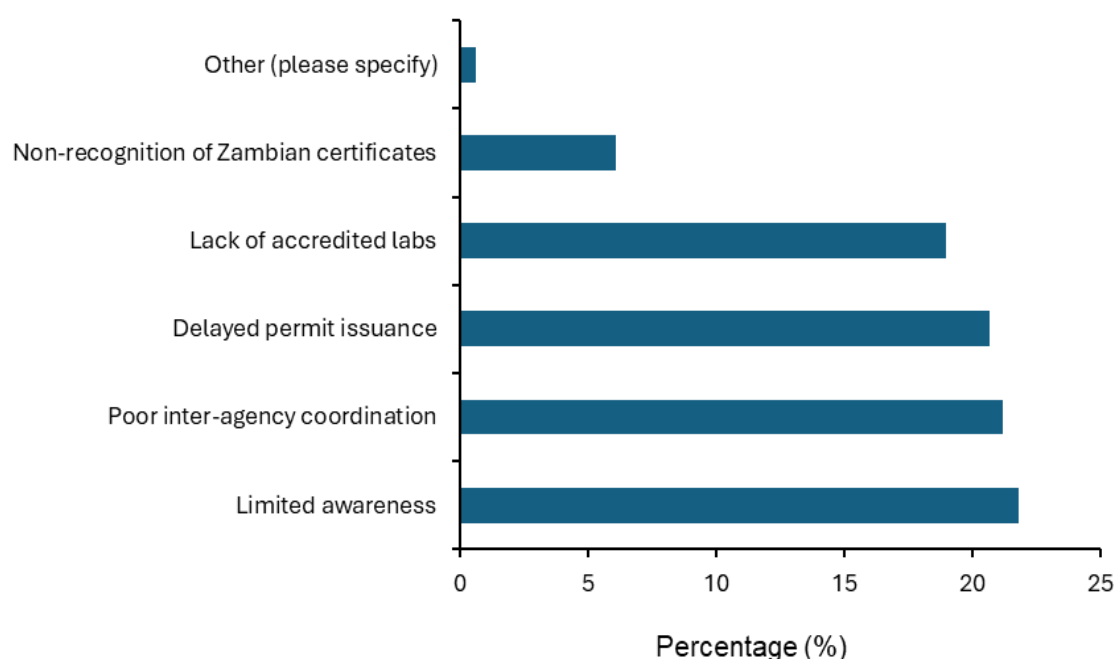


Figure 19: Key challenges in the licensing process.

3.23 Proposed reforms to strengthen compliance and market access

In the present study, respondents recommend several reforms to improve compliance and market access in the aquaculture sector. The most frequently proposed intervention is investment in cold chain infrastructure (31.3%), reflecting the critical need for proper storage and handling to maintain product quality and safety (**Figure 20**). Improving training for stakeholders is also highly emphasized (30.7%), highlighting the importance of capacity building in enhancing compliance with regulatory standards. Other notable recommendations include harmonizing standards at the regional level (19.6%), adopting digital systems to streamline regulatory and administrative processes (19.0%), building accredited testing laboratories (18.4%), and simplifying licensing and procedural requirements (17.9%). A very small proportion (0.6%) suggest other unspecified reforms. These responses underscore a multifaceted approach to strengthening compliance and market access, combining investments in infrastructure, human capacity development, regulatory harmonization, and procedural efficiency. Implementing such reforms could enhance product quality and safety, facilitate adherence to national and regional standards, and improve the competitiveness of Zambia’s aquaculture sector in domestic and export markets.

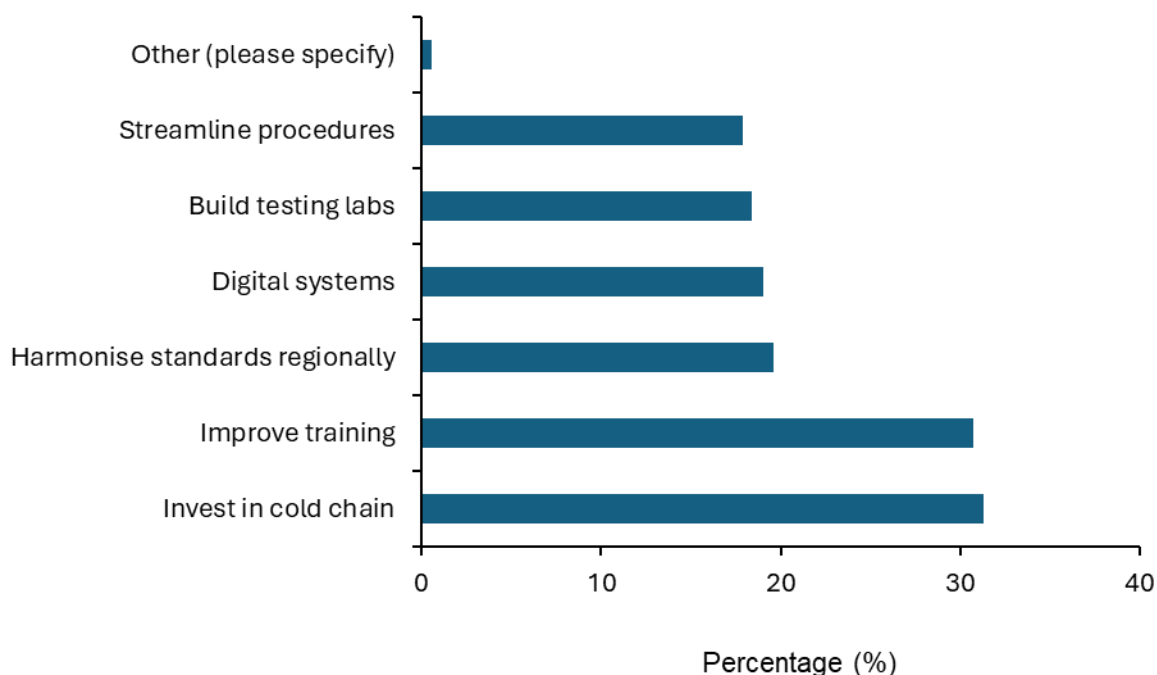


Figure 20: Reforms proposed by respondents to improve compliance and market access.

3.24 Priority measures to improve trade performance and compliance readiness

The respondents identified several measures that should be prioritized in order to improve trade and compliance in the aquaculture sector (**Figure 21**). Regional harmonization within SADC and COMESA is the most frequently cited intervention, selected by 50.3% of respondents, underscoring the perceived importance of aligning standards and regulations across regional markets. Capacity building and awareness-raising initiatives are similarly prioritized (49.2%), reflecting the need to strengthen stakeholders' knowledge of regulatory requirements and best practices. The establishment of accredited national testing laboratories is also widely recognized as critical (48.0%), highlighting the role of technical infrastructure in ensuring compliance with quality and safety standards. The need for improved cold chain infrastructure is identified by 38.5% of respondents, emphasizing the importance of maintaining product quality and marketability during storage and transport. Fewer respondents prioritize incentives for exporters (16.2%) or digital certification and tracking systems (13.4%), while only 0.6% suggest other interventions. Collectively, these findings indicate a strong preference for interventions that enhance regional coordination, institutional capacity, and critical infrastructure as the primary pathways to improving trade performance and regulatory compliance in Zambia's aquaculture sector. Addressing these areas is likely to facilitate greater market integration, reduce compliance costs, and strengthen the competitiveness of aquaculture products in both domestic and regional markets.

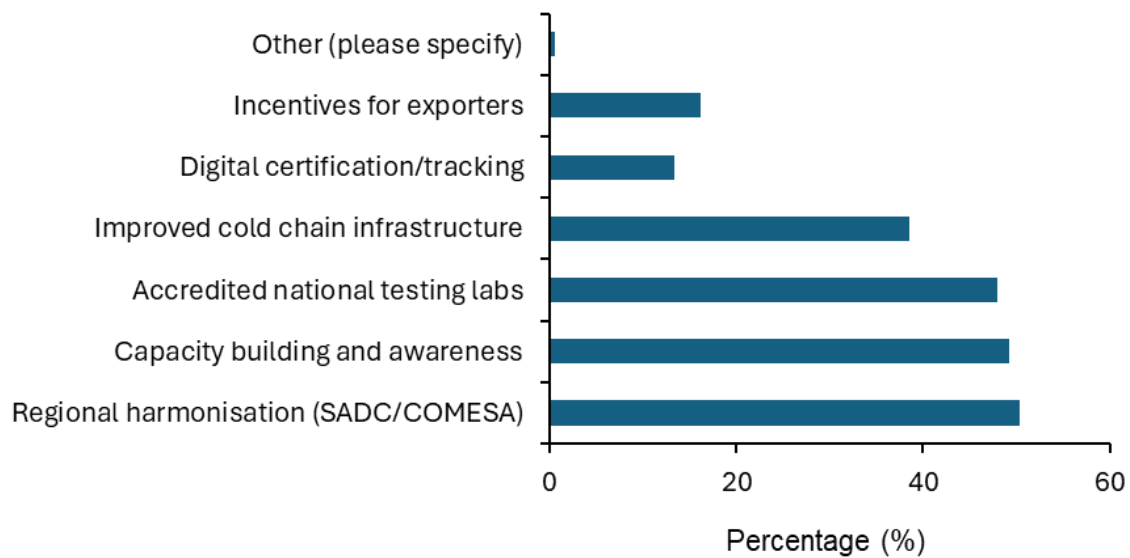


Figure 21: Priority measures identified to improve trade and regulatory compliance.

3.25 Additional stakeholder suggestions and open-ended responses

Respondents provided a limited number of additional suggestions to improve trade and compliance in Zambia’s aquaculture sector, with the majority (76.5%) offering no additional comments, indicating either satisfaction with earlier responses or limited further input. Among those who responded, financial support and improved access to funding (7.8%) emerged as the most frequently cited intervention, highlighting the importance of affordable credit, government support, and flexible financing conditions in enabling sector growth. This is followed by training, capacity building, and sensitisation (4.5%), reinforcing the need to strengthen stakeholder knowledge and technical skills.

Cold chain and storage infrastructure (2.2%) also featured among the key suggestions, alongside feed production and quality (1.7%) and broader production challenges such as predation and high production costs (1.7%), pointing to persistent constraints at the production level. Less frequently mentioned but still relevant were energy, technology, and data systems (1.1%), including solar solutions and improved analytics, as well as gender and social inclusion (0.6%), particularly women’s access to land. Additional minor themes included certification and quality compliance (0.6%) and value addition and market access (0.6%). Overall, these findings suggest that while relatively few respondents provided additional inputs, those who did emphasised financial access, capacity building, and production-level constraints as priority areas. This complements earlier results by

underscoring the need for targeted support measures alongside broader regulatory and infrastructural reforms to enhance sector performance.

Table 11: Thematic summary of additional stakeholder suggestions from open-ended responses.

Theme	Frequency	Percent (%)
Financial support / funding access (government funds, loans, reduced conditions)	14	7.8
Training, capacity building & sensitisation	8	4.5
Cold chain & storage infrastructure	4	2.2
Feed production & feed quality	3	1.7
Production challenges (predation, high production costs)	3	1.7
Energy, technology & data systems (solar, analytics)	2	1.1
Gender & social inclusion (women's access to land)	1	0.6
Certification & quality compliance	1	0.6
Value addition & market access	1	0.6
No comment / none / thanks / not applicable	5	2.8
No additional comments (missing/blank)	137	76.5
Total	179	100

3.26 Types of institutional support reported by respondents

In the current study, the respondents report several types of support provided by their institutions to enhance aquaculture market access (**Figure 22**). Training is the most commonly reported form of support (29.6%), reflecting a focus on building skills and capacity among stakeholders. Financial support is provided by 13.4% of institutions, while infrastructure support accounts for 8.4%. Policy and standards guidance is reported by 6.1%, and a very small proportion (0.6%) indicates other forms of support. These findings suggest that capacity-building through training represents the predominant form of institutional support for aquaculture market access, while financial assistance, infrastructure development, and regulatory guidance play more limited but complementary roles in strengthening the sector.

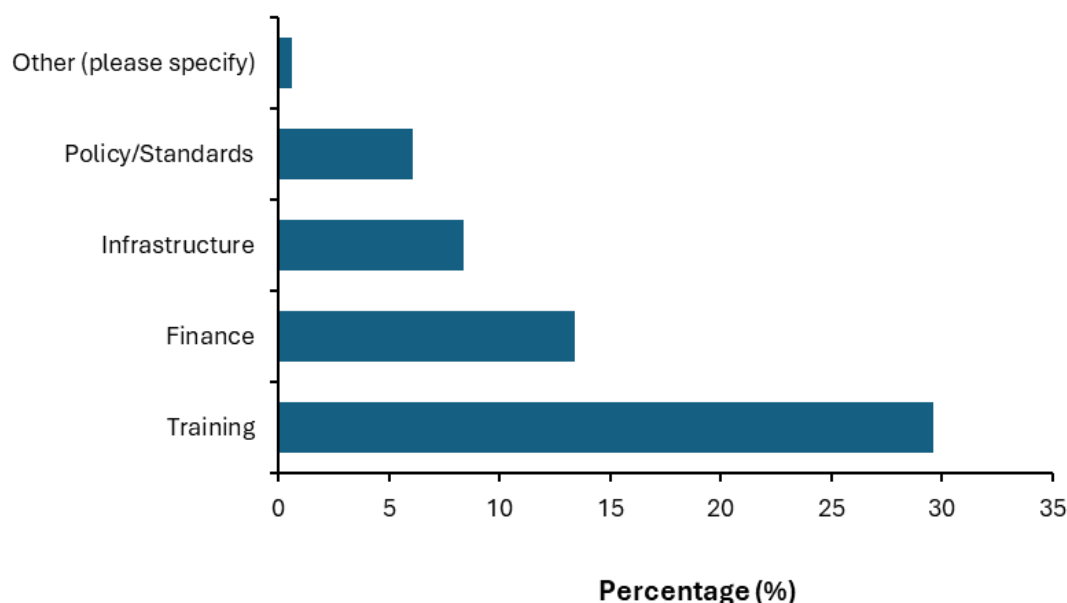


Figure 22: Types of institutional support provided to improve aquaculture market access.

3.27 RECOMMENDATIONS

Based on key findings of this study, we recommend the followings approach

i. Strengthen Regulatory Awareness, Transparency, and Stakeholder Engagement

High levels of uncertainty (over 92% “unsure”) indicate that regulatory barriers stem primarily from information gaps rather than excessive stringency. Hence, there is a need to strengthen regulatory awareness, transparency and stakeholders’ engagement through;

- **SHORT TERM (0–2 years) | Lead: Ministry of Fisheries and Livestock (MFL), with support from Zambia Development Agency (ZDA), World Bank and NGOs**
 - Develop and roll out a national aquaculture regulatory awareness programme using simplified guides, radio programmes, and extension materials covering licensing, SPS compliance, and export procedures.
 - Integrate regulatory literacy into existing extension services and farmer training programmes, prioritising new entrants.
- **MEDIUM TERM (2–5 years) | Lead: MFL, Local Authorities**
 - Institutionalise district and provincial stakeholder–regulator forums with defined schedules and feedback mechanisms.
 - Develop a single online regulatory portal consolidating licensing, certification, and compliance information across agencies.

ii. Simplify and Digitise Licensing, Certification, and Administrative Procedures

Procedural inefficiencies (costs, delays, and poor coordination) are key binding constraints.

- SHORT TERM | Lead: MFL, Ministry of Commerce, Trade and Industry (MCTI), Zambia Bureau of Standards (ZABS), Zambia Development Agency.
 - Undertake a regulatory audit to identify duplication and clarify mandates across agencies.
- MEDIUM TERM
 - Pilot a one-stop-shop for aquaculture licensing and certification integrating fisheries, veterinary, and standards services.
 - Digitise licensing, permit applications, and certification systems with tracking features to improve transparency and reduce delays.
 - Introduce risk-based inspection systems to reduce compliance burdens for low-risk operators.

iii. Support Capacity Building and Professionalisation Across the Value Chain

The sector is dominated by new entrants requiring structured skills development.

- SHORT TERM | Lead: MFL, Universities, NGOs, Cooperatives Department, MCTI, World Bank
 - Scale up training on Good Aquaculture Practices (GAP), hygiene, traceability, and record-keeping to different scales and roles along the value chain.
 - Support formation and strengthening of trader and processor associations to enhance coordination and market access.
 - Promote the formation of trader and processor associations to enhance collective action, improve market access, and strengthen value chain coordination.
 - Support these associations through targeted capacity building in quality management, packaging, and labelling to improve product quality and market competitiveness.
 - Strengthen collaboration with universities, vocational institutions, and research centres to deliver practice-oriented curricula.
 - Integrate gender-sensitive approaches to ensure women engaged in processing and informal trade benefit from capacity-building initiatives.
- MEDIUM TERM | Lead: Training Institutions
 - Develop practice-oriented curricula and certification programmes for aquaculture value chain actors.

iv. Expanding Cold Chain, Transport, and Post-Harvest Infrastructure

The findings have revealed that cold storage and logistics remain the most severe infrastructure gaps, hence, it is important that.

- **SHORT–MEDIUM TERM | Lead: Ministry of Agriculture, World bank, NGOs, MFL, Private Sector**
 - Support the development of community-based and privately operated cold storage facilities in major aquaculture hubs, with targeted public investment or concessional financing.
 - Integrate aquaculture into national cold chain and agri-logistics development strategies, ensuring alignment with broader food system investments.
 - Promote energy-efficient and solar-powered cold storage solutions, particularly in off-grid rural areas.
 - Improve feeder roads and transport services linking production zones to urban and border markets.
 - Provide concessional financing and incentives for investment in cold storage facilities in aquaculture hubs.

v. **Invest in Accredited Testing Laboratories and Quality Assurance Infrastructure**

The limited testing capacity constrains compliance and export competitiveness.

- **MEDIUM–LONG TERM | Lead: ZABS, MFL**
 - Upgrade and accredit national laboratories (ISO/IEC 17025) for SPS, residue, and quality testing.
 - Promote PPP models to expand laboratory capacity and ensure financial sustainability.
- **LONG TERM | Lead: MFL, Research Institutions**
 - Establish satellite/mobile laboratories in major production zones to improve access.

vi. **Enhance Regional Harmonisation of Standards and Trade Facilitation**

Regional alignment is critical given Zambia's export concentration in neighbouring markets.

- **SHORT–MEDIUM TERM | Lead: MCTI, Ministry of Foreign Affairs**
 - Actively engage in SADC, COMESA, and AfCFTA processes to harmonise SPS standards, certification requirements, and inspection procedures for fish and aquaculture inputs.

- Promote mutual recognition agreements for certificates and test results to reduce duplication and border delays.
- Strengthen coordination between fisheries authorities and customs agencies to improve border efficiency and clearance times, especially for perishable products.
- Pilot fast-track (“green lane”) clearance systems for compliant exporters of perishable products.

vii. Address Constraints in Aquaculture Input Supply and Import Regulation

Although most producers rely on local inputs, a significant minority depend on imported feed, equipment, pharmaceuticals, and seed, for whom import-related NTMs create moderate to severe production impacts. Hence, it is recommended.

- SHORT - MEDIUM TERM | Lead: MCTI, ZRA, ZABS,
 - Simplify and expedite import procedures for essential aquaculture inputs through streamlined licensing and inspections.
 - Strengthen domestic capacity for feed production, fish hatcheries, and equipment supply to reduce reliance on imports over time.
 - Enhance coordination between biosecurity, veterinary, and customs authorities to balance risk management with production efficiency.

viii. Adopt a phased export development and market diversification strategy

- SHORT-MEDIUM TERM | Lead: ZDA, Private Sector, MCTI
 - Develop a phased export readiness strategy focusing initially on regional markets.
 - Develop a phased export readiness strategy, starting with regional markets and gradually expanding to higher-value destinations.
 - Provide targeted support (technical assistance, certification subsidies, market intelligence) to potential exporters rather than applying blanket interventions.
 - Promote value addition (processing, packaging, branding) to reduce exposure to price volatility and increase profitability.
 - Introduce selective export incentives linked to compliance and quality upgrading.
- LONG TERM | Lead: Government (Fiscal Policy)
 - Introduce performance-based export incentives linked to compliance and quality upgrading.

Conclusion

This study assessed the impacts of non-tariff measures (NTMs) on Zambia's aquaculture sector, focusing on regulatory requirements, institutional capacity, and infrastructure constraints affecting market access. The findings indicate that NTMs, particularly sanitary and phytosanitary (SPS) measures, certification, customs procedures, and laboratory testing, do not yet constitute widespread binding constraints for most operators. This is largely because the sector remains predominantly domestic-oriented, with limited engagement in formal export markets. However, where NTMs are encountered, especially by exporters and producers reliant on imported inputs, their impacts are meaningful. High compliance costs, limited awareness of regulatory requirements, weak inter-agency coordination, and inadequate access to accredited laboratories increase transaction costs and create procedural delays.

These challenges disproportionately affect small- and medium-scale actors and discourage formalisation and export participation. More critically, the study finds that infrastructural and institutional bottlenecks, rather than the stringency of regulations themselves, represent the most significant constraints to sector growth. Poor cold chain infrastructure, weak transport and logistics systems, uneven market access, and variable institutional enforcement capacity undermine product quality, increase post-harvest losses, and limit compliance with food safety and quality standards. These constraints also restrict Zambia's ability to expand regional trade, which is currently concentrated in a small number of neighbouring markets. The results suggest that Zambia's aquaculture sector is at an early but pivotal stage of development. While NTMs are not yet highly restrictive, their relevance will increase as production scales up and export participation grows. Proactive investments in regulatory awareness, institutional capacity, quality infrastructure, and regional harmonisation are therefore essential. Addressing these issues now will support a gradual transition from informal, domestic markets toward more competitive, standards-compliant, and resilient participation in regional and international aquaculture value chains.

APPENDIX – QUESTIONNAIRE

Key Stakeholder Questionnaire

TITLE: ASSESSMENT OF NON-TARIFF BARRIERS AND REGULATORY FRAMEWORKS FOR ENHANCING MARKET ACCESS IN ZAMBIA’S AQUACULTURE SECTOR

This questionnaire aims to gather information on non-tariff measures (NTMs) affecting the production, trade, and market access of aquaculture products in Zambia. The results will identify gaps, challenges, and opportunities to enhance competitiveness in domestic, regional, and international markets. Your responses will remain confidential and used for research purposes only. Estimated completion time: 10–15 minutes.

Section A: General Information (All Respondents)

1. Name of respondent (optional):

2. Name of Organisation/Enterprise/Farm:

3. District/Province:

4. Role/Position:

5. Type of aquaculture operation (tick all that apply):

☐ Pond culture

☐ Cage culture

☐ Tank culture

☐ Hatchery

☐ Processing

☐ Trading/Export

☐ Input supply

☐ Other (please specify):

6. Scale of operation:

☐ Small-scale

☐ Medium-scale

☐ Large-scale

7. Years in operation:

8. Primary fish species farmed/processed:

9. Average production per cycle (tonnes):

Section B: Domestic Market Access (Producers, Traders, Processors)

1. Which regulatory or administrative measures affect your ability to sell aquaculture products in Zambia? (tick all that apply)

- ☐ Licensing/registration
- ☐ Sanitary Phytosanitary standards
- ☐ Food safety inspections
- ☐ Product quality standards
- ☐ Packaging/labelling rules
- ☐ Movement permits
- ☐ Other (please specify):

2. Which procedural challenges do you face under these measures?

- ☐ High compliance costs
- ☐ Long approval/testing delays
- ☐ Lack of accredited labs
- ☐ Inconsistent enforcement
- ☐ Limited awareness
- ☐ Other (please specify):

3. Are hygiene and sanitation standards required during handling or processing?

- ☐ Yes
- ☐ No

If yes, rate their effectiveness (1 = Very poor, 5 = Excellent): ☐1 ☐2 ☐3 ☐4 ☐5

4. Do certification or labelling requirements act as barriers to selling fish in Zambia?

- ☐ Yes
- ☐ No

If yes, rate the extent of barrier (1 = Minor, 5 = Severe): ☐1 ☐2 ☐3 ☐4 ☐5

5. Rate the adequacy of the following infrastructure (1 = Very Poor, 5 = Excellent):

Cold storage facilities: ☐1 ☐2 ☐3 ☐4 ☐5

Transportation and logistics: ☐1 ☐2 ☐3 ☐4 ☐5

Market facilities: ☐1 ☐2 ☐3 ☐4 ☐5

Section C: Imports of Aquaculture Inputs (For Producers and Traders)

1. Do you import aquaculture input?

☐ Yes

☐ No

3. If yes, which inputs do you import?

☐ Feed

☐ Seed

☐ Drugs

☐ Equipment

4. Which NTMs apply to these imports?

☐ Import licence

☐ Quality certification

☐ Quarantine/inspection

☐ Tariff-rate quota

☐ Other (please specify):

5. Major challenges faced (tick all that apply):

☐ High import costs

☐ Long customs procedures

☐ Limited testing capacity

☐ Inconsistent quality

☐ Other (please specify):

6. Rate how import regulations affect your production efficiency (1 = No effect, 5 = Severe impact):

☐1 ☐2 ☐3 ☐4 ☐5

Section D: Regional and International Market Access (Exporters)

1. Do you export aquaculture products?

☐ Yes

☐ No

2. If yes, list destination countries:

.....

3. Mode of export:

- ☐ Direct
- ☐ Through intermediaries
- ☐ Both

4. Which NTMs affect your exports?

- ☐ SPS requirements
- ☐ Quality standards
- ☐ Packaging/labelling rules
- ☐ Certification and inspection
- ☐ Customs and border procedures
- ☐ Other (please specify):

5. Rate the severity of these NTMs (1–5 scale for each):

SPS requirements: ☐1 ☐2 ☐3 ☐4 ☐5

Export certification: ☐1 ☐2 ☐3 ☐4 ☐5

Customs delays: ☐1 ☐2 ☐3 ☐4 ☐5

Lab testing: ☐1 ☐2 ☐3 ☐4 ☐5

6. Do border delays affect product freshness or value?

- ☐ Yes
- ☐ No

7. If yes, rate the impact (1 = Minimal, 5 = Severe): ☐1 ☐2 ☐3 ☐4 ☐5

Section E: Institutional and Policy Framework (Government, NGOs, Regulators, Associations)

1. Is your institution involved in supporting aquaculture market access?

- ☐ Yes
- ☐ No

2. If yes, specify support type:

- ☐ Finance

- ☐ Training
- ☐ Infrastructure
- ☐ Policy/Standards
- ☐ Other (please specify):

3. Effectiveness of existing regulatory frameworks:

- ☐ Very effective
- ☐ Effective
- ☐ Neutral
- ☐ Ineffective
- ☐ Very ineffective

4. Key institutional gaps hindering compliance (tick all that apply):

- ☐ Poor inter-agency coordination
- ☐ Lack of accredited labs
- ☐ Delayed permit issuance
- ☐ Limited awareness
- ☐ Non-recognition of Zambian certificates
- ☐ Other (please specify):

5. Rate institutional capacity for enforcing NTMs (1 = Very weak, 5 = Very strong):

- ☐1 ☐2 ☐3 ☐4 ☐5

6. What reforms would you recommend improving compliance and market access? (Tick all that apply)

- ☐ Streamline procedures
- ☐ Invest in cold chain
- ☐ Build testing labs
- ☐ Harmonise standards regionally
- ☐ Improve training
- ☐ Digital systems
- ☐ Other (please specify):

Section F: Opportunities and Recommendations (All Respondents)

1. Which of the following would most improve trade and compliance? (select top 3)

- ☐ Regional harmonisation (SADC/COMESA)
- ☐ Accredited national testing labs
- ☐ Capacity building and awareness
- ☐ Digital certification/tracking
- ☐ Incentives for exporters
- ☐ Improved cold chain infrastructure
- ☐ Other (please specify):

2. Any additional comments or suggestions:

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