5. Summary

This document presents conceptual and empirical frameworks for assessing the contribution of commercial aquaculture to economic growth, poverty alleviation, and food security. Conceptually, we focused on value added (as contribution to GDP), labour income and employment as three major dimensions of economic growth, and examined how commercial aquaculture contributes to them via its own production as well as its linkage impacts on the rest of the economy. Other dimensions include commercial aquaculture's contribution to tax revenues, investments in human and non-human capital, productivity, foreign exchanges, among others.

Commercial aquaculture's contribution to economic growth is a general measure of its contribution to poverty alleviation and food security. Specifically, we developed a conceptual framework that focuses on commercial aquaculture's contribution to long-term food security (including food availability, access, and utilization as three major dimensions) as well as its contribution to short-term, transitory food security through stable production (prices) and diversified food supplies.

Based on the conceptual frameworks established, we developed indicators for quantitative assessments of the many dimensions of commercial aquaculture's economic contributions, explained the rationales behind them, discussed the data needed to operationalize them, and provided some illustrative examples of their applications. Table 14 provides a summary of the indicators used for the assessment.

TABLE 14
Indicators for commercial aquaculture's economic contribution

Indicators for commercial aquaculture's economic contribution

Dimensions	Index	Indicators	Notes
Gross domestic product			
	[1.1]	VAD_t^{ca} / GDP_t	share of CA's value added in GDP
	[1.2]	$\Delta VAD_t^{ca} / \Delta GDP_t$	CA's contribution to GDP growth
	[1.3]	VAD_t^{ca} / VAD_t^{ag}	share of CA's VAD in agriculture VAD
	[1.4]	$\Delta VAD_t^{ca} / \Delta VAD_t^{ag}$	CA's contribution to agriculture VAD growth
	[1.5]	M_v	VAD multiplier
Employment			
	[2.1]	E_t^{ca} / E_t^{total}	share of CA employment in total employment
	[2.2]	$\Delta E_t^{ca} / \Delta E_t^{total}$	CA's contribution to total employment growth
	[2.3]	E_t^{ca} / E_t^{ag}	share of CA employment in total agriculture employment
	[2.4]	$\Delta E_t^{ca} / \Delta E_t^{ag}$	CA's contribution to agriculture employment growth
	[2.5]	M_e	employment multiplier
Labour income			
	[3.1]	W_t^{ca} / W_t^{total}	share of CA's labor income in total labor income
	[3.2]	$\Delta W_t^{ca} / \Delta W_t^{total}$	CA's contribution to total labor income growth
	[3.3]	W_t^{ca} / W_t^{ag}	share of CA's labor income in total agriculture labor income
	[3.4]	$\Delta W_t^{ca} / \Delta W_t^{ag}$	CA's contribution to agriculture labor income growth
	[3.5]	M_w	labor income multiplier
Tax revenues			
	[4.1]	T_t^{ca} / T_t^{total}	share of CA's tax payments in total tax revenues
	[4.2]	$\Delta T_t^{ca} / \Delta T_t^{total}$	CA's contribution to total tax revenue growth
	[4.3]	T_t^{ca} / T_t^{ag}	share of CA's tax payments in total agriculture tax payments
	[4.4]	$\Delta T_t^{ca} / \Delta T_t^{ag}$	CA's contribution to agriculture tax payment growth
	[4.5]	M_τ	tax multiplier
Foreign exchange			
	[5]	NFE	net foreign exchange earning
Productivity			
	[6.1]	CA output per worker	CA's labor productivity
	[6.2]	CA output per ha	CA's land productivity
	[6.3]	*TFP*	Total factor productivity based on structural models
	[6.4]	ln(*TFP*)	Total factor productivity based on index analysis
Food availability			
	[7.1]	*CPS*	CA's protein (or other nutrients) supply
	[7.2]	*CPS* / *TPS*	share of CA's protein supply in total protein supply
	[7.3]	*CPS* / *APS*	share of CA's protein supply in total animal protein supply
	[7.4]	*CDPS*	CA's direct protein supply
	[7.5]	*CIFS*	CA's indirect food supply
Food access			
	[8.1.1]	W^{ca}	CA's direct contribution to labor income
	[8.1.2]	$W^{ca} * M_w$	CA's total contribution to labor income
	[8.2.1]	w^{ca}	CA's average wage rate
	[8.2.2]	w^{ca} / w^{ag}	wage level comparison between CA and agriculture
	[8.3.1]	E^{ca}	CA's employment
	[8.3.2]	E_j^{ca} / E^{ca}	CA's employment composition
	[8.3.3]	E_f^{ca} / E^{ca}	female share in CA's employment
Transitory food security			
	[9.1.1]	σ_x^2	magnitude deviation of production (protein supply) from trend
	[9.1.2]	$\sigma_{\tilde{x}}^2$ (tilda)	percentage deviation of production from trend
	[9.2.1]	σ_p^2	magnitude deviation of price from trend
	[9.2.2]	$\sigma_{\tilde{p}}^2$ (tilda)	percentage deviation of price from trend
	[9.3.1]	cov (x, y)	covariance between x and y
	[9.3.2]	$\rho_{x,y}$	correlation between x and y

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