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GREEN economy and TRADE

A Guide for the Assessment of the Costs and Benefits of Sustainability Certification

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List of Acronyms and Abbreviations

ACC	Aquaculture Certification Council
ASC	Aquaculture Stewardship Council
ATFS	American Tree Farm System
BAP	Best Aquaculture Practices
CBA	Cost-Benefit Analysis
CDC	UK's Development Finance Institution
CEA	Cost-Effectiveness Analysis
FMO	Nederlandse Financierings-Maatschappij voor Ontwikkelingslanden N.V. (Netherlands Development Finance Company)
FoS	Friend of the Sea Criteria
FSC	Forest Stewardship Council
GAA	Global Aquaculture Alliance
GE-TOP	Green Economy and Trade Opportunities Project
HACCP	Hazard analysis and Critical Control Points
IFOAM	Organic Standard
MCA	Multi-Criteria Analysis
NPV	Net Present Value
OECD	Organization of Economic Co-operation and Development
PEFC	Pan-European Forest Certification Council
SFI	Sustainable Forest Initiative
TEEB	The Economics of Ecosystems and Biodiversity
TEV	Total Economic Value
WWF	World Wide Fund for Nature

1. Introduction

Background

A variety of sustainability standards have been developed in recent years, with the aim to improve the environmental quality, social inclusiveness and economic performance of production and trade. This wave has been motivated by an increased awareness of consumers around the world about the impacts of their purchasing decisions, with certification being a key signalling mechanism for consumers that want to buy more responsibly. Driven by this demand and increased awareness, producers and other actors in the value chain are increasingly choosing to adopt standards that verify and certify the compliance with sustainability criteria. These standards have spread across many industries, including forestry, agriculture, and fisheries & aquaculture (See *Table 2* for a detailed list of standards in each sector).

Sustainability certification is intrinsically linked with trade. The majority of production of certified goods originates from outside of the countries where their final consumers are located. Trade can amplify the impacts of production of certain products, as producers have access to the vast demand emanating from consumers around the world. This demand can generate social inequality, and poor and unsafe working and environmental conditions. Nevertheless, with the help of sustainability standards, trade has an enormous potential to increase the wages of producers through the price premiums that some certified products command, but can also be an engine to promote better social and environmental performance.

Certification can also serve as an important means of implementation for the Green Economy. Firstly, it provides a mechanism to internalize the environmental and social costs of production. Secondly, it provides producers with an incentive to improve their social and environmental track record all while providing economic incentives in the form of increased market access and price premiums. Thirdly, it informs consumers and provides them with options to consume more responsibly. This guide complements the standards work conducted by UNEP under its **Green Economy Trade Opportunities Project (GE-TOP)**, in Vietnam, Peru, Chile, and South Africa.

Rationale

While sustainability standards are drawing increasing attention from producers and consumers, a coherent methodological framework for the analysis of the full social, environmental, and economic costs and benefits related to sustainability standards is still missing. This is partly due to the difficulty of quantifying the benefits and costs of environmental and social aspects, including ecosystem services, with the added complexity of differentiating between private and public costs and benefits. The adoption of an integrated framework for measuring the economic, social and environmental 'profitability' of sustainable businesses (and hence of sustainability certification) is crucial to adequately inform the strategic decisions of producers and policy makers, both on investment decisions and on policy formulation and evaluation.

Starting from these considerations, this study seeks to provide guidance on how to approach an assessment of the broader costs and benefits deriving from sustainability certification. In contrast to traditional Cost-Benefit-Analyses, this methodology is addressed to researchers, policymakers and practitioners who want to explore the economic implications of the use of sustainability standards and complement these with environmental and social implications of sustainability certification for both the public and the private sector. Based on this more comprehensive analysis, relevant stakeholders should be able to strategically choose those policies, practices and strategies which deliver the highest overall societal and environmental benefits.

Objectives

Since the specifics of the CBA vary greatly depending on each particular case, the industry, and the focus of the analysis, this paper has the objective to provide a general introduction to the CBA methodology and to provide a toolkit that can be adapted to a wide array of different cases. This study is not intended to provide a full-fledged technical guide on the actual implementation of a CBA, but rather, to provide a diverse set of tools that can be adapted to the specific focus of the question the user is trying to answer. It will guide the user through the most relevant steps of the analysis, and provide further resources to deepen the technical knowledge to implement a CBA. Thus, the specific objectives of this guide are to:

- Understand the fundamentals of a Cost-Benefit-Analysis (CBA).
- Integrate environmental and social impacts into the CBA methodology.
- Provide a clear step-by-step guide on how to conduct a CBA.
- Understand how a CBA can help draw conclusions on the use of sustainability certification.

2. Cost-Benefit Analysis

Different Methodologies

A cost-benefit analysis (CBA) is a systematic process for calculating and comparing benefits and costs of a given decision, and it is based on assigning a monetary value to all the activities performed (either as input or output). Given a set of options, a project should be undertaken if the expected benefit is higher than the expected costs of the project. Different CBA techniques are commonly used to evaluate the feasibility and profitability of business strategies and projects, as well as (in some cases) public policy interventions. These techniques generally compare the total investment required for the implementation of the strategy/project against its potential returns. Commonly, CBA techniques focus on economic aspects, leaving social and environmental aside, particularly when they cannot be assigned clear monetary values.

The following are amongst the most common CBA techniques utilized:

- The **payback period** is the most basic of all cost-benefit analysis techniques. First, all costs associated with a specific strategy/project are quantified and aggregated. In particular, costs might include investment in fixed assets, labour and training costs, as well as the time lost for training or implementation. The total aggregated costs are then divided by the expected financial returns deriving from the implementation of the strategy/project. The result obtained corresponds to the indicative time needed for the investment to pay for itself. It does not, however, inform about the overall benefit of a project.[1]

- The **rate of return** technique is generally used to assess single or small investments. The formula consists of subtracting the total costs associated with the investment from the expected added benefits, and then to divide the obtained value by the investment's costs. The value obtained at the end of the analytical process is the percentage return on investment, which gives an idea of the profitability of the proposed strategy/project. However, caution needs to be used when applying this technique as it can be misleading.[2]
- The **net present value (NPV)** analysis follows the same procedure as the payback period technique for the calculation of total costs and benefits associated with strategy/project implementation. In addition, the cost of capital associated with outside funds needed to start the strategy/project is estimated. Based on the comparison between present and estimated future value of financial costs and benefits (including estimation of future inflation trends), the net present value of a given strategy/project is calculated. If the final result is a negative value, the project is generally not considered as worthwhile, and thus rejected. Projects with a higher NPV will be preferred over projects with a lower NPV. The NPV rule requires, however, a discount rule to be applied to future benefits and costs.[3]

[1] For more information on the payback method is available here.

[2] For more information on the rate of return technique, see ***"Cost-Benefit Analysis and the Environment", OECD, 2006***. An Executive Summary can be accessed here.

[3] For more information on the NPV analysis, go here.

Companies and policymakers may also use alternative techniques to assess the viability of investments, among them cost-effectiveness analysis (CEA) and multi-criteria analysis (MCA). A CEA is a form of economic analysis that compares relative costs and outcomes (effects) of two or more courses of action. It is broader than a CBA and includes the analysis of non-monetary impacts, evaluated qualitatively, or ranked, for instance, on a scale from 1 to 5. An MCA is a decision-making process that allows the assessment of different options against a variety of criteria, including quantitative and qualitative indicators. In contrast to CBAs and CEAs, MCAs can be conducted in cases where multiple objectives and criteria exist.

Monetization of Environmental and Social Factors

Improvements in the state of the environment or in social welfare should be measured in monetary terms to the extent possible, in order to surpass the shortcomings of traditional CBAs, which focus exclusively on economic costs and benefits and do not take into account the social and environmental dimensions. Nevertheless, the precise identification and monetization of these aspects may pose several challenges.

Firstly, the impacts of sustainability certification largely depend on the specific context and sector of production. Consequently, the choice of indicators should be carefully customized on a **case-by-case basis**. Another key challenge for the valuation of social and environmental costs is the **limited amount of data** available with regard to the environmental and social consequences of unsustainable production and trade. Finally, the **different perspectives on environmental and social avoided costs** of sustainability certification should be taken into account.

For example, forest ecosystem deterioration resulting from unsustainable timber production might generate high costs for local communities that are highly reliant on forest goods and services. On the other hand, timber production companies might give less priority to such costs in the short term, and only perceive them as relevant in the medium and long-term, when environmental degradation would have a strong impact on the profitability of their business.

As indicated by WWF (2013) perhaps the clearest and most useful way to trace the relationships between ecosystem services, economic values and human well-being outcomes is to **combine two frameworks**. The first is **total economic value (TEV),** which is commonly applied by economists. The second is the **ecosystem services/human well-being framework** presented in the Millennium Ecosystem Assessment (MA, 2005), which is widely used by conservation planners and decision-makers. This framework has been adopted by The Economics of Ecosystems and Biodiversity (TEEB), a global initiative that sets out the case for natural capital valuation, and continues the discussion on ecosystem service classification begun by the MA, synthesizing various methods and case studies from the academic disciplines of ecological and environmental economics.

The estimation of the TEV implies the analysis of the complete range of characteristics of ecosystems as integrated systems − resource stocks, flows of services, and the attributes of the ecosystem as a whole. These include (Emerton, 2006):

- **Direct values**: raw materials and physical products that are used directly for production, consumption and sale.
- **Indirect values**: ecological functions that maintain and protect natural and human systems.
- **Option values**: the premium placed on maintaining ecosystems for future possible uses, some of which may not be known now.

- **Existence values**: the intrinsic value of ecosystems and their component parts, regardless of their current or future use possibilities.

In order to estimate the environmental and social costs of unsustainable production and trade, the researchers could apply different methods and techniques for the valuation of ecosystem services. These include, for example:

- **Household production costs:** the costs paid by households as result of the impact of environmental degradation. *Example: costs of cleaning or repairing due to pollution.*
- **Replacement costs**: the cost of replacing a service with a man-made system. *Example: cost of construction of reservoirs due to reduced natural watershed regulation.*
- **Dose-response**: how changing an environmental service affects the production costs of a product. *Example: the increase in food prices as result of reduced production due to soil erosion.*
- **Averting behavior**: expenditures to defend against negative effects of ecosystem degradation. *Example: cost of building preventive walls for possible floods.*
- **Travel cost method**: changes in the value of a recreational site or changes in the environmental quality of that site by using the amount of money and time people spend traveling there. *Example: cost that people are willing to pay to get to a white-sand beach.*
- **Hedonic pricing method:** based on the idea that people prefer and will pay more to live in areas with good environmental quality, or consume sustainably produced goods. *Example: the value of environmental quality is embedded in housing prices.*

Using one or a combination of the above-mentioned methods can help to explore the value of intangible assets conserved through the application of sustainability standards, which can then be incorporated in the CBA. For further information on the monetization of environmental and social changes, see "Ecosystem and Human Well-Being: Synthesis" (Millenium Institute, 2005) and "The Economic Value Of Ecosystem Services In The Mekong Basin- What We Know, And What We Need To Know" (WWF, 2013).

Review of Studies on CBA of Sustainability Certification

Various approaches and methodologies are used to identify and estimate costs and benefits of sustainability certification. In general, the methodological approaches utilized depend on the characteristics of the geographical area studied, the sector analysed, and the availability of data. This section focuses on the review of cost-benefit analysis (CBA) methods for assessing the profitability of sustainable practices, and the advantages of complying with sustainability standards and eco-labelling schemes. It includes examples of studies having used CBA and will therefore facilitate the understanding of situations in which this technique can potentially be applied. Several studies were reviewed and classified based on the scope of the analysis (See **Table 1**), differentiating between:

(1) Studies that focus exclusively on economic and commercial aspects of sustainability certification.

The majority of the studies reviewed on certified organic agriculture and timber products are conducted using a traditional CBA, which considers demand and supply trends, the cost of compliance to standards, and additional benefits deriving from higher yields and premium market prices for certified products. In particular, most studies use the Net Present Value (NPV) to assess the profitability of certified products (Afari-Sefa & Gockowski, 2010; Simula, Astana, Ishmael, Santana, & Schmidt, 2004). Although the NPV methodology is widely used for investment analysis, it may be inaccurate under uncertain market conditions, since it is entirely based on information available at the time of the investment and policy implementation, and does not capture market dynamics and

potential modifications of expected scenarios. In addition to being static, traditional CBAs conducted using NPV are mainly focused on pure economic aspects of sustainability certification, and tend to underestimate social and environmental impacts. In particular, socio-economic benefits deriving from the preservation of ecosystems and natural capital are not explicitly included in the framework of analysis.

(2) *Studies that are entirely dedicated to the analysis of social impacts deriving from a shift in production and commercialization patterns.*

These studies use a CBA to evaluate social impacts of sustainability certification schemes (Rozman, Pazek, Bavec, Bavec, Turk, & Majkovic, 2006). The focus is normally on a limited number of households, and data are collected from surveys and interviews. The final objective of the analysis is to assess the degree to which producers benefit from the adherence to sustainability standards, focusing mainly on income and net revenues, and in some cases including indicators of health and educational status. Although they provide useful information on the relation between sustainable business and social well-being, these studies tend to focus mainly on observed trends, without considering potential future scenarios (e.g. economic, social and environmental benefits potentially deriving from certification in the medium- to long-term). Moreover, the analyses are generally limited to social indicators, leaving marginal importance to the dynamic relations between social, economic and environmental variables.

(3) *Studies that include a comprehensive analysis of economic, social and environmental costs and benefits of sustainability certification.*

A significant share of the studies reviewed makes reference to economic, social and environmental costs and benefits of sustainability certification (WWF, FMO & CDC, 2012; Rao & Holt, 2005). However, since most of these studies do not quantify social and environmental impacts in monetary terms, they are unable to provide an integrated framework to evaluate the profitability of investments. On the other hand, social and environmental considerations tend to be analysed by means of qualitative methods, including surveys and multi-stakeholder meetings.

(4) *Studies that combine CBA with simulation models and scenario analysis.*

An increasing number of studies make use of quantitative simulation models to project alternative scenarios of complying with sustainability standards. For example, some studies combine different methodologies, such as CBA, MCA, scenario analysis, simulation models etc., in order to quantify economic returns of investments in certification, including an estimation of income generation potential and of benefits from enhanced ecosystem services (Pretty, et al., 2005; Némes, 2009; Clough, et al., 2011). Also, dynamic biodiversity species population models are used in some cases to analyse information on native species and generate natural capital management scenarios (UNCTAD, 2013). In other cases, modelling methodologies are applied to the analysis of specific sectors, with the aim to identify the most effective production processes (i.e. technology and value chain analysis), considering short-, medium- and long-term costs and benefits (McKeough, et al., 2005; Smeets, Faaij, & Lewandowski, 2005; Rozman, Pazek, Bavec, Bavec, Turk, & Majkovic, 2006). Some authors clarify that simulation models are used to overcome the limitations of NPV analysis, allowing to account for market oscillations and potential unintended consequences of investments (Pažek & Rozman, 2012).

Depending on the scope and objectives of each study, different indicators of costs and benefits should be monitored and analysed. In general, total costs include operating/variable costs (e.g. costs of certification, and of planting and harvesting organic products *vs.* conventional products), fixed costs (e.g. costs of

technology and machinery), cash overhead (e.g. taxes, land rental etc.), and non-cash costs (e.g. depreciation and opportunity costs for equipment, tools etc.). Also, when the analysis covers public policy interventions aimed at promoting the adoption of sustainability certification schemes costs include public subsidies and other forms of incentives implemented to support the development of sustainable businesses.

The benefits addressed by the reviewed studies generally include revenues from trade, and income generation. Some of the studies also include a monetary estimation of environmental and social benefits. Overall, there is a wide difference among authors in how to aggregate and compare costs and benefits. For example, some studies only use direct benefits (e.g. profits from sales) to estimate the potential for shifting to sustainable production processes (Pažek & Rozman, 2012), while other studies also include indirect benefits (e.g. health benefits) in the analysis (WWF, FMO & CDC, 2012). Similarly, some studies are focused on short-term costs and benefits (Schreiber, 2006), while others provide a broader analysis, encompassing medium and long-term expected impacts (Smeets, Faaij, & Lewandowski, 2005). Furthermore, different methodologies are often combined (e.g. CEA, MCA, surveys, NPV Analysis) in order to introduce a variety of perspectives, or to compensate for limited data availability.

The methodology proposed in this study (presented in the next section) builds on the strengths identified in the literature review, and seeks to overcome the limitations highlighted in the various studies analysed. In particular, it is clear that a systemic approach to sustainability certification is needed, which incorporates social, economic and environmental dimensions in a coherent and quantifiable framework.

Table 1: Overview of Selected Studies

Sector	Focus area	Title and Author(s)	Year	Methodology(ies)	Key indicators	Sectoral coverage[4]	Time horizon	Outcomes
Agroforestry	Ghana	Afari-Sefa & Gockowski: "*Economic Cost-Benefit Analysis of Rainforest Alliance Certified Cocoa in Ghana*".	2010	Net Present Value Analysis Benefit Cost Ratio Labour Internal Rate of Return	Labour quantity and costs Physical input costs Net annual return Expenditures during production and harvest seasons.	Ec; S	Present	Certified cocoa would lead to 30% lower yields. However, benefits of a 25% yield increase following certification training exceed the costs of certification.
Biofuel chains	Canada, Netherlands, Russia	McKeough, et al.: *"Techno-economic analysis of BioTrade chains. Upgraded biofuels from Russia and Canada to the Netherlands".*	2005	Technical-economic analysis Simulation models	Biomass production costs Capital and O&M costs Energy consumption Energy conversion efficiency CO_2 emissions	Ec; En	Short term	Production and electricity consumption costs are lower when biofuels are delivered through international BioTrade chains.
Biofuels	Brazil and Ukraine	Smeets, Faaij, & Lewandowski: *"The Impact of Sustainability Criteria on the Costs and Potentials of Bioenergy Production".*	2005	Cost-benefit analysis Sustainability criteria GIS (spatial data) Simulation models	Wages; Child labour Education Health care Pesticide use Nutrient losses Soil erosion Biodiversity	Ec; S; En	Medium and long term	It seems feasible to produce biomass for energy purposes at reasonable cost levels and meeting strict sustainability criteria. In Brazil and Ukraine, estimated production costs are in the range of EUR2/GJ. Economic co-benefits deriving from sustainable production (e.g. reduced soil erosion, value of jobs) were not quantified.

[4] **Ec: Economic; S: Social; En: Environmental**

Sector	Focus area	Title and Author(s)	Year	Methodology(ies)	Key indicators	Sectoral coverage[4]	Time horizon	Outcomes
Forest Certification	USA	Schreiber: *"A Cost Benefit Analysis of Forest Certification at The Forestland Group"*.	2006	Cost-benefit analysis Surveys Regression analysis	Direct and indirect costs and benefits	Ec; S	Present	The Forestland Group receives $771,000 of additional annual revenue from certified forests. The domestic sale of finished wood products generates a price premium of 30.0%, while premium for exported wood products is 3.4%.
Green Supply Chains	South East Asia	Rao & Holt: *"Do green supply chains lead to competitiveness and economic performance?"*.	2005	Surveys Structural equation modelling		Ec, S; En	Short and medium term	An integrated green supply chain ultimately leads to enhanced competitiveness and economic performance.
Organic Agriculture	North Eastern Slovenia	Pažek & Rozman: *"Option Models Application of Investments in Organic Agriculture"*.	2012	Real Options Approach Cost-benefit analysis Simulation model (Integrated Technologic-Economic Deterministic Simulation Model)	Investment costs Annual Cash Flow Net Present Value Investment return period	Ec	Short and medium term	CBA analysis shows positive net present values for both processed spelt for human nutrition (spelt grain and spelt flour). The investment return period is 2 years.
Organic Agriculture	North Eastern Slovenia	Rozman, et al.: *"A Multi-Criteria Analysis of Spelt Food Processing Alternatives on Small Organic Farms"*.	2006	Cost-benefit analysis Multi-criteria Analysis Simulation model	Nutritional, technological and processing indicators for spelt wheat production	Ec; S	Short and medium term	Spelt wheat represents additional business and market opportunities for organic farmers.
Organic agriculture	Brazil and Peru	Collinson, Burnett & Agreda: *"Economic Viability of Brazil Nut Trading in Peru"*.	2000	Cost-benefit analysis	Total costs, selling price and profit margins for Castaneros, Habilitadores and Export companies	Ec; S	Present	From FOB to consumption the trade pattern does not currently have an ethical dimension. Furthermore, the high degrees of efficiency and competitiveness within the international trade mean that there is very limited scope to

Sector	Focus area	Title and Author(s)	Year	Methodology(ies)	Key indicators	Sectoral coverage[4]	Time horizon	Outcomes
								introduce ethical innovations
Palm oil	Companies located in different geographic areas.	WWF, FMO & CDC: *"Profitability and Sustainability in Palm Oil Production. Analysis of Incremental Financial Costs and Benefits of RSPO Compliance".*	2012	Interviews Cost-benefit analysis	Land assessment and management costs; Additional transport and storage costs for Segregated CSPO Pesticide cost reduction; Accident rate reduction Social conflicts; Labor turnover; Revenues and Market Access Access to Capital Productivity gains from smallholders	Ec; S; En	Medium and long term	Although potential market premiums serve as the initial attraction to RSPO certification, each major category of benefits was, in and of itself, potentially capable of outweighing RSPO implementation costs.

3. Three-Indicator CBA Model

This study chooses the an integrated and systemic approach to identify the broader costs and benefits of the adherence to sustainability certification and eco-labelling. The steps mainly follow the Net Present Value Analysis (NPV) methodology, but integrate social and environmental costs in monetary terms to address the inadequacy of conventional CBA.

An integrated and systemic CBA methodology is proposed in this section for the analysis of the broader costs and benefits related to the adherence to sustainability certification and eco-labelling schemes. In particular, three main analytical components are described, and can be used to better appreciate the multiple advantages of sustainable production and trade:

a) *Investment and operating costs:*

From a private sector perspective, investments refer to the **costs for greening production** (e.g. the purchase of machinery and the transformation of production processes and techniques, potential additional labour and training costs) as well as the **monetary costs of complying with sustainability standards**, including, annual certification fees, auditing and other management costs related to certification. From a public sector point of view, investments refer to the **allocation and/or reallocation of financial resources** with the aim to create enabling conditions for the development of sustainable businesses in a given country.

b) *Added benefits:*

The monetary evaluation of **economic, social and environmental benefits** deriving from sustainability certification, focusing on **short-, medium- and long-term impacts across sectors and actors**. These include enhanced access to markets, or the availability of premium prices for certified products.

c) *Avoided costs:*

The estimation of **potential costs that could be avoided** as result of the successful adherence to sustainability principles and processes. These refer to the use of green production practices (as a result of sustainability certification) and may include direct savings deriving from a more efficient use of natural resources, as well as indirect avoided costs, e.g. health expenditure, avoided losses from environmental degradation, and avoided payments for the replacement of key ecosystem services.

All three components are respectively dependant on the point of view the researcher is adopting. Thus, it has to be clearly distinguished between which investments, added benefits and avoided costs apply to which group of actors. For example, the individual farmer may not consider long-term environmental benefits as an added benefit because he might not be affected by these. A government representative, in contrast, might rather be interested in the aggregated social and environmental impacts of a decision. We therefore distinguish between public and private investments, benefits and costs. Likewise, due to the fact

that investment, benefits, and costs will vary depending on the sector, this paper differentiates between three main sectors: agriculture, fisheries & aquaculture, and forestry. Trying to reflect these different aims, this framework is proposed as a modular and customizable method for conducting a systemic analysis of sectoral and cross-sectoral implications of sustainability certification.

Based on the three analytical components of the proposed CBA model (investments, added benefits, and avoided costs), Table 2 provides sample indicators for each component based on some international certification programmes by sector. It gives an overview of sample indicators that can be used for estimating investments, added benefits and avoided costs in relationship with the adherence to the suggested programmes. The following section presents more detailed descriptions of indicators for each component, which are assembled from various certification-related studies (see references) and presents a “best of” from these different analyses. It is neither exhaustive nor applicable to all sectoral analyses, but rather reflects a generic portfolio of indicators that can be flexibly customized to the requirements and objectives of specific sectoral assessments.

Table 2: Summary of Key Sustainability Certificates and Possible Indicators for Organic Agriculture, Fisheries & Aquaculture, and Forestry.

Sector	Key Sustainability Certificates	Investment & Operating Costs	Added Benefits	Avoided Costs
Organic Agriculture	- Organic Standard (IFOAM) - Hazard analysis and Critical Control Points (HACCP) - International Faitrade Certification Mark - Global GAP - Rainforest Alliance	- Water efficient technology. - Biological inputs. - Training programs on green farming practices. - ICT. - Post-harvest storage. - Research and development. - Monitoring & Evaluation.	- Market price premiums (Delbridge, Coulter, King, Sheaffer, & Wyse, 2011). - Increased productivity (Pretty, et al., 2005). - Avoided soil erosion (Auerswald, Kainz, & Fiener, 2003). - Additional employment and income opportunities (OFRF, 2012).	- Reduced costs of inputs (less fertilizers and pesticides). - Avoided costs of water purification. - Avoided cost of soil degradation.
Fisheries & Aquaculture	- Marine Stewardship Council - Friend of the Sea Criteria (FoS) - Monterey Bay Aquarium's Seafood Watch - U.S. National Oceanic and Atmospheric Administration's Fish Watch - Dolphin-Safe - Aquaculture Stewardship Council (ASC) - Aquaculture Certification Council (ACC) - Global GAP - BAP/GAA	- Training of fishermen on sustainable fishing techniques. - Re-training of fishermen. - Periodic assessment of biological status of fish resources. - Equipment	- Market price premiums (Prein, et al., 2012). - Sustainable fish catch (UNEP, 2011).	- Avoided losses from fish stock depletion. - Reduced operational waste (e.g. lost fishing gear, oil spills etc.).
Forestry	- Forest Stewardship Council (FSC) - Pan-European Forest Certification Council (PEFC) - Sustainable Forest Initiative (SFI) - American Tree Farm System (ATFS)	- Protected areas. - Costs associated with the respect of legal and customary rights of indigenous people. - Training and supervision of forest workers. - Sustainable plantations.	- Market price premiums for sustainably produced wood (FSC, 2012). - Additional revenues from NTFP (FAO, 2012). - Forest regeneration and increased productivity due to respect of natural cycles (Vogt, Larson, Gordon, & Fanzeres, 1999). - Additional revenues from eco-tourism (UNEP, 2011).	- Reduced waste associated with harvesting and on-site processing operations. - Reduced losses of forest resources others than timber.

A. Investment and operating costs

The shift to sustainable production and trade requires a close **collaboration between private and public actors**. This is needed to bridge the gap between policy interventions and investment allocation, both aimed at creating more value for local producers (e.g. through the creation of new value chains).

The analysis of possible alternative investment options is a key starting point for any business development strategy, and can be effectively informed by relevant indicators, adequately customized to the national context. More specifically, **public investments** could be used to implement incentive schemes to reduce upfront investments, or to offset potential additional costs that may put a strain on producers in the transition to greener production practices (as a result of certification). For example**,** targeted subsidies and grants could be provided for the purchase of innovative technologies and green inputs (e.g. biological fertilizers and pesticides), with the aim to accelerate the certification process for biological products. Also, a larger share of the national budget could be allocated to support research and development activities in fields related to sustainable production and trade, such as biotechnology, wild resource assessments, food processing technologies and techniques, etc. The reallocation of public budget towards the promotion of sustainable business is likely to create more favorable conditions for private investments, and to enhance access to national and international markets.

On the other hand, **private investments** are needed for adapting production and trade processes to the requirements of sustainability standards, and to obtain certification. In particular, the shift to sustainable businesses implies the adoption of a new investment model that takes into account not only short-term financial returns, but also environmental, social and ethical considerations that are likely to improve resilience and also increase income.

Table 3 provides a general overview of key indicators of investment, broadly subdivided into capital and operation & management costs, training costs, certification costs, and government costs. These indicators should be considered in the analysis of specific sectors eligible for sustainability certification, including agriculture, fisheries & aquaculture, and forestry.

Table 3: Sectoral indicator samples for measuring investments in sustainability certification.

Sector	Private Costs Capital and Operation & Management Costs	Private Costs Training Costs	Private Costs Certification Costs	Public Costs
Agriculture	Cost of organic pesticides and fertilizers (US$/kg; US$/ha). Cost of water and energy efficient technology (US$/ha). Operation & Management Costs (US$/ha). Labor costs (US$/ha). Energy costs (US$/ha). Water costs (US$/ha).	Training of farmers in sustainable agriculture technologies and processes (US$/person). Training of law enforcement officials (US$/person).	Application fee (US$). Annual renewal fee (US$/year). Assessment on annual production or sales fees (US$/year). Inspection fees (US$/year).	Incentives for the purchase of organic inputs (US$/kg). Incentives for the purchase of organic agriculture technology (US$/kg).
Fisheries & Aquaculture	Cost of water- and energy-efficient technology (US$/ha). Establishment/Expansion of Marine Protected Areas, including enforcement costs (US$/year). Fuel costs (US$/ton; US$/year). Cost of sustainable fishing gear (US$/ton; US$/year). Operation & Management Costs (US$/ha). Labor cost (US$/person; US$/year; US$/ton).	Training of fishermen on sustainable fishing techniques (US$/person). Training of law enforcement officials (US$/person). Training on assessment of biological status of fish resources (US$/person).	Annual fee (US$/year). Royalties (% of value of consumer facing seafood products that are sold/purchased). Periodic assessment of biological status of fish resources (US$/year).	Subsidies to fishermen for reducing fishing activities (US$/person; US$/year). Incentives for the purchase of equipment, e.g. fishing gear that minimizes the incidental take of non-target species (US$/year).
Forestry	Establishment/Expansion of Forest Protected Areas, including enforcement costs (US$/year). Costs associated with the respect of legal and customary rights of indigenous people (US$/ha). Sustainable plantations (US$/ha). Operation & Management Costs (US$/ha). Labor cost (US$/person; US$/year; US$/ton).	Training and supervision of forest workers (US$/person). Training of law enforcement officials (US$/person).	Initial and annual audit costs (US$/ha). Compliance costs, e.g. retaining a percentage of trees to function for wildlife habitat, elaboration of forest management plan and forest inventory (US$/ha; US$/year).	Subsidy to family forest owners to support costs of certification audits (US$/ha). Subsidies to local forest communities (US$/year). Development and implementation of policies for Environmental, Social, & Economic Performance Criteria (US$/year).

Main references: Afari-Sefa and Gockowski (2010); Macfadyen and Huntington (2007); MSC (2013); Nemes (2009); Owens (2008); Pazek and Rosman (2012); Schreiber (2006); UNEP (2013a).

B. Added benefits

Once the total investment (both public and private) needed for sustainability certification and for creating or expanding green value chains has been estimated, the additional benefits potentially deriving from sustainable production and trade should be properly assessed. In particular, **economic, social and environmental benefits** should be identified, and measured using relevant indicators.

The correct estimation of **economic returns that could be obtained by private actors** as a result of the adherence to sustainability standards largely influences the willingness of producers to invest in new production practices and to comply with certification requirements. At the same time, **public actors** will only facilitate the use of sustainability standards with adequate policy frameworks if they consider the resulting benefits worthwhile. As the advantages of certification and green production are rarely visible in the short-term, they tend to be underestimated in a conventional cost-benefit analysis. It is therefore crucial to extend the analysis both **across sectors and over a longer time frame** to account for the economic returns deriving from investments in sustainability certification. Only with this more comprehensive approach can we carry out a more objective analysis.

The added benefits of sustainable production and compliance with sustainability standards include **sectoral/economic value added**, as driven by natural resource stocks and flows. This is, e.g. increased production, sustained availability of natural resources needed for production, direct employment creation and natural capital improvements on stocks, flows, ecosystem goods and services relative income generated along the value chain (additional revenues deriving from healthier ecosystems,). These benefits largely vary based on the sector and country context, as well as on market readiness, technological advancement, and more.

An important economic aspect of sustainability related CBA is the estimation of the impact of certification on trade performance. The assessment of the potential for expanding national and international market shares, increasing sales and profits, and creating trade opportunities in new markets is essential to increase confidence of producers on the profitability of certification. Researchers can use a variety of **trade and market access indicators** to conduct CBAs, depending on the specific product and market analysed. These indicators could be, among others: economic competitiveness, access to sustainable global value chains, export rate in certified products, access to premium prices, profits, and tariffs. These types of indicators should be considered in sustainability related CBA. In particular, **trade and market access improvements should be quantified in monetary terms** and calculated as added benefits of certification. Positive impacts in these indicators could, for instance, result in:

- Increased economic competitiveness due to improved resource efficiency in production processes;
- Improved access to and benefits from sustainable global value chains, including highly competitive markets in developed countries;
- Increased exports of certified products;
- Access to premium prices for sustainably produced products;
- Increased profits from higher productivity and sales, as well as a better reputation;
- Reduced average tariffs imposed by importing countries on certified products;

Overall, the multiple economic advantages of sustainable business development have been demonstrated by several studies and market research. For example, the potential for investments in the sustainable exploitation of native biological species has been confirmed on occasion of the First BioTrade Congress,

when it was highlighted that domestic and international sales by BioTrade businesses reached over 2.3 billion in 2011, corresponding to a 14% growth with respect to 2010 (UNCTAD, 2012).

In addition to economic returns deriving from market dynamics, the CBA of sustainability certification should include an estimation of **social benefits** generated. In particular, sustainable production practices generally require more labor force to be carried out (e.g. in organic agriculture, due to a reduced use of chemical fertilizers and pesticides, as well as more labor intensive land management, harvesting and post-harvesting processes). As a result, additional employment and income opportunities might be created due to the certification, as well as new jobs could be created from the establishment of new value chains, with greater advantages potentially accruing to poor communities in developing countries. For example, studies conducted in developing countries demonstrate that organic agriculture has the potential to increase jobs by 30% compared to traditional agriculture methods (FAO, 2012). In particular, investments in organic certification could generate additional income for women, due to the gender-related nature of certain productive activities in specific country contexts - e.g. traditional plant-based activities (UNEP, 2012b).

Finally, added **environmental benefits** deriving from sustainable production schemes should be quantified and included in the assessment framework. In particular, economic advantages are derived from the preservation of natural capital. For example, the valorization of native forests and their biological products is expected to improve the provision of other forest goods and services, including timber and non-timber forest products, as well as watershed regulation and carbon sequestration services, among others. Moreover, the environmental benefits of healthier ecosystems would be enjoyed across key sectors, such as water management (e.g., through watershed preservation and better conservation of water resources in protected areas) and agriculture (higher soil quality). As a result, relevant national and international studies and data could be used to estimate the economic value of added environmental benefits deriving from sustainability certification investments.

Table 4 provides a general overview of sample indicators for measuring economic, social and environmental benefits of sustainability certification subdivided into direct and indirect benefits.

Table 4: Sectoral indicator samples for measuring economic, social and environmental benefits of sustainability certification.

Sector		Economic Benefits	Social Benefits	Environmental Benefits
Agriculture	*Direct*	<u>Private</u> Increased access to global BioTrade markets (% or US$/year). Increased productivity (US$/ha). Premium market price (%; US$/year). <u>Public</u> Increased revenues from taxes on agribusiness as result of increased private profits (US$/year).	Income generation for rural population (US$/year).	Improved soil quality (% of degraded agricultural land).
	Indirect	<u>Private</u> Additional revenues from improved corporate reputation/customer loyalty (US$/year). Increased revenues in other sectors, e.g. fisheries and forestry, as result of reduced environmental impact (US$/year).	Poverty reduction (% poor population). Increased access to water (% of population). Improved nutritional levels (kcal/person/day).	Preservation of forest cover (forest cover as % of total land). Preservation of fish stocks as result of reduced water pollution (fish stock level/year). Improved air quality (Air

Sector		Economic Benefits	Social Benefits	Environmental Benefits
		Public Additional fiscal space to support the expansion of organic agriculture and BioTrade (US$/year).		Quality Index) from reduced emissions.
Fisheries & Aquaculture	*Direct*	Private Increased access to global aquaculture markets (% or US$/year). Premium market price (%; US$/year). Increased profits from improved customer confidence (US$/year) Public Increased revenues from fishery taxation as result of increased private profits (US$/year).	Sustainable income of fishermen households (US$/year).	Restoration of damaged marine ecosystems (US$ per area, or % of restored marine ecosystems).
	Indirect	Private Additional revenues from improved corporate reputation/customer loyalty (US$/year). Increased revenues in other sectors, e.g. eco-tourism, as result of reduced environmental impact (US$/year). Public Additional fiscal space to support the expansion of sustainable aquaculture (US$/year).	Improved nutritional levels (kcal/person/day) Fishermen income from alternative activities (US$/year)	Improved conservation of coastal ecosystems (% of degraded coastal ecosystems).
Forestry	*Direct*	Private Increased access to global BioTrade markets (% or US$/year). Increased productivity (US$/ha). Premium market price (%; US$/year). Public Increased revenues from taxes on forestry as result of increased private profits (US$/year). Revenue from selling forest credits (US$/year).	Increased income of local forest communities (US$/year).	Increase in forest cover from sustainable plantation (forest cover as % of total land).
	Indirect	Private Additional revenues from improved corporate reputation/customer loyalty (US$/year). Increased revenues in other sectors, e.g. eco-tourism, agriculture etc., as result of reduced environmental impact (US$/year). Public Additional fiscal space to support and promote sustainable forest management (US$/year).	Increased access of forest dwellers to traditional forest products (%).	Improved air quality (Air Quality Index). Preservation of biodiversity (GEF biodiversity index).

Main references: Blackman and Rivera (2010); Nemes (2009); Owens (2008); Pretty et al. (2005); Schreiber (2006); UNEP (2013a).

Case study: CBA of sustainable shrimp and pangasius certified production in Vietnam

The following example will serve as a demonstration of how a CBA can be conducted. It will be further developed throughout the Step-by-Step-section in Chapter 4:

The shift from conventional to organic aquaculture practices is increasingly considered as an option for the sustainable development of the sector in many areas of the world, especially in developing countries. In the **Mekong River Delta Region of Vietnam** a study was recently conducted to assess the potential profitability of investing in the certification of shrimp and pangasius products. It focused on four key indicators of trade and market access:

- *Price:* calculated as the weighted average of the selling price, estimated using the volume produced by each surveyed farm. This price was calculated based on the prices of both conventional and certified production.
- *Yield:* the yield was calculated as an average of the yields from each farm, and measured on a per hectare basis.
- *Sales:* for farmers, revenues were calculated as the average yield multiplied by the average selling price; for processors/exporters, sales were calculated multiplying total annual exports by the average export price.
- *Profits:* Net revenues were calculated as the difference between sales and production costs.

The outcome of the analysis demonstrated that shrimp certification had positive impacts on trade performance at both the farmer and exporter level, mainly due to an increase in selling prices and sales volume, driven by improved access to global markets. On the other hand, the effect of pangasius certification on trade and market benefits is negative under business as usual, mainly due to a significant increase in production costs compared to increases in sales and selling prices. Certified pangasius farmers would experience positive trade benefits only in the case of price increases of at least 10%. For more information, see the GE-TOP study **"Sustainability Standards in the Vietnamese Aquaculture Sector."**

C. Avoided costs

An integrated CBA of sustainability certification should include the valuation of environmental and social (avoided) costs deriving from shifting to sustainable production processes through certification. This analysis is particularly relevant from a green economy perspective, where social inclusiveness (i.e. the equitable distribution of costs and benefits across actors) is at the core of sustainable development. Improving the sustainability of a sector has the potential to **reduce costs of ineffective natural resource management practices** and use sustained by public and private actors, and **avoid potential future costs** deriving from the depletion of natural capital and ecosystem degradation.

Sustainability certification can therefore lead to **direct and indirect environmental and social avoided costs**. Firstly, green economy practices may support a **reduction in the use of inputs**, such as water, fertilizers and energy. Secondly, better environmental management may **reduce vulnerability and lower costs** – e.g. keeping the forest in place may avoid floods by lowering sedimentation and siltation. These costs also include the activities implemented for the replacement of degraded ecosystem services. For example, the shift to organic agriculture inputs and processes is likely to reduce groundwater pollution from chemical fertilizers and pesticides, thereby cutting costs of water purification.

Thirdly, a more sustainable exploitation of natural resources might help to **reduce social costs associated with environmental degradation and poverty**. In particular, the depletion of natural capital and consequent decline of natural resource-based sectors is likely to have an impact on the well-being of people and communities directly depending on those sectors/resources for their livelihood. Three billion people live on small farms, in coastal areas or close to forests, and directly depend on nature (soil, forests, fish, water, biodiversity etc.) for their nutrition, health, employment and income (UNEP, 2013b). The adoption of socially responsible business principles, combined with the protection of natural capital and biodiversity assets, can safeguard livelihoods and lift people out of poverty. Thereby, it reduces the costs generally sustained by governments to assist vulnerable communities, such as social protection schemes and subsidies to improve access to basic services (e.g. water, electricity).

Two examples:

- A shift to organic agriculture is likely to reduce soil erosion due to the use of chemical pesticides and fertilizers, thereby ensuring sustained yields and higher profits in the medium to long term in a more environmental friendly way. On the other hand, the intensive use of chemical inputs is likely to boost yields in the short term, but it will require increasing investments by farmers in the longer-term to make up for soil depletion (e.g. greater amounts of inputs, displacement of production).
- A shift to certified timber production is likely to reduce unsustainable deforestation and protect key ecosystem services provided by forests, such as watershed regulation, flood protection, carbon storage, etc. The improved water availability from healthier forest ecosystems, for instance, would thereupon increase water security in the timber production area, thereby improving revenues of the company, and avoiding the costs of water provisioning. Reduced deforestation would also decrease the risk of flooding in certain areas. Consequently, the company would save the costs of flood damages, as well as potential compensation costs for damages occurred to local communities as result of increased floods.

Table 5: Sectoral indicator samples for measuring economic, social and environmental avoided costs of sustainability certification.

Sector		Economic Avoided Costs	Social Avoided Costs	Environmental Avoided Costs
Agriculture	*Direct*	Private Reduced use of fertilizers and pesticides (US$/year). Reduced water intensity (US$/ton). Public Avoided costs of food subsidies, as result of increased food production and overall well-being (US$/year).	Reduced employment and income losses from soil degradation and abandonment (US$/year)	Reduced GHG emissions and associated costs (tCO2e/year; US$/year).
	Indirect	Private Reduced productivity losses from soil degradation (US$/year). Public Reduced costs of ground water purification (US$/year).	Reduced health costs due to malnutrition water pollution diseases (US$/year) Reduced costs of urbanization from abandoned agricultural land, e.g. subsidies to urban poor (US$/year)	Reduced costs of water pollution, e.g. from nitrogen concentration (ug/L; US$/year).
Fisheries & Aquaculture	*Direct*	Private Reduced profit losses from fish stock depletion (US$/year). Reduced losses from improved stock management and traceability (US$/year). Reduced fuel consumption (US$/year). Public Reduced losses from illegal fishing (US$/year) Reduced costs of subsidies to unsustainable fishing activities (US$/year).	Reduced income losses from fish stock depletion (US$/year).	Reduced costs of marine ecosystem degradation (US$/year). More sustainable fish stock management (replenishing of stocks etc.)
	Indirect	Private Reduced economic losses in other sectors, e.g. eco-tourism, as result of environmental degradation (US$/year). Public Avoided costs of fish imports (US$/year)	Reduced health costs due to malnutrition (US$/year). Reduced costs of urbanization from abandoned coasts, e.g. subsidies to urban poor (US$/year).	Reduced salinization of groundwater sources from improved marine ecosystem management, and related costs (mg/L; US$/year).
Forestry	*Direct*	Private Reduced pesticides use (US$/year). Reduced losses of timber and non-timber forest products (US$/year). Reduced energy use (US$/year). Public Avoided costs of reforestation programmes (US$/year).	Avoided loss of habitat by forest dwellers (households/year). Reduced damages from floods and inundations on households (US$/year).	Reduced deforestation (forest cover as % of total land). Reduced costs of desertification of forest area (Aridity Index, Rain concentration index,).
	Indirect	Private Reduced economic losses in other sectors, e.g. eco-tourism, as result of environmental degradation (US$/year).	Reduced costs of urbanization from abandoned forests, e.g. subsidies to urban poor (US$/year).	Reduced costs of replacement of ecosystem services, e.g, watershed

		Public Avoided costs of imports of timber and non-timber forest products (US$/year).	Reduced health costs from air pollution, floods etc. (number of hospitalized people/year).	management (US$/year).

Main references: European Commission et al. (2012); Pretty et al. (2005); Schreiber (2006); TEEB (2010); UNEP (2011).

4. Step-by-step guide to conduct sustainability-related CBAs

While Section 3 outlines a broad methodological framework to assess costs and benefits of adopting and complying with sustainability standards (through certification and the greening of production practices), this section provides a step-by-step guidance for conducting sustainability certification-related CBAs. **Seven steps** are proposed for the selection, categorization and comparative analysis of relevant indicators (see *Table 6*).

Table 6: Key steps, objectives, actions and challenges for carrying out a sustainability-related Cost-Benefit Analysis

Steps	Objective	Actions	Potential challenge	Actions to mitigate challenges
1- Explore your case and pose a research question	To get acquainted with the case by exploring existing data and studies on the same topic. Assess to which extent further investigation could reveal new information and insights that could answer a precise research question.	- Explore and chose relevant documents on the same topic. - Scan data bases and make a first evaluation on the scope of data available. - Carefully ask what the purpose of the CBA is. Formulate a research question and make a first outline of which aspects to cover in the analysis. Consider the following: Who is looking at the costs and benefits of a specific decision (individual, company, country?) What is the relevant time frame of the analysis and the research question?	The purpose of the study is not entirely clear and/or its contribution is overestimated.	Scan related studies and estimate the possible scope of the CBA. Set the goals of the CBA, embedded in the research question, within feasible limits.
2- **Identify relevant indicators**	To identify a comprehensive range of transparent, reliable and measurable indicators of costs and benefits (i.e. investments, added benefits and avoided costs) that should be used to assess the profitability of adhering to sustainability certification.	- Identify indicators of investment. - Identify indicators of added benefits, economic, social and environmental. - Identify indicators of avoided costs, economic, social and environmental. - Analyse relevant case studies to better inform the indicators identification process.	Data availability issues preventing researchers from identifying indicators that respect the four basic criteria of (1) policy relevance; (2) analytical soundness; (3) measurability; and (4) usefulness in communication.	Perform an extensive review of studies conducted in similar contexts, and use the results to inform their analysis.
3- **Customization of the framework methodology to the specific business case**	To assess the need for indicators in more detail, with an approach tailored to the specific sector, certification programme and context analyzed, as well as the progress already made in greening production.	- Select indicators to assess current level of compliance with certification requirements in the respective sector of analysis. - Select indicators of transition costs directly related to the sector context and current compliance level. - Select indicators of benefits directly related to the sector context, including indicators of trade benefits and sustainability gains. - Provide a brief justification of the choice of indicators.	Problems with obtaining information from producers, investors and other key actors along the value chain.	Conduct surveys, focus groups and interviews with relevant stakeholder samples.
4- **Collect available data**	To collect data on relevant indicators in order to inform the cost-benefit analysis.	- Collect sector-specific data from relevant sources at the national, regional and global level. This includes primary data, by means of questionnaires, interviews	Limited national, local and (especially) private sector data on sales, profits, productivity	Use qualitative methods such as surveys, interviews and focus groups to fill in the gaps

Steps	Objective	Actions	Potential challenge	Actions to mitigate challenges
		etc., and secondary data. - Collect data from international databases on global production, trade and consumption trends. - Collect data and relevant information from sector-specific case studies.	etc.	encountered in quantitative data. Use global databases on production and trade for international comparison. Use data from studies on similar contexts and sectors.
5- **Classify data based on specific analytical needs**	To categorize the information in a way that facilitates the implementation of a sustainability-related CBA, following the methodology proposed in Section 3 of this study.	- Group data on investments needed to comply with specific certification requirements. - Group data on potential added benefits of shifting to sustainability certification. - Group data on potential avoided costs of adhering to sustainability certification.	The monetary valuation of environmental and social benefits and avoided costs might represent a challenging task, especially in the case of limited data availability.	Develop technical skills for the use of internationally agreed approaches and methods for the valuation of social and environmental costs (e.g. TEEB, SEEA).
6- **Analyse the data adopting an integrated and systemic approach**	To plug categorized data into the indicator framework in order to conduct the assessment of costs and benefits of sustainability certification.	- Analyze the data and select the most suitable cost-benefit analysis technique (e.g., net present value, payback period, rate of return). - Carry out a cost-benefit analysis by comparing investments with added benefits and avoided costs. - Assess the results of different scenarios, adopting a systemic perspective. - Compare the outcome of different scenarios (e.g. outcome of one or more investment scenarios against a business as usual (i.e. “no action”) scenario).	Unrealistic and poorly documented scenario assumptions may challenge the credibility of the analysis.	Perform sensitivity analyses, namely the analysis of possible alternative assumptions through the combination of upper and lower boundaries defined for each key indicator (e.g. market price).
7- **Evaluate CBA results and inform the decision-making process**	To ensure that CBA outcomes are taken into consideration in public and private decision-making processes on sustainability certification.	- Evaluate the results of the analysis through a multi-stakeholder process. - Outline potential impacts of certification across actors, in the sector of analysis. - Evaluate the overall profitability of adhering to the selected certification scheme (including economic, social and environmental gains).	Stressing the importance of medium and long-term sustainability gains is often a difficult task for researchers.	Design and implement a sound communication strategy.

Step 1: Explore your case and pose a research question

Objective

To get acquainted with the case by exploring existing data and studies on the same or a similar topic. Assess to which extent further investigation could reveal new information and insights that could answer a precise research question. It serves as an indispensable starting point for the analytical narrative and determines the scope and angle of the CBA. The research question determines, inter alia, the CBA's benchmark, i.e. if results are measured/compared against a business-as-usual (i.e. "no action") scenario and/or between different certification investment scenarios.

Actions required

a. Critically ask what the purpose of the CBA is. Formulate a research question.
b. Explore and chose relevant documents on similar topics.
c. Scan data bases and make a **first evaluation of the extent of data availability** .Make a first outline of which aspects to cover in the analysis. This outline should include the following aspects: Who is looking at the costs and benefits of a specific decision (individual, company, country?) What is the relevant time frame of the analysis and the research question?

Potential challenges

In this step, posing a suitable research question for which there is relevant data is the crucial challenge. Answering the above-mentioned questions might help to get a clearer view on the purpose of the study. This step should result in an idea of what the specific CBA can and what it cannot deliver.

Case Study: CBA of certified shrimp and pangasius aquaculture in Vietnam – Step 1

Vietnam currently exports pangasius and shrimp to 156 international markets, including EU, US, Japan, South Korea and China. The total pangasius export in 2013 reached US$1.8 billion, while the exports of shrimp products brought US$3.1 billion of revenue in the same year. Although Vietnam has a comparative advantage in the production of pangasius (e.g. favourable climate conditions, water availability), profits from aquaculture are declining due to increases in production costs, unstable export price, and strict quality control in higher-end markets (Minh, 2013)[1]. Annually, Vietnam loses US$14 million in aquaculture exports returned due to quality barriers of foreign markets. Starting from these considerations, the study assessed the potential impacts of a shift to sustainable shrimp and pangasius production in the country. National researchers therefore asked: Is it profitable to invest in the certification of shrimp and pangasius products in order to shift from conventional to organic aquaculture practices? They followed the key steps summarized in Table 6 as a methodological approach to conduct the study.

Summary of Step 1: Explore the case

Tasks:

a. *Critically ask what the purpose of the CBA is. Formulate a research question.*
b. *Explore and chose relevant documents on similar topic.*
c. *Scan data bases and make a first evaluation of the extent of data available.Make a first outline of which aspects to cover in the analysis.*

Key questions:

- *Is there relevant literature? Are there previous studies on a similar topic that can be used for reference and comparison?*
- *How much information is available? How much information can possibly be generated/gathered?*
- *What is the purpose of the CBA? What are the expected outcomes?*

Step 2: Identify relevant indicators

Objective

To identify a comprehensive range of indicators of costs and benefits (i.e. investments, added benefits and avoided costs) that should be used to assess the profitability of adhering to sustainability certification. **Table 7** provides a list of potential indicators.

Actions required

a. Perform an in-depth literature review according to your research question. Talk to experts as well as researchers who have conducted studies in the field. Analyse relevant case studies and extract lessons learned. Formulate thereof sub-questions that can function as milestones on the way to your desired result.

a. Identify indicators for investment, including, among others, (1) capital and operation & management costs, e.g. for the purchase of machinery; (2) training costs, e.g. for monitoring compliance with certification requirements and for the maintenance of machinery and infrastructure; (3) costs of certification, including fees (registration and periodic fees) and costs of auditing and inspection fees; (4) Incentives provided by the government, e.g. subsidies or other incentive payments for certification, which would reduce the total costs incurred by the private sector.

b. Identify indicators of added benefits, **including direct and indirect economic, social and environmental benefits** potentially deriving from the shift to sustainable production and trade, and the creation of green supply chains. Indicators of economic benefits are sector-dependent and might include, for example: increased access to national and international markets (e.g. higher sales) and the availability of a premium price for certified products (leading to higher profitability). Furthermore, social benefits, primarily from a **public sector perspective**, should be estimated using indicators for employment creation, income generation, and improvement in the well-being of employees and local communities. Concerning **private companies**, possible gains in reputation, labour productivity, and a better attachment of employees to corporate values and corporate goals and targets should be considered. Finally, indicators of additional environmental benefits could include an improved ecosystem balance (e.g. through the analysis of ecosystem goods and services) and natural capital preservation and regeneration (e.g. through the analysis of natural resource stocks and flows). These can also be monetized making use of existing studies and ongoing research in this field (e.g. global initiatives for the valuation of natural capital and ecosystem services, such as TEEB, SEEA and others).

c. Identify indicators of avoided costs resulting from sustainability certification and greener production processes. For example, indicators of natural resource (or production input) prices, as well as the consumption of these resources, should be monitored to estimate potential savings from improved resource efficiency (e.g. savings from reduced water and energy consumption, reduced costs of waste treatment and disposal). Also, the avoided social costs of unsustainable practices could be estimated, including for example reduced health expenditure (e.g. from pollution related diseases). Finally, the avoided costs of environmental degradation should be quantified and included in the integrated CBA process. Indicators of natural capital loss and costs of replacement of ecosystem services are essential to evaluate the broader benefits of sustainability investments, especially concerning large-scale projects and investments.

Potential challenges

The main challenges for the identification of indicators are associated with the **relevance of indicators** to sustainability related cost-benefit analyses. A key priority in this phase is to select indicators that respect **four main criteria**, namely (OECD, 2011): (1) policy relevance; (2) analytical soundness; (3) measurability; and (4) usefulness in communication. These criteria aims to provide a set of **transparent and reliable** indicators. An extensive review of studies conducted in similar contexts, and use of their results to inform the analysis can help to overcome data limitations while ensuring the analytical soundness of selected indicators.

Case Study: CBA of certified shrimp and pangasius aquaculture in Vietnam – Step 2

The CBA of investing in certified shrimp and pangasius aquaculture products in Vietnam started from the identification of indicators of investment, added benefits and avoided costs related to sustainability certification. The researchers carried out a literature review to gain insights from the approach followed by previous studies applicable to the Vietnamese aquaculture sector. The review focused especially on the following issues:

- Identification of trade opportunities and potential trade benefits arising from compliance with internationally recognized sustainability standards;
- Evaluation of the impacts of sustainability certification on trade flows;
- Assessment of the costs and benefits, as well as (trade) opportunities and challenges of internationally recognized sustainability certification;
- Collection and processing of existing information and data related to the uptake of, and compliance with, sustainability standards for pangasius, especially in regards to internationally recognized standards (e.g., ASC, Global GAP, BAP/GAA);
- Analysis of the current landscape of national policies related to the sustainability of the overall aquaculture sector, and of the shrimp and pangasius sub-sectors in particular.

The following tables give an overview of the indicators of investment, added benefits, and avoided costs selected for this case study.

Table 7: Overview of the indicators of investment, added benefits, and avoided costs selected for this case study

Area of assessment		Capital Investment	Training Costs	Certification Costs
Investment		Infrastructure renovation costs (VND)	Training and consultancy service for farmers on sustainable techniques (VND/farmer)	Initial certification costs (VND) Annual renewal fee (VND/year) Additional compliance costs (VND/year) Other costs directly related to certification (VND/year)
Area of assessment		**Economic Benefits**	**Social Benefits**	**Environmental Benefits**
Added benefits	*Direct*	Increased access to markets • To local material market (MT/cycle) • To global market (MT/year) Premium market price (VND/MT) Increased profit margin (VND/MT)		Sustainability of production (yield, survival ratio and FCR) Improvement of surrounding environment (1-5 score)
	Indirect	Additional revenues from improved corporate reputation (VND/year)	Job and income generation for workers (number of additional employees and additional payroll in VND/year) Better income and job security for workers (1-5 score)	
Area of assessment		**Economic Costs Savings & Avoided Costs**	**Social Costs Savings & Avoided Costs**	**Environmental Costs Savings & Avoided Costs**
Avoided Costs	*Direct*	Reduced losses from improved stock management and improved disease management (1-5 score) Reduced losses from improved traceability (1-5 score)	Reduced losses from improved relationships with the community (1-5 score)	Costs of waste water treatment (VND/year) Other environmental treatment costs (VND/year) Saving in feed costs from improved sustainability ratio (VND/cycle) Reduced losses from improved environmental treatment (1-5 score)

Summary of Step 2: Identify relevant indicators

Tasks:

a) Perform an in-depth literature review and analyse relevant case studies.
b) Identify indicators of investment.
c) Identify indicators of added benefits, economic, social and environmental.
d) Identify indicators of avoided costs, economic, social and environmental.

Key questions:

- *Is there literature/Are there previous studies on a similar topic that can be used for reference and comparison?*
- *What are the available indicators that allow comparing investments, added benefits and avoided costs of adhering to sustainability certification?*
- *Do indicators comply with the criteria of policy relevance, analytical soundness, measurability and usefulness in communication?*

Step 3: Select indicators relevant and applicable to your specific sector case

Objective

To narrow the set of identified indicators in order to tailor it to the specific sector, certification program and context analysed, as well as to account for progress already made in greening production.

Actions required

Researchers should assess whether producers in a given sector already comply with the sustainability principles, criteria and standards defined by the organization issuing the certificate (Case A), or additional interventions are needed to transform production and trade in order to comply with these requirements (Case B). The selection of indicators for **Case B** should include specific data on additional costs and benefits of shifting to sustainable production and trade processes and procedures. On the other hand, **Case A** only requires an analysis of advantages and disadvantages directly related to the sustainability certification process (mostly for the monitoring and evaluation of the interventions already implemented). The specific actions for Case A and Case B are listed below.

- ***Case A**. Producers/companies that already comply with certification requirements*

  a. Estimate the **costs of certification**, including for example: (1) application fees; (2) annual fees; (3) inspection fees; (4) costs of monitoring compliance with certification requirements (e.g. some sustainability criteria require periodic laboratory tests, which should be conducted by certified laboratories).

  b. Evaluate the **advantages of becoming certified** using indicators of economic profitability and access to trade, such as: (1) the availability of premium prices for eco-labelled products; (2) access to international markets from which the company would be otherwise excluded; (3) reputational benefits; (4) increased business opportunities deriving from the participation to international sustainability fairs, conferences etc.

  c. Measure/compare **the costs and advantages of trade in certified products** against a business-as-usual (i.e. "no action") scenario and/or for different certification investment scenarios, thus altering the level of investment and assessing the change in outcome.

- ***Case B**. Producers/companies that do not comply with certification requirements*

  a. Select indicators of **market potential**. In particular, the market potential should be assessed considering opportunities and costs related to the identification of certified suppliers, creation of linkages, partnerships and networks, monitoring and auditing of potential partners.

  b. Select indicators of investment **directly resulting from a shift to sustainability certification**. The costs of compliance with sustainability principles, technical standards and common procedures should be analysed using a broad set of business-specific indicators. In particular, the analysis should focus on possible additional costs or barriers related to: (1) knowledge gaps associated with an analysis of the value placed on learning in the specific country/sector context addressed; (2) access to credit for primary producers; (3) technology gaps, among others. Finally, additional costs might derive from the adherence to social sustainability principles, such as higher costs for ensuring employee welfare and benefits to local communities. On top of these, more conventional investment indicators should be selected and analysed (e.g. for certification as well as for greening the production process).

c. Select indicators of the **benefits of sustainability certification**, such as: (1) reduced amount of inputs used in the production process due to improved resource efficiency; (2) increased productivity; (3) long-term availability of natural resources and avoided cost of natural capital depletion; (4) additional social benefits accruing to employees, local communities and the company as result of complying with sustainability standards (e.g. minimized health costs from improved working conditions; attachment to company values etc.).

d. Select indicators of **additional costs of sustainable trade**, such as: (1) additional marketing costs for competing on global markets for sustainable products; (2) costs deriving from trade barriers (e.g. tariff and non-tariff barriers) in certain markets; (3) additional transportation and overall logistics costs due to the expansion of exporting activities.

e. Select indicators of **added benefits and avoided costs of sustainable trade**, which might include, depending on the business context analysed: (1) revenues from premium prices on sustainably produced products; (2) access to international markets for sustainable products; (3) reduced costs from optimization of transportation and logistics; (4) increased revenues from expanding demand for sustainably produced products, etc.

Checklist for the choice of indicators for sustainability certification CBA

General

- The indicator is relevant for the specific case analysed, as it can contribute to the estimation of costs and benefits of sustainability certification.
- The indicator is based on the best available science and used in other relevant studies and publications.
- The indicator is measurable at a reasonable cost.
- The indicator can be measured across time, and used for comparison across different spatial contexts.
- The indicator can be easily used for communication with the intended audience.
- The set of indicators chosen for the CBA are covering broad economic, social and environmental aspects of sustainability certification.
- All selected indicators are expressed in monetary terms and can be summed up and compared for analytical purposes.

Investment indicators

- Upfront investments for the shift to sustainability certification are quantified (e.g. infrastructure development, upfront certificate cost, purchase of machinery).
- Periodic costs of certification are measured through indicators (e.g. registration and certification fees, costs of periodic inspections).
- Investments for gaining access to new markets (e.g. enlargement of distribution network) are accounted for.
- Training costs on sustainable production and trade methods and techniques are estimated.
- Public subsidies or other incentives that would reduce private investments are considered in the analysis.

Added benefits indicators

- Indicators of added benefits related to production/processing of certified products are considered (e.g. higher productivity).
- Indicators of added benefits related to trade are considered (e.g. higher sales and profits, premium price).
- Indicators of social added benefits are considered (e.g. higher employment and salaries).
- Indicators of environmental added benefits are considered (e.g., higher value of natural resources).

Avoided costs indicators

- Indicators of avoided costs from improved resource efficiency are estimated (e.g., reduced amount and cost of inputs to production, such as water).
- Indicators of avoided social costs are integrated in the analysis (e.g., reduced costs of sanitary assistance to employees due to reduced air pollution).
- Indicators of avoided environmental costs are integrated in the analysis (e.g., reduced costs of water purification).

Potential challenges

The selection of costs and benefits indicators for a specific case study analysis requires a detailed study of the context in which production and trade take place. However, researchers might find it **difficult to receive information from producers, investors and other key actors along the value chain**. Therefore, when selecting indicators, the performed literature review can inform indicator selection. Also, the selection of indicators of environmental and social benefits and avoided costs deriving from sustainability certification should be done considering the **specificities of the context** (e.g. natural resources stocks, environmental trends, employment level, average income), which may be **unknown** to local actors, and the **perspective of the target group**.

Case Study: CBA of certified shrimp and pangasius aquaculture in Vietnam – Step 3

After having identified indicators of investment, added benefits and avoided costs related to investments in certified shrimp and pangasius aquaculture in Vietnam, researchers conducted field visits and stakeholder consultations in order to assess the current level of compliance of Vietnamese aquaculture producers with international sustainability standards. The research population consisted of all Vietnamese businesses who had obtained a certification for production or processing of shrimp or pangasius for at least one season in 2013. Producers and processors that adhered to a certification programme after 2013 were excluded from the sample in order to filter out too newly-certified farms and businesses, which had not experienced the costs and benefits of a full cycle of certified production.

The analysis of questionnaires, combined with the outcomes of field visits and focus groups, allowed the researchers to customize the indicators to the specific context of the Mekong Delta region. First of all, a clear distinction was made between shrimp and pangasius farmers and producers, so as to evaluate the impacts of certified production along the value chain. The “investments and costs” category was subdivided into (1) start-up costs (e.g., infrastructure renovation); (2) recurrent costs of certification (cost of renewing the certificate); (3) production costs (e.g., breedstock, labor); and (4) environmental treatment costs (e.g., water treatment costs). The key indicators of economic benefits estimated the difference between certified and non-certified products with respect to (1) selling price, (2) in profit margins; (3) sales volumes and (4) revenues from improved reputation. Social benefits indicators included (1) salary; (2) job creation; and (3) income generation. Three indicators of environmental benefits were used to assess the potential for cost savings. They included (1) the survival ratio; (2) the feed conversion rate; and (3) the yield. The environmental impacts on production were measured by comparing the “after” to the “before” values and analyzing how many businesses experienced positive changes.

Summary of Step 3: *Select indicators relevant and applicable to your specific sector case*

Tasks:

a) Do research on in how far sustainability standards are already implemented.
*b) Select indicators to assess **current level of compliance** with certification requirements in the respective sector of analysis.*
c) Select indicators of transition costs directly related to the sector context and current compliance level.
d) Select indicators of benefits directly related to the sector context, including indicators of trade benefits and sustainability gains.
e) Provide a brief justification of the choice of indicators.

Key questions:

- *Does the specific producer/sector analysed already comply with sustainability certification requirements?*
- *What are the relevant indicators of costs and benefits of adhering to sustainability certification **in this specific case**?*
- *What are the indicators of costs and benefits particularly related to sustainable trade in this specific*

Step 4: Collect available data

Objective

To collect data on selected indicators in order to inform the CBA.

Actions required

a. Delve into the data gathered in Step 1, 2 and 3 (Case Studies, Reports, Stakeholder interviews)

b. Consult additional data sources (e.g. ranging from surveys to national databases). Priority should be given to field data, possibly directly obtained from the producers (or industry representatives/associations) that are interested in exploring sustainability certification.

c. Consult international databases (if applicable). Some relevant examples include, among others:

- OECD industry and trade statistics.
- World Bank's World Development Indicators (WDI).
- Eurostat databases on industry and trade trends.
- WHO's International Trade Statistics.
- Trade statistics of the International Trade Centre (including specific tools such as the Standards Map, focused on sustainability certification trends at the global level).

d. Consult case studies from similar country contexts and sectors when country specific data are not available. The analysis of studies conducted in similar country contexts could be of use to fill in gaps. The assessment and comparison of different case studies is particularly relevant to facilitate the estimation of expected benefits and costs potentially deriving from sustainability certification in the medium- to long-term. This is especially due to the fact that sustainability impacts may require time to become visible, and measurable.

e. If only an insufficient amount of data can be found, returning to Step 3 might be necessary in order to select an alternative indicator that has enough data availability.

Potential challenges

While global databases provide a wealth of openly accessible information, the case might not be the same for national and (especially) private sector data on sales, profits, productivity, etc. For this reason, the use of qualitative methods such as surveys, interviews and focus groups might fill in the gaps encountered in the collection of secondary quantitative data.

Case Study: CBA of certified shrimp and pangasius aquaculture in Vietnam – Step 4

The data used for assessing the costs and benefits of certified shrimp and pangasius production in Vietnam was based on primary data from questionnaires and in-depth interviews with Vietnamese shrimp and pangasius farmers, processors and exporters, carried out in December 2013 – March 2014. In total, the researchers interviewed 70 farms and processors in nine provinces of the Mekong Delta, including four largest provinces for shrimp production and five for pangasius production. After filtering out uncompleted questionnaires, the sample consisted of 55 producers and processors, including 24 from farming establishments and 31 from processing and exporting companies. Moreover, visits to relevant government agencies and industry stakeholders facilitated an understanding of policy best practices for the creation of the enabling conditions for a shift to sustainability certification in Vietnamese aquaculture.

Some key challenges were encountered in the data collection phase. In particular, limitation in time and budget prevented the analysts from expanding the scope of the research, especially as surveys, interviews and focus groups resulted to be extremely time consuming. Furthermore, since aquaculture certification is a new issue in Vietnam, it was not possible to find reliable historical data for expanding the time horizon and improving the credibility of the analysis.

Summary of Step 4: Collect available data

Tasks:

a) Analyse already gathered data closely.
b) Collect additional sector-specific data from relevant sources at the national, regional and global level. This includes primary data, by means of questionnaires, interviews etc., and secondary data.
c) Collect data from international databases on global production, trade and consumption trends.
d) *Collect data and relevant information from sector-specific case studies.*

Key questions:

- *What are the most effective approaches to collect information directly from key stakeholders?*
- *What information can be found in international databases? How this information compares with national data?*
- *Are there similar studies on the specific sector/certification programme addressed? What information could be used from these studies?*
- *Overall, are there sufficient data to carry out the analysis using the indicators selected in Steps 3?*

Step 5: Classify data based on specific analytical needs

Objective

To categorize the information in a way that facilitates the implementation of a sustainability-related CBA, following the methodology proposed in Section 3 of this study.

Actions required

a. Group data on investments needed to comply with specific certification requirements. Data categories under this group may include: (1) Capital and Operation & Management costs; (2) Training costs; (3) Certification costs; (4) Government costs.

b. Group data on potential added benefits of shifting to sustainability certification. Data categories under this group should include: (1) Direct and indirect economic benefits; (2) Direct and indirect social benefits; (3) Direct and indirect environmental benefits.

c. Group data on potential avoided costs of adhering to sustainability certification. Data categories under this group should include: (1) Direct and indirect economic avoided costs; (2) Direct and indirect social avoided costs; (3) Direct and indirect environmental avoided costs.

Potential challenges

When grouping collected data into a coherent assessment framework, researchers should make sure that data are expressed in monetary terms, so as to allow the estimation of expected returns on sustainability certification investments. While conventional indicators of economic costs and benefits are generally expressed in monetary terms (or easily convertible), the valuation of environmental and social benefits and avoided costs might require further elaboration, including the adoption of internationally agreed approaches and methods (e.g. ***The Economics of Ecosystems and Biodiversity*** (***TEEB***); ***System of Environmental-Economic Accounting*** (***SEEA***)), for which specific technical skills are needed.

Case Study: CBA of certified shrimp and pangasius aquaculture in Vietnam – Step 5

After having defined key indicators and collected information from surveys and questionnaires, the researchers have categorized the data on investments, added benefits and avoided costs of shrimp and pangasius certified production. For each indicator, the data on certified and non-certified products were compared in a dedicated table, highlighting the percentage change between the two types of products. *Table 8* provides an example of the comparison between the trade performance of certified and non-certified pangasius, focused on three main indicators, namely (1) total export volume; (2) average selling price; and (3) average profit margin.

Table 8: The Trade Performance of Certified and Non-Certified Pangasius

	Certified pangasius	Non-certified pangasius	Difference	% change
Total export volume (tons), 14 processors	113,909	104,515	9,394	9.0%
Average selling price (US$/kg)	2.379	2.275	0.10	4.54%
Average profit margin (US$/kg)	0.29	0.20	0.09	43.38%

Summary of Step 5: Classify data based on specific analytical needs

Tasks:

a) Group data on investments needed to comply with specific certification requirements.

b) Group data on potential added benefits of shifting to sustainability certification.

c) Group data on potential avoided costs of adhering to sustainability certification.

Key questions:

- *What information is related to investments in sustainability certification?*
- *What information is related to added benefits of sustainability certification?*
- *What information is related to avoided costs of sustainability certification?*
- *Are all data expressed in monetary terms? (See Section 2 for monetization)*
- *Are data comparable under a coherent cost-benefit assessment framework*

Step 6: Analyse the data adopting an integrated and systemic approach

Objective

To plug categorized data into the indicator framework in order to conduct the assessment of costs and benefits of sustainability certification.

Actions required

a. Analyse the data and select the most suitable cost-benefit analysis technique. Depending on the research question, the data available, and the specific sector addressed, several techniques are available, including net present value, payback period, rate of return, among others (see Section 2).

b. Carry out a cost-benefit analysis by comparing investments with added benefits and avoided costs. In this phase, the researcher should sum up the costs of sustainability certification and compare them with the sum of added benefits and avoided costs potentially deriving from certification programmes. The assessment will have to take into account uncertainty (e.g. market access). For this reason, **various scenarios** should be created, e.g. a **no premium price scenario** (business-as-usual, no action) to be **compared with a 30% premium price scenario** to assess potential threshold and minimum requirements for achieving a positive economic return on investment.

c. Assess the results of different decisions, choosing a consistent point of view in all indicators. In this phase, checking for consistency across data from different sources is essential to evaluate the coherence of the analysis. This is important also to assess a variety of cross-sectoral indicators, which are often not available in a single, integrated database (e.g. by means of triangulation techniques). In particular, given the cross-sectoral nature of a sustainability-related CBA, observed trends should be evaluated using a systemic approach, which takes into consideration the dynamic interplay between economic, social and environmental variables. For example, environmental indicators showing a positive trend in soil quality could be linked to the overall increase in the productivity of sustainably certified agricultural land, in turn leading to higher income levels and company profits. Trends for these variables should be carefully evaluated to determine the presence of behavioural patterns that would reflect the existence of causal relations and, possibly, hidden costs and benefits (e.g. synergies) resulting from sustainability certification.

d. Compare the outcome of different scenarios. Once the costs and benefits under each scenario have been quantified and assessed, the comparison between different scenarios should be done in order to identify the most profitable options in the short, medium and longer-term.

Potential challenges

When selecting scenarios, researchers should make sure that the assumptions are grounded on solid evidence so as to ensure that the analysis is focused on realistic alternative futures. On the other hand, it should be made clear that scenarios are not forecasting tools, but rather an attempt to facilitate the understanding of complex dynamics that govern the system. In order to reduce the gap between realistic scenarios and systemic complexity, researchers should assess CBA results through **sensitivity analyses**, namely the analysis of a large number of possible outcomes through the combination of upper and lower boundaries defined for each key indicator. Such technique is essential to increase the confidence of the targeted audience (e.g. policymakers, private investors) on the outcomes of the CBA.

Case Study: CBA of certified shrimp and pangasius aquaculture in Vietnam – Step 6

Using the data collected and categorized, the researchers conducted a cost-benefit analysis to estimate the rate of return of investments in certified shrimp and pangasius production at both the farmer and processor/exporter level. Further, a sensitivity analysis was carried out in order to compare average costs and benefits of certified and non-certified products, under different price scenarios for certified production. The objective was to provide an overarching analysis of the potential returns deriving from greening aquaculture in Viet Nam, and to inform the investment decisions of shrimp and pangasius producers and exporters.

Four pricing scenarios were analyzed and compared to evaluate the impact of potential price variation of certified shrimp and pangasius. These are: (1) business as usual (BAU), which uses the average selling price derived from survey data; and premium prices reaching 10% (2), 20% (3), and a price reduction scenario (4), which simulates the impacts of potential price reductions. The percentage reduction changes across production and producers (5%, 10% or 20% reductions), depending on the category analyzed. Price scenarios allow assessing potential threshold and minimum requirements for achieving a positive economic return on investment. This type of assessment also serves to reduce risk and increase confidence in sustainability certification. In addition to profit margins, the CBA focuses on the net social and environmental benefits of certified production/processing, thereby providing an integrated analysis of sustainability certification.

The following summary results were obtained for each category of product and producer:

- Shrimp farmers: the *profit margin* (defined as profits over revenues) is 9 percentage points higher for certified production relative to BAU. This value declines to 1 percentage point when prices decline by 20%, 11 percentage points and 14 percentage points when prices increase by 10% and 20% respectively. Further, the net *social benefits* of certified farms are positive, as new jobs have been created and net income generation achieved. Also, the net *environmental benefits* are positive, as all the key sustainability indicators are improved in shrimp farming, including the yield, the survival ratio and FCR.
- Shrimp processors/exporters: the *profit margin* is 6 percentage points higher for certified production relative to BAU. This value declines to -3 percentage points when prices decline by 10%, and increase by 13 percentage points and 18 percentage points when prices increase by 10% and 20% respectively. The net *social benefits* are positive, as new jobs have been created and net income generation achieved. The *environmental benefits* are also positive, as there is less water pollution from the processing factories while the environmental treatment costs decreased.
- Pangasius farmers: *profit margins* in certified farms are 1% lower than in conventional farms. On the contrary, certified pangasius production would be significantly more profitable than conventional farming under the 10% and 20% premium price scenarios, reaching 129% and 228% profit

differential, or 7 and 15 percentage points in profit margin differential, respectively. Finally, in the case of a 10% price reduction, certified pangasius production would not be profitable for farmers, as the profit margin would be 12 percentage points lower than the conventional production. There is no significant evidence on the *social benefits* from certified pangasius farms. On the net *environmental benefits*, of three sustainability indicators only one related to survival rate improves, while yield decreases and the feed conversion rate reveals no clear trend. Environmental effects related to water pollution are positive, but farmers are paying additional costs for environmental treatment.

- Pangasius processors/exporters: considering the *profit margin*, it was calculated that certified exporters obtain 12.2% compared to 8.8% under conventional methods, corresponding to a 3.4 percentage points margin differential. On the other hand, the profits of certified exporters would be would be 188% and 317% higher than those of conventional exporters under the 10% and 20% price increase scenarios, respectively. Finally, a 5% price reduction with respect to BAU would lead to profits 7% lower for certified exporters with respect to non-certified ones, leading to a profit margin 1.2 percentage points below BAU. There is no significant evidence on the *social and environmental benefits* from certified pangasius processors.

Summary of Step 6: Analyze the data adopting an integrated and systemic approach.

Tasks:

a) Analyze the data and select the most suitable cost-benefit analysis technique (e.g., net present value, payback period, rate of return).
b) Carry out a cost-benefit analysis by comparing investments with added benefits and avoided costs.
c) Assess the results of different scenarios, adopting a systemic perspective.
d) Compare the outcome of different scenarios (e.g. outcome of one or more investment scenarios against a business as usual (i.e. "no action") scenario).

Key questions:

- *What type of CBA technique is suitable for the specific sector/product analyzed?*
- *What is the most effective and recognized approach to monetize costs and benefits of sustainability certification (including social and environmental added benefits and avoided costs)?*
- *What reasonable assumptions can be adopted to generate alternative scenarios?*
- *Based on the outcome of the CBA, what is the most suitable scenario? Why?*

Step 7: Evaluate CBA results and inform the decision-making process

Objective

To ensure that CBA outcomes are taken into consideration in public and private decision-making processes on sustainability certification.

Actions required

a. Evaluate the results of the analysis through a the involvement of multiple stakeholders. Given the complexity and significance of the CBA evaluation phase, the outcomes of the analysis should be validated through a multi-stakeholder process in order to take into account different perspectives of key actors along the value chain.

b. Outline potential impacts of certification across actors, in the sector analysed. The outcomes of the multi-stakeholder validation process should be clearly communicated in the final analysis. In particular, the potential impacts of sustainability certification on key actors should be explained taking into account the different perspectives, including the companies/producers collaborating along the supply chain, their employees, as well as local communities and the public sector.

c. Evaluate the overall profitability of adhering to the selected certification scheme (including economic, social and environmental gains). Once stakeholder inputs and recommendations are integrated in the CBA, the final results of the analysis can be communicated, including precise recommendations for future action. Based on the outcome of the CBA, informed decisions can be derived by producers and companies interested in sustainability certification. The evaluation of CBA results should be done considering the various combinations of assumptions, both with regard to business strategy and market responses.

Potential challenges

The evaluation of costs and benefits of certification should cover a time period long enough to adequately estimate the sustainability gains of transitioning to resource efficient, socially responsible, and environmentally friendly production practices. Stressing the importance of medium and long-term sustainability gains is often a difficult task for researchers, especially when confronted with policymakers or business leaders that prioritize short-term returns due to the limited duration of their mandate or contract. **A sound communication strategy is essential to find key entry points for action.**

Case Study: CBA of certified shrimp and pangasius aquaculture in Vietnam – Step 7

Once the results of the integrated cost-benefit analysis were obtained, a national validation workshop was organized in the Mekong Delta region of Vietnam with local farmers, processors, exporters, business associations, research institutes and provincial government. During the workshop, all the key actors shared their perspectives on the costs and benefits of certified aquaculture, and provided relevant feedback on the results of the CBA analysis.

Based on the outcome of the workshop, the results of the CBA analysis, and the review of strengths and weaknesses of the current policy framework, the researchers proposed a number of key policy recommendations for encouraging investments in certified shrimp and pangasius. Key recommendations included, among others:

- Speeding up the review of aquaculture master plans to ensure that the favorable conditions are in place to develop aquaculture infrastructure in an efficient and sustainable way.
- Establishing concentrated raw material farming areas to minimize the negative environmental impacts and support the synchronous infrastructure development
- Implementing credit and financial policies to support aquaculture farmers and processors willing to comply with international standards.
- Designing policies to improve agriculture and aquaculture extension services, especially related to promotion, awareness raising for the producers to assess the costs and benefits of compliance to new farming methods.
- Implementing appropriate trade and market policies that would allow maintaining a price premium for “green” and “sustainable” certified products compared to that of non-certified products.
- Providing legal and procedural support to farmers for acceding to certification programmes.
- Promoting investments in the quality, packaging and traceability of sustainable aquaculture products.
- Improving coordination among government ministries involved in green economy and green growth, especially between the Ministries of fishery, trade and industry.

Summary of Step 7: Evaluate CBA results and inform the decision-making process

Tasks:

a) Evaluate the results of the analysis through a multi-stakeholder process.
b) Outline potential impacts of certification across actors, in the sector of analysis.
c) Evaluate the overall profitability of adhering to the selected certification scheme (including economic, social and environmental gains).

Key questions:

- *What are the different perspectives of actors along the product value chain with respect to the CBA results?*
- *What would be the overall outcome of investments in sustainability certification?*
- *What is the most effective way to communicate the results of the CBA and influence the decision-making process?*

Useful Resources

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