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Economic, social and environmental impacts and overall sustainability of the tea sector in Sri Lanka

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A B S T R A C T

This evidence based study uses combined lifecycle and value/supply chain analysis to examine the sustainability (environmental, social and economic impacts) of tea manufacturing in Sri Lanka, a major export earner and employment creating product. Environmental indicators assessed include carbon emissions and energy use, social indicators include labour use and gender, and the economic indicator is cost. These indicators are assessed at all stages of production, processing, export, use and disposal. A cross-section of Low, Medium and High grown tea factories producing Crush, Tear, Curl (CTC) and Orthodox and Green tea (where available) were investigated. The study uncovered many issues including energy efficiency of the industry, Green House Gas (GHG) emissions, and occupational health hazards. One key result is that at the cultivation and processing stage, low grown orthodox tea is the most efficient in terms of labour use, energy use and carbon emissions. Energy use is highest in the use phase due to the high amounts of energy needed to heat water for a 2.5g tea bag. CO_2 emissions are highest in the packaging stage due to the large amount of materials such as cardboard needed to package tea bags. Labour use is highest in the labour intensive cultivation stage. Costs are also highest in the cultivation stage/purchase of tea leaves, due to the high labour use.

Keywords: Sustainability; Sustainomics; LCA; Value chain; Tea

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1. Introduction

Tea is the most commonly drunk beverage in the world. Approximately 5.1 million tonnes of tea are produced every year and over 1.8 million tonnes are exported a year (FAO, 2015). Because of its importance, research on the sustainability of tea production and consumption will not only provide important information on how to improve the tea industry worldwide, but also yield key lessons for a wide range of other agrico-industries and contribute greatly to making development more sustainable. The tea industry in Sri Lanka is the second largest foreign exchange earner and employs millions of workers. The key policy implications that are derived from this study can benefit the entire Sri Lankan economy and is relevant for the tea industry globally.

Accordingly, this paper examines the sustainability of tea manufacturing in Sri Lanka, by using a combination of LCA and supply/value chain analysis to look at the sustainability

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Abbreviations: CTC, Crush, Tear, Curl; GHG, Greenhouse Gas; CSR, Corporate Social Responsibility; LCA, Life Cycle Analysis; VCA, Value Chain Analysis; SDG, Sustainable Development Goals; GWP, Global Warming Potential
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of the tea industry to assess the economic, environmental and social impacts of tea production and consumption and to identify opportunities for improving the sustainability of the product. The framework used is designed to assist in generating evidence based results required for policy and decision making in the agro-industrial sector. This will also help in the transition towards climate-friendly best practices, by developing improved measures. The use of a value chain analysis highlights the fact that the production of tea not only has monetary values, but also social and environmental values, both negative and positive. Overall, this research will enable positive changes in the sector by informing decision makers, generally raising public awareness, and facilitating multi-stakeholder dialogues with national and international networks of civil society and business organizations in both the production and consumption spheres.

The specific aims of the study are to identify critical issues at various stages in the life cycle and value/supply chain of the tea industry (production, processing, export, trade and production regulations) from the perspective of sustainable development (energy use, carbon emissions, environmental degradation and social issues). Unlike many other value chain analyses (VCA), this study extends over the entire product life cycle. We analyse the life cycle of the tea industry from the plantation stage to the disposal of the tea waste after consumption, and identify key economic, social and environmental impacts at each of the different stages. The study helps to identify opportunities and bottlenecks in the tea industry (production, processing, retail and packing) and draw out policy implications and make suggestions to various stakeholders and the industry on how to improve the sustainability of the (global) tea supply chain. The study brings together academics and experts from the tea industry to ensure that appropriate measures are identified and effectively implemented.

Life Cycle Analysis (LCA) is a cradle-to-grave approach that is an effective tool for assessing sustainability. It can be used to gain a broad and comprehensive perspective of product footprint—the raw material, purchasing of input materials, manufacturing, transport, packing, consumption and disposal (Munasinghe et al., 2015). LCA enables industries to benchmark their product against alternatives with respect to climate change, energy use, water consumption, land use, and other environmental indicators as well as social indicators such as labour use.

Conventional supply/value chain analysis tends to place more emphasis on the cost/economic impacts of the product. Many firms use this type of analysis to reduce their costs of production (Riley, 1987; Han, 2012). Our study goes further, by identifying and analysing, social, environmental (especially carbon) and energy hotspots along the supply/value chain, improving sustainability and energy efficiency, reducing emissions and providing overall improvements. It focuses on the "cradle to grave" lifecycle (as opposed to a "cradle to gate" analysis, where the boundary ends at the processing factory). Value chain analysis creates many benefits for the firm/industry such as the ability to diagnose and create competitive advantage, creating cooperation, increasing profitability, and the enhancing the ability to analyse of strengths and weaknesses of the industry (Antoniou et al., 2011).

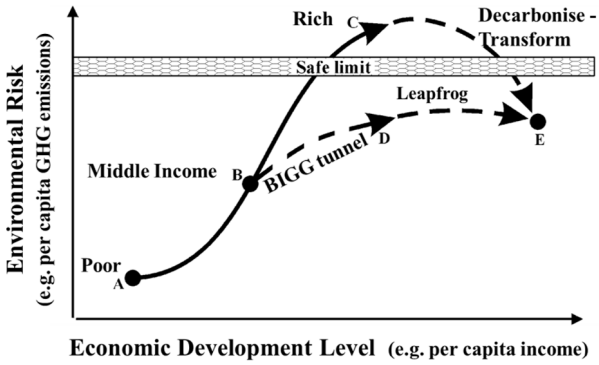

Fig. 1.1 – Environment-Economy trade-off along the development path, and Balanced Inclusive Green Growth (BIGG) Tunnel to sustainable development.
***Source:* Adapted from Munasinghe (1995) "Making Growth More Sustainable", *Ecological Economics*, 15:121-4.**

1.1. *Addressing unsustainable production and consumption in the food sector*

Humanity currently faces multiple global challenges—like poverty, hunger, inequality, natural resource scarcities, disease, and finally climate change, which exacerbates all the preceding issues (Munasinghe, 2009). Two major global agreements in 2015 (Sustainable Development Goals and COP21 Paris Climate Change agreement), highlighted different aspects of over-consumption—SDG 12 covered sustainable consumption and production, while COP21 addressed atmospheric carbon concentrations.

Due to unsustainable consumption and production, the global economy already uses natural resources equivalent to over 1.6 times what the planet earth can sustainably produce—also called the global ecological footprint of humanity (Global Footprint Network)[1]. The 1.4 billion people in the richest 20th percentile of the world's population consume about 85% of global output—65 times more than those in the poorest 20th percentile (Munasinghe, 2009). Clearly, the consumption of the rich is not only ecologically unsustainable, but also overburdening the very resources needed to help the poor (Munasinghe, 2012).

There is great current interest in defining a practical "***balanced inclusive green growth***" **(BIGG)** path that will provide everyone a decent quality of life, without overusing planetary resources— Munasinghe (1992, 2002) proposed a framework called "Sustainomics" for this. Our tea study would facilitate the search for such a path. Using carbon emissions to illustrate this approach, Fig. 1.1 shows the typical curve of environmental risk against economic development. Rich nations are at point C (high GHG emissions and high GNP per capita), poor nations are at point A (low GHG emissions and low GNP per capita), and intermediate countries are at point B.

Sustainable development paths vary by country type:

- industrial countries (already exceeding safe limits) should mitigate and follow the future ***green growth*** path CE, by restructuring their development patterns to delink carbon emissions and economic growth;
- Middle income, emerging and poor economies could adopt innovative policies to seek the ***green growth***

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