

Socioeconomic LCA of Milk Production in Canada

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Abstract Over the years, the agricultural sector, and the livestock and dairy sectors in particular, have been increasingly criticized for their environmental impacts, especially with regard to greenhouse gas emissions. At the same time, there has been a growing awareness that farm activities equally induce significant social and economic impacts over a wide range of stakeholders. In order to face the new challenges arising from this context and to clarify the path towards sustainable milk production in Canada, the Dairy Farmers of Canada (DFC) commissioned the

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realization of a Social and Environmental Life Cycle Assessment (SELCA) of Canadian Milk. Launched in 2010, this project, which ended in September 2012, was conducted as part of the Dairy Research Cluster. The study was conducted by three partners, two consulting firms (Groupe AGECO and Quantis) and a research center (CIRAIG), based at the Montreal Polytechnic, with a section dedicated to socioeconomic life cycle assessment based at the University of Quebec in Montreal. It aimed at providing a comprehensive assessment of the Canadian milk production sector with respect to sustainability. The main deliverables include an environmental profile of the average kilogram of milk produced in Canada, as well as an evaluation of the socioeconomic performance of the Canadian dairy sector. This chapter addresses the social and socioeconomic dimensions of the global project. It presents the methodological choices made, such as combining a specific analysis and a potential hotspots analysis (PHA) for two parts of the system under study. It then presents the economic contributions of the Canadian dairy sector, which has generated over 127,000 direct, indirect and induced jobs in 2009, contributed approximately \$7.2 billion to the national GDP, and procured almost \$1.4 billion in total tax revenue. Canadian dairy farmers are also corporate citizens whose behaviors—individually and collectively—impact their stakeholders. This SLCA provides a detailed picture of this socioeconomic performance. It appears from this assessment that the Canadian dairy farms perform positively overall. The dairy farmers' engagement towards their local communities is significant, with the vast majority involved in their communities in many different ways. However, more could be done in terms of cohabitation, with producers adopting practices minimizing the spreading of odors, for example. The picture is also contrasted with regard to farm workers. Although dairy farmers provide overall working conditions that go beyond labor standards—to which they are mostly not legally subjected—there is room for improvement regarding various issues, such as professional training and communication of working conditions. The same holds true with respect to their suppliers and business partners, given that a majority of dairy producers do not usually consider their suppliers' performance in regards to social responsibility in their procurement decisions.

Keywords Milk production • Social LCA • Socioeconomic • Dairy farmers of Canada • Performance reference points • Hotspots • Specific analysis • Stakeholders • Impact categories

1 Introduction

In an effort to clarify the path towards sustainable milk production in Canada, the Dairy Farmers of Canada (DFC), through the Dairy Research Cluster, a part of the Canadian Agri-Science Clusters Initiative of Agriculture and Agri-Food Canada (AAC), commissioned an environmental and social life cycle assessment (SLCA) of Canadian milk. This study was carried out by Quantis Canada, AGECO, in collaboration with The Interuniversity Research Centre for the Life Cycle of Products, Processes and Services (CIRAIG), and the results were published in 2012 (Quantis Canada, Ageco and CIRAIG, 2012, Environmental and Socioeconomic Life Cycle Assessment of Canadian Milk, DFC, 285 pages). This project is the basis of the case study that we are presenting in this chapter and, as we will see, there was an exploratory dimension in the objectives as it was the first time that the DFC were commissioning an LCA, and, furthermore, an integrated environmental and socioeconomic LCA.

The project's objectives were threefold:

- (1) To evaluate the environmental and socioeconomic impacts of dairy production in Canada;
- (2) To identify potential areas of focus for further improvements of the dairy sector's sustainability; and
- (3) To provide the framework and the building blocks to support comparison and benchmarking (in reference to milk production in other countries, for example).

The results of this environmental and socioeconomic life cycle assessment were meant to be used by DFC for decision-making at a macro level, but also for communication purposes with all stakeholders (dairy farmers, policy makers, processors, consumers, media, etc.). The results will also serve as a basis for the sustainability agenda of the farmers' association.

This initiative took place within a context where many relevant actors of the industry have been active on the international scene. At the international level, the International Dairy Federation (IDF) promotes the sustainable production of milk and milk-based products through its Dairy Sustainability Framework and the production of a methodology for the lifecycle assessment for the dairy sector.

Many associations of milk producers and governments have already reported the results of LCAs of milk production, including the European Dairy Association, which commissioned a carbon footprint across the EU dairy sector (Sevenster and De Jong 2008), as well as the Swedish Dairy Association, the Australian Dairy, and the US Dairy Management Inc. In France, an upcoming policy towards environmental labelling of products under the "Grenelle Environment Forum" has accelerated the implementation of LCA in various consumption products, including food and dairy. Furthermore, the FAO also completed a carbon footprint in 2010 with a global perspective over the entire supply chain, and there is a continuous process

for improvement in place. Because of the wide scope of the study however, numerous assumptions and generalizations were needed.

Companies having performed and communicated on LCAs of their dairy products include Danone in France, Arla in Sweden and Denmark, Fonterra in New Zealand through a national investigation (Lundie et al. 2009), Aurora Organics in the US in 2007, and Cadbury in England in 2008. In Canada, Liberté has been active in LCA for many years and publishes information on their Web site (Liberté 2012). These studies are sometimes limited to a few farms only, which does not imply a small herd, as the Aurora Organics study involved six farms only and a total herd of close to 12,000 cows.

However, there is little to no literature surveying the social or socioeconomic aspects of sustainability in dairy. The need to do so has been noted in certain documents, such as in the Life Cycle Initiative Program for the United Nations (Grießhammer et al. 2006) and the IDF review of literature, which noted that “Future research will possibly enable inclusion of social issues in LCA to create a new impact category. The social conditions of workers could be accounted for at farms as well as dairies or retail phase” (IDF 2009).

This chapter is directly derived from the full report, with a formal authorization of representatives of the DFC, but it will concentrate only on the social and socioeconomic LCA part of the study. In particular, we wish to stress that all tables and figures come from the report and therefore are not referenced individually to this report (For a detailed presentation of the environmental LCA and the socioeconomic LCA, please refer to the full integrated report at http://www.groupeageco.ca/PLC_EnvironmentalAndSocioeconomicLCA_FullReport.pdf).

After this introduction, the chapter is divided into four main sections. In Sect. 2 we consider a series of definitions related to SLCA and qualify the approach selected for the study. This will expectedly cover the boundaries, the system under study, and the assumptions made in defining the approach. Then we present the two different types of analysis that we will use for two components of the Canadian Milk Production System. First, the “specific analysis” that will apply to the farm level, for which we have gathered primary data (Sect. 2.2). Then we will present the various stakeholder categories used and the impact of the categories that we considered for these different stakeholders, continuing with the impact assessment methodology and the data collection process. Secondly, in Sect. 2.3 we deal with the generic part of the study—that is, the potential hotspot analysis. The same elements will be considered in this subsection as that in the previous one. In Sect. 3 we present the results of both assessments and discuss them as well as the challenges met in the study in Sect. 4. Section 5 deals with the main conclusions and possible future steps.

2 Social and Socioeconomic Life Cycle Assessment: Definition and Approach

SLCA is a “technique that aims to assess the social and socioeconomic aspects of products and their potential positive and negative impacts along their life cycle” (UNEP/SETAC 2009, p. 37). The main features of this tool are its broad scope, which encompasses a product’s entire life cycle, and its assessment method, which relies on benchmarks to assess the relative social performance of the organizations (private, public, or non-profit) involved in the product’s life cycle.

The SLCA methodology relies on the recently developed *Guidelines for Social Life Cycle Assessment of Products* (hereinafter the Guidelines). Published in 2009 by the United Nations Environment Programme (UNEP) in collaboration with the Society of Environmental Toxicology and Chemistry (SETAC), these Guidelines provide the general framework needed to conduct such an assessment.

The Guidelines propose a classification of the main socially significant themes to assess, as well as a categorization of the main stakeholder categories potentially affected by the socioeconomic impacts induced by the activities and behaviors of the organizations involved in the product’s life cycle. Six main impact categories are listed in the Guidelines, each one related to a number of impact subcategories, or specific issues of concern, which are “socially significant themes or attributes” to assess (UNEP/SETAC 2009, p. 44). These impact categories are: human rights, working conditions, health and safety, governance, cultural heritage, and socio-economic repercussions. As for the stakeholder categories, the Guidelines list the following five groups: workers, local communities, society, consumers, and value chain actors.

In addition to this general framework, the Guidelines also specify the steps to follow and the requirements to fulfill in order to conduct a rigorous and transparent assessment. However, the Guidelines are a work in progress towards the elaboration of a comprehensive assessment framework. Adaptations are admittedly needed in order to perform an SLCA (UNEP/SETAC 2009, p. 82). For instance, the Guidelines do not define any particular assessment methodology, so it was necessary to develop an “assessment framework,” compatible with the Guidelines in order to perform the SLCA of milk production in Canada. The following sections thus describe this framework and present the methodological underpinnings on which it is based. When needed, the adjustments made to the general framework provided by the Guidelines are discussed.

The first step of an SLCA aims to describe the intended application and the reasons for carrying out the study (goal) and to define its depth and breadth (scope). As highlighted in the Guidelines, “the ultimate objective for conducting an SLCA is to promote improvement of social conditions and of the overall socioeconomic performance of a product throughout its life cycle for all of its stakeholders” (UNEP/SETAC 2009, p. 50). This is also the project’s main objective: assessing the socioeconomic performance of the Canadian milk production sector and identifying

potential social hotspots to provide some recommendations in order to improve the system’s overall socioeconomic performance towards its stakeholders.

As for an ELCA, this implies identifying the functional unit, the product system, and its boundaries (UNEP/SETAC 2009, pp. 51–57). The UNEP/SETAC Guidelines do not provide any particular direction on how the scope of an SLCA should be adapted to fit that of an ELCA when both assessments are conducted together. It is acknowledged, however, that given the SLCA’s specificities, the scope might not necessarily be the same or totally integrated.

As the objective of the Canadian Dairy Farmers is to study not only the production of the milk but also its transportation at the gate of the processing facility, excluding the transformation, the functional unit for the ELCA part of the study is:

1 kg of fat and protein corrected milk (FPCM) from a Canadian farm, to the processing facility

We used it for the SLCA as well as for the sake of similarity in the development of the two components—social and environmental—of the project.

2.1 Boundaries and Assumptions

For the purposes of this analysis, the system was grouped into five principal life cycle stages, as presented in Fig. 1.

- (1) Feed Production: includes manure spreading, pesticide and fertilizer production and spreading, any energy required (diesel) for field manipulations, irrigation water.

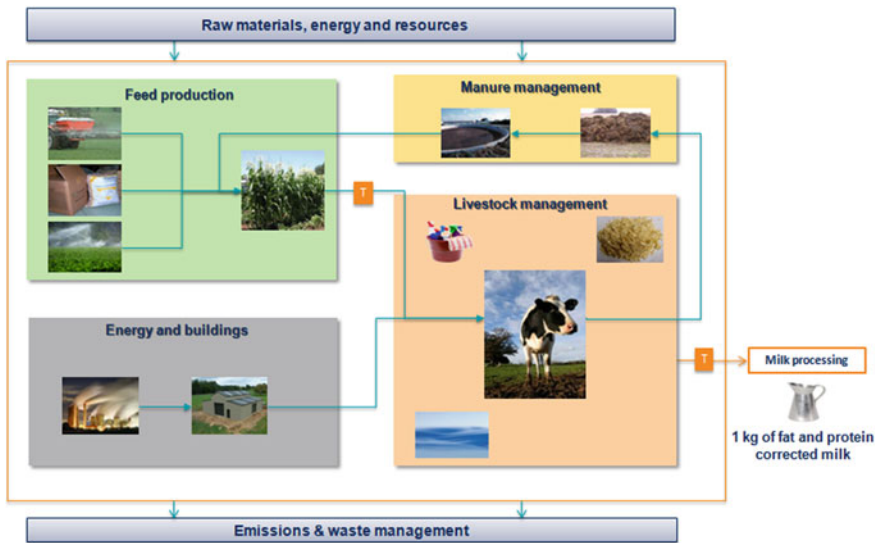


Fig. 1 Life cycle system

- (2) **Livestock Management:** includes bedding, drinking water, milking equipment, cleaning products and water, ammonia emissions from housing, and methane emissions from enteric fermentation.
- (3) **Manure Management:** limited to emissions of nitrous oxide, methane and ammonia from storage.
- (4) **Energy and Buildings:** includes electricity for dairying, cattle housing and milk parlor equipment and buildings, and gasoline for regular operations.
- (5) **Transportation:** includes only purchased feed transportation, purchased animal transportation and raw milk transportation to processor.

Within each of these stages, the LCA considers all identifiable “upstream” inputs to provide as comprehensive a view as is practical of the product system. For example, when considering the environmental impact of transportation, not only are the emissions of the truck considered, but also included are the impact of additional processes and inputs needed to produce the fuel, as well as truck and tire manufacturing. In this way, the production chains of all inputs are traced back to the original extraction of raw materials, within feasible limits.

However, the product system differs slightly between an SLCA and an ELCA, firstly in its constituting parts: Since an SLCA primarily focuses on the behavior of the organizations involved in the product’s life cycle, an SLCA product system is made of those organizations, organized in value chains, rather than by the processes they perform as in an ELCA. Secondly, it differs in its scope: For a matter of simplification and access to data, the scope of an SLCA product system is usually circumscribed to include only the most important and relevant value chains and organizations, where the product system in ELCA is more exhaustive and usually extended until no more exchanges are made between processes inside the technosphere.

Hence, the definition of an SLCA product system first requires identifying the organizations involved in each value chain included in the product’s life cycle. In an SLCA perspective, a value chain can be defined as a set of businesses located whether upstream or downstream of an organization, providing the inputs and services needed for the production and the marketing of the product under assessment. Then, depending on the objectives of the project, criteria are set to delimit the scope and the range of the system under study.

The above considerations have been taken into account to specify the product system used to perform this SLCA of milk production in Canada. Based on the information provided by the Milk Cost of Production Database,¹ it was possible to define the main value chains involved in milk production according to the inputs

¹ The milk CoP database is a sample of farms (stratified by region and size and randomly selected to represent the population) used by provincial Dairy Boards and the CDC each year to establish the cost of production of 1 hl of milk. The P5 database (Quebec, Ontario, Maritimes) is supervised by AGECO.

and services they provide to the dairy farms.² Given the vast array of inputs and services involved, decisions were made to further circumscribe the scope of the system. First, inputs related to farm buildings are excluded from the system, because this group of expenses is related to various kinds of tools, materials and services of low individual significance. Cow replacement is also excluded, given that these animals are generally traded among dairy farmers. Items only related to services, such as salaries, joint marketing plan management fees and field equipment maintenance expenditures, and those not directly associated to milk production, such as interest fees and taxes, are also excluded. Although milk transportation is a service, it is left within the system since it is part of its scope. Finally, it was decided to exclude “electricity” from the system and to include “pesticides,” although it accounts only for 0.4 % of the average total cost. These choices are justified by the fact that electricity is a relatively minor and non-agricultural input from which suppliers are globally disconnected from the agricultural sector (Parent et al. 2012), whereas pesticides are an economically and socially sensitive product primarily used in agricultural production. According to these choices, the following inputs and services are therefore included in the SLCA system:

- Animal feed
- Farm inputs (fertilizers, seeds, pesticides)
- Milk transportation
- Veterinary services (drugs and bovine semen)
- Agricultural machinery
- Fuel and diesel

Each of these inputs and services is provided to dairy farms via a specific supply chain composed of a number of steps (from extraction of raw material to final distribution). Each step involves a vast number of businesses producing products or providing services. In order to simplify the system, cut-off criteria have also been used to limit the length and complexity of each of these value chains:

- For each value chain, only one to two representative inputs or services have been considered at each step, according to their relative importance at this step.
- The range of each value chain was extended, as long as it was possible to trace back a main input or service used in the production of the previous product or service.

Figure 2 shows the product system selected for the SLCA study. First tier suppliers, i.e., businesses or value chain actors directly interacting with dairy farmers for advice or commercial purposes related to the selected inputs, are shown to the left of dairy farms. They include advisers or representatives, such as feed and farm inputs dealers, whether or not affiliated to specific companies involved in the

² While part of the socioeconomic system in which the milk production sector and its business partners operate, the institutional, sectorial, social and political organizations or associations operating with and around the economic actors involved in milk production are excluded from this system.

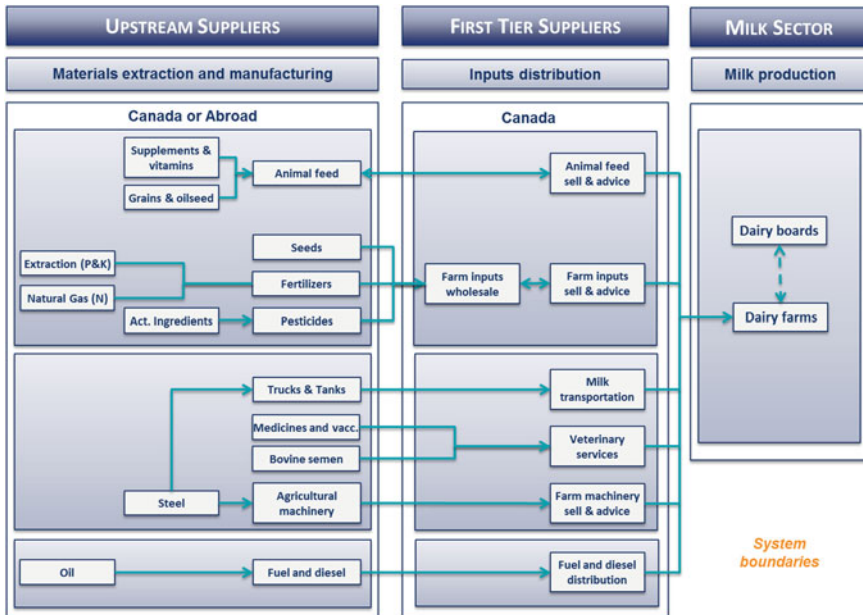


Fig. 2 Product system of the Canadian milk production

production or the handling of some inputs. Upstream are listed the selected inputs sold to dairy farmers (or used to supply the services) and the main auxiliary inputs needed to produce them. Taken together, these inputs, auxiliary inputs and the companies producing and handling them, shape the product system considered to perform this SLCA.

Although the aim of an SLCA is to provide, for a given product, a profile of the socioeconomic performance of the organizations involved in its entire life cycle, the assessment’s degree of details can vary across the system. It is not always readily possible, necessary or even relevant, to assess in detail the behavior of all the organizations throughout the life cycle of a product. While practical constraints such as data limitations, short delays or budget restrictions can impede in-depth analysis, the assessment’s focus is generally determined by the intended applications of the SLCA results by the commissioner (Parent et al. 2012).

In the case of this study, the objective of the SLCA is to give a socioeconomic profile of the product system with an emphasis on the Canadian milk production sector. Therefore, the socioeconomic performance of the Canadian dairy farms and their sectorial organizations are assessed through a specific analysis—which provides a high level of details on their degree of social responsibility based on the compilation of primary data collected on-site.

For the rest of the product system, a potential hotspots analysis (PHA) is performed—which offers an overview on the possibility of encountering risky

behaviors among the supply companies/sectors based on the compilation of generic data collected from international and national databases, the Social Hotspots Database (SHDB), human rights reports, etc.

2.2 *The Specific Analysis*

The aim of the Specific Analysis is to provide a detailed analysis of the socio-economic performance of a particular company/organization/sector by assessing its degree of social responsibility toward its stakeholders. Given the focus of this project, the Specific Analysis approach is used to assess the socioeconomic performance of the milk production sector in general, and of the dairy farms and dairy organizations in particular.

Because of the structure of the Canadian milk production sector, which involves about 13,000 dairy farms across Canada that are provincially and nationally organized, the assessment addresses more specifically the socioeconomic performance of the sector at three different levels—since the behaviors and practices encountered at each level do not necessarily affect the stakeholders in the same way or do not relate to the same issues of concern. The three assessment levels are:

- *Dairy farms level.* The dairy farms are at the center of the assessment. Their behavior and practices affect mostly the farm workers, the local communities where they are located, and their suppliers.
- *Dairy boards level.* All across Canada, dairy farms are organized in provincial dairy boards performing the administrative, marketing and communicative tasks assigned by the dairy farmers. By fulfilling these tasks, those organizations induce impacts on different stakeholders.
- *Sector level* Milk production takes place in a legal and institutional framework that shapes most of the sector's characteristics, which in turn have significant implications on the entire sector's stakeholders. Whereas this particular framework is not necessarily specific to the milk production sector, or dairy producers directly accountable for it, its implications still have to be assessed as producers have the ability to act upon it together.

In this chapter we will only present the detailed methodology and results for the dairy farm level, but neither for the dairy board nor sector levels.

It is important to stress that the SLCA approach in general, and the Specific Analysis in particular, exclusively addresses the relationships between a business/organization and its stakeholders, the former being the one inducing the socio-economic impacts—positive or negative—on the surrounding groups of individuals. Accordingly, the impacts experienced by the dairy farmers or the dairy boards resulting from their own behavior are not addressed by this framework. Rather, the assessment framework assesses the degree to which the Canadian dairy farmers and dairy boards behave in a socially responsible manner towards their stakeholders.

2.2.1 Stakeholder Categories

Formally, stakeholders are “those groups and individuals that can affect, or are affected by, the accomplishment of organizational purpose” (Freeman 1984 cited by UNEP/SETAC 2009, p. 47). As pointed out earlier, the UNEP/SETAC’s Guidelines proposes a list of five main stakeholder categories potentially impacted by the life cycle of a product. These are the workers, the local communities, the society, the consumers, and the value chain actors. However, depending on the study’s boundaries and the sector’s particularities, it is possible to add, to exclude, to differentiate, or simply to define more precisely the proposed categories to get a clearer description, at each step of the value chain, of the stakeholders involved (UNEP/SETAC 2009, p. 46).

Given the scope of this study and the focus of the Specific Analysis, such adaptation of the basic stakeholder categories was necessary. The “consumers” category (seen as the “people who buy milk in different forms from a retail store”) was hence excluded from the framework. The issues of concern potentially affecting consumers have instead been assessed in relation with the “value chain actors” category, since raw milk is the main input used by dairy processors to elaborate the dairy products sold to consumers. The other four stakeholder categories adequately cover the various groups of individuals potentially impacted by milk production activities, as shown by a review of the existing literature. Based on the results of several focus groups conducted in the first stages of the study, each stakeholder category has been defined in more detail (Table 1). Given that the Specific Analysis was exclusively conducted on the dairy farms and their boards, the categories have been adapted only to the individuals impacted by dairy activities.

2.2.2 Issues of Concern or Impact Subcategories

Impact subcategories are the “socially relevant characteristic or attribute to be assessed” in an SLCA (UNEP/SETAC 2009, p. 71). Based on international agreements (conventions, treaties, etc.), the guidelines already propose a list of internationally recognized impact subcategories, each being related to a specific stakeholder category. While most of the listed impact subcategories are relevant in a Canadian context, some of them, such as “delocalization and migration” or “prevention of armed conflicts,” are not necessarily relevant.

In order to encompass comprehensively the issues of concern related to milk production in Canada, and as allowed by the guidelines, the list of subcategories was justifiably adjusted on the basis of a review of the existing literature, experts’ opinions, and the results of three focus groups conducted among the sector’s stakeholders.

Table 2 presents the impact subcategories chosen for the study. Each one is explicitly defined to ensure a common understanding of the social issue it covers. These definitions do not necessarily follow those proposed in the methodological

Table 1 Definition of the stakeholder categories impacted by milk production activities of the Canadian dairy farms and their boards

Stakeholder categories	Definition
Workers	<p>This category covers only farm workers that are not relatives of the producer (husband, wife, children, etc.). As business owners, the producer and his family members are not considered to be “workers,” even if they work on the farms</p> <p>This category has been further subdivided into four subcategories of workers frequently working on farms</p> <p>(a) <i>Regular workers</i>: farm workers working at least 25 h/week, at least 40 weeks/year on the farm (irrespective of their particular occupation)</p> <p>(b) <i>Temporary foreign workers</i>: foreign workers hired to work on a farm for a temporary period of time through the Seasonal Agricultural Worker Program (SAWP) or the Agricultural Stream of the NOC C and D Pilot Project</p> <p>(c) <i>Young workers</i>: school-age individuals working on a farm (family included)</p> <p>(d) <i>Occasional workers</i>: local or foreign workers hired temporarily through the services of an employment agency</p>
Local communities	Regardless of their geographic location, this category covers the individuals or groups of individuals directly affected by the milk production activities, i.e., neighbors, local and regional groups, surrounding populations, etc.
Society	This category refers to acknowledged social values upheld in a particular society by organizations such as provincial, national or international interest groups, government agencies, or the civil society as a whole
Value chain actors	This category refers to dairy farms’ inputs and services suppliers (Fig. 2), but also indirectly to consumers, given that the Canadian milk production sector’s efforts to provide dairy processors with high quality milk have an impact on “final” consumers

sheets published by the Life Cycle Initiative (LCI 2010), because they do not adequately describe the issues under assessment in this specific case.

A scale of assessment level is also specified, as some issues of concern relate primarily to dairy farm activities while some others relate rather to their provincial boards, or even to the milk sector as a whole. One issue of concern can be related to more than one level of assessment as well.

2.2.3 Impact Assessment Methodology

The impact assessment phase of an SLCA involves translating inventory data into measured impacts by aggregating inventory indicators within subcategories and comparing them against a so-called “performance reference point” (PRP)—or benchmark. However, as the Guidelines point out, “impact assessment methodologies are under development and SLCA is an open field for future research” (UNEP/SETAC 2009, p. 69). For instance, unlike the ELCA methodology, there is

Table 2 Impact subcategories according to the corresponding stakeholder categories

Stakeholder categories	Selected impact subcategories	Definition	Assessment level		
			Dairy farms	Dairy boards	Dairy sector
Workers	Working hours	Working hours are a major proxy of proper working conditions. Even if agricultural production is characterized by long work days and that most farm workers are not covered by labor standards, too many working hours per week can affect workers' welfare	X		
	Benefits	Government sets minimal norms regarding benefits and social securities. An employer can, however, offer improved conditions to his employees and their families	X		
	Salary and contribution to fringe benefits	Salary is a central component of working conditions. It should not be inferior to minimum wage, when required by law. If possible, it should be competitive compared to the sectorial average wages and be inflation-adjusted to protect workers' purchasing power. Other monetized benefits can also be provided to workers in addition to/or as a complement to the salary, such as bonuses for statutory holidays and premiums for overtime	X		
	Working conditions transparency	Good communication between the employer and the employees concerning working conditions is essential to build a fair relationship between the two parties	X		
	Freedom of association and collective bargaining	The growing numbers of non-family related workers on farms causes unionization to become an economic as well as a social issue in the agricultural sector. While challenging, this new issue needs to be addressed by provincial regulations to allow farm workers to assert their rights			X
	Health and safety	Farm workers should benefit from safe and secure conditions at their workplaces and have access to all the necessary resources to prevent incidents that could compromise their physical or psychological health	X		
	Professional accomplishment	Employees should benefit from a stimulating and rewarding workplace that allows personal and professional development	X		

(continued)

Table 2 (continued)

Stakeholder categories	Selected impact subcategories	Definition	Assessment level		
			Dairy farms	Dairy boards	Dairy sector
Local communities	Integration and/or discrimination (<i>for temporary foreign workers</i>)	There should be no significant and unfair discrepancies between the working conditions offered to temporary foreign workers and to regular farm workers			X
	Young workers employment	Working conditions of school-age workers should respect legal requirements and contribute positively to their development			X
	Community engagement	Through its implication and involvement in its community, a producer can foster local development and contribute to the creation of a harmonious environment with the community	X	X	
	Natural and built heritage	Farms can contribute to the beauty of the countryside through initiatives aiming at enhancing and protecting the natural and built heritage	X		
	Cohabitation (i.e., life quality)	Although nuisances such as noise, smells and dust inevitably arise from normal agricultural activities, farmers can minimize their impacts on local life quality by using different production methods and by informing the neighborhood before the most disturbing activities	X		
Society	Commitment to sustainability issues	Producers as well as their organizations can commit themselves in regard to sustainability by holding formal certifications	X	X	
	Agroenvironmental practices	Milk production can have a significant impact on the environment, depending on how producers manage the manure, use chemicals, and work their land. By adopting good agroenvironmental practices, they can minimize this impact	X		
	Contribution to economic development	This subcategory assesses to what extent dairy activities contribute to the economic development of the country by generating revenue and creating jobs			X

(continued)

Table 2 (continued)

Stakeholder categories	Selected impact subcategories	Definition	Assessment level		
			Dairy farms	Dairy boards	Dairy sector
	Technology development	This subcategory assesses whether the boards participate in joint research and development for efficient and environmental sound technologies		X	
	Animal welfare	As a growing number of consumers are becoming sensitive to the way animals are treated and require more humane treatment, animal welfare is becoming one major concern in the agrofood sector, especially at the production level	X	X	
Value chain actors	Responsible procurement practices	Purchasing decisions can be based on social and environmental considerations or criteria to ensure socially responsible procurement practices	X		
	Responsible supplier practices	As a supplier, dairy producers can adopt voluntary norms and certifications in order to supply the dairy industry with a competitive, yet high quality product	X		
	Promotion of social responsibility	This subcategory assesses to what extent dairy boards are committed and involved in initiatives and partnerships aimed at promoting social responsibility		X	
	Fair competition	Competitive markets in which a vast number of sellers and buyers interact freely usually constitute a safeguard to protect market actors as well as consumers against abusive market practices and non-competitive prices. This subcategory assesses to what extent the Canadian milk sector is characterized by fair competition			X

no characterization model allowing the translation of inventory indicators into socioeconomic impacts using quantitative models.

Although the Guidelines do not provide any particular indications or suggestions regarding the impact assessment methodology to use in an SLCA, this issue is extensively discussed in the socioeconomic impact evaluation literature (Burdge 2004; Burdge and Vanclay 1995; Chadwick 2002; Becker and Vanclay 2003). Our assessment methodology thus relies not only on this literature, but also on our expertise in this field.³

Most social assessment methods, including the SLCA methodology, rely on socioeconomic indicators to measure and assess the social and economic impacts induced on stakeholders by a particular activity. But as pointed out in the Guidelines, “several inventory indicators and units of measurement/reporting types may be used to assess each of the subcategories. Inventory indicators and units of measurement may vary, depending of the context of the study” (UNEP/SETAC 2009, p. 44). Indeed, there is no formal or universally acknowledged set of indicators to which one can refer to assess the socioeconomic performance of a particular product or company. To carry out a particular assessment, a specific set of indicators thus has to be developed according to the project’s objectives and data availability.

Based on the multiple assessment frameworks suggested in the literature—many of which have been conceived to be used in an agricultural context—but also on expert judgments, a list of indicators has therefore been developed to assess the socioeconomic performance of the Canadian milk production sector. A four-level evaluation scale was created and they specify how each indicator can be declined practically, given the PRP used.

More specifically, these evaluation scales (Table 3) allow assessing, for a given issue of concern, the level of social responsibility of a dairy farmer.

A *risky behavior* is considered to be a hazardous practice that can cause significant damages or create serious problems to the concerned stakeholders. Given that most hazardous practices are forbidden by law, they are generally related to illegal behaviors. Yet, in some cases, it is possible to consider a particular behavior as risky (even if it is not illegal) insofar as it can potentially have serious and negative implications for the individual or group of individuals it concerns, compared to its potential benefits. This is, for example, the case with the “working hours” subcategory, as there is generally no legal limit to the length of the work week or legal standard relating to work overload in the agricultural sector. Allowing

³ The dairy industry has been analyzed by AGECO from various points of view over the years and at different industry levels (farm level, processing activities, domestic and international dairy policies, etc.): supply system management, financial situation of Canadian dairy farms, dairy farm production costs, and labor problems at the farm and processor levels are some of the subjects that have been studied. New opportunities in marketing settings and dairy products marketing were also studied. AGECO has also animated a few years ago a reflection session within the Premium Milk Innovation project. Therefore, AGECO is familiar with each actor as well as with the stakes of the Canadian dairy industry on a national and international level.

Table 3 Specific analysis’s behavior evaluation scale

			
Risky behavior	Compliant behavior	Proactive behavior	Committed behavior

a number of working hours beyond a certain threshold can, however, have negative implications for the workers’ health and safety—irrespective of the fact that they agree to work them.

A *compliant behavior* refers to a normal and expected practice. It generally corresponds to a minimal legal requirement or simply to an absence of initiative or commitment in situations where it is not required. In other words, a compliant behavior means that the organization, while not acting in a socially irresponsible manner, is not especially socially responsible either.













The two other levels refer to behaviors that go beyond compliant or minimal expectations to tend toward more socially responsible behaviors. Depending on the issue and the PRP identified, a *committed behavior* is hence considered to be the most socially responsible practice a leading organization can reach, while a *pro-active behavior* translates an in-between engagement; the business goes beyond legal requirement, but has not yet reached a leading behavior.

Of course, this classification is relative, as the PRPs used to determine whether a particular behavior is more or less socially responsible can evolve in time and place. In other words, today a committed behavior could become a minimal expectation in the future, or could be considered a desired behavior in another region. This evaluation scale is also dependent on data availability. In order to assess a particular behavior according to this four-level scale, it is necessary to have access to detailed information both to establish the PRPs and to assess the behavior itself.

Table 4 presents a selection of indicators used to assess the socioeconomic performance of dairy farmers, but all indicators developed are presented later in the results of the study. They are classified according to the stakeholder categories and the related impact subcategories. To ensure that the assessment framework is both clear and transparent, each indicator is detailed, using a standardized approach. First, a brief description of what each indicator measures is given; then, the PRPs—or benchmarks—against which the performance is assessed are specified (UNEP/SETAC 2009, p. 69).













As mentioned earlier, PRPs are acknowledged social standards, norms or practices used as thresholds to distinguish, among the observed practices or behaviors, those that are socially responsible from those that are minimally expected from the organization. One indicator can be related to several PRPs, such as a national or international minimal legal standard, a “best available practice,” an average performance of a company or a group of businesses, etc. Given the Canadian milk production sector’s particularities, the PRPs have mostly been selected according to minimal legal requirements, sectorial standards and average performance, as well as best expected practices based on our own expertise of the sector. The choice of each PRP is justified for each indicator.

Table 4 Selection of impact subcategories and the corresponding socioeconomic indicators per stakeholder categories documented at the dairy farm level

Farm workers			
Benefits			
Scope of the protection	Description	Number of social benefits provided to employees	
	PRP	AGECO (2010): list of the social benefits most commonly provided to farm workers (wage insurance; health insurance; life insurance; pension plan contribution; paid sick days; unemployed insurance; in kind)	
	Justification/commentary	Each benefit is counted individually even if they are provided in a collective insurance scheme	
	Evaluation scale		–
			The producer provides only the minimal legal requirements to its employees
			The producer provides enhanced social benefits to its employees and their families in at least one of the listed categories
			The producer provides enhanced social benefits to its employees and their families in more than one of the listed categories
	Justification/commentary	Provincial labor standards define socially accepted working conditions that should be minimally guaranteed to employees. Even if farm workers are frequently excluded from most provisions, they are still relevant benchmarks to consider. The provincial median hourly wage in the agricultural sector is another relevant benchmark to compare with the salary paid to dairy farm workers (regardless of the other premiums or benefits paid or provided)	
	Evaluation scale		The average hourly wage of regular workers < the provincial legal minimum wage rate
			The average hourly wage of regular workers is = the provincial legal minimum wage rate
		The average hourly wage of regular workers is > the provincial legal minimum wage rate, but ≤ the provincial median hourly wage	
		The average hourly wage of regular workers is > the provincial median hourly wage rate in the agricultural sector	
Farm workers			
Working conditions transparency			
Communication of working conditions	Description	Employees should receive and have access to written copies of their contracts	
	PRP	Best expected practices	
	Justification/commentary	In order to avoid conflicts and to ensure a correct understanding of working conditions, a formal and written contract should be given and signed by each employee	
	Evaluation scale		–
			Employees neither receive nor have access to formal copies of their employment contracts
			–
		Employees receive and have access to formal copies of their employment contracts	













(continued)

Table 4 (continued)

Farm workers			
Benefits			
Health and safety			
Health and safety training	Description	Whether employees have received health and safety training.	
	PRP	Best expected practices.	
	Justification/commentary	Although most farm workers are covered by the provincial occupational health and safety legislation, employers can tool up their employees with additional skills and resources	
	Evaluation scale		–
			Employees have neither received health and safety training nor does the farm have a formal procedure in case of injury
		Either employees have received health and safety training, or the farm has a formal procedure in case of injury	
		Employees have received health and safety training and the farm has a formal procedure in case of injury	
Local community			
Community engagement			
Implication within the community	Description	Assess whether the producer is involved in a local organization, hosts trainees, allows free visits on his farm, or makes donations to local non-profit organizations	
	PRP	Best expected practices	
	Justification/commentary	These four examples are the frequently observed forms of engagement in the agricultural sector	
	Evaluation scale		–
			The farmer is not involved in a local organization, does not host trainees, does not allow free visits to his farm, or make any donations to local non-profit organizations
		The farmer participates in at least one of the previously listed activities	
		The farmer participates in at least two of the previously listed activities	
Cohabitation (i.e., life quality)			
Communication with the neighborhood	Description	The farmer informs his neighbors before spreading manure	
	PRP	Best expected practices	
	Justification/commentary	Informing the neighborhood before spreading manure application can reduce the risk of conflict with the surrounding community	
	Evaluation scale		–
			Producer does not inform its neighbors before spreading manure
		–	
		Producer informs its neighbors before spreading manure	





(continued)

Table 4 (continued)

Farm workers			
Benefits			
Society			
Commitment to sustainability issues			
Environmental certification	Description	The enterprise holds a formal certification/specification aiming at minimizing environmental damage (ISO 14 001, organic certification, etc.)	
	PRP	Best expected practices	
	Justification/commentary	Producers can go beyond goodwill and engage in formal and binding processes aiming at minimizing environmental damage induced by their activities	
	Evaluation scale		–
			The dairy farm does not hold any certification/accreditation or specification requiring minimizing environmental damage
		–	
		The dairy farm holds a certification/accreditation or specification requiring minimizing environmental damage	
Agroenvironmental practices			
Manure storage structure	Description	Whether the farm is equipped with a manure storage structure	
	PRP	Best expected practices	
	Justification/commentary	An efficient storage structure can contribute to reducing manure spillage and facilitate manure management, hence reducing potential environmental damage	
	Evaluation scale		–
			The producer does not have any particular manure storage structure (manure pit, cement slab, lagoon/cement pond, lagoon/earth, slurry store/metal)
		–	
		The producer holds a manure storage structure	
Animal welfare			
Training and practices	Description	Assess whether the producer and/or his employees are informed and trained and whether they have changed their practices with regard to animal welfare	
	PRP	Best expected practices	
	Justification/commentary	In order to respond to the growing awareness and questioning of consumers regarding animal welfare issues, producers and farm workers can inform themselves and participate in training activities in order to enhance their practices	
	Evaluation scale		–
			The producer has neither (1) read the “Codes of Practice for the Care and Handling of Farm Animals” from the National Farm Animal Care Council; (2) fulfilled the “Checklist for Dairy Animal Welfare on Farms” published by the DFC; nor (3) attended any training activity regarding animal welfare issues
		The producer has performed one of the previous training activities, but has not changed his practices to enhance his animals’ welfare	
	The producer has performed one of the previous training activities and has changed at least one of his practices to enhance his animals’ welfare		

(continued)

Table 4 (continued)

Farm workers			
Benefits			
Value chain actors			
Responsible procurement practices			
Effort to promote social responsibility	Description	Producers' purchasing decisions are influenced by social and environmental considerations or criteria	
	PRP	Best expected practices	
	Justification/commentary	By referring to socially responsible procurement practices, producers can ensure that their suppliers and their products respect both the environment and the individuals	
	Evaluation scale		–
			The producer does not make purchasing decisions on the basis of social and environmental considerations or criteria
		–	
		The producer makes purchasing decisions on the basis of social and environmental considerations or criteria	

The Specific Analysis was conducted by scoring, at the level of each socio-economic indicator, the behavior or practice of each participating farm. However, given that the project aimed at evaluating the socioeconomic performance of the milk production sector as a whole, and in order to preserve the respondents' privacy, the individual scores have been compiled at the provincial level to get a weighted⁴ average score of the socioeconomic performance of the Canadian milk production sector.

2.2.4 Data Collection Process

Conducting a Specific Analysis requires a significant amount of data and information to document the PRPs and the organizations' behaviors. Unfortunately, there are very few databases that cover and record, on a regular and systematic basis, the social and socioeconomic issues at the sector or organization level. Primary data, i.e., data collected directly from the participating businesses and organizations, are thus generally needed to undertake such an analysis.

Due to the scope of the Specific Analysis performed in this project, the data collection process was expectedly challenging. In addition to the large variety of undocumented information needed, it was also necessary to document this information in a standardized manner across all provinces in order to obtain consistent results at the Canadian level.

⁴ In order to obtain a representative national average score, the individual answers have been weighted according to each province's relative importance in the Canadian sector, in terms of the number of milk producers they host.

This challenge was first met through the PRPs. The lack of data and reliable documentation on most of the issues of concern under assessment made it difficult to assess not only these issues, but also to select standardized PRPs suited for the milk production context in each province. For that reason, most of the PRPs used have been based on experts' judgement and on our own knowledge of the Canadian dairy sector and agricultural production.

Primary data were used to assess dairy farms' behaviors and practices. To do so, questionnaires were sent to 817 milk producers located in six (6) provinces: Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, and Alberta. The indicators in Table 4 above were at the basis of the questionnaire, together with traditional socioeconomics variables qualifying the farm. The participation in the survey was on a voluntary basis,⁵ and various techniques were used to distribute the questionnaires. In Quebec and New Brunswick, the producers participating in the annual cost of the production study carried out by the AGEKO team were asked to complete a complementary questionnaire between September and November 2011. In Ontario, Nova Scotia, and Alberta, questionnaires were sent to all dairy producers, all of whom were offered \$20 in compensation for sending back the completed form between March and June 2012. Three hundred (300) completed questionnaires were received. Both the sample's size and the characteristics (number of cows, ownership, cultural practices, etc.) of the participating dairy farms in each province fairly well reflect the population they represent.

The data collected at the provincial level have been pooled and weighted at a national level to assess the average Canadian dairy farmers' socioeconomic performance. Weighting was necessary because the provincial samples were not of relative equivalent size, and the Canadian average score has been determined by compiling, for each indicator, farmers' individual answers. In case of a missing value for a particular question, this was taken into account by an adjustment of the size of the sample when calculating the mean. Then, the weight of each individual answer was established according to the relative size, in terms of number of dairy producers, of the respective province.

2.3 The Potential Hotspot Analysis: The Generic Part of the Study

The PHA aims to provide a screening of the socioeconomic performance of the companies involved in the product system. This assessment uses generic data, i.e., data that are not site-specific, and it is therefore easier to run than a Specific Analysis.

⁵ Surveys were sent in provinces where at the beginning of the project the board showed an interest in participating in the data collection process.

The PHA assesses the risk of encountering behaviors going against accepted social norms among businesses that are part of the system's supply chains (upstream system). More specifically, this assessment method allows identifying *potential socioeconomic hotspots*,⁶ i.e., the presence of risky behaviors that might negatively impact groups of stakeholders. A PHA therefore provides a preliminary overview of the social issues found among a product's supply chains to bring awareness of the socioeconomic risks related to current procurement practices and to point out issues requiring deeper analysis. It was carried out through the combination of literature survey, consultation of specific sources of information (such as Web sites) and of using the Social Hotspot Database (SHDB), a database that was under development when the study was being conducted.⁷

As for the Specific Analysis framework, the PHA framework is built upon the UNEP/SETAC's Guidelines, which have been adjusted to be operationalized.

The stakeholder categories considered in the PHA framework are the same as those considered in the Specific Analysis: *workers, local communities, society, and value chain actors*. The "consumers" category is also excluded, as they are not significantly and directly impacted by the behavior of the assessed businesses operating upstream in the milk's value chain.

2.3.1 Impact Subcategories

The PHA assesses the possibility of encountering risky behaviors according to a list of issues of concern (impact subcategories) related to a particular stakeholder category. While most issues are drawn from the UNEP/SETAC's Guidelines, some adjustments have, however, been made in the context of the PHA.

Since the PHA framework is developed to cover a vast array of organizations operating in various countries, impact subcategories have not been adjusted to take into account specific sectorial or regional issues of concern. The reasons that subcategories have been removed or adjusted are rather related to methodological concerns. In some cases, it is due to the lack of relevant generic data necessary to assess a particular issue. Some subcategories have also been removed because they

⁶ In the Guidelines (UNEP/SETAC 2009), a social hotspot is defined as an activity "located in a region where a situation occurs that may be considered as a problem, a risk or an opportunity, in function of a social theme of interest". As suggested by Parent et al. (2012) "for the sake of consistency in the use of concepts in LCA and SLCA, social hotspots are therefore defined as areas where an improvement is required. This definition is also more consistent with the hypothesis that an organization uses SLCA to enhance enterprises' behaviors as a way to reach the ultimate goal of improving social conditions along the product life cycle, as implicitly suggested in the Guidelines". National and regional context influences businesses' behaviors, but at the end it is those behaviors that are of interest. Therefore, a country's situation is considered to be a factor influencing the possibility of encountering—or not—companies behaving in such ways that they can cause negative social impacts.

⁷ The Social Hotspot Database is now fully operational and can be accessed at www.socialhotspot.org.

are not related to risky behaviors that could negatively impact individuals (e.g., social benefits and social security or end-of-life responsibility). When possible, those subcategories have been adjusted (or reworded) to cover social risks rather than benefits (e.g., “social benefits and social security” has been replaced by “employment insecurity”). Finally, some have been merged not only because of their similarities, but also because the subtlety between them could not be adequately captured by the PHA methodology (e.g., access to material resources, access to immaterial resources, delocalization, and migration and cultural heritage have been merged).

To perform a PHA it is first necessary to identify and localize the companies involved at each step in order to document their behaviors afterwards. The product system defined earlier identified nine (9) main supply chains associated with milk production. Each supply chain has been defined by identifying only one or two representative inputs and by limiting its range up to the last identifiable major auxiliary input.

In order to assess the presence of potential social hotspots, the PHA refers to proxies such as representative sectorial practices or frequently observed behaviors, informing on businesses’ behaviors. According to Macombe et al. (2010), “companies belonging to one industry tend to become similar with time.” Therefore, one can assume that the information gathered at a sector or industry level is a representative proxy of individual behaviors of the companies operating in that sector or industry.

Moreover, given that the legal and cultural context can influence businesses’ behavior, it is also important to specify where the companies, sectors or industries assessed carry their operations. As one product or input supplied to the Canadian market can come from several countries, only the main or outweighing sourcing countries for each input have been taken into consideration, in line with Bienge et al. (2010). As a consequence, the possibility of encountering businesses behaving inappropriately (or in a risky way in comparison with the commonly accepted social norms) has been assessed, at each step of each supply chain, at the sector level and in the different countries where the companies are supposed to carry out their activities.

For this purpose, the relevant representative sourcing regions have been specified. To do so, the relative weight of imports, compared to the domestic consumption level, has been calculated to make, first, an assumption on whether the supply of each input is mostly ensured by the domestic market or by a foreign one.⁸

⁸ An activity was considered to be taking place fully abroad when, for a given input, imports accounted for 60 % or more of the total domestic consumption. The same activity was considered to be taking place fully in Canada when the import level accounted for 40 % and less of the total domestic consumption. When the import level was similar to the domestic production level, the activity was considered as taking place in Canada as well as abroad. Data were collected in the Canadian Trade, by industry database (data for 2010 were collected online from the Canadian Industry Statistic database between February and June 2012 [<http://www.ic.gc.ca/eic/site/tdo-dcd.nsf/eng/Home>]). Data for 2009 were collected online between February and June 2012 from

Then, countries supplying the Canadian market have been identified using a trade database.⁹

2.3.2 Data Collection Process

The PHA approach relies on generic data and is thus dependent on their availability. In order to document potential risky behaviors among supply chains, three complementary data collection techniques were therefore used, depending on the information needed.

First of all, when available, data on potential behaviors in a *specific sector located in a specific country* have been collected from national and international statistical databases, country-specific human rights reports, and from a variety of other sources identified through a Web search and a literature review.

While data collected at the sector level are relevant proxies to document behaviors of specific companies, they are generally scarce. To fill in this gap, another proxy was used; it involved documenting behaviors of a *small sample of companies* belonging to the sector and localized in the country under assessment. Samples were built by identifying the major businesses operating in the sector/country under assessment by using, for example, the Canadian Industry Statistic database.¹⁰ Information on those businesses' behavior was also collected from human rights literature and other sources. The Business and Human Rights Resources Centre¹¹ collects articles on businesses' practices related to human rights issues, and Wikipedia also compiles information on social issues related to specific companies; those two sources were systematically used. As the goal of the PHA is to highlight the risk of encountering potential hotspots, it was not necessary to validate the collected information at the field level.

Finally, when no data were available, either at the sector level or by referring to the sample of companies, the social performance of the *country* was used as a proxy. It is acknowledged that the national context in which a business carries out its activities greatly influences its behavior (Macombe et al. 2010).

In summary, for each step of each supply chain under assessment, three proxies were used to collect data giving insight on the potential behavior of companies:

(Footnote 8 continued)

CANSIM, Table 379–0025. [<http://strategis.ic.gc.ca/eic/site/cis-sic.nsf/eng/Home>]. Data for 2007 collected online in February [<http://www5.statcan.gc.ca/cansim/a01?lang=eng>] from CANSIM.

⁹ Only countries holding a share of 30 % or more of the total value of imports have been included in the system. Data were collected in the Canadian Trade See above by industry database (data for 2010 were collected online between February and June 2012 [<http://www.ic.gc.ca/eic/site/tdo-dcd.nsf/eng/Home>]).

¹⁰ Canadian Industry Statistics (CIS). Hosted by Industry Canada, available online [<http://strategis.ic.gc.ca/eic/site/cis-sic.nsf/eng/Home>], accessed from February to May 2012.

¹¹ Business and Human Rights Resource Center, online library available [<http://www.business-humanrights.org/>], accessed from March to June 2012.

1. Sectorial data;
2. Information related to the behavior of a sample of representative businesses; and
3. Country-level data.

2.3.3 Impact Assessment Method

This section details how the possibility of encountering companies not behaving in compliance with accepted social norms was assessed. As for the Specific Analysis, each issue of concern was assessed using an assessment method. Since the PHA relies on generic data, the method varies according to their availability. For some issues of concern, it was possible to document behaviors at a business or sectorial level. For others, information was only available at a national level. Depending on sources, quantitative, semi-qualitative and qualitative data have also been used. But in all cases, the assessment was carried out using a standardized three-level evaluation scale assessing the possibility (low, moderate, high) of encountering companies with risky behavior, i.e., not behaving in compliance with the accepted social norms (Table 5).

The following tables describe the method used to assess the possibility of encountering enterprises with non-complying behaviors for each issue of concern, depending on how the indicators have been documented. When more than one source of data could have been used to assess the level of risk related for a same issue of concern, only the most relevant, i.e., the most closely related to the sector, was used. Sector- specific data, as well as data collected through a sample of companies, have been favored because they constitute better proxies of businesses' behavior than country-level data. We relied on a country-level indicator only when no sectorial data were found using available statistical databases or a Web review. But given the current scarcity of information regarding companies' or sectors' behavior, the assessment relied mostly on country level indicators.

2.3.4 Sectorial Data

The issues of concern have first been documented using sectorial data collected from three different sources. In the case of *fair salary*, *working hours* and *occupational health and safety*, statistical data at the sector level have been used to assess the possibility of encountering social hotspots. Table 6 describes the indicators developed as well as the PRPs considered to assess the level of risk.

The issues of freedom of association and collective bargaining, child labor, working hours, forced labor and occupational health and safety have also been

Table 5 Risk evaluation scale




		
Low possibility	Moderate possibility	High possibility

Table 6 Risk evaluation scale

Workers		
Fair salary		
Adequacy of the median salary	Description	The possibility of encountering businesses offering an inadequate median salary is based on the comparison between the median salary of the sector and half the median salary at the national level
	PRP	50 and 60 % of the national median salary
	Rationale/ commentary	This indicator is derived from the International Labor Organization (ILO) works, suggesting that a salary being half of the national median is inadequate (Anker et al. 2002). When the median wage was not available, the average wage was used
	Data sources	National and international statistical databases
	Evaluation scale	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>		The sectorial median salary is between 50 and 60 % of the national median salary
<input type="checkbox"/>		The sectorial median salary is >60 % of the national median salary
Working hours		
Excessive hours of work	Description	The possibility of encountering excessive weekly hours of work, i.e., more than 48 h/week, was assessed using the occupational hours of work per country published in the October Inquiry statistics gathered by the ILO (the more recent data available are for 2008)
	PRP	48 and 45 h/week
	Rationale/ commentary	This indicator is based on the international standards set by ILO convention C-01, art. 2 (ILO 1919), stating that working more than 48 h/week is excessive. In this analysis, working more than 48 h/week was considered as a high risk of hotspot and 45 h as a moderate risk. As the database provides the weekly hours of work for a variety of occupations in a same sector and that here we are interested in the risky behaviors in a sector, the occupation with the longer weekly hours of work was used
	Data sources	The possibility of encountering excessive weekly hours of work, i.e., more than 48 h/week, was assessed using the occupational hours of work per country published in the October Inquiry statistics gathered by the ILO (the more recent data available are for 2008)
	Evaluation scale	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>		Occupational hours of work are ≥45 and ≤48
<input type="checkbox"/>		Occupational hours of work are <45

(continued)

Table 6 (continued)

Workers			
Fair salary			
Occupational health and safety			
Rates of fatal and non-fatal injuries	Description	The possibility of encountering unsafe and unhealthy practices was assessed on the basis of the average rates of fatal and non-fatal occupational injuries at the sectorial level. They have been compared to the average rates of the various sectors in a country	
	PRP	National average rates of fatal and non-fatal occupational injuries	
	Rationale/commentary	The statistic collected by the International Labor Organization (ILO) on rates of fatal and non-fatal occupational injuries were used. The rates were not compared between countries, since “varying reporting formats hamper the comparability of the data” (Anker et al. 2002). Comparing sectors in a same country is, however, expected to minimize this bias	
	Data sources	International database (Laborstat)	
	Evaluation scale	<input checked="" type="checkbox"/>	Rate of fatal injuries is above country average
	<input checked="" type="checkbox"/>	Rate of non-fatal injuries is above country average	
	<input type="checkbox"/>	Rates of fatal and non-fatal injuries are below country average	

assessed at the sector level using information found in two human rights reports: the US Department of State Country Report on Human Rights (U.S. Department of State 2011), and the Annual Survey of Violations of Trade Union Rights 2011 (ITUC et al. 2012). The qualitative information provided in those reports has been used to assess the possibility of encountering violations in the sectors under assessment.¹² The assessment method used to differentiate the risk level relied on our expert judgment. For a matter of transparency, this judgment is always justified in the “detailed justifications” sections found in Appendix J of the full report.

Finally, a web search has been conducted to document all issues of concern at a sector and country level. The collected information was assessed based on our expert judgment and transparently detailed in the “detailed justifications” sections found in Appendix J.

¹² Except for the US, as no report on human rights is available. The issues of concern (freedom of association and collective bargaining, child labor, working hours and forced labor) were assessed at the country level when no better information was found through the web and libraries search.

2.3.5 Data Collected from a Sample of Businesses

To complement the sectorial data, a review of the available publications was conducted to document, for each issue of concern, the potential risky behaviors of the main companies involved in the sectors and regions under review. This review focused on the criticisms directed towards the businesses included in the sample for practices going against accepted social norms. Here again, the collected information was assessed based on our expert judgment and transparently detailed in the results sections.

2.3.6 Country Level Data

Finally, for issues that could neither be documented through the sector-level assessment nor through the sample of businesses, country-level data were used. The possibility of encountering companies behaving inappropriately compared to accepted social norms was assessed using social indicators selected from several sources.¹³

Three main sources of data have been used:

- The World Economic Forum's (WEF) annual Executive Opinion Survey, whose results are published in *The Global Competitiveness Report 2011–2012* (WEF 2011);
- The SHDB; and
- a variety of other sources, such as the GINI and the Corruption Perception Index.




Some issues of concern were assessed using data collected from the WEF Annual Executive Opinion Survey. This survey, published in *The Global Competitiveness Report 2011–2012* (WEF 2011), asks business executives about the situation in their respective countries regarding several socioeconomic issues, some of them similar to those addressed in the PHA. For each issue, the survey respondents' opinion was scaled from 1 to 7, with 1 representing the worst situation and 7 the best; the score represents the average opinion.

Table 7 lists the WEF indicators to which we referred in the PHA. The assessment method, which is similar for all indicators, is described below.

Table 8 presents the list of indicators selected from the SHDB, which is being developed to support SLCA practice. Only the "workers" stakeholder category is evaluated using the SHDB indicators. The SHDB offers a risk assessment analysis at the country level. The evaluation scales come from the SHDB: Risk and

¹³ The Task Force for the integration of social aspects to LCA has gathered a broad range of national data sources in their Methodological Sheets (Benoit-Norris et al. 2011). Indicators that could apprise a possibility of encountering businesses not behaving in compliance with accepted social norms were selected through a review of those sources.

Table 7 Indicators of the WEF annual executive opinion survey

Subcategories assessed by the WEF		
Stakeholders	Subcategories	WEF indicators
Workers	Freedom of association and collective bargaining	Cooperation in labor-employer relation
	Employment insecurity	Hiring and firing practices
Society	Secure living conditions	Reliability of police services
	Corruption ^a	Transparency of government policymaking Ethical behavior of firms
Value chain	Fair competition	Effectiveness of anti-monopoly policy
	Respect of intellectual property rights	Intellectual property protection
Evaluation scale ^b		The survey result is >5
		The survey result is ≥3 and ≤5
		The survey result is <3

^a When the two WEF indicators for corruption did not yield the same result, the level of risk was determined based on our expert judgment. Justification is provided in the “Detailed Justifications” sections in Appendix J

^b The scale is reversed for “hiring and firing practices” for which the best situation is ease in hiring and firing. We interpreted it as a threat to employment security. The scale is also slightly modified to better represent the different levels of probability: >6 is a high risk, between 4 and 6, a moderate risk, and below 4, a low risk

Opportunity Table Development document (Benoît et al. 2010). Data sources are not listed in the present document but can be found in Benoît et al. (2010).

Finally, Table 9 presents a list of country level indicators selected from various sources. Issues of concern related to the stakeholder categories *Local community* and *Society* are evaluated using these indicators. The PRP and the scales of evaluation are also presented.

All these indicators in Tables 7, 8 and 9 were documented and assessed. However, they were aggregated in Table 11, as indicated later, but the detailed results are published in the 50-page Annex J of the full report.

3 SLCA Results

The socioeconomic performance of the Canadian milk production sector will therefore be analyzed in two ways: (1) at a specific level by describing the dairy farms’ level of social engagement on the one hand, and (2) at a generic level by providing a preliminary overview of the social risks (potential hotspots) related to the sector’s supply chains on the other.

Table 8 Indicators selected from the social hotspots database

Workers			
Working hours			
Risk of population working more than 48 h/week	Description	The possibility of excessive hours of work is based on the percentage of the population working more than 48 h/week (when quantitative country data were available) and/or on qualitative description of some criteria	
	PRP	Percentage of a country population working more than 48 h/week	
	Evaluation scale	<input checked="" type="checkbox"/>	>25 of the population ^a
		<input checked="" type="checkbox"/>	10–25 % of the population
<input type="checkbox"/>		<10 % of the population	
Risk of population working more than 48 h/week	Description	The possibility of excessive hours of work is based on qualitative description of some criteria	
	PRP	Presence of laws, proofs of enforcement or violations	
	Evaluation scale	<input checked="" type="checkbox"/>	If more than one “medium” issue exists
			If laws are “frequently not enforced”
		<input checked="" type="checkbox"/>	If no laws exist for compulsory overtime or compensated overtime
			If only domestic workers work overtime
			If only formal sector abides by laws
		If foreign workers do not have adequate labor laws	
<input type="checkbox"/>	If laws are not “actively enforced”		
	<input type="checkbox"/>	Laws are enforced and overtime is compensated	
Forced labour			
Risk of forced labor	Description	The possibility of encountering forced labor in a country is based on qualitative description of the situation regarding this issue	
	PRP	Importance of the evidence	
	Evaluation scale	<input checked="" type="checkbox"/>	Forced labor is indicated in 2 or more of the main resources or, if only one source is available, the evidence is very compelling
		<input checked="" type="checkbox"/>	Forced labor is indicated in one of the main sources
<input type="checkbox"/>		From available sources, risk of forced labor seems low as there is minimal evidence as such	

(continued)

Table 8 (continued)

Workers			
Working hours			
Equal opportunities/discrimination			
Overall fragility of gender equity	Description	The possibility of encountering non-compliance with the right to equal opportunities is represented by a composite index on gender inequity. In the SHDB, the risk of gender inequity in a country is based on a weighted mean of five gender equity indicators derived from different data sources (see Benoît et al. 2010): the “Social Institutions and Gender Index (SIGI)” (30 %), the “Global Gender Gap (GGG)” (30 %), the CIRI (20 %), the GDI (10 %) and the GEM (10 %)	
	PRP	Interval throughout the scores of the composite index	
		■	>2,3 ^b
		■	1,3–2,3
		□	<1,3
Child labour			
Risk of child labor	Description	The possibility of child labor is based on the population of children working over the entire population of children in a country	
	PRP	Interval in percentage of children working	
	Evaluation scale	■	>10 ^c
		■	>4–10 %
□		<4 %	

^a The scale used in the SHDB has 4 levels: low (<10% of the population), moderate (10–25% of the population), high (25–50% of the population) and very High (>50% of the population). We aggregated the «high» and «very high» levels in order to be consistent with our evaluation scales. When the SHDB attributes a very high score for a specific country, this will be mentioned in the results section.

^b The scale used in the SHDB has 4 levels: low (<1,2), moderate (1,3–2,3), high (2,3–3,3) and very high (<3,3). We aggregated the “high” and “very high” levels in order to be consistent with our evaluation scale. When the SHDB attributes a very high score for a specific country, this will be mentioned in the results section

^c In the SHDB, the scale for the risk of child labor has 4 levels: low (<4%), moderate (>4–10 %), high (>10–20 %) and very High (>20 %). We aggregate high and very high in order to be consistent in our evaluation scale. However, when the SHD attributes a very high score for a specific country, this will be mentioned in the results section

3.1 Socioeconomic Performance at the Dairy Farm Level

Figure 3 shows the average socioeconomic performance of the Canadian dairy farms towards their stakeholders, i.e., the farm workers, their local communities, the society and the value chain actors—i.e., their suppliers and business partners (including the consumers). Each circle represents a level of the social responsibility

Table 9 Indicators selected from a variety of sources

Local community			
Delocalization and migration			
Centre of housing rights and evictions (COHRE)	Description	The possibility of impairment to the access to material or immaterial resources is based on the presence or absence of the country in the reports database of the Centre of Housing Rights and Evictions (COHRE) and the likelihood that a violation could be related to an economic activity (potentially found in the life cycle of a product)	
	PRP	Presence of a country in a database; experts' judgment on the possibility that the violation can be related to an economic activity	
	Evaluation scale	<input checked="" type="checkbox"/>	The violations mentioned are related to an economic activity (other than war or politics)
		<input checked="" type="checkbox"/>	The country is in the COHRE database
<input type="checkbox"/>		The country is not in the COHRE database	
Indigenous rights			
Violations in human rights reports	Description	The possibility of encountering cases of non-respect of indigenous rights is based on the presence of violations reported in two human rights reports: the US Department of State Country Report on Human Rights (2011), and the State of the World's Human Rights Country Report of Amnesty International (2011)	
	PRP	Presence and importance of the evidence	
	Evaluation scale	<input checked="" type="checkbox"/>	There is at least one mention of violations of indigenous rights in the US Department of State Country Reports or the State of the World's Human Rights Country Report of Amnesty International reserves a section for the indigenous issue
		<input checked="" type="checkbox"/>	There are mentions of poor living conditions of the natives without specific violations of indigenous rights in any of the reports
<input type="checkbox"/>		There is no mention of concerns related to indigenous people in any of the reports	
Society Corruption			
Corruption perception index	Description	The possibility of encountering corruption is based on the Corruption Perception Index (2010), which is a measure of the perceived level of corruption in the public sector of a country by business people. The lower the score, the higher the perceived level of corruption	
	PRP	Interval in the index scores	
	Evaluation scale	<input checked="" type="checkbox"/>	<3
		<input checked="" type="checkbox"/>	≥3 to <6
<input type="checkbox"/>		≥6	

(continued)

Table 9 (continued)

Local community			
Delocalization and migration			
Fair distribution of revenues			
GINI	Description	The GINI Index is an index of the equity in the distribution of wealth where 0 is a completely equal distribution and 100 a totally unequal distribution. The GINI is used here as a proxy of the distribution inside the enterprises of a country. Data comes from the World Fact Book of the US Central Intelligence Agency (CIA)	
	PRP	Interval in the GINI scores	
	Evaluation scale		GINI ≥ 50
			GINI ≥ 30 et < 50
		GINI < 30	

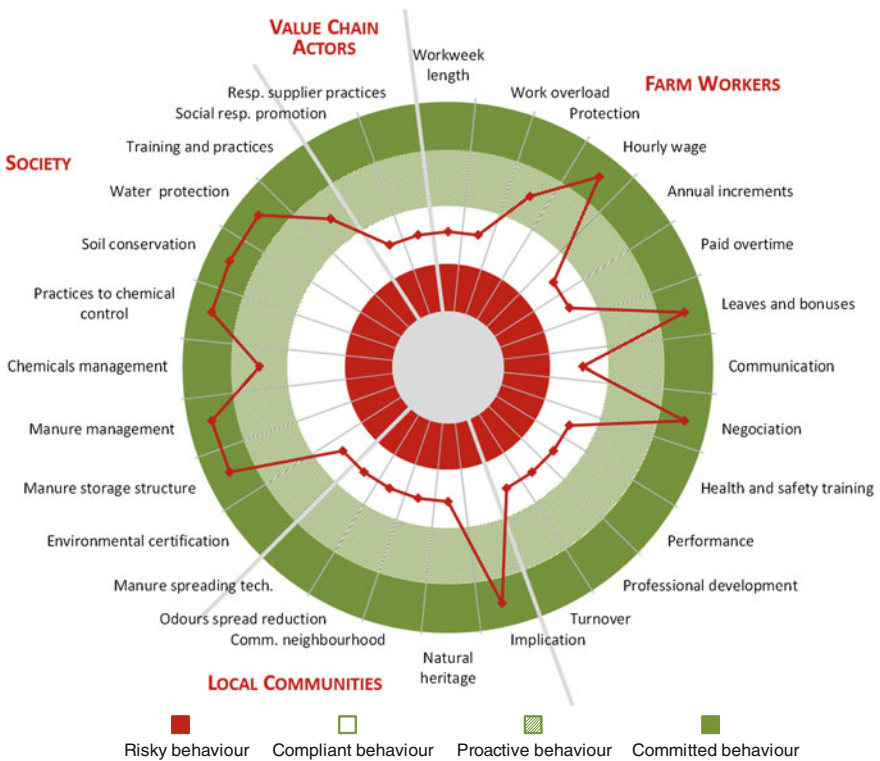


Fig. 3 Socioeconomic performance of the Canadian dairy farms

evaluation scale, going from “risky behavior” in red to “committed behavior” in dark green. The red line represents the average socioeconomic performance of the Canadian dairy farmers according to each indicator. The closer the red line is to the outermost circle, the better the sector’s average socioeconomic performance, with a leading socially responsible behavior.

Canadian dairy farms have a positive socioeconomic performance globally. That is the case, for instance, for the agroenvironmental practices, whether it concerns water source protection, manure storage, or soil conservation. If this commitment is obvious from an environmental point of view, it is also significant in a socioeconomic perspective, as it also meets the Canadian society’s expectations.

The dairy farmers’ engagement towards their local community is also significant, with the vast majority involved in their communities in many different ways. More could be done, however, in terms of cohabitation, with more producers adopting practices—for instance, in minimizing odor propagation.

The picture is also contrasted with regard to farm workers. Although dairy farmers provide overall working conditions that go beyond the labor standards—to which they are mostly not legally subjected—there is still room for improvements regarding various issues such as professional training and communication of working conditions. The same holds true with respect to their suppliers and business partners, since a majority of dairy producers do not usually consider their suppliers’ performance with regard to social responsibility in their procurement decisions.

The average performance of the Canadian dairy farmers, as seen before, can hide some variability within the sector. For a given issue of concern, some producers might have a proactive or committed behavior where others will only comply with the expected social norms, as is the case with the odors spread reduction practices. This variability suggests that there is always room for improvements, since the average socioeconomic performance can be improved and, when already committed, reinforced, as more dairy producers could adopt some more socially responsible practices. Moreover, since today a committed behavior could become a minimal expectation in the future, a continuous engagement from all the producers is also advisable in order to improve, but also to preserve, the sector’s socioeconomic performance over time.

This variability is shown in Table 10. For each indicator, the average score is presented according to the evaluation scale used, as well as the variability of the practices and behaviors documented.

The “Variability” column presents the relative share of answers that correspond to each possible value and the “average performance” column shows where the “mean” value is, via an arrow. The color code is as described earlier in the document:

- : risky behavior; : compliant behavior; : proactive behavior;
- : committed behavior; ✕: non-available evaluation level.

Table 10 The average socioeconomic performance of the Canadian dairy farms

Farm workers		Variability	Average performance
Working hours	Workweek length		
	Work overload		
Social benefits	Scope of protection		
Salary and contribution to fringe benefits	Average hourly wage of workers		
	Annual increments		
	Paid overtime		
	Leaves and bonuses for statutory holidays		
Working conditions transparency	Communication of working conditions		
	Negotiation of working conditions		
Health and safety	Health and safety training		
Professional accomplishment	Performance		
	Professional development		
	Turnover rate		
Local community			
Community engagement	Implication within the community		
Natural and built heritage	Preservation of natural and built heritage		
Cohabitation	Communication with the neighbourhood		
	Odours spread reduction		
	Manure spreading technology		
Society			
Commitment to sustainability issue	Environmental certification		
Agroenvironmental practices	Manure storage structure		
	Manure management		
	Chemicals management		
	Alternative practices to chemical control		
	Soil conservation techniques		
Animal welfare	Water sources protection		
	Training and practices		
value chain actors			
Responsible procurement practices	Effort to promote social responsibility		
Responsible supplier practices	Practices ensuring the products' quality		

3.2 *The Potential Hotspots Analysis Results*

Although this SLCA is primarily aimed at assessing the socioeconomic performance of Canadian milk at the farm level, the study also looked at the potential social risk in the suppliers upstream of the dairy sector, such as manufacturers of machinery, fertilizers, pesticides, or pharmaceuticals.

The PHA has been conducted over nine supply chains in order to assess, by using generic data, the possibility of encountering risky behaviors among the businesses involved at each stage.

The detailed description and evaluation of these risks can be found in Appendix J of the full report. This section presents the overall results and discusses their implications for the Canadian dairy sector.

Table 11 presents the *aggregated results* as well as the main potential hotspots related to the Canadian dairy sector's supply chains. The results have been aggregated for simplification, by measuring the average risk related to each stakeholder category, given the score attributed to each associated issue of concern. No weighting method has been used between the issues of concern or the regions, when it was applicable.

Globally, this preliminary overview indicates that most supply chains show low social risk. With the main suppliers located in Canada or the United States, the prevalence of social hotspots is generally lower than in countries such as China. Yet there are some socially troubling practices occurring upstream in the sector's supply chains, beyond the first-tier suppliers (which were not covered in this study). Among the most troubling practices are corruption, unsafe working conditions, non-respect of indigenous rights, and unfair competition.

This is, for example, the case in the fertilizer and oil extraction industries, where it was possible to document disturbing practices of collusion as well as bankrolling techniques from subsidiary companies of some major players. Potential hotspots were also identified in the Canadian grain and oilseed sector with regard to working conditions, as workers are generally not protected by labor standards. The analysis also brought up public health issues, as well as conflicts of use of natural resources related to many industries, among them the pesticides and pharmaceutical sectors.

Unfortunately, the use of generic data does not allow having a precise and detailed analysis of the actual hotspots occurring in the supply chains. Manufacturing information is only available at a national level, for instance, and is hence characterized by a high level of uncertainty regarding the actual behaviors of the businesses operating there. Furthermore, many of the identified hotspots are related to companies, sectors or regions located far upstream and on which the Canadian dairy sector has little power to influence.

The objective of this PHA was, however, to provide a preliminary overview of the social issues found among a product's supply chains in order to bring awareness of the socioeconomic risks related to current procurement practices and to point out issues requiring deeper analysis. In a social responsibility perspective, it is important for the Canadian dairy farmers—as well as for their organizations—to

Table 11 Aggregated results and main potential hotspots related to the Canadian dairy sector's supply chains^{a, b}

Supply chains	Aggregated results				Main potential hotspots
	W	LC	S	VCA	
Retail and wholesale	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	There are no major hotspots identified at this stage of the supply chain, apart from the relatively high rate of non-fatal occupational injuries occurring in this sector and the rapid concentration taking place in the farm retail sector, which could lead to a decreased level of competition
<i>Fertilizer manufacturing</i>					
Extraction	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The PHA indicates that there are some preoccupying situations occurring in the fertilizer sector. There are, for instance, some hotspots related to the working conditions and in particular with the occupational health and safety and working hours issues, especially in the Canadian and US mineral extraction sector. Also relating to the mineral extraction activities, it was possible to document criticisms addressed to the mining industry in Canada and the United States with regard to the safe and healthy living conditions issue. More preoccupying are, however, the documented behaviors regarding the implication of some major fertilizer manufacturers in armed conflicts and corruption practices in North America and abroad. While these documented behaviors are localized and isolated, they suggest that they might be more widespread in this industry
Gas distribution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Manufacturing	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Pesticides	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	There are some disturbing hotspots identified in the pesticides system. Among them are the documented cases of contamination in the US and abroad from major pesticides manufacturers, which impacted the health and safety of a vast number of individuals. Similarly, there are preoccupying incriminations hanging over some major companies for their involvement in armed conflicts, in addition to proven practices of corruption, falsified entries and bribing. Here, again, these documented practices are isolated, since they are related to specific actors and circumstances. However, given that the six main companies operating in this sector own 85 % of the market worldwide, such behaviors can be more widespread than this assessment infers

(continued)

Table 11 (continued)

Supply chains	Aggregated results				Main potential hotspots
	W	LC	S	VCA	
Seeds	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The main potential hotspots related to this input are associated with issues related to local communities. The PHA documented, for example, a contrasted situation regarding the responsibility of the agribusiness sector in general and the seed breeding companies in particular towards the food (in)security issue. Similarly, the assessment suggested the possibility of encountering risky behaviors related to the protection and preservation of the cultural heritage, as well as a risk of encountering behaviors negatively impacting the living conditions of a local population. There are also preoccupying indications that the seed breeding sector is evolving in a non-competitive market and that its main operating companies adopt unfair behaviors against each other and their clients
<i>Animal feed</i>					
Feed manufacturing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	As discussed in the Specific Analysis, agricultural workers in Canada are, depending on the region where they work, partially or totally excluded from the labor standard’s provisions. This—makes them more vulnerable to abuse or potential risky behaviors. The main hotspots documented are consequently related to this stakeholder category. For example, the salary and working hours issues at the farm level are both related to moderate hotspots based on the assessment framework used in this PHA. The same can be said with regard to the occupational health and safety issue, given that the grain production and feed manufacturing sectors, are characterized by significant and documented risks
Additives and supplements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Grain production	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Medicines and vaccines	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	There are no major hotspots identified in the medicines and vaccines supply chain. The main issues are globally related to the lobbying efforts of the main companies operating in this sector ,whether to protect their markets by jeopardizing the efforts made to facilitate the access to cheap generic medicines, or to promote politically their interests with politicians
Bovine semen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is no significant hotspot specifically related to this supply chain

(continued)

Table 11 (continued)

Supply chains	Aggregated results				Main potential hotspots
	W	LC	S	VCA	
<i>Agricultural machinery</i>					
<i>Machinery manufacturing</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The PHA raised several hotspots regarding the agricultural machinery sector and supply chain. Most of them are isolated and are related to a specific business in a particular region. There are, however, some more preoccupying ones. The occupational health and safety of workers operating in the steel production and recycling sector is, for instance, still characterized by the high level of fatal injuries, despite all the efforts made by this industry to improve the situation. Among the other hotspots are some preoccupying practices with regard to land appropriation, as well as to environmental damages caused by the pollution generated by steel plants activities
<i>Steel production and recycling</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Trucks and trailers manufacturing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is no significant hotspot specifically related to this supply chain
<i>Fuel and diesel</i>					
Fuel distribution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The PHA indicates that there are many potential socioeconomic hotspots related to this input, and at all stages of the supply chain. Regarding the workers category, the PHA has documented, for example, moderate and high possibilities of encountering impairment to the rights of freedom association and of collective bargaining at the step of oil extraction in Algeria and Kazakhstan. The same is true regarding the child labor issue. The overall working conditions in the oil extraction sector, especially Algeria and Kazakhstan, are in fact preoccupying. Local communities are also affected by this industry, with its activities impacting the health and safety of local populations as well as limiting and degrading their access to natural resources. Numerous lawsuits have been launched against oil companies, in Canada and abroad, regarding these issues. Potential social hotspots are also significant on a societal perspective, as major companies operating in this industry are involved in serious controversies related to armed conflicts and corruption practices
Petroleum refining	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Oil extraction	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

^a Risk evaluation scale Low possibility; Moderate possibility; High possibility

^b These are aggregated scores measured by calculating the simple average of all scores related to a specific stakeholder category, regardless of the region. No weighting was used. This aggregation is for simplification purposes only. The detailed evaluation is available in Appendix J of the full report

consider not only the risks but the potential socioeconomic consequences related to their sourcing practices as well. By getting involved and by considering environmentally and socially responsible criteria in their procurement practices, the Canadian dairy sector could improve the overall socioeconomic performance of milk production in a life cycle perspective. This assessment can be seen as a starting point in this direction.

4 Discussion: Advantages, Limitations and Challenges Faced

As one of the first SLCAs conducted after the publication of the UNEP-SETAC guidelines in 2009, this project has been the opportunity for developing an innovative methodology to assess the socioeconomic performance of a product in a life cycle perspective. We strove to develop a rigorous, transparent, replicable and evolutive assessment methodology to enhance the SLCA development and facilitate its wider use. To do so, we relied on a few guiding principles that we still follow today: operationalization, readability, usefulness, and participation.

However, this context of novelty was also the first challenge that we faced. There were not many practical studies to use as a model, and the guidelines were vague on many aspects (Blom and Solar 2009; Revéret and Parent 2012, 2013). As Feschet (2014) explains, we could see that some researchers were promoting an impact pathway approach to SLCA and others a social responsibility approach and performance-based SLCA. Macombe and Falque (2013) identify this second category as “life cycle corporate social responsibility.” Although we understand and accept that measuring a company’s social performance is not an endpoint measurement of the social impact that we are interested in, we considered the fact that there are solid hypotheses on the causal relationship between adopting good practices and generating a positive impact. Therefore we made the choice to develop an approach based on PRP, which was later adopted in other studies conducted by our team and also by others. We note that the recently published *Handbook for Product Social Impact Assessment* (2014) also promotes an approach based on PRPs (Goedkoop 2014). However, it remains important to develop a better understanding of the pathways that link company behaviors to social impacts so that SLCA can make use of these relations to measure accordingly the positive and negative social impacts of products.

A second limitation of the guidelines that we faced was that not much was said about the linkages between environmental and SLCA when both were to be conducted simultaneously in a single study. Questions about the goal and scope, the limits of the system under study, and the still controversial question of the functional unit about whether or not it is relevant to use the same, when it is clear that the impacts as they are considered in an SLCA, are not quantified in a way that allows them to be reported per functional unit. This question of the quantitative versus qualitative nature of what is being observed is as present now as it was four years ago.

These differences—between the now classic environmental LCA and the newly born SLCA—were another source of debate. Although the development of SLCA was very much influenced by the parallel development of tools for CSR, such as ISO 26000 (performance-based, using similar categories of stakeholders, etc.), it was also firmly based on the ground of environmental LCA and on a similar logic. However, social issues are of a different nature than environmental ones, and are captured by different types of variables. Very often the more important aspects of social impacts are qualitative in nature, and the causal relationship with the product at the core of the study is not so clear; they are more related to the company's behavior than to the product itself. All these elements do not facilitate the integration into a tool that is designed for quantitative data with solid causal chains that can be accurately and mathematically modeled—all of which create obstacles in the development of an efficient interdisciplinarity.

Understanding that we would not be able to develop integration at a conceptual level, we at least made sure to develop a procedural integration in the way we worked with the environmental team from QUANTIS and CIRAIG. We developed the social system under study from that used for environment and adjusted it to the fact that our social study was conducted, as we saw, at two levels of precision—the first, a specific study at the farm level using primary data, and the second, searching for potential hotspots in the supply using secondary and generic data.

5 Conclusion

The purpose of this study was to profile the socioeconomic performance of ordinary Canadian milk. Using data from over 300 farms as well as provincial and national statistics, a regionalized characterization of average provincial scenarios allowed for a nationwide understanding and assessment of milk production. While variability in farm practices and results were discussed at every stage of the life cycle steps, and for the different socioeconomic indicators, it is important to remind the reader that such variability was evaluated only between the provincial averages, and, as such, does not come close to evaluating and understanding the variability between various farms. As a result, the current study provides an understanding of how various scenarios and locations affect the environmental profile of milk—without, however, being able to assess the potential by which best practices within one type of management can contribute to reducing the overall burdens. With respect to the assessment of the average socioeconomic performance of Canadian milk production, the study evaluated the Canadian dairy farmers and their boards at a national level, based on their degree of social engagement, and was not intended to assess the performance at an individual level.

It is clear from this assessment that Canadian dairy farms have an overall positive performance. It is also obvious, with respect to the agroenvironmental practices, whether concerning water source protection, manure storage, or soil conservation. The engagement of dairy farmers with their local community is also

significant, as the vast majority are involved in their communities in many different ways. More can be done, however, in terms of cohabitation, with producers adopting practices that minimize odors propagation.

The picture is also contrasted with regard to farm workers. Although dairy farmers provide overall working conditions that go beyond labor standards—to which they are mostly not legally subjected—there is room for improvements regarding various issues, such as professional training and communication of working conditions. The same holds true with respect to their suppliers and business partners, given that a majority of dairy producers do not usually consider their suppliers' performance with regard to social responsibility in their procurement decisions.

This suggests that there is always room for improvement, both now and in the future. For example, with more producers adopting more socially responsible practices, the average socioeconomic performance could be enhanced. Moreover, since a committed behavior today can become standard in the future, continuous improvement from all producers is also required, not only to improve, but also to preserve the sector's socioeconomic performance.

Finally, the study also looked at the social risk potentially present in the suppliers upstream of the dairy sector, such as manufacturers of machinery, fertilizers, pesticides, or pharmaceuticals. With the main suppliers located in Canada or the United States, the prevalence of social hotspots is generally lower than in countries such as China. The fact remains, however, that some risks seem present in a few links of the supply chains. This is the case in the fertilizer and oil extraction industries, for example, where it was possible to document disturbing practices of collusion as well as bankrolling techniques from the subsidiaries of some major players. Potential hotspots were also identified in the North American grain and oilseed sector with regard to working conditions, as they are generally not protected by labor standards. The analysis also brought up public health issues, as well as conflicts of use of natural resources related to many industries, among which are the pesticides and pharmaceutical sectors. Some links are also characterized by a lack of competition. Although the Canadian dairy sector has little power to influence these actors located far upstream, in a life cycle perspective, it falls under the responsibility of dairy farmers and their associations to get involved. This assessment can be seen as a starting point in this direction.

This SLCA and the environmental LCA were the first step towards engaging all stakeholders in a comprehensive sustainable development strategy. This assessment provides the Canadian dairy sector with an innovative, comprehensive and actionable roadmap to move in the direction of a more sustainable milk production in Canada. We should mention, as a practical recognition of the importance of the role of farmers, the Dairy Farm Sustainability Award, which was established in 2012.¹⁴ This competition promotes the recognition of Canadian dairy farmers that

¹⁴ <http://www.dairyfarmers.ca/what-we-do/programs/environment-and-sustainable-development/dairy-farm-sustainability-award>.

have adopted on-farm management practices that extend beyond standard industry practice and meet the objectives defined in the DFC's sustainability strategy.

Moreover, capitalizing on these results also depends on the extent of communication with involved parties, which is a crucial part of the next steps. In addition to the various academic conferences and the numerous webinars organized for farmers and their boards' representatives across the country, many communications documents based on the study were produced and are being used at the national and provincial levels. The model generated here can also serve as a basis for a self-assessment tool aimed at farmers, which could be improved to better identify best practices. Such a self-assessment tool is now under development as part of the next phase of the Dairy Research Cluster and will be soon implemented at the farm level.

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