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Implementation of a Cleaner Production Agreement and impact analysis in the grape brandy (pisco) industry in Chile

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ABSTRACT

The aim of this study was to determine the impact generated by the Cleaner Production Agreement signed in 2004 between the Pisco Sector of the Region of Coquimbo and the National Council for Cleaner Production. For this study, the pisco sector is represented by the Sociedad Agrícola Hacienda Mal Paso. The agreement considered actions associated with clean practices used in the production process, mainly the handling of waste products and the efficient use of water, among other variables. An econometric model was used to determine the incidence of the data gathered between the years 2006 and 2011. A low incidence of solid waste was found directly related to water resources during processing, demonstrating that the handling of liquid industrial waste, along with efficient use of water, are the factors having the greatest impact.

1. Introduction

A new production practice, called Cleaner Production, has been implemented for a number of years in the region of Coquimbo, with the aim of maximizing resources while at the same time decreasing emissions generated by production processes.

This research project was conducted in Sociedad Agrícola Hacienda Mal Paso, a pisco-producing company that has been implementing these cleaner practices stipulated in the Cleaner Production Agreement, an agreement signed between the Region of Coquimbo and the National Council for Cleaner Production. Evaluation of the agreement was conducted after the year 2008, only considering compliance of actions and goals, which have not yet been quantified for our purposes. It should be noted that only pisco will be analyzed, without considering other grape by-products, and only during the manufacturing process.

Cleaner production has been defined as "the continuous application of a preventive integrative environmental strategy for processing, products and services, so as to increase efficiency and reduce human and environmental risks" (Askounes, 1994). It advocates for a voluntary emphasis in the reduction of environmental damage, while at the same time reducing costs (Van Hoof and Lyon, 2013).

There have been many efforts to develop new models to motivate cleaner production (Dieleman, 2007), as well as to promote and implement cleaner practices (Berkel, 2007). Positive impacts have been recorded when these cleaner practices are implemented, both in efficiency and financial performance (Zeng et al., 2010). Cleaner production practices represent an important ally in the optimization of raw materials, and thereby in the conservation of economic resources (Varón et al., 2011), while at the same time achieving a decrease in supplies used and waste, resulting in the improvement of operations, the economy and the competitiveness of businesses (Medina and Medellín, 2006).

A number of countries have adopted the concept of cleaner production as a strategy to improve environmental performance (Kjaerheim, 2005). In Colombia, policies have been established in order to make cleaner production practices a driving force for development (Van Hoof and Herrera, 2007), identifying good practices in processes to reduce risks to human health and the environment (Pareja et al., 2010). Centers have also been created that are responsible for technology transfer to support sustainable production (Grutter and Egler, 2004).

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In order to accurately assess the real costs and benefits of implementing cleaner production practices, it is fundamental to use the proper evaluation methods that support decision-making processes (Bonilla el al., 2010). Diverse world-wide studies and analyses have been conducted in various industries, including footwear manufactures in Colombia (Londoño, 2010), a group of 71 Lithuanian companies in 18 regions (Kliopova and Staniskis, 2006), milk farms in Chile (Nahuelhual et al., 2009), and there have been many simulations using fuzzy logic to identify the efficiency status of cleaner production within a company (Rodríguez, 2009). In Denmark, fish processing plants have yielded reductions in the use of water as well as in wastewater (Thrane et al., 2009). In the province of Zhejiang, China, a program has been developed aimed at pilot companies whose main goal is to reduce pollution costs, improve environmental performance, as well as to build organizational skills. The implementation of this program has produced savings upwards of 1.1 million dollars (Hicks and Dietmar, 2007).

In New Zealand, one of the main research aims in the wine industry, which also uses grapes as raw material, has been to measure the environmental impact of the industry by analyzing the main waste products (pomace, lees and wastewater) (Barry, 2011). In 2011, Bosco et al. conducted a study in the wine industry to understand greenhouse gas emissions in Italy. In Spain, environmental impact was evaluated using the life cycle assessment, including economic and environmental indicators. Water use as a variable was not included in the study, since the author did not consider this factor to be important (Vázquez-Rowe et al., 2012). Rugani et al. (2013) has stated that recent research activity in the industry has been focused on improvement strategies regarding consumption of water and energy, pesticide use, and possible subsequent pollution effects. In Chile, a cleaner production agreement in the frozen fish industry in the Region of Bio-Bío, has yielded results that have led to the analysis of the main environmental issues (Bezama et al., 2012).

In 1997, Chile began the development of its national cleaner production strategy, originally headed by the Ministry of Economy, and subsequently by the National Council on Cleaner Production (CPL for its acronym in Spanish) in 2001. Recently, the CPL established its cleaner production agenda towards 2020 (CPL, 2012a).

The National Council for Cleaner Production is defined as a platform for open dialog and collaborative action between the public sector, companies and their workers, with the aim of disseminating and focusing environmental management on the prevention of pollution rather than on controlling the end result. A cleaner production agreement (CPA) is defined as a voluntary management tool, based on an agreement between a specific productive sector and the public sector, and looks to implement cleaner production through specific goals and actions within a determined period of time (CPL, 2012b).

The cleaner production agreement in the pisco industry came into effect in La Serena in the year 2004, between the Pisco Sector, represented by the Association of Pisco Producers (APP) in their capacity as a union, and diverse institutions such as the Regional Government, the Ministry of Economy and Energy, the Ministry of Health (MINSAL), Chile's Agriculture and Livestock Service (SAG), the Office of the Superintendent of Sanitary Services (SISS), the National Council on Cleaner Production (CPL), the Corporation for Production Development (CORFO), and the National Commission on the Environment (Association of Pisco Producers AG, 2008), with the aim of implementing cleaner production measures and technology in order to increase productive efficiency and to decrease point source pollution, as well as to promote the implementation of good operation practices, reutilization and recycling (Herrera, 2011).

The duration for the CPA was set as 31 months, during which time the pisco industry worked on the implementation, establishing environmental commitments through the environmental policies of each participating company, shown on Table 1.

Since the complete implementation and certification of the agreement, two reassessments have been conducted with 100% compliance. The pisco industry continues to comply, which has made way for a second CPA currently in the diagnostic stage to gather baseline information about the industry, and contemplates the inclusion of a carbon footprint and efficient water use (Herrera, 2011).

2. The pisco industry in Chile

Pisco production is an emblematic and significantly relevant activity in the Regions of Atacama and Coquimbo, with the majority of grape plantations located in the Region of Coquimbo, where 94% of the planted surface area is destined for pisco production (Banfi, 2010).

The Government of Chile has registered the Appellation of Origin of Pisco with international organizations (Cortés, 2005), hence the implementation of a cleaner production agreement will significantly contribute to not only the development of the industry, but also to the development of pisco grape producers.

The economic pisco sector is currently represented by 10,500 productive hectares in the Regions of Atacama and Coquimbo, grown by 2726 farmers, of which 85% are considered small, and whose main means of organization is through cooperatives (Instituto de Investigaciones Agropecuarias, 2012). The number of pisco grape producers is 3,190, with an average farm size of 3.1 ha. Available information additionally shows that 90.4% of producers are located in the Region of Coquimbo, with an average farm size of 3.3 ha. Therefore, the region of Atacama, which accounts for 9.6% of producers, represents an average farm size of 1.9 ha (Banfi, 2010).

In terms of pisco grape varieties produced, four varieties represent over 91% of the total surface area, with three of these

Table 1
Participating production plants in the Cleaner Production Agreement.

Name of plant	Company	Location	Region
PL. Pisco Elqui	Compañía Pisquera de Chile S.A.	Paihuano	Coquimbo
PL. Monte Grande	Cooperativa Agrícola Pisquera de Elqui Ltda.	Paihuano	Coquimbo
PL. Río Elqui	Soc. Agrícola Pisquera Río Elqui Ltda.	Vicuña	Coquimbo
PL. Vicuña	Cooperativa Agrícola Pisquera de Elqui Ltda.	Vicuña	Coquimbo
PL. Hurtado	Cooperativa Agrícola Pisquera de Elqui Ltda.	Hurtado	Coquimbo
PL. Sotaquí	Cooperativa Agrícola Pisquera de Elqui Ltda.	Sotaquí	Coquimbo
PL. Sotaquí	Compañía Pisquera de Chile S.A.	Sotaquí	Coquimbo
PL. Monte Patria	Compañía Pisquera de Chile S.A.	Monte Patria	Coquimbo
PL. Huamalata	Soc. Agrícola Hacienda Mal Paso y Cía. Ltda.	Ovalle	Coquimbo
PL. Varillar	Agroproductos Bauzá y Cía. Ltda.	Monte Patria	Coquimbo
PL. Punitaqui	Cooperativa Agrícola Pisquera de Elqui Ltda.	Punitaqui	Coquimbo
PL. Salamanca	Compañía Pisquera de Chile S.A.	Salamanca	Coquimbo
PL. Salamanca	Cooperativa Agrícola Pisquera de Elqui Ltda.	Salamanca	Coquimbo
PL. San Felix	Agricola e Inmobiliaria San Félix S.A.	Alto del Carmen	Atacama
PL. El Rosario	Soc. Agr. Y Comercial El Rosario Ltda.	Alto del Carmen	Atacama
PL. Alto del Carmen	Cooperativa Agrícola Pisquera de Elqui Ltda.	Alto del Carmen	Atacama

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