Journal of Cleaner Production 189 (2018) 485–501

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

The world's first carbon neutral coffee: Lessons on certification and innovation from a pioneer case in Costa Rica

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ARTICLE INFO

Article history:
Received 13 October 2016
Received in revised form
12 March 2018
Accepted 22 March 2018
Available online 23 March 2018

Keywords:
Carbon neutral
Life cycle assessment
Social network analysis
PAS 2060
Coffee
Innovation
Costa Rica

ABSTRACT

As agriculture is an important contributor to greenhouse gas emissions, carbon labelling aiming at climate protection will play an increasing role in the future. An important example is the development of guidelines and standards for climate-neutral agricultural products and their respective certification. Carbon neutral certifications are, however, affected by criticism and mistrust as there were cases of doubtful claims to carbon neutrality in the past. Against this background, this paper analyses a rather promising case of certification for carbon neutrality: the pioneer case of the Costa Rican coffee cooperative Coopedota, which is the first organization worldwide that achieved certification for carbon neutrality in coffee using a renowned international standard. Coopedota's carbon neutral coffee is certified according to the Publicly Available Specification (PAS) 2060, which is based on a Life Cycle Assessment (LCA). The paper analyses how the cooperative came to apply this certification, which challenges it faced and how the cooperative solved them. Furthermore, the paper examines the social, political and institutional factors that fostered this innovation. To analyse the success factors that were relevant in this case, a Social Network Analysis approach was used. An innovative tool called 'Process Net-Map' was applied to visualize the social networks that enabled the actors to pursue the certification scheme. Process Net-Map also made it possible to identify the role and importance of different types of actors. The analysis shows that the certification created awareness on emission hot-spots along the coffee value chain. Reliable farm data from producers were identified as crucial because emissions at the farm level account for 60% of total emissions. It was also found that by avoiding pure offsetting, PAS 2060 supports emission reduction; however, PAS 2060 does not account for on-site carbon sequestration, for which coffee cultivation has high potential. Overall, the study found that the most important success factors include a combination of (i) past achievements in Coopedota's sustainability policy, which was incentivised by national and international trends and (ii) strong, visionary actors who performed the necessary network functions. The analysis also showed that the network of relevant actors is highly centralized, (indicated by a degree centrality of 86%), which may jeopardize the sustainability of the innovation project. Moreover, the network analysis revealed the importance of 'double linkages' between actors, which points to the role that combined services, such as funding and advice, played for the introduction of the certification scheme. General implications are derived from this case for future efforts to promote carbon neutral certification schemes for agri-food products.

1. Introduction

In recent years, there has been a growing demand for climate certifications, such as carbon neutrality (CN). The state of being carbon neutral has been defined by the British Standards Institution as a 'condition in which during a specified period there has been no net increase in the global emission of GHGs to the atmosphere as a result of the GHG emissions associated with the subject during the same period' (British Standard Institute (BSI), 2014, p. 2). While carbon neutrality is a promising approach, there have been improper claims to carbon neutrality in the past, which were not based on recognized standards. This has created mistrust, especially among consumers (Co2 Balance, 2011), and such skepticism can still be observed. Moreover, consumers often expect climate-

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https://doi.org/10.1016/j.jclepro.2018.03.226
0959-6526/

friendly products to be generally sustainable, which might not necessarily be the case (Swarr, 2009). In the future, the role of climate certification in the agricultural sector may increase, as food systems are responsible for 19–29% of anthropogenic greenhouse gas (GHG) emissions (Vermeulen et al., 2012). Agriculture contributes to climate change mainly by converting forest to agricultural land and by emitting methane and nitrous oxide from cattle production and from producing and applying nitrogen fertilizers (Bellarby et al., 2008).

To explore the potential of carbon neutral certifications for agri-food products, this paper presents a case study of Coopedota, the first cooperative worldwide that certified its coffee as carbon neutral based on a widely recognized international standard. Coffee lends itself well to such a case study because it is a highly nitrogen-intensive crop and is responsible for 9% of Costa Rica's national GHG emissions (national inventory 2010 as cited in Nieters et al., 2015). At the same time, coffee suffers from the effects of climate change. Bunn et al. (2014) predict that half of the area suitable for coffee production worldwide will be lost by 2050 due to climate change. Coffee production in Costa Rica is dedicated to *Coffea arabica*, which is particularly affected by climate change.

Coffee is also an interesting example for a case study because it is one of the most extensively traded food products worldwide. At the same time, coffee is an important livelihood base of smallholder farmers in the producer countries. The global coffee demand has increased by 33% between 2000 and 2012 (International Coffee Organization (ICO), 2014, p. 12), and it is expected to continue to rise. This is mainly due to emerging coffee markets, e.g., in Algeria, Australia, Russia, and South Korea, but also due to an increasing consumption in coffee exporting countries (ICO, 2014). Furthermore, coffee has a high potential to support the global movement towards a bioeconomy.[1] Coffee is one of the most valuable primary products in world trade, but processing of coffee leads to substantial amounts of residues, mainly coffee silver skin and spent coffee grounds (Mussatto et al., 2011), but also pulp, husk, and sugars. These residues contain substrates of high value, which can be extracted and used in the pharmaceutical and food industry (Esquivel and Jiménez, 2012; Fernandez-Gomez et al., 2016; Mussatto et al., 2011). Even without using this potential, climate-friendly certification of coffee still contributes to the bioeconomy because it leads to increased resource use efficiency (RUE) while reducing emissions along the coffee value chain.

While there are many international efforts to meet climate mitigation demands in the agricultural sector (Lewandrowski and Hohenstein, 2013), the case of Coopedota is unique because this cooperative produces the world's first carbon neutral coffee, certified by the most advanced certification available to date: the publicly available specification (PAS) 2060 for CN. PAS 2060 is the only independent specification that can be applied to certify CN of products or services. Coopedota is also the first company outside of the EU that has achieved certification according to PAS 2060. This pioneer character makes the cooperative a good example of successful innovations for climate protection.

Pioneers and innovations are recognized as particularly important for achieving sustainable development (Forrest and Wiek, 2014). Different factors have been identified in the literature to foster innovations, such as leadership and entrepreneurship, networking, institutional and financial support, and political and technological infrastructure (Biggs et al., 2010; Ceschin, 2013; Feola and Nunes, 2014; Grabs et al., 2016; Luqmani et al., 2016). Strandberg quoted in Lipsett et al. (2001) summarized the success factors into three categories: (i) money, (ii) capable people and (iii) encouragement and support (e.g. by institutions). The importance of capable people (the human asset factor) is widely recognized (Biggs et al., 2010), particularly with regard to the innovativeness of businesses and companies (Ceschin, 2013; Luqmani et al., 2016). Nevertheless, only few studies have tried to understand success factors of green innovations from a social network perspective. In particular, there are knowledge gaps regarding the network dynamics and the role different types of actors and linkages play in successful pioneer cases of innovation (Hermans et al., 2013; Johnson and Silveira, 2014; Klagge and Brocke, 2012). The present case study addresses these knowledge gaps.

PAS 2060 accepts three internationally recognized standards to quantify the GHG emissions of products and services. Among them is PAS 2050, a specification for the assessment of the life cycle GHG emissions of goods and services. This case study is of particular interest because, so far, only a few cases have been studied that used the LCA-based specification PAS 2050 to assess the carbon footprint (CF) of agricultural products. Iribarren et al. (2010) studied canned mussels. Kilian et al. (2013) examined Costa Rican Coffee that is exported to Europe and O'Brien et al. (2014) investigated dairy farms in Ireland. So far, cases of agri-food products that have been certified as carbon neutral by PAS 2060 have not been investigated. Therefore, the case of the world's first PAS 2060 carbon neutral certified coffee offers the opportunity to generate new insights that are relevant for potential future applications of PAS 2060 and comparable carbon neutrality certification schemes to agri-food products.

To learn from the experiences of Coopedota and make them available to potential followers, it is important to identify and study the challenges the cooperative faced during the certification process. At the same time, it is important to analyse the case from an innovation perspective and to examine especially the role of the human factor for successful innovations. Against this background, the following research questions are addressed:

i. Taking coffee as an example, how can the PAS 2060 CN certification be implemented on an agri-food product and what are the challenges that arise related to agri-food products?
ii. How did the idea of carbon neutral coffee at Coopedota emerge?
iii. Why was Coopedota successful in implementing the CN certification?

By addressing these questions, this paper contributes to the limited literature on PAS 2050-based cases of carbon neutral certifications of agricultural products and on SNA approaches to study success factors of pioneer projects. Due to the single case study character of this paper, the possibilities to generalize the findings regarding success factors of pioneers and regarding the implementation of carbon neutral certifications in the agri-food sector can only be sketched out. Nevertheless, the in-depth analysis of a pioneer case of carbon neutrality certification in agriculture provides valuable insights and can also serve as a basis for comparison with future studies in this field.

2. The publicly available specification (PAS) 2060

Climate-related informations on products and services are on the rise (Finkbeiner, 2009; Schaefer and Blanke, 2014). Several agricultural certification frameworks have created new standards or add-ons of existing standards (e.g., climate module of Rainforest

[1] Bioeconomy can be defined as 'the sustainable and innovative use of renewable resources to provide food, feed and industrial products with enhanced properties. Besides economic growth the bioeconomy aims for food security, climate protection and conservation of scarce natural resources'. (Bioeconomy Council of the German Government, 2017).