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Social Network Analysis of "Café de Colombia" in the Context of Third-wave Coffee Movement

MASTER'S THESIS

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Declaration

I hereby declare that I have done this thesis entitled “Social Network Analysis of “Café de Colombia” in the Context of Third-wave Coffee Movement” independently, all texts in this thesis are original, and all the sources have been quoted and acknowledged by means of complete references and according to Citation rules of the FTA.

In Prague 27 of April 2020

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William Corredor Avila

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Abstract

The adverse situation of traditional coffee producers in Colombia has produced the increasing product differentiation, therefore the migration to markets where receive better payments and face minor price volatility from selling their specialty coffee. In this context, the FNC have designed policies to support the farmer to access high-value chains and advertise Colombian geographic origin as a high-quality product, associated with Specialty coffee in the international market. Our main objective was to examine the interaction of coffee certification labels by conducting Social Networks Analysis within the framework of Colombian government export policies and international marketing strategies. The results answer whether the intended governmental communication policy works and whether it is possible to observe already some changes in online communication.

We selected their twitter profiles, downloaded al their contacts in twitter and create a social network with the account that link them. From this network, we detected sub-communities and identified influential and observers nodes. The analysis demonstrated that “Café de Colombia” are closer and form a community with Specialty, highlight the importance of communication media and the weak presence of accounts from producer counties among the most influential actors of the network. The findings indicate first that the "Café de Colombia" promotion policy is reflected by associating Colombian coffee as a specialty coffee; second FNC has an opportunity filling this gap with the content demanded by the relational segment.

Further research is needed in areas such as Sentiment analysis, Topic modelling, Trend analysis and Visual analytics to understand the network characteristics and strengthen the effectiveness of marketing campaigns.

Key Words:

Marketing, Market Access, Social media, Communication

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List of the abbreviations used in the thesis

FNC: National Coffee Federation of Colombia

SNA: Social Network Analysis

MkIS: Marketing Information System

VSC: Voluntary Standard Certification

SC: Specialty Coffee Association

CC: Café de Colombia

FT: Fairtrade International

RA: Rainforest Alliance

GI: Geographical Indications

PGI: Protected the Geographical Indication

PDO: Protected Denomination of Origin

1. Introduction

The adverse situation of traditional coffee producers in Colombia has produced the increasing product differentiation, therefore the migration to markets where the customer is willing to pay higher prices. Producers have subscribed voluntary standards certifications for environmental and socially responsible agricultural products and trade to promote the coffee in the differentiated or second wave segment. However, the demand for single-origin high-quality coffees and the need for better communication of the stories behind the products in the 3rd wave segment has encouraged some farmers to adapt their practices to the conditions of the new market requirements, that is grading their coffee according to Specialty Coffee Association standards, and building direct trade relations.

The demand for high-quality and sustainable coffees influences the price volatility faced by the farmer, their income and the land-use decisions. The new industry dynamic creates new opportunities for value distribution and vertical integration. It represents a better bargaining position for coffee producers, favours a new way of transparency in the supply chain and provides specific input to develop tailored-support programs to growing communities.

In this context, the FNC has been supporting the farmer to access high-value market chains through the programme “cafes especiales”, the label “100% café de Colombia” and the policy of exporting coffee in small quantities. To increase the effectiveness of your marketing decisions, the policymakers, as well as programme users, need to gain daily information about the external environment as the industry is in continuous change and the local actors are exposed to international markets.

Internet and social media serve in this context as an important source of information, a channel of interaction and a forum for individuals and organisations in the coffee sector. Since there is no evidence of previous studies, with this exploratory research, we examine the interaction of coffee certification labels on social networks within the framework of Colombian government export policies and international marketing strategies. Our main

question is whether the intended governmental communication policy works and whether it is possible to observe already some changes in online communication.

We want to contribute to a better understanding of the coffee certification labels relationships and their roles within the network. With this deeper understanding, the potential impact on Colombian coffee farmers, especially those struggling to market their specialty coffee internationally, can be discussed. Eventually, the results may be of particular interest to the FNC and Colombian Coffee producers, using them to map the coffee network and to find insights that help Marketing Intelligence and decision making.

Last but not least, we want to evaluate relevance of such type of analysis for understanding drivers of development of modern international value chains with tropical agricultural products.

This research is divided into six parts. The first part gives an overview of the traditional, differentiated and relational segment, Marketing Information System, Social Network Analysis and a brief description of the Colombian Coffee Industry and the coffee federation policies. The second part sets the objectives of the research. The methodology is outlined in the third section. Finally, we present the results, followed by discussion and conclusions of the study.

2. Literature review

2.1 Traditional, Differentiated (2nd wave) and Relational (3rd wave) coffee segments

Global commodity chains are border-crossing value-adding networks of labour and production processes whose result is the use of a finished commodity (Gereffi & Korzeniewicz 1994). The value chains in the coffee market are commonly divided into three segments: the traditional, differentiated (2nd wave) and relational (3rd wave) segments, which are going to be described in the following subchapters.

2.1.1 Traditional coffee value chain

In the traditional coffee value chain, the coffee is traded as a primary product, where there is no clear differentiation in quality, origin or species; therefore, the supplier of the product can be easily replaced.

Gereffi et al. (2005) defined the governance structure of the value chain as the property that determines the level of explicit coordination and power asymmetry. In the traditional segment, the governance structure is highly concentrated within three companies dominating the international trade (Kaplinsky 2004) and five roasters controlling 69% of the market (Daviron & Ponte 2005). The price is settled as a result of interaction between offer and demand in the international markets, mainly New York and London commodity exchanges, and the asymmetric power influences its distribution within the chain.

Coffee was trading mainly with the above-mentioned characteristics until 1990s when the most prominent coffee crisis in terms of income for farmers in developing countries changed the global coffee industry conditions. There were a series of events that led to the crisis. The dismantling of the International Coffee Agreement, the entrance of Vietnam as a leading coffee producer and the boost of the Brazilian supply triggered coffee price collapse. Besides the oversupply, the nineties have led to the shift in the bargaining power of agents in the coffee chain; the situation was favouring the accumulation of rent in the nodes located in developed countries (Ponte 2002) (Talbot 1997). The high price volatility of the traditional

channel makes the continuity of the economic sustainability of growers only possible with high levels of productivity.

2.1.2 Differentiated (2nd wave)

The coffee crisis was a point of inflexion where different actors saw the necessity of working towards a more equitable value distribution. The concern allowed the development of the differentiated segment.

One answer to this unequal balance of value creation and appropriation has been the addition of Voluntary Standard Certification (VSC) which was introduced in the category primarily through second wave brands. The adoption of labels and certifications in the coffee industry was a long-term strategy to promote the origin and the production conditions that belong to the specific product.

Two basic business models define the field of VSC: the consumer-facing label and the business-to-business standard (Potts et al. 2014). For the research, we focused on the customer-facing labels. Coffee labels provide information about for the customers that are aware of social and environmental problems associated with production and trade. It is often used when the customer cannot easily verify that the product was produced in the manner described by the producer. It can help to promote the product in different markets thought product differentiation, the attributes that usually are highlighted in the package are quality, origin and sustainability.

VSC is a written guarantee given by an independent organisation. The certification verifies that the production process or the coffee complies with specific standards established by individual organisations or countries; these standards often focus on environmental and socially responsible agricultural products and trade. Additionally, VSC are classified by the nature of the organisation that is providing the certification. It can be a third party or independent standard (Fairtrade, Rainforest Alliance, Organic, Utz Certified), private standard (Starbucks C.A.F.E. Practices, Nespresso AAA), or an internal standard or common code of the coffee community which is the case of the 4C certified.

The participation in VSC systems facilitates coordination between roasters/traders and some growers, which may lead to upgrading opportunities. From the perspective of the farmers, the adoption of VSC has two potential benefits: i) it increases the ability to reap economic rent (upgrading) or capture more value from the market and ii) improves the chances of gaining access to, or remaining in, a particular market (Muradian & Pelupessy 2005) (Samper et al. 2017). However, expectations are not reflected in reality. Muradian & Pelupessy (2005) concludes that participation does not ensure better economic performance. The same results were presented by Souza et al. (2019), they ascertained that there are indications that the producers did not benefit from product upgrading or as it was pointed out by Borrella et al. (2015) there is an unequal division of the gains in the value chain. Similarly, Garcia-Cardona (2016) affirms that the potential of VSC could take both a long time and require more significant institutional efforts to build capacities and to generate significant increases in livelihoods standards for certified producers; he concludes that VSC does not produce consistent improvements over time. Samper and Quiñones-Ruiz (2017) also question the long term impact in the farmer's profitability, especially after the adoption of the VSC standards by traditional brands.

The coffee industry is constantly changing. Grabs (2017) identified four emerging trends in the global coffee sector. First, the greater southern involvement in the creation and implementation of Voluntary Sustainability Standards. Second, the attempt to reclaim the discussion on how sustainable coffee should be defined. Third, the emergence of sectoral sustainability platforms, such as the Sustainable Agriculture Initiative Platform in 2002, Global Coffee Platform in 2016, International Coffee Partners in 2001, Sustainable Coffee Challenge in 2015, Initiative of Coffee and Climate in 2010, Coalition for Coffee Communities in 2012, Sustainable Agriculture, Food and Environment- SAFE in 2015. Ultimately, the instrumentalisation of third-party certification and verification, which is the adoption of certifications that are self-defined “sustainable” in order to use them as a marketing tool, to ensure traceability in the supply chain and as possible technological scaling up. In consequence, the instrumentalisation has produced the rise of minimum standard certifications; based on Voluntary Coffee Standard Index developed by Diets et al., (2018),

4C certified is the most produced certificated coffee with a total of 29% of the total coffee production, standard that at the same time was considered one of the least strength ones.

Coffee brands often combine different labels to highlight their product attributes and let the customer know what makes the product unique in the market. This is not just a mere marketing strategy, it is crucial for the long term strategy of the company. For instance, if the critical differentiating attribute is the VSC label instead of the origin of the coffee, the costs of switching suppliers by exporters or importers to other farmers or coffee regions will continue to be low, making producers vulnerable even after adapting to VSC conditions.

2.1.3 Relational segment (3rd wave)

To the extent that the client demands more information about coffee, the market segment becomes more sophisticated; therefore, higher value is generated, and prices increase. The relational segment is nowadays an alternative for farmers to access to more profitable market segments, to become independent and for consumers who want to have a greater variety of products and qualities.

The increasing focus on quality differentiation is accompanied by efforts to shorten the value chain. The direct trade model consists of small roasters that handpick specialty coffee micro-lots based on a complex scoring system − usually from the SCA − and ideally source directly from individual estates, smallholders or cooperatives. The system rewards high quality, small quantities, and high levels of regional and product differentiation (Borrella et al. 2015).

Ric Rhinehart (2017) Executive Director of the Specialty Coffee Association (SCA), considers a truly specialty coffee as the one that delivers satisfaction on all counts and adds value to the lives and livelihoods of all involved is truly a specialty coffee. This is evaluated by the quality of the product and by the quality of life that the coffee can deliver to all of those involved in its cultivation, preparation and consumption.

In the third wave, the availability of information is crucial to warranty access to the market and minimise the transactional constraints identified by London et al. (2010). The consumer

demands more access to the product-related information such as the technical aspects and the story behind the cup, while the producer request the market requirements to adapt their production and expand its product portfolio. The development of new communication channels between producers and consumers, including the Internet, social media and information technologies facilitate the development of a direct trade relationship.

The farmer adapts his production to the opportunities created by global market trends, leading to changing local and regional landscapes. Rueda and Lambin (2013) found that the demand for high-quality and sustainable coffees affects the land-use decision among the Colombian farmers, as they receive a large portion of the value-added and face lower price volatility than mainstream producers.

The new industry dynamic brings new opportunities for value distribution and vertical integration; it represents a better bargaining position for coffee producers, and favours a new way of transparency in the supply chain. In the relational segment, the roles of the producers, exporters, importers, and roasters are less distinct. Farmers are moving to roast or commercialisation where more value-added is generated; similarly, roasters are more involved in the coffee production. Exciting examples are Paul Kevin Doyle, and the coffee brand “Pergamino” (2019). The first one is an American roaster that moved to Colombia to establish “Mikava” farm and who was the winner of the Cup of Excellence Colombia North (2019). Meanwhile, “Pergamino” is a family business who harvest, roast, serves, and deliver coffee in small amounts to national and international markets.

In addition to blurring the actor's roles, the relational segment is also favouring the appearance of new actors in the supply chain. Borrella et al. (2015) presented a cross-case study of ‘connective businesses’ whose mission is to facilitate direct trade relationships between smallholder farmers and specialty coffee roasters. The study suggests that ‘connective businesses’ reduce the transactional and productivity constraints farmers face to access the specialty coffee market. To do so, ‘connective businesses’ connect smallholder farmers to the market more efficiently and effectively, reducing access barriers, empowering them to negotiate better, and providing more stability than the mainstream markets. They

build strategic alliances with non-traditional partners such as development actors and improve transparency and distribution of value in the supply chain; the value captured by each actor is disclosed, and the supply chain is streamlined, eliminating superfluous intermediaries who were not adding value to the product.

The 3rd wave becomes a major trend that other segments could not ignore, Samper et al. (2017) conclude in that the impact of the relational coffee segment is increasingly felt in both 1st and second wave segments. It appears to be lasting and powerful, suggesting that conventional and differentiating brands are quickly adopting successful experiential offerings and practices.

As mentioned before, in the third wave, the availability of information is crucial to warranty access to the market and minimize the transactional constraints and the internet and social media is becoming a valuable source of information (London et al. 2010). The next chapter describes how information is used for developing marketing and business strategy.

2.2 Marketing Information System

Marketing Information System (MkIS) can be defined as a set structure of procedures and methods for the regular, planned collection, analysis, and presentation of information for use in making marketing decisions (Kotler & Keller 2009). MkIS provide an organised flow of information to enable and support the marketing activities of an organisation. It is essential for planning, understanding customers and competitors, tapping trends, threats and opportunities. The adaptability of the organisation to the market forces will depend on the quality of this information.

According to Kotler et al. (2009), the four components that comprise the MkIS system are Internal Reports (Records) System, Marketing Research System, Marketing Intelligence System, and Marketing Decision Support System.

As part of the MkIS, Marketing Intelligence System is a primary source used by managers for gaining daily information of the external environment, hence assists the managers to react

to the changing rapidly. The external environment is understood as the target market, marketing channels, competitors publics, macro-environmental forces.

Traditionally the means of collecting the marketing information were the television, radio and press. However, in the last decades, a rapid rise of the Internet has revolutionised communications and it has become a vital tool for exchanging knowledge and education. Internet is an inexhaustible source of information and a channel for cooperating with other people and groups who are working on related topics. According Kemp from Data Reportal (2020), there are 4.54 billion internet users in the world today with an average amount of time spent online of 4 hours per day in the OECD countries according to Our World in Data (2019). In some states, the standard is above 6 hours per day; for instance, in the US, adults spend more than 6 hours per day on digital media (apps and websites accessed through mobile phones, tablets, computers and other connected devices such as game consoles).

The rise of the Internet has come together with the use of social media. Approximately 3.8 billion people use social media each month (Kemp 2020); this means one-in-three people in the world use social media platforms, equivalent to more than two-thirds of all internet users. Social media serves as a connector for individuals and companies in the digital sphere; companies use social media to increase their visibility among potential customers, to communicate Authority (source of information), show authenticity, encourage engagement, and to provide customers support. Moreover, it allows identifying the target group effectively by reducing the cost of the search. Companies reach people based on their demographics, location, interests and behaviours.

The strategic function of marketing is further emphasised as Internet-based technologies have enabled radically new approaches to selling where information technology for the first time touches customers and provides new means for collecting marketing information (Harmon 2018). From the marketing intelligence point of view, social media platforms are self-seeding data sources, as the users provide data by posts, likes, reactions, comments, photos and videos, among others.

Social media analytics research facilitates conversations and interaction between online communities and extract useful patterns and intelligence to serve entities that include, but are not limited to, active contributors in ongoing dialogues (Zeng et al. 2010). Social media metrics include the opportunities to identify audiences, emerging business, competitors, suppliers, relevant topics, brand perceptions, user attitudes and behaviour, market segments or government policies (Ruhi 2014**).** Additionally, social media analysis help businesses along with the product or service life cycle from design to disposal, as well as the supporting activities that take place in parallel with these activities (Fan et al. 2014).

Digitalisation is supposed to be "unavoidable" (Durmaz & Efendioglu 2016). Sellers can identify appropriate niches because they can more easily be searched for and discovered, as search costs online are less determined by geography. Small-scale sellers may have an advantage of reaching small niches, thus have a brighter future in a wired world (Bakos 2001), being able to identify niche markets automatically increase the possibilities for product differentiation and portfolio expansion. According to Lies (2019), marketing intelligence already has started to impact marketing practice, for instance, by including the stakeholders' perspective in the content of marketing and value creation, which also originate new creative potential.

The identification of niches in other geographies automatically opens the door for companies to expand and diversify into new markets. In the case of agricultural products, the E-commerce adoption provides an alternative communication medium with business partners and further developing their business activities through the Internet; can foster the trustful communication between e-business and users, and can help to build long-term relationships based on the reputation and user loyalty (Cloete & Doens 2008).

Electronic commerce has the potential to change in the institutional structure in many sectors by reducing the role of traditional intermediaries to new intermediaries (cybermediaries) (Turban et al. 2006). Zeng et al. (2017) concur with Turban et al. (2006); they conducted a systematic literature review on the field of Agri-food e-commerce (AE) with focus on the case of China. The research states that the adoption of AE is an innovative way of influencing

food systems and market access for smallholders since it could avoid intermediaries, and remove information asymmetry. For instance, by adopting drop shipping or third-party logistics solutions, as well as building relations and facilitating the flow of information.

Moreover, at the regional level, AE can be beneficial for promoting the development of the rural economy and society in such facets as economic growth, poverty alleviation and employment.

The techniques to gather and analysing information from social media are very varied. Fan et al. (2014) summarised the most common social media analytic techniques. Including Sentiment analysis, Topic modelling, Trend analysis, Visual analytics and Social Network Analysis. The latter is the one we will focus on in this investigation.

2.3 Social network analysis (SNA)

Social Network Analysis (SNA) is generally defined as mapping and measuring the relationships and flows between people, groups, organisations, computers or other information processing entities (Mcguire et al. 2016). SNA has its theoretical roots in sociology with the work of Georg Simmel, Émile Durkheim and Jacob Levy Moreno; although the SNA was being applied more intensively in social and behavioural sciences previously (Wasserman & Faust 1994). It was first developed mainly for analysing static mathematical graphs; today, it is used almost in all areas, particularly with emerging data availability result of the extensively use of social networks and information technologies. A review of novel and widespread online social network analysis problems has been presented in the work of Can & Alatas (2019).

The unit of analysis in SNA is the entity a set of interacting objects leads to complex systems with hidden properties rather than the individual (J. Lu, X. Yu, G. Chen, 2015). The recognition of the nodes and edges as fundamental components of the network is vital for understanding the SNA. Nodes represent actors and Edges are the associated relationship between two actors.

A key property of each node is the degree, which is the number of links it has to other nodes. In other words, the degree of a node is the number of edges that are adjacent to the node. The number of the degree is counted as the sum of i) in-degree, which are connections from other nodes to the particular one, and ii) out-degree, that are the links the node has in direction to another node. The distinction in the directionality of the edges is crucial, where the flow is an intrinsic feature of the system they represent. Centrality measurements, based on the shortest paths applied to direct networks, can reveal essential features of the network that might go undetected if the orientation of connections is ignored (Gardun et al. 2014). In Figure 1, nodes are the circles, and edges are the lines clockwise directed.

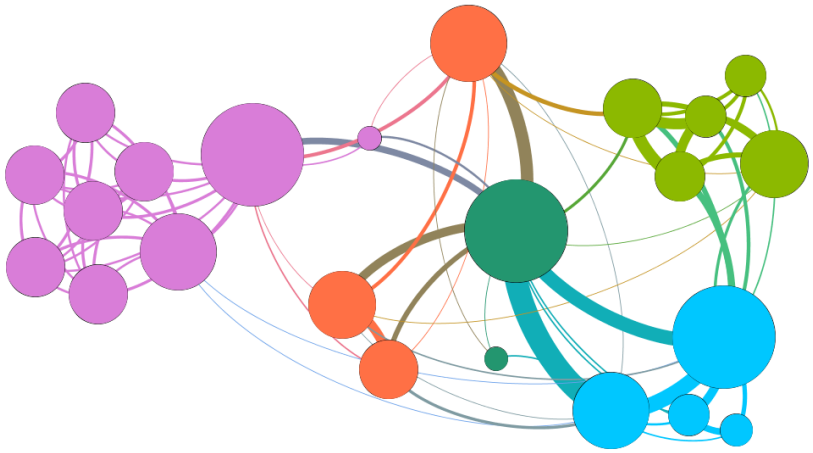

Figure 1. The essential components of the social network structure

For understanding the structures of complex networks, commonly SNA aims to detect communities. Communities detection and the division of the network into modules is a calculation that consists in decomposing the networks into sub-units or communities, which are sets of highly interconnected nodes. The members of the community have similar tastes, choices, and preferences that get associated with a social network; it is a group of entities that are in proximity to each other when compared to other objects of a data set. The community identification may help to uncover a-priori unknown functional modules such as topics in information networks or cyber-communities in social networks. Blondel, Guillaume

and Lefebvre (2008) analyse the language communities in a Belgian mobile phone network of 118 million nodes and more than one billion edges; after the analysis, they proposed a method of modularity optimisation to extract the community structure of large networks.

As mentioned by Bonchi et al. (2011), the detection of these communities can be beneficial for numerous applications in which group decisions are taken. For instance, sending messages targeting a community, determining the customer satisfaction of companies, identifying key points in viral marketing campaigns on social media platforms, identifying sub-communities, and providing greater precision in designing products and marketing materials. Martin Grandjean (2016) and Aramo-Immonen et al. (2015) conducted studies where they use SNA to identify sub-communities within a large community, the first one mapping the digital humanities community of Twitter, and the second one by analysing the most popular discussions of conference participants. In Figure1, the communities are the sub-graphs differentiated by colours.

Another application of SNA is the identification of opinion leaders or authoritative actors. Opinion leaders are those who can impact significantly on their networks and who can influence the opinions of the individuals attached to them. The identification of the roles of the actors can be beneficial for marketing or political spheres by marketing plans by finding opinion leaders in social networks and finding interrelated users. Eigenvector centrality and he algorithm HITS are used to rank nodes influence in a spreading dynamic.

Eigenvector centrality is a measure of the influence has a node in a network. It assigns relative scores to all nodes in the network based on the well-known principle that connections to high-scoring nodes contribute more to the rating of the node in the question than equal connections to low-scoring nodes (Noori 2011). In general, connections to nodes which are themselves influential will lend a node more influence than links to less influential nodes. The eigenvector centrality defined in this way accords each node a centrality that depends both on the number and the quality of its connections, having a large number of connections still counts for something, but a node with a smaller number of high-quality contacts may outrank

one with a more significant amount of mediocre contacts. Eigenvector centrality turns out to be a revealing measure in many situations (Newman 2008).

HITS is an alternative for the detection of influential nodes. It is a link analysis algorithm that rates Web pages, developed by Jon Kleinberg (1997). The metric computes two different scores: hubs and Authority. The algorithm identifies good authorities and hubs for a topic by assigning two numbers to a page: an authority and a hub weight. These weights are defined recursively. A higher authority weight occurs if the page is pointed by pages with high hub weights. A higher hub weight occurs if the page points to many pages with high authority weights. A good hub increases the authority weight of the pages it points. A good authority increases the hub weight of the pages that point to it.

This research analyses the relationship between the most common coffee certification labels in Colombia through Social Network Analysis. The next chapter will give an overview of the Colombian coffee industry and the policies towards Cafes Especiales.

2.4 Colombian Coffee Industry and policies

Colombia, with 13.8 million bags of 60 kilos per year, is the third biggest producer of Coffee after Brazil (62.9 million bags of 60 kilos) and Vietnam (31.1 million bags of 60 kilos) (ICO 2018). Coffee production is the primary agricultural industry with a cultivated area of 742,373 hectares (Agronet 2018) and employs 563,000 families (FNC 2020a).

According to United Nations Statistical Division (COMTRADE, 2018), 50% of the Colombian coffee exports are going to North America (1.23 billion USD), 33% to Europe (799 million USD), and 15% to Asia (379 million USD). The United States is the leading destination with 40% of the total exports, followed by Japan with 9.6% and Germany with 8.5%. Table1 **¡Error! No se encuentra el origen de la referencia.**shows the destination of C olombian exported coffee in 2016.

Table 1. Where does Colombia export coffee?

Country of destination	Export value in USD	Export value %
USA	1,030,656,455	40%
JPN	247,249,223	9.60%
DEU	217,838,178	8.50%
CAN	182,726,861	7.10%
BLX	144,833,794	5.60%
CHE	97,136,880	3.80%
KOR	89,547,213	3.50%
ITA	74,027,908	2.90%
GBR	68,829,402	2.70%

Source of data: United Nations Statistical Division (COMTRADE)

Colombian coffee industry is organised under the Colombian Coffee Growers Federation (FNC). Created in 1927, the FNC is a non-profit organisation that represents the coffee growers both nationally and internationally, defends their rights and find ways to improve their quality of life. FNC collect and invest the export tax paid by coffee growers in research and development; provide technical assistance to coffee growers through the extension service; improve the quality of coffee while optimising the cost of production; and purchasing a substantial part of the annual harvest ("FNC - Quienes Somos" 2018). Precisely, the FNC's participation in purchasing a significant portion of the harvest and exporting it to international markets has been considered the primary benefit Colombian farmers receive since it protects them from the oligopsonistic power of domestic and international buyers (Ramírez et al. 2002).

Aware of the increasing demand for high quality and sustainable coffees, the FNC put in place a value-added strategy designed to create higher revenue to farmers by adding more value at the origin and entering new market segments that would create a more extensive recognition of the Colombian coffee source (Reina & Silva 2008). The FNC plays an important role in stimulating farmers to join higher value global chains to ensure that farmers received international price signals in an otherwise highly asymmetrical market, but also

providing the needed infrastructure, technical and marketing support to enable farmers to engage in differentiated markets (Rueda & Lambin 2013). In this sense, the FNC developed the programmes "Cafés especiales", "100% Colombiano" and the export programme in small quantities. "Cafes especiales" are defined as those coffees for which consumers are willing to pay a higher price (FNC 2020b). FNC works in (i) identifying and controlling the quality of specific cup profiles attached to particular origins within Colombia; and (ii) fostering the production and marketing of third-party certified or verified sustainable coffees.

The FNC, through the extension service, promotes the above-mentioned initiatives by recommending good practices in coffee farming and processing, ensuring the quality of the coffee as a result of the accompaniment process throughout the production and processing of the bean. The participation of producer associations is encouraged to strengthen crop profitability and farm sustainability. Specialised technical assistance is provided for producers to meet the requirements of different seals and codes of conduct and to get the certification or verification that accredits their coffee as sustainable (FNC 2020b).

Promotion of third party certified production or verified sustainable coffees has led Colombia thas become an attractive country of origin for sustainably certified products. According to the FNC (2018a), 40% of the total cultivated area in Colombia is part of at least one sustainable programme; this is equivalent to 237,000 farms with more than 370,000 hectares of coffee. Table 2 shows the total cultivated area by each certification programme.

Table 2. Total cultivated area by certification program

Certification program	Cultivated area (in thousand ha.)
4C	271
Nespresso	43
Fairtrade	37
Rainforest	24
UTZ	17.7
C.A.F.E. practices	17

Organic	6.6

Source: FNC 2017

Colombia is the second-largest source of standard-compliant coffee worldwide after Brazil, providing 17% of the world supply; indeed, in 2011–2012, 28% of global Fairtrade certified supply came from Colombia, 11% each of Rainforest Alliance and UTZ Certified coffee, and 15% of global 4C amount (Potts et al. 2014). According to Rueda & Lambin (2013) three elements have contributed to the success of this endeavour: (i) FNC's credibility and long time engagement with farmers through the extension service facilitated the adoption of the sustainability and quality standards; (ii) the network of cooperatives that actively buy coffee throughout the country provided both a price transfer mechanism and a traceability system that engaged farmers and clients in the trade of "Cafes Especiales"; (iii) FNC's participation in the export market and active marketing strategies provided a portfolio of old and new clients for the segments being promoted.

The implementation of the Voluntary standards has been traditionally top-down and Northern-centric in structure (Schouten & Bitzer 2015). Although, as announced by Velez (2016), the FNC was in the process of developing their own sustainability and climate-friendly certifications for high-quality specialty coffees. The FNC certification must be the result of the co-responsibility of all the actors involved in the coffee chain:

- Café de Colombia positioning the quality, origin and sustainability;
- third party certifications (Rainforest Alliance, USDA organics, UTZ, 4C, C.A.F.E Practices, Nespresso AAA) by providing specific information, ensuring traceability, and
- the connection with customers by creating new value with producers.

The FNC initiative agrees with the tendencies of the sector identified by Grabs (2017), concerning the greater involvement of the producing countries in the implementation of certifications.

Precisely, the FNC provides "Café de Colombia" logos for coffee brands that comply with the FNC program "100% Café de Colombia" ethical codes of conduct and respect the origin of Colombian Coffee (FNC 2020c). FNC advertises "Café de Colombia" as a source of high-quality coffee and can be use as a certification mark. Colombian Coffee is the denomination given to 100% washed Arabica coffee produced in the coffee-growing regions of Colombia, in areas that can surpass the 2.000 meters above the sea level. Geographical Indications (GI) is a sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin. FNC possess the Protected the Geographical Indication (PGI) − for the EU market − and the Protected Denomination of Origin (PDO).

Both the promotion policy of the Utz, Rainforest Alliance and Fairtrade International labels, as well as "100% Café de Colombia", have a fairly strong marketing component; by communicating the information related to each standard and the concept that each of them wants to cover. The above is reflected not only in the product labels but also on the website and profiles on social networks.

On the other hand, in 2016, the FNC launched a new programme that simplifies the procedures to export coffee in small quantities through courier companies. Although the programme is not aimed exclusively the specialty coffees − as it can be used also to send samples for the client evaluation − it constitutes an opportunity to cover the specialty coffee demand the global market (FNC 2019). The programme clings with the trade policy of the last 20 years of reducing barriers and increase integration; and boost the exports of specialty coffee and provide direct linkages between producers and importers that would provide sustainable income growth.

It is considered as a "small quantity" the deliveries made up to 60 kilograms of green coffee, 50.4 kilograms of roasted coffee, 23 kilograms of soluble coffee and 23 kilograms of coffee

extract, the value of the dispatch does not have to exceed 5,000 US Dollars. To make the delivery with special prices, the FNC established alliances with the following courier companies: 4-72, Deprisa, DHL Express, FedEx, Servietrega, United Parcel Service (UPC) and TNT.

The balance of the Export Programme of Coffee in Small Quantities (ECSQ) since its implementation in May 2016 till December 2018 is 47,691 kilos of industrialised coffee (roasted and lyophilised) and 16,957 kilos of green coffee exported in 5,411 transactions made by 284 exporters (FNC 2018).

3. Aims

The study seeks to respond whether the intended governmental communication policy works and whether it is possible to observe already some changes in online communication. We want to evaluate the impact for the marketing online of FNC and farmers, as well as assess the relevance of this type of analysis for understanding drivers of development of modern international value chains with tropical agricultural products.

The overall aim, with which the study seeks to respond to the research problem, is to conduct a Social Network Analysis of the coffee certification labels network created using their Twitter profiles. The specific objectives are:

- To construct and describe the structure of the coffee certifications labels network.
- To analyse the network relationship by identifying observer and influential nodes.

Even though the online communication strategy is not reduced to one social network, the most relevant for this study is Twitter, as it differentiates from others due its strong emphasis on real-time information, which allows participating in the latest conversations, either as a simple observer or as a reference.

4. Methodology

As mentioned before, this research consists of a Social Network Analysis of the Colombian Coffee certification labels. The descriptive and exploratory research is based on qualitative and quantitative information obtained from Twitter.

Twitter is a social media platforms created in 2006 by Jack Dorsey, Noah Glass, Biz Stone, and Evan Williams in San Francisco, California. As of the first quarter of 2019, Twitter averaged 330 million monthly active users, (Clement 2019). It is a place in which users post and interact with messages known as "tweets". Its principle of "following" users without mandatory reciprocity makes the platform a direct network by definition; clearly, it is not the same to 'follow' a widely known personality in Twitter as to be followed by one. Moreover, the platform allows to group accounts into lists, which creates a contact directory and a specific timeline where the tweets are displayed.

Its simplicity makes it a frequently used tool to report current events, communicate with costumers, have a conversation around a particular topic or used as a customer service channel. It is a platform for engaging, build a brand personality and increase brand exposure. Moreover, the application allows access to data through its programming interface (API), which have made it the most popular social media platform among researches in the field of SNA.

4.1 Data collection and sampling

4.1.1 Definition of the coffee labels sample

The selection of the customer-facing coffee certification labels was based on the labels promoted by the FNC together with the FCN official profile for Colombian Coffee promotion and the Specialty Coffee Association (SCA), identified as the most prominent actors in the relational segment. It is worth noting that the FNC used to have two profiles on Twitter, one in Spanish and one in English; however, the English profile was disabled, which might affect the interaction with other accounts.

Organic certifications are also customer-facing labels adopted by coffee farmers in Colombia; however, due to the dependency of the organic certifications on the standards established by the importing country or group of countries, the FNC does not specify the name of any organic certifications. The study does not include any national organic certification in the network.

Table 3 contains the final selection of the Twitter accounts from which the network was created. From now on this set of nodes will also be referred to as the root set.

Table 3. Root set

Members	**Abbreviations used in graphs**	**Twitter**
Rainforest Alliance	RA	https://twitter.com/RnfrstAlliance
FairTrade International FLO	FT	https://twitter.com/FAIRTRADE
UTZ	UTZ	https://twitter.com/UTZCertified
Café de Colombia	CC	https://twitter.com/CafedeColombia
Specialty Coffee Association SCA	SC	https://twitter.com/SpecialtyCoffee

4.1.2 Data collection and processing

The data extraction for each of the actors − Table 3 − was made the 10 of October 2019 using the application NodeXL Pro. The program is a tool for social network and content analysis; however, it is not a separate programme but an extension of Microsoft® Excel®. On the one hand, this fact implies that their visualisation features are limited. On the other hand, it offers the advantage of importing and manipulating the data directly in Microsoft® Excel®. Among its features, the tool can request Twitter public data through the application programming interface (API) developed by Twitter for that purpose.

We downloaded the total connections for each of the five accounts of the root set. These connections have a direction, they are divided between the nodes that follow and are followed by the account of the root set. Additionally, the data include specific information about the connectors, including the user name, label, number of following, number of followers, number of tweets, number of favourite tweets, description, location, web link, joined twitter date and link to the user profile.

The total connections per actor are presented in Table 4; in total they are equivalent to 469,906. However, the nodes that are interesting for the research are the ones that serve as connectors between the accounts of the root set; thus the nodes that have a degree connection of minimum two and their degrees are formed by at least two coffee certification labels were considered. Therefore, the final group of nodes are those that are:

a. followed by two or more coffee certification labels

b. following two coffee certification labels

c. followed by one certification and following another certification

Table 4. Total connections of raw data

Dataset #	Name	Followed	Followers	Total edges
1	Rainforest Alliance	9,545	199,480	209,025
2	Fairtrade Intl	2,978	45,347	48,325
3	UTZ	1,134	6,533	7,667
4	Café de Colombia	178	115,373	115,551
5	Specialty Coffee Association	18,473	70,865	89,338
	Total	**32,308**	**437,598**	**469,906**

4.2 Data analysis

The data was imported and consolidated in the software Gephi. This is a software for Exploratory Data Analysis; a paradigm appeared in the Visual Analytics field of research. Gephi is a network visualisation software used for data analysts and scientists from various disciplines keen to explore and understand graphs. The user interacts with the representation, manipulate the structures, shapes and colours to reveal hidden patterns.

The datasets were imported as "Direct Graph" in Gephi, it means that the edges are directed from one node to another (The Node A follows a Node B, but it does not mean that is followed back). The software identifies and unifies the nodes in each of the datasets using the column "Id". The Edges are added to the corresponding node, which is essential to create the final network.

One of its key features of Gephi is the ability to execute default algorithms as well as third-party algorithms. For the network illustrations, we use Force Atlas 2, a force-directed layout graph layout algorithm designed by Jacomy et al. (2014) for network spatialisation in Gephi. It integrates different techniques such as the Barnes Hut simulation, degree-dependent repulsive force, and local and global adaptive temperatures. The fundaments of the algorithm are not sophisticated. Nodes repulse each other, while edges attract their nodes. These forces create a movement that converges to a balanced state. This final configuration is expected to help the interpretation of the data.

The size of the nodes, which scale from 1 to 200, was determined according to their degree; the standard colour palette, Figure 2, go from the soft red to the deep red, meaning from small values to high values, respectively.

Figure 2. Node colour scale

Additionally, the size of the labels nodes is proportional to the node size, and the curve of the edges is clockwise oriented. The previous settings apply unless otherwise stated.

The analysis goes beyond visual representation. The data analysis of the coffee certification network is divided into three parts. The first part employed the isolation of network structures, and for the second and third part, we calculated metrics and statistics for Social Network Analysis (SNA).

The first part consisted of determining the group of nodes that connects individually Specialty Coffee Association with another node of the root set. Connector nodes were classified according to the type of connection, see Table 5; the lists of the nodes for each case were provided in the annexes.

Table 5. Type of connections between two nodes of the root set (SC=Specialty Coffee; X=connector node; A=Café de Colombia, Fairtrade, Rainforest or UTZ; ">"= edge directed to the right; "<"=edge directed to the left*)*

Type	Degree	Outdegree	Indegree	Direction
1	2	2	0	SC < X > A
2	2	0	2	SC > X < A
3	2	1	1	SC > X > A
4	2	1	1	SC < X < A
5	3	1	2	SC > X >< A
6	3	1	2	SC >< X < A
7	3	2	1	SC < X >< A
8	3	2	1	SC >< X > A
9	4	2	2	SC >< X >< A

The second, includes the calculation of common network metrics or statistics, such as the average degree, network diameter and average path length; and finally, the identification of the nodes neighbourhoods and communities using the algorithm proposed by Blondel, Guillaume and Lefebvre (2008).

Finally, we use the Hyperlink-Induced Topic Search (HITS) function that is based on the work by Jon Kleinberg (1998), and it calculates two separate values for each node. The first, termed as Authority, provides a measure for how valuable information stored by a particular node is, while the Hub number measures the quality of the links to and from that specific node. The calculations identify the most critical nodes in the network. Additionally, the level of influence or Authority was confirmed by the measure the eigenvector centrality

4.3 Limitations of the research

The results of the study must be seen bearing in mind some limitations.

First, it is internet-based research, hence the importance of the digital communication strategy varies for each of the certifications.

Second, there might be a limit of representativeness caused by the selection of the actors. Due to the limited hardware processing capacity, it was not possible to produce a more complex network. A deeper analysis could be addressed in future research.

5. Results of the Analysis

5.1 Coffee certifications labels structure

Specialty Coffee Association was linked individually to another account of the root set through intermediary nodes. Table 6 provides the total number of nodes connectors by the type of connection. Additionally, for each type, the list of the accounts is presented in annexes.

Type of connection 1 is the most common among the nodes. Correspond to the group of nodes that are observers and follow Specialty Coffee and another account of the root set; 2470 (77.19%) nodes follow Café de Colombia and Specialty Coffee, the highest portion if compared with other nodes of the root set.

The highest portion of nodes with a connection of type 6, if compared with other accounts of the root set, is between Fairtrade and Specialty Coffee with 177 nodes, equivalent to 7,51% of the connections.

Nodes of type 9, connecting SC and CC, FT, RF or UTZ by following and being followed at the same time, equal to the 12.52%, is notably higher between SC and RF.

Table 6. Specialty Coffee connector by type of connection

	SC and CC		SC and FT		SC and RF		SC and UTZ	
Type of link	**subtotal**	**% of the total**	**subtotal**	**% of the total**	**subtotal**	**% of the total**	**subtotal**	**% of the total**
1	2470	77.19%	1420	60.22%	2006	52.98%	712	62.13%
2	5	0.16%	62	2.63%	132	3.49%	17	1.48%
3	29	0.91%	22	0.93%	39	1.03%	12	1.05%
4	4	0.13%	21	0.89%	12	0.32%	11	0.96%
5	1	0.03%	14	0.59%	35	0.92%	4	0.35%
6	15	0.47%	177	7.51%	50	1.32%	38	3.32%
7	24	0.75%	85	3.60%	105	2.77%	80	6.98%
8	619	19.34%	365	15.48%	933	24.64%	200	17.45%
9	33	1.03%	192	8.14%	474	12.52%	72	6.28%
Total	3200	100%	2358	100%	3786	100%	1146	100%
Full list in	*Appendix A*		*Appendix B*		*Appendix C*		*Appendix D*	

Table 7 presents the portion of nodes that fulfil the condition for the selection of the nodes. It was observed that despite the number of followers in Twitter, only 4% of Café de Colombia followers were selected for the creation of the network. On the other hand, 60% of the UTZ Followers were also linked with another account of the root set.

Generally, the portion of the Twitter accounts that a member of the root set follows and the accounts that fulfil the condition for the selection is considerably higher. In the case of Café de Colombia, 51% of the accounts they Follow are also connected with another account of the network, and contrarily, this number is 14% in the case of Specialty Coffee.

Table 7. Network nodes selection

Id	Followers	Following	In-degree	Out-degree	Indegree/ followers	Outdegree/ following
cafedecolombia	115373	178	4090	91	4%	51%
fairtrade	45345	2978	9402	1266	21%	43%
rnfrstalliance	199475	9545	11882	1551	6%	16%
specialtycoffee	70865	18473	7490	2517	11%	14%
utzcertified	6533	1134	3900	710	60%	63%

Figure 3 is the visual representation from the final network that is formed by 17,200 nodes and 42,879 edges. The size and colour are determined by the Degree of the node; the more connections a node has, the bigger it is and coloured in intense red. The Average Degree of the network is 2.493; furthermore, the maximal distance between all pairs of nodes is 3 nodes, while the average graph-distance between all pairs of nodes is 2.375. The observed degrees vary between k=2 and k=13,433; 75.59% of the total nodes of the network correspond to nodes with two-degree connections (k=2). The most connected node corresponds to Rainforest Alliance, followed by Fairtrade, Specialty Coffee, UTZ and Café de Colombia.

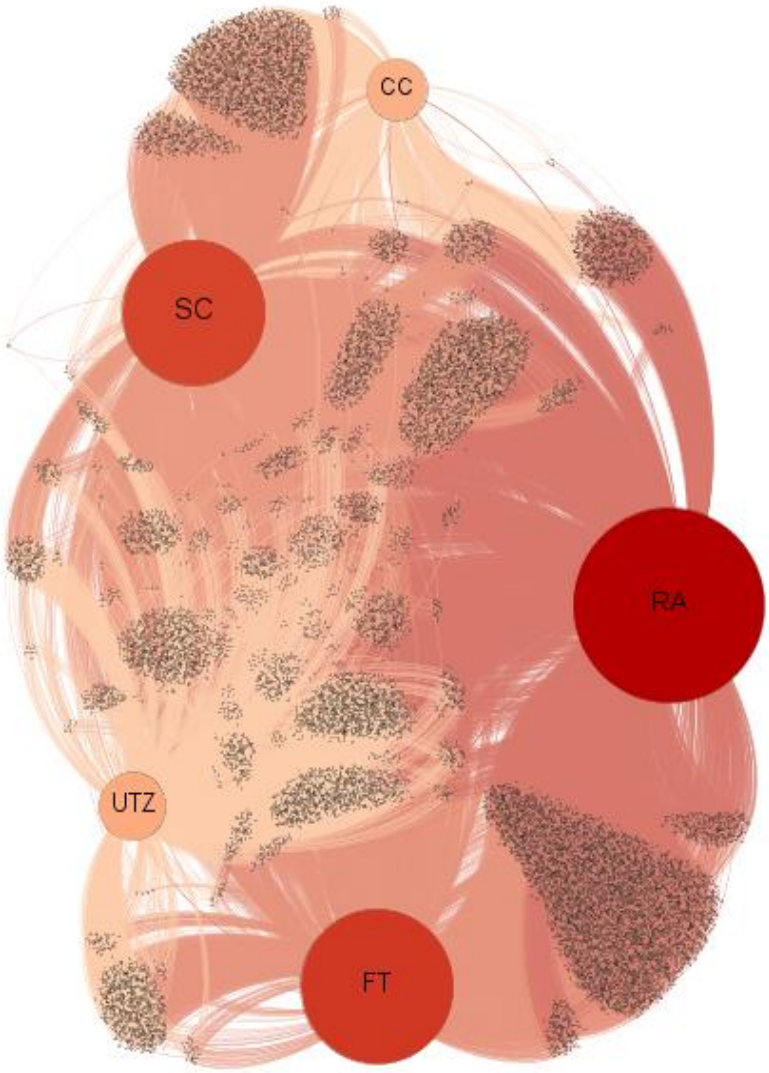

Figure 3. Final network (CA= Café de Colombia, SC= Specialty Coffee Association, UTZ= UTZ, RA= Rainforest Alliance, FT= Fairtrade international. Edge direction: clockwise oriented)

Node neighbourhoods are presented in Figure 4; the colour intensity was set by the distance from the root set nodes; the closest neighbours are coloured with dark red and distant neighbours with light red. Café de Colombia and Fairtrade neighbourhoods are nearby their nodes, meanwhile, Rainforest Alliance, Specialty Coffee, and UTZ neighbourhoods are better linked with other nodes and thus are spread on the network.

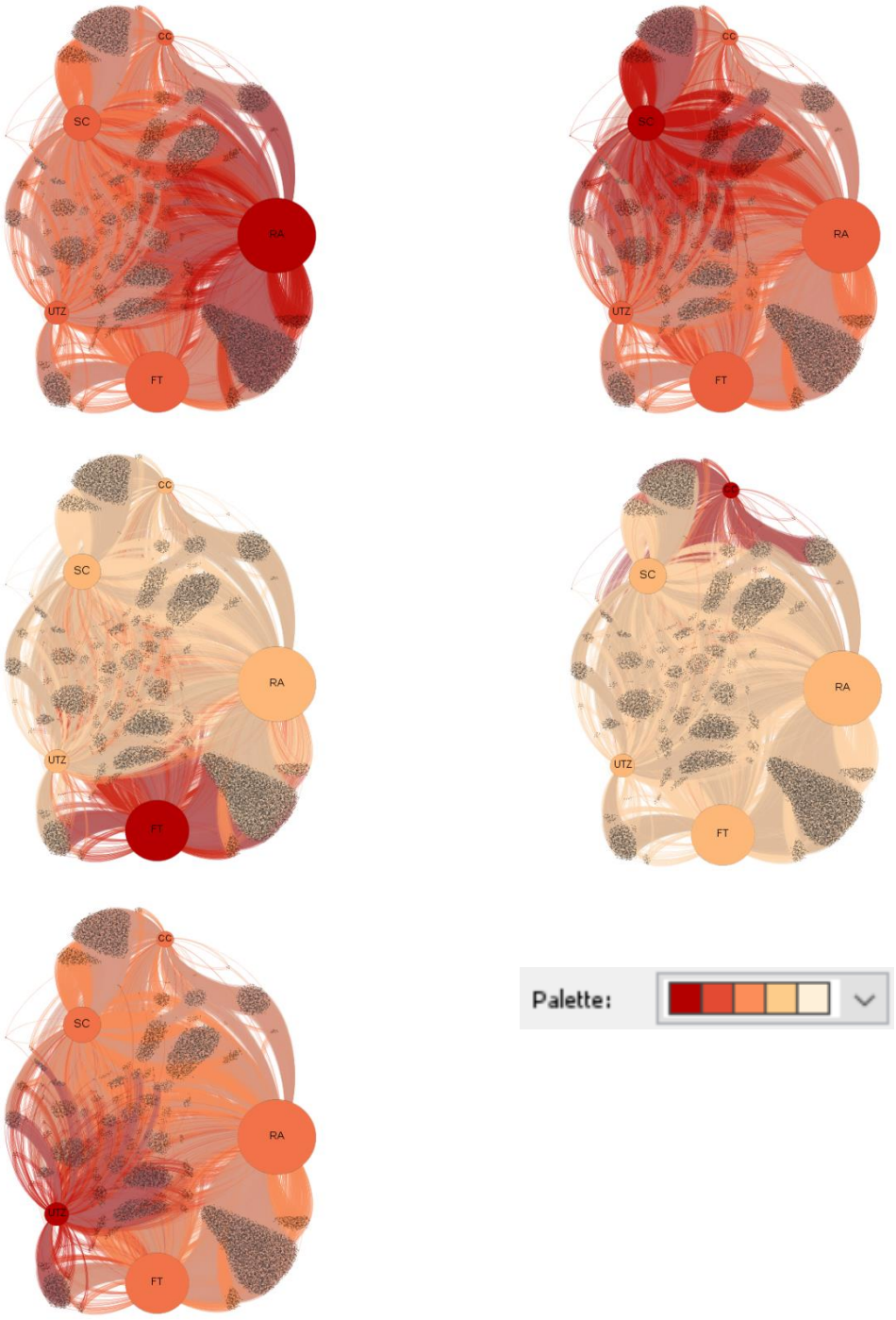

Figure 4. Neighbourhoods (CA= Café de Colombia, SC= Specialty Coffee Association, UTZ= UTZ, RA= Rainforest Alliance, FT= Fairtrade international. Edge direction: clockwise oriented)

The community detection analysis distinguishes the three sub-networks (or communities) found in the network in Figure 5. According to the calculations, Specialty Coffee Association and Café de Colombia form the first community, likewise Fairtrade International and Rainforest Alliance constitute another community, and separately there is the UTZ network.

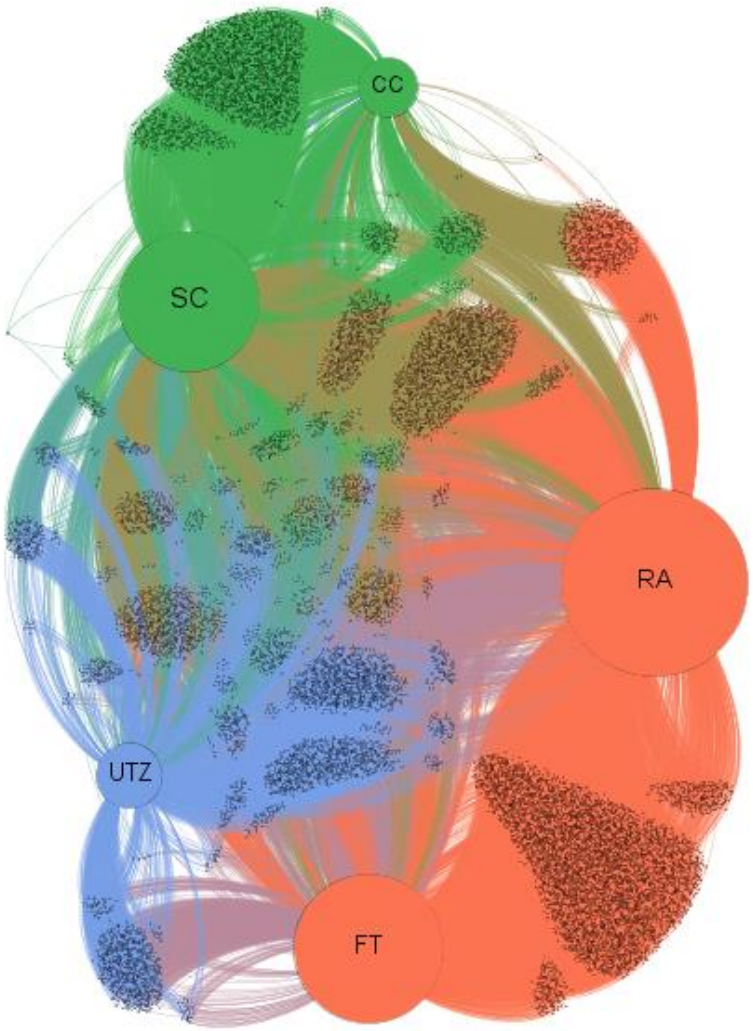

Figure 5. Modularity (CA= Café de Colombia, SC= Specialty Coffee Association, UTZ=UTZ, RA= Rainforest Alliance, FT= Fairtrade international. Edge direction: clockwise oriented)

5.2 Hubs and authorities

The process of identifying the users that play an essential role in the networks passes beyond the visual representation. Below are the results of the calculations of nodes Authority and Hubs.

Nodes influence was measure by estimating the Eigenvector centrality and the level of Authority. The ranking in both cases shows very similar results; therefore ranking of authorities is presented in *Table 8* with 49 actors, and the eigencentrality calculations in Appendix E with 45 actors.

Nodes authority is an indicator of the quality of a node's connection. Coffee certification labels were on the top of the ranking; the list is led by Rainforest Alliance, followed by Fairtrade International, Specialty Coffee Association, UTZ and Café de Colombia. However, this result was predictable since they are the root set nodes from which the network was created and hence are the most connected.

The nodes that interest us the most are the ones that create links between them. The first group of nodes with the most prominent Authority is formed by three media accounts (Global Coffee Report, Roast Magazine, Barista Magazine), two industry associations (National Coffee Association USA and the International Coffee Association), one Farmer association (FNC) and one NGO (Coffee Quality Institute).

Following the previous group, there is a variety of different actors in Table 8. 55% of the accounts are directly and exclusively linked to the coffee sector. There is an outstanding presence of media accounts in the authority ranking, 28% of the accounts or the equivalent to 14 nodes, comprises podcasts, magazines, blogs, among others. It was found that additional labels appeared on the ranking – Equal Exchange and Fair Trade Certified – which appeared on the ranking as additional labels. There are two research institutes, World Coffee Research and CIAT; the last one is at the same time part of the CGIAR network, which is also in the list.

Regarding the global distribution of the accounts in the authority ranking, the headquarters of 5 out of the 49 accounts are located in producers countries; these nodes are Café de Colombia, FNC and CIAT from Colombia, and Kevin Wilkins and Gabriela Cordon consultants from Côte d'Ivoire and Guatemala respectively.

Table 8. Top-ranked nodes based on Authority

Ranking	Id	Name	Authority
1	rnfrstalliance	Rainforest Alliance	0.703071
2	fairtrade	Fairtrade Intl	0.571764
3	specialtycoffee	Specialty Coffee Association	0.332578
4	utzcertified	UTZ	0.21475
5	cafedecolombia	Cafe de Colombia	0.148234
6	nationalcoffee	NCA USA	0.000427
7	gcrmag	Global Coffee Report	0.000427
8	roastmagazine	Roast Magazine	0.000427
9	thecqi	Coffee Quality Inst.	0.000427
10	baristamagazine	Barista Magazine	0.000427
11	fedecafeteros	Federación Nacional de Cafeteros	0.000427
12	icocoffeeorg	International Coffee	0.000427
13	wcoffeeresearch	WorldCoffeeResearch	0.000354
14	mig_zamora	Miguel Zamora	0.00035
15	nespresso	Nespresso Global	0.00035
16	itcnews	International Trade Centre	0.000338
17	olam	Olam International	0.000338
18	olamcoffee	Olam Specialty Coffee	0.000338
19	coffeenetworkus	CoffeeNetwork	0.000338
20	daninierenberg	Danielle Nierenberg	0.000338
21	simransethi	Simran Sethi	0.000338
22	rootcapital	Root Capital	0.000338
23	food4farmers	Food 4 Farmers	0.000338
24	hivos	Hivos Global	0.000338
25	gcpcoffee	GlobalCoffeePlatform	0.000338
26	ciat_	CIAT	0.000338
27	mgctwest	Chris Burkeâ	0.000338
28	baristaguild	Barista Guild	0.000338
29	cgiar	CGIAR	0.000338
30	civileats	Civil Eats	0.000338
31	eqexcoop	Equal Exchange	0.000338
32	fao	FAO	0.000338

33	faoclimate	FAO Climate Change	0.000338
34	faoknowledge	FAO Knowledge	0.000338
35	fast_intl	FAST International	0.000338
36	gabrielacordon	Ired4U	0.000338
37	kevinerwilkins	Kevin Wilkins	0.000338
38	perfectdailyg	PerfectDailyGrind	0.000338
39	tsc_news	TSC	0.000338
40	fairtradecert	Fair Trade Certified	0.000337
41	beansceneed	BeanScene Magazine	0.000337
42	coffeeadventure	Jamie Ferguson	0.000337
43	coffeegeek	CoffeeGeek	0.000337
44	croptocup	Crop to Cup Coffee	0.000337
45	greenmtncoffee	GreenMountainCoffee	0.000337
46	npr	NPR	0.000337
47	shotofcoffee	Daily Shot of Coffee	0.000337
48	sprudge	Sprudge	0.000337
49	aromacafes	Aroma de CafÃ©	0.000276

While the authority score indicates the value of the node itself and hubs estimates the value of the links outgoing from the node; the biggest hubs contain useful links towards the authoritative pages. The hub calculation was made for all network nodes. Table 9 presents a simplified ranking with the top nodes with the highest Hubs scores; the detailed table is attached in Appendix F.

Table 9. Top-ranked nodes based on Hubs

Ranking	Id	Name	Hub
1	specialtycoffee	Specialty Coffee Association	0.013813
2 to 138	Group of 137 nodes	Group of 137 nodes	0.013741
139	utzcertified	UTZ	0.013005
140	cafedecolombia	Cafe de Colombia	0.012829

Specialty Coffee Association is the node with the highest Hub, followed by a group of 137 nodes that share the same score. At the end of the ranking, there is Utz and Café de Colombia.

53.57 % of nodes in the ranking are personal accounts, within them, we can highlight the baristas 2.14% and consultants 10.71%; NGOs represents the 7.86%; importers 5%; Platforms 4.29%; farmers association 3.57%; coffee brands 2.86%.

54.29 % of the nodes in Table 9 are directly and exclusively related to the coffee industry, while 45.75% have a non-exclusive relationship with the coffee industry.

Regarding the global distribution of the accounts in the Hubs ranking, 55% of the accounts are located in producers countries, 33.57% in traditionally consumer countries and 11,43% are international.

6. Discussion

Coffee crisis, oversupply, high price volatility, low bargaining power and prices received by the coffee producer, had lead coffee farmers to adapt their production and gradually move from the traditional value chain to the differentiated and relational segments. At the same time, FNC has been supporting the farmer to access high-value market chains through new export policies and international marketing strategies. Our main question is whether the intended governmental communication policy works and whether it is possible to observe already some changes in online communication. With the purpose of doing so, we conducted a Social Network Analysis of the coffee certifications labels network created using their Twitter profiles; we described the structure of the network and identified the prominent actors. Based on the analysis, we discuss the impact of the results of the study for the marketing and online activities of the FNC and consequently, farmers. Additionally, we want to evaluate the relevance of such type of analysis for understanding drivers of development of modern international value chains with tropical agricultural products.

The construction of the coffee certification labels network allows us to see the relations among the nodes of the root set − coffee certification labels promoted by the FNC, “Café de Colombia” and Specialty Coffee Association − thought the accounts that connect them. We consider a connecting account the nodes that link at least two nodes of the root set, either by

following two coffee labels, being followed by two or more coffee labels or followed by one label and following another label.

After analysing the selection of the connecting nodes for the creation of the network, we found that the UTZ followers accounts are more likely to participate in the network. At the same time, Cafe de Colombia proportionally tends to have the least followers nodes in the network (4%). These results need to be interpreted with caution. The social media strategy of coffee labels influences the outcome of the study. For instance, Café de Colombia follows a few nodes; in contrast, Specialty Coffee follows a significant number of users. A reasonable explanation is that each of the organisations has different approaches; Specialty Coffee appeals to build a global community, while Café de Colombia focuses on the promotion of Colombian coffee worldwide.

Our neighbour analysis reveals that Fairtrade is closer to Rainforest, as well as Specialty Coffee to Café de Colombia. Contrarily, Fairtrade is the most distant node to Café de Colombia. That closeness is ratified by the detection of the communities, which divided the graph into three distinct clusters. It is worth noting that 76.53% of the total connections of Café de Colombia in the network are related to Specialty Coffee. Most of them are the nodes that follows both Cafe de Colombia and Specialty Coffee. This number gives us insights into the effort of the FNC to promote the Colombian coffee geographic origin as a high-quality product associated with Specialty coffee. The study does not define the neighbour's characteristics or behaviours; hence future studies may prove how remote they are conceptually speaking from each other and if the customer considers them as related or complementary.

We would have expected to see a more significant portion of nodes connecting Rainforest Alliance, Fairtrade International and UTZ with Specialty Coffee. The reason why we were expecting more connections was based in what previously suggested by Samper et al. (2017), the traditional and differentiated segments are quickly adapting their offers and practices in response to the influence of the relational segment. However, the study reveals the low level

of connections between Rainforest and Fairtrade with Specialty coffee. On the other hand, Utz stands out having 1,146 connectors with Specialty coffee, which is equivalent to 14,94% of their total twitter nodes.

An essential part of the analysis was the direction of the link, which determines the role performed by the nodes. Some actors are influencers, and some others are observers. The HITS algorithm, as noted earlier, contributes to establishing Authority and Hub statistics. Higher authority scores indicative of a node that is linked by many hubs, while the hub calculation is based on the number of outbound links to authoritative nodes. The quality of the connections influences the classification. That explains why UTZ has more Authority than Café de Colombia, or Fairtrade is above Specialty Coffee, despite the fact that the former have fewer connections. A good analogy that helps to understand the HITS results is for instances when buying a car; the shopper is more inclined to purchase it from a dealer that a friend recommends; the Authority, in this case, would be the car dealer, and the hub would be the friend. These measures can help to identify or confirm the roles played by critical members within the network.

In addition to the nodes of the root set, the authority ranking continues with a list is made up of a very diverse group of actors. Among actors included in the ranking of are media, industry associations, farmers association, NGOs, research institutions, certifications. Their role in the network is to influence and mark trends by being a source of information. They are the actors that − where possible − need to lead the institutional designs that take into account the long-term ecological and economic sustainability of the coffee sector as a whole, including the ability to recover from natural or economic shocks.

The analysis of Hubs includes interesting examples of stakeholders; the results confirm the trends identified by Grabs (2017) concerning the appearance of new intermediaries in the value chain. The ranking includes a Colombian coffee tour operator, blockchain for the coffee industry, coffee investor consultant, farmers associations, aid organisations, industry platforms, head-hunter for sustainable works, and coffee from indigenous origin and gender approach. The previous are organisations that observe the network. Some might belittle this

ranking at first glance; however, some of them might be the future of the sector, early adopters or new business models. They might be taking advantage of market signals to align their value proposal and eventually can become authorities and change the value chain dynamic.

The identification of these actors provides exciting insights, useful to support marketing decision making of the FNC and users of the programmes "Cafes Especiales", "100% Café de Colombia" and ECSQ, especially if they are using the social media for marketing their products in international markets. Two facts caught our attention from the ranking of authorities. There is an outstanding presence of media accounts and a weak presence of nodes from producer counties. The first fact ratifies the critical role of the communication in high-value chains; however, from the analysis is not possible to determine whether if the role of the media is an effect of the Relational Segment into the network. The second fact is that the ranking is dominated by accounts with headquarters in traditionally consumer countries. Generally, we can affirm that the presence of nodes located in producer countries is weak, which implies that their level of influence in the network is also low. This result is confirmed by Hub ranking, in which the majority of the nodes located in producer countries, are more likely to be observers than authorities.

Understanding the composition of the rankings is useful for the FNC to adapt their communication strategy to the network gaps. We recommend the FNC to focus the communication strategy for specialty coffee with information about the story behind the cup with content created by the FNC programme users in their accounts, as it is the information that the relation segment demands to differentiate the product (Borrella et al. 2015). Consequently, strengthen the online presence of users of the FNC programmes, increase the interest for their products, and impact in their income and land-use decisions (Rueda & Lambin 2013). The preceding align with the policies objectives that add more value at the origin for entering new market segments, while is created a more extensive recognition of the Colombian coffee source previously studied by Reina & Silva (2008). Eventually, greater involvement of producers and their institutions, in the communication strategy might

contribute to the change of the governance structure that, as previously identified by Schouten & Bitzer (2015), traditionally has been top-down and northern-centric.

We are aware that our study may have the limitation of representativeness caused by the selection of the actors. It is plausible that this limitation might have influenced the results obtained. We wish to overcome this limitation with more prominent resources and process capacities to include more nodes in the root set and conduct a more data-intense analysis, including longitudinal measurements. Despite the limitations, we consider that the methodology of the study can be applied in other products or industries with similar characteristics − such as the wine, craft beer, tea or cocoa industries − for understanding the presence of modern international value chains on the Internet.

The findings provide a good starting point for further research. The study shows the closeness of the specific actors due to the connections they have in common. However, the findings must be corroborated with additional studies; further research should conduct Sentiment analysis, Topic modelling, Trend analysis and Visual analytics by participants in national and international level.

7. Conclusion

We started this research with the purpose to conduct a Social Network Analysis of the coffee certification labels; we managed to construct and describe the network, as well as analyse the relationship of the nodes by determining their roles of Authority and observation. Our work pretended to determine whether the intended governmental communication policy works and whether it is possible to distinguish already some changes in online communication.

The results obtained provide a general picture of network structure and ranking of highest influential nodes and most prominent observers' nodes. The finding of the study indicates that FNC communication, intended to promote the recognition of the Colombian coffee as a

source of high-quality coffee, is reflected in the actors' interaction of Twitter. We have determined the node's neighbours and communities of the Fairtrade International, Rainforest Alliance, Utz, and Café de Colombia in relation with Specialty Coffee Association. The evidence we presented above demonstrates that “Café de Colombia” is more interconnected to the Specialty Coffee Association than to any other node of the network; hence they form a community of similar characteristics. In practice, the FNC can use the detection of the groups for advertising the programmes of “Cafes Especiales” and “100% Café Colombiano” by designing products and marketing materials with greater precision. Consequently send messages, create dialogues and identify critical points in viral marketing campaigns on the social media platform effectively.

Measuring Authority, the study recognises the most influential nodes of the network. Their analysis manages to identify some of their characteristics. In general, the ranking of authorities suggests that the nodes of communication media are very influential actors in the network; the formats vary from magazines, podcast or personal blogs.

Not less important is that actors from coffee-producing countries have a low influence on the network, which denotes that there is a gap in the integration of producers and their institutions in communication. Close the gap is a task that coffee institutions in producing countries worldwide should work. The FNC opportunity is to strengthen the communication of what lies behind each cup of coffee, leveraging on the content that users of their programs publish in their accounts or what they can generate in their farms from documenting the coffee process. What in turn, it is the information demanded by the relational segment.

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