

## Article

# Popularity in Social Networks. The Case of Argentine Beekeeping Production Entities

Jimena Andrieu <sup>1,\*</sup>, Domingo Fernández-Uclés <sup>2</sup>, Adoración Mozas-Moral <sup>2</sup> and Enrique Bernal-Jurado <sup>3</sup>

<sup>1</sup> National Institute of Agricultural Technology (INTA), EEA San Juan-Argentina/National University of San Juan (UNSJ), San Juan 5400, Argentina

<sup>2</sup> Faculty of Social and Legal Sciences, Department of Business Organization, Marketing and Sociology, University of Jaén, 23071 Jaén, Spain; dfucles@ujaen.es (D.F.-U.); amozas@ujaen.es (A.M.-M.)

<sup>3</sup> Faculty of Social and Legal Sciences, Department of Economics, University of Jaén, 23071 Jaén, Spain; ebernal@ujaen.es

\* Correspondence: andrieu.jimena@inta.gob.ar; Tel.: +54-92644921079 (ext. 144)

**Abstract:** The context of the COVID pandemic has accelerated the pace of the digitalization of society, especially of its business fabric. Among the various applications offered by the Internet, social networking platforms have been identified as powerful tools that organizations have at their disposal for the development of their online business activities. This is due to the closeness and trust generated by word-of-mouth communication. In this context, the aim of this article is to identify which organizational characteristics are directly related to popularity on social networks, measured by the number of followers on these accounts. In order to achieve this objective, the Argentinean beekeeping organizations have been taken as a case study and the fuzzy set Qualitative Comparative Analysis method has been used. The results obtained allow us to validate the different organizational factors which, beyond the use of Facebook itself, lead to better results for the organizations in their social network strategies. These factors include their cooperative nature, localization, environmental sensitivity and presence on other digital platforms.

**Keywords:** Facebook; cooperatives; beekeeping; fuzzy set qualitative comparative analysis



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## 1. Introduction

Argentina plays a central role in beekeeping production, both regionally and globally. Thus, in 2018 it was ranked as the first honey-producing country in America and the third in the world, after China and Turkey. This importance is maintained not only in volume produced, but also in volume marketed. Thus, in 2018, on a world export volume of approximately 650 thousand tons of honey, Argentina contributed 10.5%, being only surpassed by China, with 19% of the total. Between the two countries, they concentrated almost a third of the international sales of this product [1].

Despite Argentina's global importance in the world beekeeping market, the sector has been facing important difficulties, both in production and marketing. On the one hand, primary production has been suffering a drop in average yields since the beginning of the 21st century, due to a series of factors that negatively affect the beehive environment and beekeeping practice. Examples include the loss of biodiversity, the advance of agriculture over pastures and natural forests, homogenization of landscapes and the increased presence of diseases, among others [2,3]. On the other hand, with respect to the structure of the production system, this is characterized by a high atomization in primary production, a low relative size of the productive units and, as a consequence, a strong dependence on distribution. Argentina has a total of 13,722 beekeeping registries located throughout the country, most of which have fewer than 500 hives (The same negative trend can be observed in sales of honey certified as organic. Since 2008, Argentina's share in the world

organic market has been declining despite its favorable evolution in both demand and world prices) [4–6].

In addition to these problems present in the field of production, there are others related to the marketing of these products, such as the significant dependence on foreign markets and their evolution, the lack of differentiation derived from the preferential sale in bulk and the concentration of sales from a few exporting companies. Indeed, in 2018, 85% of domestic production was destined to international markets, mainly to the United States, Germany and Japan [1,7]; a figure that has shown a downward trend if we consider that it had reached up to 95% in previous years [8]. Another commercial problem is related to the pursuit of a commercial strategy based on the exchange of large volumes of honey (in drums). This form of sale has an impact on the average prices per kilo exported, causing Argentine prices to be below the world average (An analysis of the evolution of prices for the Americas throughout the 21st century shows that they are, on average, intermediate prices between those of Europe (mainly Western Europe) and Asia. Oceania, based on the differentiation of “Manuka” honey, shows considerably higher prices.) [1,8].

This problem tends to worsen as exports in this large-volume format become more and more frequent, making product differentiation difficult. The sector also loses a large part of the added value generated in the packaging and distribution stages (The same negative trend can be observed in sales of honey certified as organic. Since 2008, Argentina’s share in the world organic market has been declining despite its favorable evolution in both demand and world prices.) [9–11]. In turn, it is estimated that only three entities control approximately half of the exported volume [10,12]. The way of organizing such commercialization has traditionally been structured on the basis of the figure of the “stockpiler” as the main intermediary. However, during the last few years there has been an advance in backward integration in the chain by exporting companies through the implementation of direct contracts with producers [10]. This situation tends to reinforce a distancing between the primary production sector and the final consumer, and with it the loss of participation of the first sector in the honey valorization process [8,13].

This is taking place in a context in which, in general terms, honey consumption is showing a favorable evolution (In 2018, the apparent honey consumption data implies a value of 243 grams per person per year. This figure is higher than the average value for the period 2011–2016 that implies 156 grams per person per year (p. 21). However, these values still represent a low level of national domestic consumption.) [1,7,14,15]. Thus, honey has managed to consolidate itself within the group of natural products related to healthy eating [16,17], due to its characteristic as a natural sweetener, in addition to other properties that expand its potential use [18,19]. In the Argentine case, its consumption will be favored in the future to the extent that strategies tending to improve the diet of the local population are developed based on a reduction in the consumption of ultra-processed products and an increase in the consumption of natural products with an intersectional look. This is coupled with a commitment to the implementation of production and distribution systems that are more sustainable [20–22].

The above problems suggest the need for the sector to adopt measures to improve the supply of this food product, not only from the perspective of production but also along the distribution chain [23]. Such measures should include those aimed at improving exchange networks in order to achieve greater differentiation of production and more direct communication with the consumer [13,24]. In this sense, several authors have highlighted the determining role that can be played by the use of virtual applications, such as company websites or social networks [25–27] especially in the case of natural products, as is the case of honey [26,28]. Thus, certain “experiential” agricultural products, due to their intrinsic characteristics, are particularly suitable for marketing through the Web [29]. For example, the purchase and consumption of products such as honey or wine are based on an intensive exchange of information on tangible aspects of the product as well as on symbols, tradition, culture, tourism and gastronomy; all aspects that can significantly enhance the value perceived by the consumer [30]. Thus, social networks, due to their closeness and

interactivity with users, are positioned as an ideal communication channel for transmitting such information [31].

In line with the above, some authors have defended the need to address the link between the beekeeping subsector and ICT (Information and Communications Technology) [32]. However, the literature review shows that there are no studies focused on the beekeeping sector that have tried to investigate the degree of use of social networks and which factors are associated with greater success in the use of these technologies. Indeed, studies focused on the beekeeping sector can be divided into three groups: first, those that have focused on the analysis of honey markets and their potential at the local scale [12,33,34]; a second group has focused on the analysis of production, its socio-economic structure and the analysis of technical efficiency [10,35]; and, finally, a third group of studies has focused on the transformations of the digital era, paying more attention to production than to interactions between producers and consumers [36,37]. Thus, the focus of these latter studies tends to be on the analysis of the digital impact on machinery, equipment and other inputs needed to increase production efficiency, with less frequent studies addressing the benefits of a comprehensive use of the Internet in terms of communication and management improvements [38].

Based on the premise that social networks are tools that can provide answers to the problematic situation described above, especially the commercial one, the objective of this paper is to analyze which characteristics of beekeeping organizations are directly related to greater success in the use of these technologies. To achieve this objective, the Argentine beekeeping organizations have been taken as a case study and their use of the social network Facebook and the factors related to greater popularity in this network have been analyzed using the fuzzy set Qualitative Comparative Analysis method. The paper is structured as follows: after this introduction, the contextual framework detailing the study propositions is presented, followed by the technical characteristics of the research in the methodology section, after which the results are presented and finally, the conclusions and reflections are derived from the data analysis.

## 2. Materials and Methods

### 2.1. Contextual Framework

In this sense, transaction cost theory has often been used as a basis for analyzing and highlighting the potential of information and communication technologies (ICT) for business, especially in the commercial sphere [39]. Social media, as the main example of this phenomenon, brings multiple benefits in terms of business performance and reduction of different types of costs. Thus, information costs decrease thanks to the informational potential of online social networks, which facilitate, improve and speed up information exchanges [40]. Negotiation costs decrease because online media can improve customers' access to the organization and enable them to receive more personalized offers [40]. Finally, assurance costs are minimized because users are offered reliable and good quality information and feedback [41].

However, experience indicates that not all companies have the same ability to take advantage of the benefits offered by the Internet. Rather, several studies indicate that adaptation to the Internet and social media in which one operates in this medium depends on several factors, which differ according to the sector or region in which the company operates [42]. In the specific case of agricultural markets, McFarlane et al. [43] found that the characteristics of the distribution chain, the scope of the company and the type of product it sells (organic) influence the intensity of adoption of the ICT strategy.

The literature has been concerned with investigating the challenges and organizational characteristics of cooperative entities that delay or could delay the adoption of technology and the use of ICT [44]. This happens despite the fact that aspects shared between Social Economy entities and Web 2.0 technologies and the different tools that integrate them are highlighted. Particular reference is made to the affinity of these types of tools with cooperative principles, such as their participatory and democratic nature and the predominance

of the social component of capital [45]. Thus, it is identified that the benefits of ICT are increased in cooperative societies due to their ability to coordinate activities, people and processes [46]. In short, the potential of ICT use within cooperative societies for information exchange and communication is recognized as a key factor for their management [46]. In turn, this potential is identified in terms of improving aspects that determine the economic viability of organizations [47]. Thus, the following assertion is established:

**Proposition 1.** *Having the legal form of a cooperative is directly related to popularity in social networks.*

The literature points out the importance of agglomeration economies for the circulation of knowledge and innovation of firms located in the same geographical space. Thus, the role of the network of linkages will be key to the extent that it is also structured beyond the local level [48]. In this line, several studies in Argentine companies account for the importance of connections with third parties and cooperation links for the circulation of information and on the innovation process [10,12,49]. Thus, the literature makes it clear how clusters are an element that enhances competitiveness, improving the innovative performance of the organization and its commercial actions [50]. Based on these arguments, the following proposition is put forward:

**Proposition 2.** *The location of the entity in a central area for beekeeping production favors greater popularity in social networks.*

On the other hand, a growing social concern for environmental issues and environmental conservation can be observed. An increasing number of consumers are seeking information in this regard and are considering environmental aspects in their purchasing decision process [51]. In this sense, these consumers are increasingly resorting to the use of digital media as an alternative purchasing channel [52]. In addition, consumers of organic products tend to be more active on the Internet, in part because of their greater need for information [53]. Precisely, among the various tools offered by the Internet, social networks are the ideal platforms for acquiring trusted information and mitigating existing misinformation when purchasing organic food [54]. From the business point of view, Mozas et al. [55] identify that the organic character of the organization positively affects its innovative character. Moreover, Fernández-Uclés et al. [52] show how organizations of a greener character are likely to achieve higher performance in the use of social networks. Thus, the following proposition is established:

**Proposition 3.** *The environmental sensitivity of companies favors the increase of their popularity in social networks.*

Virtual social networks are a key communication channel in the commercial strategy of organizations to increase their notoriety and improve their performance [56]. To do this, it is necessary to make a solid commitment to these tools, which will give the organization greater competitiveness and better business results [57]. Furthermore, when an organization integrates a technology, a learning process begins that will lead to a better use of the technology [58]. This know-how, the result of the experience of using an innovation, makes it possible to improve business performance in an innovative environment, favoring an increase in performance and even the ability to obtain sustainable competitive advantages [59]. Therefore, experience is going to be a factor that will go hand in hand with an increasingly efficient use of social networks [60]. This line of argument leads us to put forward the following proposition:

**Proposition 4.** *The experience of using social networks favors the greater popularity of the entities in them.*

A key aspect in organizational performance is the integration and combination of different social media [61]. Having a corporate website when accompanied by virtual social networks facilitates contact, information exchange and interaction with consumers, improving the company's positioning on the Internet [62]. The interconnectivity of the different online platforms gives them greater visibility and therefore better results in this medium [63]. The existence of an increasingly sophisticated audience requires companies to increase the amount of company information on the internet and its presence on different platforms [64]. Thus, the optimization of social networks requires an effective strategy based on the interaction with the different platforms where the organization is present [65]. In this line, we find the strategies of so-called Inbound Marketing, based on the interconnection of all the virtual platforms in which the company has a presence and aimed at the consumer, which will supposedly increase the performance of these technologies and the company itself [66]. Thus, we put forward the following propositions:

**Proposition 5.** *The interconnectivity of social networks with the website leads to greater popularity in social networks.*

**Proposition 6.** *Presence on digital platforms other than the entities' websites favors greater popularity in social networks.*

## 2.2. Population and Methodology

### 2.2.1. Population

In order to determine the organizational structure of the Argentine beekeeping sector, information was obtained on the population and basic commercial characteristics of the set of legal entities taxed under the category "beekeeping production" during the fiscal year 2019/2020 [67]. In July 2020, a total of 228 legal entities registered in the category "beekeeping production" in the Argentine territory were identified [67]. The population under study in this study will be only those entities present on the social network Facebook. Precisely, the population thus defined implies a total of 65 entities, of which 43% had the legal form of cooperative. It should be noted that this group of 65 entities concentrates approximately half (47%) of the employment generated within the category analyzed and contains 67% of the entities with a high-income level, 42% of those with a medium income and 27% of those with a low income within the Argentine beekeeping sector.

### 2.2.2. Methodology

With respect to the methodology used, the Qualitative Comparative Analysis (QCA) technique was employed, using the fuzzy sets approach (fsQCA), in order to establish technological and organizational variables that are jointly associated with a higher level of efficiency. The QCA technique, based on Boolean algebra, uses a verbal, conceptual and mathematical language that configures it as a qualitative and quantitative approach, useful for small samples by combining the main advantages of both [68]. Thus, by applying QCA it is possible to systematically analyze a set of cases to determine causal patterns in the form of necessity and sufficiency relationships between a set of conditions and an outcome [69]. This method has the advantage over a regression technique of establishing relationships between subsets of variables in order to explain relationships. Specifically, QCA has three main variations: crisp-set QCA (csQCA), multi-valued QCA (mvQCA) and fuzzy-set QCA (fsQCA). Fuzzy set (fsQCA) is positioned as one of the most widely used QCA variants, as it resolves one of the main drawbacks and criticisms of the initial approach called csQCA, namely its strictly dichotomous approach [70].

Thus, fsQCA will provide as a result one or more antecedent combinations sufficient for obtaining a particular result, such as:  $X1 * \sim X2 * X3$  sufficient for a result (Y). Making use of the symbology of this technique ( $X1 * \sim X2 * X3 \rightarrow Y$ ). Being: X1, X2 and X3, antecedents; Y, the result; \* the union and  $\sim$  the absence or negation, in this case the opposite value to X2 (1

– X2). Thus, this technique makes it possible to identify logically simplified statements that describe different combinations (or configurations) of conditions that indicate a specific result [68].

The fsQCA technique was developed for small sample or population environments [68], so it is not an inconvenience for this research, in which the study universe was small. For the correct execution of this technique, the phases recommended in the literature were followed: (1) data calibration (transform variables into fuzzy sets), (2) simplify the multiple solutions, (3) interpret the results [69]. Next, a necessity analysis of the efficiency scores on the different causal conditions was carried out to verify that none of the values obtained exceeded the threshold recommended in the literature of 0.9, established by Ragin [71], and this was corroborated.

In this study, the number of followers of the different organizational accounts on Facebook was used as the outcome (dependent variable). In turn, as conditions (independent variables), the different variables shown below (Table 1) were used.

**Table 1.** Description of the variables used in this study.

Variable	Description	Type of Variable
Followers (dependent variable)	Number of followers on Facebook	Continuous <sup>1</sup>
Coop	Organization is a cooperative society	Dichotomous <sup>2</sup>
Location	Location in a central productive region	Dichotomous <sup>2</sup>
Environmental	Degree of environmental sensitivity <sup>3</sup>	Continuous <sup>1</sup>
Experience	Days of use of the social network Facebook	Continuous <sup>1</sup>
Social web	Website interfaced with social network	Continuous <sup>1</sup>
Other sites	Presence on other digital platforms	Dichotomous <sup>2</sup>

<sup>1</sup> The continuous variables were calibrated using the fsQCA 3.0 software. <sup>2</sup> Dichotomous variables (1: yes; 0: no).

<sup>3</sup> This variable is constructed by evaluating both the presence and frequency with which different environmental aspects appear in the network. The information was structured along four axes: (i) explanation of the contribution of beekeeping to sustainability, (ii) manifestation of environmental concern, (iii) characteristics of the type of product (organic/ecological/agro-ecological) and (iv) indication of the health benefits of consuming the main product of the activity, honey. Source: own compilation.

### 3. Results and Discussion

#### 3.1. Descriptive Analysis

In a first approach to the study, Table 2 shows the average descriptive values of the variables considered in this study.

**Table 2.** Descriptive values of the variables used.

Variable	Description
Coop	43% of the companies have a cooperative legal form
Location	75% of the companies are located in a central production region for beekeeping.
Environmental	70% have some degree of environmental sensitivity.
Experience	The average company has been on this social network for 3.8 years (1397 days).
Social web	32% of companies have a website that leads to user interaction, linking social networks and including comments and ratings.
Other sites	63% of the organizations are present on other online platforms, different from the website and social networks.

Source: own compilation.

The information included in Table 2 is here interpreted according to the trends observed in the international literature. Firstly, several studies have shown the potential use of ICTs by agri-food cooperatives [44–47]. Our data reveals that the cooperative nature becomes more important when the population is analyzed by its presence on social media (28/65 over 85/228). Secondly, there is evidence that the problems with generating websites interconnected with social networks still persist for an important group of entities in the agri-food sector [52,55,62]. Table 2 shows that only one of three entities has this interconnectivity. Thirdly, there are other studies that show that the concern for sustainability aspects is more frequently found in products classified as natural [25–31]. Here we can see how

environmental sensitivity is present in almost two of three cases. Finally, it is recognized in the literature that the presence in social media is not isolated, it is rather connected with other networks and platforms [63,66]. Table 2 highlights that most of the entities have a multi-platform presence.

### 3.2. fsQCA Analysis

Table 3 identifies which of the factors listed in previous sections are positively related to the level of followers on the Facebook social network. The results obtained after applying fsQCA are shown in Table 3. The combination of the parsimonious and intermediate solution is used, which can provide a more detailed and aggregated view of the findings [72].

**Table 3.** fsQCA analysis results.

Configurations	1	2	3	4	5
Coop				●	●
Location	●	●	●	●	
Environmental		●	●		●
Experience	●	●		●	●
Social web	●	●	●	●	●
Other sites	●		●		●
Raw coverage	0.438469	0.414685	0.397449	0.278525	0.225784
Unique coverage	0.032402	0.053439	0.044812	0.330921	0.042399
Consistency	0.880886	0.934732	0.905735	0.898777	0.953421
Model coverage	0.62082				
Model consistency	0.86337				

Source: own compilation. Black circles (●) denote the presence of a condition, and a blank space represents the “do not care” condition. The distinction between core condition and peripheral condition is made by using large and small circles, respectively [73].

The results obtained show that the first configuration presents a gross coverage of 43.84 percent. This configuration establishes that, as a whole, the relationship between the variables of the organization’s experience in the use of Facebook, its location, the link between Facebook and the organization’s website and its presence on other online platforms explain a greater popularity on Facebook, measured by the number of followers on this social network. Similarly, it is worth highlighting the other configurations. Overall, this model presents a total coverage of 62 percent, which denotes the proportion of organizations that are explained by the six variables considered, and a total consistency of 86 percent of the cases. This value far exceeds the minimum consistency level recommended in the literature of 0.74, which strengthens the validity of the model proposed [74,75].

The results obtained are in line with the results of others research. The social economy as well as organic agriculture sector agree that marketing should be carried out through short channels [76]. ICT are a fundamental tool for improving organizational results, as they have the possibility of bringing producers closer to the final market [77]. This approach is crucial, based on empirical evidence in LA, to increasing the participation of producers in the honey value chain [8:156]. In addition, greater popularity and acceptance is expected for those organizations that are in line with the Sustainable Development Goals, which include linkage to the territory, innovation as a transversal axis, environmental commitment and those of attachment to the territory shared by cooperativism and the social economy [78]. Furthermore, there are studies in which the location dimension does not end up being a discriminatory variable [57]. The importance of localization found here is interpreted in the context of the production environment, therefore we invite further research to explore how to incorporate this dimension into studies on ICT.

This study is also significant in terms of the local and regional evidence that points to the importance of the use of social networks, especially Facebook, in the agricultural sector [79,80]. Other studies have also revealed the importance of the use of these networks

in the marketing and promotion of products. However, this evidence is still of a sectoral and spatial nature [81,82]. Furthermore, it is noted that both for Argentina and for Latin America the volume of electronic commerce is lower than that recorded in other regions of the world [83]. In this way, it is necessary to examine in more detail both the use of ICT and its impact within the entities related to the beekeeping sub-sector and the agricultural sector in Latin America [32,38].

#### 4. Conclusions

The Argentine beekeeping sector, the third largest honey producer in the world, faces important problems that challenge the sustainability of the activity. Among them are the atomization and the scale of work in the primary sector, which implies a strong dependence on distribution. This situation is intensified by the concentration of the commercial export sector and the sale of the product, preferably in bulk, thus losing much of the added value generated in the packaging and marketing stages. In response to this situation, it is necessary to improve the exchange networks in order to achieve greater differentiation of production and more direct communication with the consumer. Several authors have highlighted the decisive role that the use of social networks can play as a communication and information channel due to the trust they generate among users as a result of their closeness and interactivity [45,56]. Accordingly, the aim of this paper is to analyze which characteristics of beekeeping organizations are directly related to greater success in the use of these technologies, taking as a case study the third largest honey producer in the world: The Argentine beekeeping sector.

The results obtained offer empirical evidence to accept the premise that all the propositions analyzed here are relevant to explaining the popularity of organizations in the most important worldwide social networks, such as Facebook. In this way, and beyond aspects related to the use of the network itself, the cooperative nature, environmental sensitivity, appropriate location and the linkage of the company with different online platforms are reasons that lead companies to improve their positioning in social networks. It is identified that the variables of location of the entity and the interconnection between the network and its own website become necessary conditions in most of the configurations. It is also noted that the variables of environmental sensitivity and presence on other platforms will be of particular importance, especially for cooperatives that are not located in a central area.

The results obtained can help to make beekeeping sector entities aware of the potential of social networks to address the commercial problems they face and their best position to take advantage of it, given the specific characteristics of this market. At the same time, they should serve as an incentive for both public and private organizations to take measures to correct in time the possible lags that may occur with respect to other sectors in terms of the use of online social networks for commercial purposes. The relevance and topicality of the beekeeping sector, as well as the presence of a society that is increasingly technological and demanding of natural products, makes it relevant to continue delving into this line of research. As a proposal for future developments, it is interesting to analyze other sectors or to quantify economically the impact of these tools on the organizational structure of beekeeping organizations.

At this point, it is necessary to point out the main limitations of this study. On the one hand, it is worth mentioning that this research has been directed especially at beekeeping sector entities, although we believe that these contributions can be extrapolated to a large part of the agri-food sector, which presents, in general terms, a similar basic problem in terms of marketing. On the other hand, we also note as a limitation that this study has focused on the national level. In this sense, although Argentina occupies a privileged position in honey production, it might be interesting to contrast its situation with that of other producing countries.

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