

Factors that impact on broiler production management: Pestel and Swot approach

Factores que impactan en la gestión de la cría industrial de pollos: enfoque Pestel y Swot

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Abstract

The scope of this work was to evaluate the macro-environmental factors of mobile applications in the broiler production process, using the Pestel and Swot analysis approach. The Pestel analysis was used to identify the macro (external) forces that affect production with the management of the aviary with the aid of Frango's mobile application; these can be political, economic, social, technological, environmental, and legal. In the Swot analysis, a synthesis of the external and internal analyzes was performed, which identifies items for the organization of the applicability of Frango's application, which implies establishing action priorities. When considering the political, economic, social, technological, and environmental factors, the positive impacts are more significant than the sector's negative impacts, generating an impulse in production and balance in risks regarding the use of technology in the sector. The factors with the most significant influence are technological and economic, and the least significant are the social factors that still depend on improvements in the chicken production process on farms using fast service technologies such as applications.

Keywords: App, Pestel, Swot, broiler production

Resumen

El objetivo del presente trabajo fue evaluar los factores macroambientales del uso de la aplicación en el proceso de producción de pollos de engorde utilizando el enfoque de análisis de Pestel y Swot. El análisis de Pestel se utilizó como herramienta para identificar las fuerzas macro (externas) que afectan la producción con el manejo del aviario con la ayuda de la aplicación de Frango; estos factores pueden ser políticos, económicos, sociales, tecnológicos, ambientales y legales. En el análisis Swot se realizó una síntesis de los análisis externos e internos, que identifica elementos para la organización de la aplicabilidad de la aplicación Frango, lo que implica establecer prioridades de actuación. Considerando todos los factores, políticos, económicos, sociales, tecnológicos y ambientales, los impactos positivos son mayores que los impactos negativos del sector, generando un impulso en la producción y equilibrio en los riesgos en cuanto al uso de tecnología en el sector. Los factores de mayor influencia son los tecnológicos y económicos, y los de menor importancia son los sociales que aún dependen de mejoras en el proceso de producción de pollo en granjas que utilizan tecnologías de servicio rápido como las aplicaciones.

Palabras clave: Aplicación, Pestel, Swot, producción de pollos de engorde

1. Introduction

The year 2019, according to ABPA [1], presented an increase of 5.8% in chicken exports, about previous years. The sale of 2.34 million tons generated 4 billion dollars in the period and a balance of 10.8% higher than the previous year. Likewise, pork reached 414.4 thousand tons exported, representing a 19.6% increase in sales volume to the foreign market. According to the FAO report (2020) that makes projections for the decade 2016-2025, the supply of meat in the world should expand 16% by 2025, mainly due to population growth, increased consumer income, and the advancing demand in the developing countries. According to the study, broiler meat will be the primary driver of growth because of its short production cycle, which allows a quick response to market signals. The report also predicts that the supply of poultry meat will expand in the coming years, especially in countries that produce surplus grains, such as Brazil, Mexico, Russia, Ukraine, the United States, and the European Union.

The essential importers of chicken meat are the Arab countries, Asia, and Africa. During the past twenty years, the Brazilian production of broilers has become important for the country's economy. The broiler sector has evolved significantly in Brazil, and its dynamism is linked to constant productivity gains, mainly through the improvement of feed conversion rates, nutrition technology, genetic research, greater automation of chicken mills, and better production management [2,3].

The theme of animal welfare is increasingly part of the public awareness of developed countries. This fact co-occurs as there is a demand for greater food security and other changes in consumer preferences. The plurality of consumer demand and their concerns about animal welfare on the one hand, and the options of producers in different types of livestock and businesses, on the other, lead to an apparent change in breeding systems and care in the stages of pre-slaughter management, aiming to reconcile animal welfare with sustainable production [4].

Today society lives in the information age that expands access to information and access to knowledge and participation of individuals, changing the consumer market every time. In the information age, consumers are more attentive to the products they buy; in foods, they are interested in nutritional terms and health issues, so it is necessary to understand the consumer, know him and anticipate his needs.

The consumer is a more demanding consumer with more access to information and, therefore, with ever greater expectations regarding product quality and services. Today society lives in the information age that expands access to information and access to knowledge and participation of individuals, changing the consumer market every time. In the information age, consumers are more attentive to the products they buy; in foods, they are interested in nutritional terms and health issues, so it is necessary to understand the consumer, know him and anticipate his needs.

Since mobile technology arrived in the 1970s, cell phones have transformed people's behavior and all the technology around them grows exponentially [5,6]. Used by people of all ages, mobile phones have lost their primary function (making calls). They have become powerful smartphones, devices initially used as an extension of the personal computer (PCs), which have overcome the barrier of smart electronic devices and took the place of desktops (desktop computers) and laptops (lap computers). These mobile devices (mobiles) have become indispensable in everyday life due to their practicality and mobility. They have extended the possibilities of the human being, which reaches everything and everyone and is reached in the same way. There are 7.4 billion mobile phone users globally, and IoT (Internet of Things) indicates an additional increase in smartphone adoption that

will reach 16 billion by 2021. This suggests that smartphones will be the largest electronically connected devices [7,8].

Brazilians are avid smartphone users, and 84 million adults own a smartphone, representing 54% of Brazilian adults. However, as families often share a device, it is estimated that 120 million Brazilians access the internet via smartphones. Also, these devices are the primary source of internet connection for 60% of all Internet users in Brazil, according to data from [9]. Brazil is among the five countries globally with the largest number of cell phones since 2015, and the forecast is that it will be in this ranking by 2022. The others are China, India, Indonesia, and the USA. The potential of the Brazilian mobile market is evident. The present study aimed to evaluate the macro-environmental factors in managing the chicken production process using good production practices through the Pestel and Swot analysis approach.

2. Literature Review

Vulnerable points in poultry production

Exports of chicken meat from Brazil ended in 2019 with an increase of 2.8% concerning the previous year, totaling 4.212 million tons [1]. Chicken production in Brazil is expected to grow 4 to 5% in 2020, reaching between 13.6 and 13.7 million tons. The OECD and FAO suggest that Brazilian exports of chicken meat should increase by 23.5% by 2028. As the two bodies adopted based on the volume of approximately 4.3 million tons, the forecast is to reach 5.3 million tons within eight years. In this projection, Brazilian exports will have an expansion level slightly higher than that of world exports, whose volume, already very close to 17 million tons, tends to register an increase of 21%. According to ABPA [1], China became the primary customer of Brazil in chicken meat, with imports of 585.3 thousand tons, a volume 34% higher than that of 2018. The health crisis that impacted Chinese pig farming also influenced the increase in chicken meat exports. Brazilian chicken meat exports are expected to grow by 5% in 2020, reaching a new record of 4 million tons, despite the uncertainties generated by the new Coronavirus. The report highlights that, despite logistical problems at ports and internal transportation problems in China due to Covid-19, Brazilian chicken meat exports during the first two months of 2020 increased by almost 14% in volume, with record exports in February.

Applicability of technologies in the animal production system

In Brazil, the broiler production chain has advantages due to the fast production cycle. It has a vertical organizational structure, and protein has low cost, attracting consumers from different social classes [10]. This entire cycle is characterized by new technologies using modern planning systems. These management techniques result in constant production growth, resulting in reduced energy and raw material costs. These advances in research in developing new technologies in the poultry sector have turned Brazil into one of the largest producers and exporters of chicken meat globally. New equipment with high technology, the agribusiness with contact with input suppliers aims to improve the entire production process by developing new technologies [11].

Broiler production around forty years ago was centered on small rural properties, and their sale was direct to butcher shops [12]. In the 1980s, technological changes and production structures resulted in a reduction in the fattening time of broilers; that led to advancement in the selection of genetic strains; the intensification of the use of balanced feeds; the use of state-of-the-art industrial equipment, and new poultry management techniques, leading to increased productivity [13]. Scientific and technological development causes constant changes, the primary agent being Technological Innovation [14]. Poultry equipment in the industry brought innovations in processes.

This occurred about the facilities and temperature control in the aviary, with air conditioning equipment, heaters, insulating curtains, most of which are controlled via software. All this innovation arrives to adapt to the aviaries and meet the needs of welfare and thermal comfort of the birds, including traceability programs, obtaining data, from the origin of the feed, medicines to the final product. The result reaches the consumer through a seal with a label that allows establishing all production stages [13]. The rural producer that uses new technologies has (1) the reduction of the workforce with the automation of processes, (2) more significant control of the production (use of computers and monitoring systems), and (3) increase of the quality and sanitary control (biosecurity), consequently the final consumer now has a higher quality product, with food security and at a lower cost [15].

The global competition in the chicken production market is fierce, and they continue to seek solutions that meet the demands to obtain the well-being of the animal, which is the consumer's primary concern today. As the largest exporter of chicken meat, Brazil presenting an increase in production has the challenge of maintaining competitiveness, and this means that it has cooperation between the links in the chain and the maintenance of new technologies to be successful in the production chain.

2. Materials and Methods

The application was developed to operate on the Android operating system from Android version 5.0 Lollipop-API 21. This study showed a macro view, so a very detailed assessment was not made because the use of the app is free. The application development was carried out through the integrated development environment Android Studio 2.3.3 AI-162.4069837 through the Java object-oriented programming language. Figure 1 shows the interaction diagram between the user and Frango's mobile application (Figure 1). The farmer enters the answers to the first week's questions until the slaughter week and will have the final answer if there were problems related to the good practices applied to the flock.

Scores are assigned to each specific demand about the requirement in international codes, ranging from 1 to 5, such as 1 = very poor (there are no rules on this subject compared to international standards), 2 = poor (there are few standards and little or no compliance), 3 = medium (there are standards for at least half of the international standard), 4 = good (there are a lot of rules and regulations on various events during transport and a good degree of compliance), 5 = very good.



Fig.1 Frango's application interface

The Pestel analysis (Political, Economic, Social, Technological, Environmental, and Legal) was carried out using the Likert adapted scale. Thus, as shown in Table 1, the analysis is divided into internal and external factors subdivided into positive and negative points. The negative points bring difficulties or barriers to investment directly, while the positive points foster the same. External factors have a non-mutable position; that is, there is no way to interfere directly, but it is possible to reduce their impacts-when the factors are known. The influence is positive when the use of the object of study does not generate irreversible negative externalities and bring opportunities for investment in wind power, and negative when there is an affectation.

Table 1. Pestel analysis model

Pestel	Positive	Negative
External	Strong	Weak
Internal	Opportunities	Threads

For Kang [8] when organizations use Pestel analysis, it becomes easier to perceive and identify the leading indicators of changes and conflicts by political, economic, social, technological, environmental (ecological), and legal means. Data, when generating the indicators, can be used to construct future scenarios providing success or failure of the strategies of a governmental organization or program. The adapted Likert scale was used, scoring the items raised for Pestel analysis related to Frango's mobile application.

The Swot matrix comes from Strengths, Weakness, Opportunities, and Threats and is a tool that helps in the strategic planning of different areas of an organization. This tool was created by Kenneth Andrews and Roland Christensen, professors at Harvard Business School, around the 1960s, intending to study and improve the strategic planning of companies. Despite being a simple tool, it is considered quite effective in bringing applicability solutions to the business to be undertaken and understanding the market to develop the right strategies (Figure 2).



Fig.2 Swot analysis. Source: Ecommerce Brasil (2020)

Regarding the Swot analysis, a synthesis of the external and internal analyzes was carried out, which identifies items for the organization of the applicability of Frango's mobile application, which implies establishing action priorities. Through the analysis of the application, we sought: strengthening of the positive points, an indication of which points should improve chances of growth, sales of the application according to the market. Regarding the internal environment, the application's strengths and weaknesses, integration and standardization of processes, elimination of redundancy, and focus on the main activity were related. The external environment brought opportunities and threats to the application, showing confidence in the data, immediate information to support management and strategic decision, and reduced errors.

3. Results and Discussion

The Pestel analysis was used to verify the utility of the application. This analytical model facilitates understanding the external factors that may impact the software's operations (Figure 3). Political factors were analyzed: how the political scene's situation directly impacted the private sector. After all, a government that interferes a lot in the economy might create challenges for a business to maintain its profitability. In this sense, different reasons that influence the decision to invest are important for politics, notwithstanding how these investments will be made, consequently affecting the expected results from the use of the adopted technology. When perceiving the phenomenon in this way, a model that shows the influence of adoption factors on organizational performance for developing the scenario can be proposed. The influence is mediated by the planning of IT investments bringing an impact to the policy.

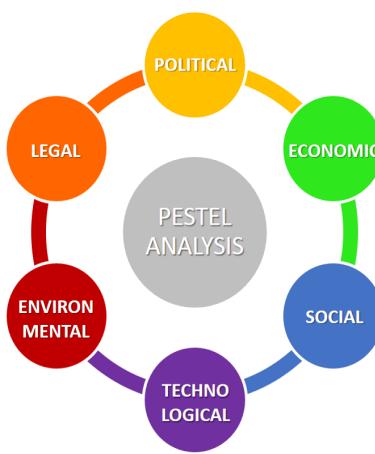


Fig.3 Pestel analysis model

As the consequences of practical use, it is speculated that a series of gains can be provided to companies, such as increased productivity, higher sales, reduced operating costs, increased customer base, higher quality decisions, in addition to the differentiation of innovative products and services [16]. These benefits, when they occur, affect organizational performance, are directly associated with improving the efficiency of operations within specific organization processes [17], bringing an optimized scenario to political factors. The economic factors that bring the possibility of doing business or prospecting new business from the use of the application are associated with the access or mobility of the user to be able to carry out his activities, which gives the user an opportunity when away from the workplace [18]. According to Gebauer [19], adopting a mobile solution is driven by its users spend outside the farm or company performing their activities, whether related to sales or some fieldwork.

According to Turban [20], several socio-technical factors drive the rapid expansion of the use of wireless mobile devices for Internet access, namely: (a) dissemination-the number of cell phones grows exponentially worldwide, with the capacity increasingly access to the Internet through these devices; (b) popularization-the use of cell phones and other wireless mobile devices is a social phenomenon, mainly in the age group between 15 and 25 years old; (c) cheapness-the price of mobile devices is more accessible to buyers, primarily due to the cost reduction provided by the scale of production; (d) functionality-the introduction of new features on devices, as well as applications on the Internet, which makes the set increasingly valuable; and (e) the speed of data transmission-the current bandwidth makes it possible to carry out operations that were previously only possible using computers connected to the Internet via a wire. The context may be somewhat different when

investigating the use of applications on farms since it presents the particularity of, in addition to serving for organizational purposes, it can also be used for personal purposes [21]. However, in many cases, employees assume the dual role of technology users and the service's consumers. Nevertheless, the use of technology for the farmer cannot be perceived as a sacrifice.

Technological and environmental factors should bring competitive advantages to users through innovative applications that use technology, such as monitoring of security devices, among other applications related to the type of business, available wi-fi networks [22, 23]. Other Internet services, popular with traditional wired access, must also be accessible and send and receive e-mails, access social networks, databases, and used and communication software, such as Messenger or WhatsApp, for example [20]. It is expected that a continuous improvement in the production process leads to reduce costs and losses in poultry production. The animal welfare rules clarify the most critical items for adequate chicken production and export within a farm.

Table 2. Result of the Pestel Analysis

Pestel	Score
Politics	4.0
Economy	5.0
Social	3.0
Technological	5.0
Environmental	4.0
Legal	4.0
Average	4.1

Current literature [20-23] advises that scores related to technological and environmental factors are above average is good. That indicates that the use of the application Frango's will bring farmers innovation and access to services and helping to implement welfare in poultry production. The social factors score was 3.0. According to Turban et al. [20], several socio-technical factors drive the rapid expansion of wireless mobile devices for Internet access.

However, access to the internet itself can be difficult in some farms, concerning wi-fi networks, internet speed and handling, and knowledge in the database to producers. This can be a point weaker. The political and economic factors were addressed as suggested by the literature [16, 18, 24, 25]. The authors explain that mobile applications would bring to society a favorable scenario for politics and technology, such as profitability through profits that would reach both the producer who will avoid poultry losses and the final consumer in the price of broiler meat.

In the Swot analysis, we observed the items applied through the results obtained by the Pestel analysis. According to the internal and positive factors of the Swot analysis, a score of 4.5 was applied. This result reflects the advantage of using the Frango's app were analyzed considering improvements to the export of broiler meat according to animal welfare standards, containing all information within the application free of charge for the product. To analyze external positive factors, we have the opportunities that Frango's application brings to the producer concerning use without prior knowledge of application systems. The use of the mobile application is self-explanatory and easy to handle (score 5.0). The negative internal factors are considered the

weaknesses of the application. The precariousness in some farms that still do not have internet and cell phones, the score 3.0 was given, because unfortunately, Brazil lacks infrastructure and access to technology for most of the population. The negative external factors are the threats that the external can bring to the use of the Frango's application would be the lack of internet and wi-fi service for the final report of presentation of the application to the producer. Legal considerations analyzed got a score of 4.0 because the laws on the subject are adequate. The problem in the question is compliance with them. A score of 3.5 was given for the same reason as the Swot analysis in the item Weaknesses applying the Likert scale with the averages. This was due to the lack of structure and technology in all country areas (Table 3). Therefore, the analysis shows more positive points with a higher average, in Table 3, than negative points, with an average of 6.5, with a total average of Swot 4.0 and Pestel: 4.1. Analyzing the Pestel and Swot table data, we obtained the following results (Table 4).

Table 3. Result of the Swot Analysis

SWOT	Positive factors	Scores	Negative Factors	Scores	Results
Internal factors	Strength	4.5	Weakness	3	7.5
External factors	Opportunities	5.0	Threads	3.5	8.5
Average					4.0

Table 4. Comparison of the scores from the Swot analysis and the Pestel analysis using the Likert adapted scale

SWOT	Score
Swot average	4.0
Pestel average	4.1
Average	4.0

Such a result indicates the pertinence of Frango's application through Swot and Pestel's analysis within the average for its market applicability.

4. Conclusions

When considering all factors political, economic, social, technological, and environmental, the positive impacts are more significant than the negative impacts of the sector generating an impulse in production and balance in risks regarding the use of technology in the sector. The most influential factors are technological and economical, and the least influential are social factors that still depend on improvements in the chicken production process on farms using fast service technologies such as applications.

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Conflict of interests

In this work there is no conflict of interest.

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