WERNER SOUZA MARTINS

**Technical recommendations for seafood supply to the Brazilian
Army in the State of São Paulo**

SÃO PAULO

– 2018 –

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Army in the State of São Paulo**

Thesis submitted to the Postgraduate Program in Experimental Epidemiology Applied to Zoonosis of the School of Veterinary Medicine and Animal Science of the University of São Paulo to obtain the Doctor's degree in Sciences.

Department:

Preventive Veterinary Medicine and Animal Health

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Advisor:

Prof. Simone de Carvalho Balian, Ph.D.

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CERTIFIED

We certify that the Research "PERCEPTIONS OF ORGANIZATIONAL BUYERS ON THE QUALITY OF FISH AND THEIR INFLUENCE ON THE CONTENTS OF TRADE", protocol number CEUAX 7715031214, under the responsibility Prof^a Dr^a Simone De Carvalho Balian, agree with Ethical Principles in Animal Research adopted by Ethic Committee in the Use of Animals of School of Veterinary Medicine and Animal Science (University of São Paulo), and was approved in the meeting of day February 25, 2015.

Certificamos que o protocolo do Projeto de Pesquisa intitulado "A PERCEPÇÃO DOS COMPRADORES ORGANIZACIONAIS SOBRE A QUALIDADE DO PESCADO E SUA INFLUÊNCIA NO ÍNDICE DE TROCAS COMERCIAIS ", protocolado sob o CEUAX nº 7715031214, sob a responsabilidade de Prof^a Dr^a Simone De Carvalho Balian, está de acordo com os princípios éticos de experimentação animal da Comissão de Ética no Uso de Animais da Faculdade de Medicina Veterinária e Zootecnia da Universidade de São Paulo, e foi aprovado na reunião de 25 de fevereiro de 2015.

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I would like to dedicate this thesis to the memory of my parents Francisco Souza Martins and Egle Martins;

Those who worked, cleaned, cared for and made possible my work and life I would not get anything alone, I'm aware;

To Jonas and Ruth, luv u ;)

To Ana Beatriz for her kindness and devotion and for her endless support to Ruth when she needed, her selflessness will always be remembered;

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Brothers and Sisters;

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Cada derrota outro azimute
Encapelado o mar faz frente...
Soçobrar? Adernar? Me por doente?
Não posso! Tenho Jonas e Ruth
Corre! Ela chorou, escute!
Tenha tempo! Tenha força, energia!
Pra singrar pela noite, vogar pelo dia
Vivo mais em curso que parado
Sol, sal, vento a vaga joga de lado
Vida de homem pai. - Tu não queria?

RESUMO

MARTINS, W. S. Recomendações técnicas para o suprimento de pescado ao Exército Brasileiro no Estado de São Paulo. [Technical recommendations for seafood supply to the Brazilian Army in the State of São Paulo] 2018. 179f. Tese (Doutorado em Ciências) - Faculdade de Medicina Veterinária e Zootecnia, Universidade de São Paulo, São Paulo, 2018.

O Exército Brasileiro oferece 18.10^3 refeições.dia⁻¹ nos 27 quartéis da 2ª Região Militar. O pescado faz parte do sortimento de alimentos, foram consumidas 105t no ano de 2015 e 81% dos lotes apresentaram não conformidades. Com o objetivo de realizar um diagnóstico sobre o processo de suprimento de pescado do e, a partir destas informações, propor recomendações técnicas para mitigar as não conformidades, foram avaliados: o processo de licitação, o edital, as características dos fornecedores de pescado, dados sobre lotes de pescado fornecidos no período de estudo, as legislações internas sobre Segurança do Alimento e as condições sanitárias e de armazenagem do pescado no 21º DSup. Uma ferramenta de avaliação de Clima de Segurança de Alimentos foi disponibilizada, todavia esta avaliação não foi realizada no período deste estudo. Para alcançar esses objetivos foram realizados *Focus Group* com especialistas e Oficiais do Exército para levantamento de informações. Aplicou-se Análise SWOT combinada com AHP para explorar a organização em relação ao processo de suprimento de pescado. Para avaliação e identificação dos critérios para fornecedores utilizou-se *Analytic Hierarchy Process*. A avaliação das Boas Práticas de Armazenagem foi realizada utilizando-se o *check list* da RDC 275 de 2002. E avaliação da série temporal de temperaturas de armazenagem. As Forças, Fraquezas, Oportunidades e Ameaças do processo de suprimento foram identificadas e matematicamente classificadas. Foram apresentados dois novos critérios para fornecedores de pescado e os já existentes foram ordenados em grau de importância, as não conformidades relativas às Boas Práticas foram identificadas e sugestões foram feitas para adequação. O fator que mais se destacou em todos os estudos foi o recurso humano, com baixa qualificação em relação à Segurança do Alimento. O Exército Brasileiro na Segunda Região possui uma visão incompleta sobre este conceito e através da aplicação de protocolos de Segurança do Alimento e processos de qualificações continuados, obterá um ganho técnico e social.

Palavras-chave: 1. Segurança do alimento; 2. Sistema de gestão de segurança do alimento; 3. Gestão de cadeia de suprimento; 4. Armazenagem de pescado congelado; 5. Compras públicas.

ABSTRACT

MARTINS, W. S. Technical recommendations for seafood supply to the Brazilian Army in the State of São Paulo. [Recomendações técnicas para o suprimento de pescado ao Exército Brasileiro no Estado de São Paulo.] 2018. 179f. Tese (Doutorado em Ciências) - Faculdade de Medicina Veterinária e Zootecnia, Universidade de São Paulo, São Paulo, 2018.

The Brazilian Army offers 18.10^3 meals.day⁻¹ to 27 barracks of the 2nd Military Region. The seafood is part of the assortment of foods, were 105t in the year 2015 and 81% of the lots presented non-compliances. In order to perform a diagnostic about seafood supply and, based on this information, propose technical recommendations to mitigate the non-compliances, have been assessed: the bidding process, the bid text, the supplier characteristics, data about lots, the military rules about food safety, Good Manufacturing Practices (GMP) and the sanitary status of deposit. An Food Security Climate Self-Assessment Tool was made available, however this evaluation was not performed during the period of this study. To achieve these goals were achieved Focus Group with experts and army officers for information gathering. SWOT Analysis was combined with AHP to explore the Organization in relation to the seafood supply. For evaluation and identification of criteria for seafood suppliers was applied the Analytic Hierarchy Process. The evaluation of GMP in seafood cold storage was carried out using the check list of the RDC 275/2002 and verification of the temperature time series. The strengths, weaknesses, opportunities and threats of the seafood supply were identified and mathematically classified. Were presented two new criteria for fish suppliers and existing ones were ordered in degree of importance. Non-compliances related to GMP were identified and suggestions were made for fitness. The most outstanding factor was the "human resource", with low-skill in relation to Food Security. The Brazilian Army in the second region has an incomplete vision about this concept and through the application of Food Safety protocols and processes of continuous qualifications will get a technical and social gain.

Keywords: 1. Food safety; 2. Food safety management system; 3. Management supply chain; 4. Storage of frozen fish; 5. Public procurement.

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GENERAL INTRODUCTION

The present study is result of the partnership between the University of São Paulo and the Brazilian Army. The Food Supply of the Brazilian Army is a strategic operation, related to National Security. Seafood is one item that compounds the assortment of foods offered to the military contingent. The supply operation demands operational research, compliance with rules, technical knowledge and feature of qualifying staff. A several numbers of meals are served daily in the barracks of Brazilian Army, but according to themselves, the seafood is not well accepted by the staff. This is understandable, meanly because the seafood has very particular characteristics, is very perishable and, against the common sense, requires maintenance of cold chain from catch to consume.

By the way, the consumer, especially the staffs of Brazilian Army, even if they do not know about the specific characteristics of seafood, are able to evaluate the sensorial attributes during the meal: flavour, texture, smell, colour and appearance. This is the responsible factor for the high level of rejection of seafood by the Brazilian Army consumers. This phenomenon is particularly negative, considering that seafood is an essential amino acids source and an important nutrient for people with high demand energy such as military. The above also raises the problem: the seafood is nutritionally very important, but currently in the Brazilian Army it is low consumed, the consumers allege that the seafood is not good.

In this regard, the overall objective of this study is to describe the seafood supply process in the 2nd Military Region (São Paulo State), in order to provide basis for present technical recommendations with the purpose of making better the seafood supply. To address this, the overall objective was fractioned in six main problem: i.) To understand the researches state of art about seafood and seafood quality, in Brazil and worldwide, ii.) To identify the most important factors (positive and negative) related to seafood supply in the 2nd Military Region and the priority for improving the supply, iii.) To describe the criteria that the supplier (seller) should have had, iv.) To know the status of the Good Manufacture Practices and propose improvement and, v.) To evaluate the Food Safety Climate in the 2nd Military Region.

We identified that the two species more produced and investigated by Brazilian aquaculture are not consumed by the Brazilian Army, it is should be prioritised. Several information about seafood quality and seafood supply is available,

moreover, this field is differentiated from the other, researches are performed worldwide and the number of researchers with interest in this subject is expressive, therefore the adjustment of 2nd MR seafood Supply is feasible. The main research centres of seafood are in countries which keeps close relationship between industry and research institutes evinces that the partnership between University of São Paulo and Brazilian Army is a worldwide success model performed to solve seafood supply problems.

We identified the principal factors related to the seafood supply system by combining of tools, traditionally used in the field of applied social sciences: Focus Group, with participation of Military Officers and Specialists to enumerate the principal factors related to seafood supply from the perspective of SWOT. Analyses and the weight of factors were calculated using the Analytical Hierarchy Process. This first step allowed a big picture about the process. The information was shared and let us knows the situation. The results showed some problems for which this research was dedicated. Here the first clues arose for what would emerge such the central thesis of this work: the human factor.

However, the seafood supply, is a serial process and involves various actors. The purchase accomplished through that the particular instrument named bind presents the demands and shows the contract rules. This is an important tool and the text must be clear and specific, containing all information about the products, avoiding doubts and distorted interpretations. After the purchase the products are receipt and the analysed, in order to ensure that the clauses of contract are fulfilled. Between these clauses are the sanitary and quality standards, fiscal documents (Brazilian Legislation) and qualitative/quantitative elements (bind rules).

Respect the bind rules is a responsibility of seller and must be strictly monitored as to its compliance. Monitor transaction have a cost and doesn't always guarantee the supply of quality products. One way to mitigate the non-compliances of seafood supply, according to the *Codex Alimentarius* (FAO/WHO, 2003) is the rational selection of suppliers with offers added value and trust. With this goal the second chapter entitled: Seafood Supply criteria to the 2nd Region of Brazilian Army: a case study, presents what is necessary to change in the *modus operandi* of the process, adding new requirements and practices. The human factor appears again such a key element.

Following the *Codex Alimentarius* recommendations and the Brazilian Legislation, we seek to assess the Good Manufacturing Practices applied in the seafood supply chain in the 21st Supply Deposit. The aim of this approach was evaluate the status of supply operations such as storage and products maintenance in relation to good manufacturing practices and cold chain.

Finally, we translate, validate and adapt a food safety climate self-assessment tool, aiming at the assessment of the food safety climate. This version in Portuguese now should be used by industry managers or owners to know the perception, climate and the culture of food safety among the workers. It was not possible to perform food safety climate research in the 21ndSD, because the survey did not have staff adhesion. In this way, this thesis is comprised of six chapters corresponding to the following manuscripts:

MARTINS, W.S., RIBEIRO, N.A.S., LAVENHAGEN, R.S., URBIZAGASTEGUI, R., de CARVALHO BALIAN, S. Brazilian scientific academic production about seafood. *Informação & Sociedade: Estudos*, v. 25, n.1, 2015.

MARTINS, W.S., de CAMPOS LEITE, A.B., GALVÃO, V.C., de CARVALHO BALIAN, S. (2017). Bibliometric study of seafood quality literature. *Ciência da Informação*, v. 46, n.2, 2017.

MARTINS, W.S., de CAMPOS LEITE, A.B., MARTINS, R.L., SILVA, J.O., de CARVALHO BALIAN, S. (It is on the press) Seafood supply assessment in the 21st Supply Deposit of Brazilian Army.

MARTINS, W.S., de CARVALHO BALIAN, S. Critérios para fornecimento de pescado ao exército brasileiro na segunda região militar: estudo de caso. *Revista Brasileira de Engenharia de Pesca*, v. 11, n. 1, 2018.

MARTINS, W.S., de CAMPOS LEITE, A.B., MARTINS, R.L., SILVA, J.O., de CARVALHO BALIAN, S. (It is on the press) Assessment of Frozen Seafood Good Storage Practices in the 21st Supply Deposit of the Brazilian Army.

MARTINS, W.S., de CAMPOS LEITE, A.B., de CARVALHO BALIAN, S. Translation into Portuguese, adaptation, and validity assessment of the food safety climate self-assessment tool. *Journal of Food Safety*, p. e12552.

This work corresponds to the sub-project of the thematic project under the responsibility of the Prof. Simone de Carvalho Balian, approved by the Research Ethics Committee of the School of Veterinary Medicine and Animal Science, University of São Paulo, under the Protocol n.77150314, and it follows the ethical procedures established by resolution No. 466/2012 (BRASIL, 2012). This study was not funded and does not present a conflict of interest.

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FAO/WHO. **Codex Alimentarius: Food hygiene, basic texts**. Rome: Codex Alimentarius Commission Food Standards Programme World Health Organization, 2003. 136 ISBN 9251051062.

1 BRAZILIAN SCIENTIFIC ACADEMIC PRODUCTION ABOUT SEAFOOD

ABSTRACT

This study aimed to evaluate the Brazilian scientific academic production, available in Brazilian Digital Library of Theses and Dissertations (BDTD) from the Brazilian Institute of Information in Science and Technology (IBICT) about “seafood” for human consumption, between the years of 2000 and 2014. Was used the search element: +pais:br resumo:"pescado" #ano_defesa::>2000 e +pais:br assunto:"pescado" #ano_defesa::>2000. We found 222 works of search result, 67 (30%) were selected. The southeast region was the region with the largest number of works defended in its institutions and cataloged on this basis, and the University of Sao Paulo - USP took first place with 40.3% of the total. The master's thesis were 83.5% of the total and the years with highest numbers of defences were those of 2010 and 2011, but the temporal series demonstrates trend of growth in the number of research studies conducted about the topic seafood. The species with major occurrence in dissertations and thesis were the Nile tilapia (*Oreochromis niloticus*) and shrimp (*Litopenaeus vannamei*). The scientific academic production is expanding along with the expansion of the sector in Brazil.

Key word: Scientific production. Academic Production. Seafood. Bibliometric. Brazil.

1.1 INTRODUCTION

The term 'seafood' includes fish, crustaceans, molluscs, amphibians, chelonians, and mammals of fresh and salt water used for human consumption according to Regulamento da Inspeção Industrial e Sanitária de Produtos de Origem Animal - RIISPOA, article 438 (Brasil, 1952).

It is an undeniable fact that the main use of world seafood production is the human consumption (Fao, 2014), this is the main source of protein for most of the world's population (Fao, 2009), consumed since there are historical records (Pigott and Tucker, 1990). Excellent nutritionally, recognized as functional food (Soccol and Oetterer, 2003), ideal for diet by groups where there is prevalence of cardiovascular accidents deaths (Herrero, 2001), it is characterized by: easy digestibility, composed of high biological value proteins (Sikorski, 1994; Oetterer, 2002), high in amino acids such as lysine and Leucine (Shahidi and Botta, 1994), important source of polyunsaturated fatty acids, such as *eicosapentaenoic* (EPA) e *docosaexaenoic* (DHA), proteins, vitamins and minerals (Ogawa and Maia, 1999; Soccol and Oetterer, 2003).

To exploit the accumulated knowledge in a particular area of science is the quantification of the written communication processes, applying mathematical and statistical methods. Publications, authors, keywords, users, and scientific journals are observable parameters in bibliometric studies of literature, with in turn can quantify, describe and predict the written communication process (Pao and Lee, 1989).

Bibliometric studies popularized in Brazil mainly in the 1970, carried out in the Instituto Brasileiro de Bibliografia e Documentação – IBBD (Araújo, 2007), stimulated, according to Alvarado (1984) by the discipline 'Processamento de Dados na Documentação'. The main bibliometric laws are: Bradford's law (Scientific

Journals productivity), Lotka's law (authors productivity) and Zipf's law (words frequency) (Hayashi *et al.*, 2007), and these are added others methods covering the diffusion of communication (Goffman's law) such a elitism and literature obsolescence (Alvarado, 1984).

In the 21st century, especially in the period that this study will address (from 2000 to 2014), bibliometric studies were carried out in the different areas: accounting sciences Leite Filho (2006) explored the scientific productivity in congresses and Brazilian journals, using descriptive and quantitative methods; in Business Administration Caldas and Tinoco (2004) used Bibliometric approach to understand, the influence of authors and institutions, on academic production, in human resources in Brazil in 1990's, similar to the Walter and Silva (2008) that reviewing how the resource-based view (RBV) was studied in the strategy field in the "Encontro Anual da Associação Nacional de Pós-Graduação e Pesquisa em Administração – EnANPAD".

In the field of health Castro and Ramor (2004) examined the articles published about the psychosocial aspects related to HIV/Aids between 1992 and 2002 comparing the Comparing the publications of Brazil and Spain indexed in PsychINFO; In History, Hayashi *et al.* (2007) investigated the academic scientific production on Jesuit education in Brazil, and they might notice the growth of research in this field throughout history; the analytic bibliography of Lotka's law was investigated and submitted to analysis using Lotka's law (Urbizagastegui, 2008);

Domestic violence was examined from articles indexed in international databases by Bhona *et al.* (2011). The authors have associated the term domestic violence with the words: 'man', 'woman', 'child', 'teenager' and 'old'. This kind of

research demonstrates the power of bibliometric methodologies and the importance of this tool to the society.

In the field of environmental sciences Gallon *et. al.*, (2007) examined the methodological characteristics of environmental sciences scientific articles, published between 2000 and 2006. Was concluded that until the time of this study, had not been catalogued national studies that seek to examine and categorize the research in this area, also Felix *et. al.* (2008) used Bibliometric approach to evidence the average life of literature and botanic literature obsolescence, the authors have selected the journal, regarded in this field, “Boletim do Museu Nacional”. This research showed that the average life of the studies in this area is thirty years.

Through simple consultation of journals, information retrieval systems and search engines on the web it is possible to observe the absence of bibliometric researches about Seafood specially approaching the theme Human Food.

Throughout the history of the seafood research in Brazil, much information was generated and made available to society in the form of scientific communication, but there is still much to be done to promote the access to this information, so, as suggested Chan and Costa (2005), create a strong social, economic and technical infrastructure, essential in the process of developing.

The present study aimed to present the results of a Bibliometric and retrospective search, about quantification of academic scientific production (i.e. M.Sc and PhD thesis) indexed with the use of the term 'seafood', between 2000 to September 2014, knows the research centres, the Brazilian regions, target species and evaluate the literature growth and its fit to mathematic model.

1.2 METHODS

It is a Bibliometric study, descriptive and retrospective, carried out through the literature review. The unit of analysis was limited to dissertations and thesis (in this study will be named both such thesis) available for consultation in the “Biblioteca Digital Brasileira de Teses e Dissertações – BDTD” from “Instituto Brasileiro de Informação em Ciência e Tecnologia – IBICT”. The BDTD integrates in a single portal, the information systems of thesis and dissertations from Brazil and offers to users a national catalogue of full texts and metadata (e.g. title, author, abstract, keyword, and other). It is worth noting, as a clarification, that the non-choice of “Base de Teses e Dissertações da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – CAPES”, due to the fact of this data recovery tool just provide access to works published from the year 2011 (Capes, 2014).

The BDTD does not perform the search by key word, however offers the researcher an electronic search tool able to retrieve the theses by: author, abstract, title, subject, contributor, institution, country, language and year.

The present study was carried out with the search strategy of the term 'seafood' in the 'summary' and 'subject', in the period of 2000 to September 2014, in any language or institution, published in Brazil, resulting in the following search elements:

+pais:brresumo:"pescado" #ano_defesa::>2000

+pais:brassunto:"pescado" #ano_defesa::>2000.

Reading the summaries was possible to distinguish between seafood and other issues (e.g. public policies, automation, analytical-chemistry, fishing ordainment, hydrobiology and animal husbandry).

The data tabulation naturally sharpens the interest to verifying the relationship between the dependent variable y (thesis quantity) with another or other independent variables x (or x_i , $i = 1, \dots, n$). This relationship is general rule and could be translated in a simple linear regression model (RLS) (Magalhães and de Lima, 2000).

Considering the variables X e Y . Given n pairs $(X_1, Y_1), (X_2, Y_2), \dots, (X_n, Y_n)$, if Y is linear function of X , can establish a simple linear regression whose statistical model is (Equation 1):

$$Y_t = \beta_0 + \beta_1 X_t + e_t, \quad \text{for all } i = 1, \dots, n, \quad (1)$$

Where:

Y_t = is a random variable and represents the value of the response variable (dependent variable) in the i -th observation (number of theses at time t);

X_t = represents the value of the explanatory variable (independent variable regressors variable) in the i -th observation;

E_t = is a random variable that represents the experimental error;

β_0 and β_1 are the parameters of the model, which will be estimated, and that define the regression line and n is the sample size (Magalhães and de Lima, 2000).

In order to assess the quality of the model fit we used the coefficient of determination. Basically, this coefficient indicates how the model was able to explain the data collected (Bussab and Morettin, 2010). The coefficient of determination is given by (Equation 2):

$$R^2 = \frac{SQR}{SQT} = 1 - \frac{SQE}{SQT} = \frac{\hat{\beta} \sum_{i=1}^n (x_i - \bar{x}) Y_i}{\sum_{i=1}^n (Y_i - \bar{Y})^2} \quad (2)$$

The data were manually coded and analysed using the statistical package SPSS 20.0 version for Windows.

1.3 RESULTS AND DISCUSSION

There is a considerable difference between the search results using the term 'fish' in the 'summary' and 'matter'. The category "summary" presented a larger number of theses, although, in the category "subject" the search result was closer to the goal, namely, the scientific literature on the subject seafood for human consumption (Table 1). Among the 32 theses found in category "subject", only four were different from those found in the category summary, the other appeared in both search. The 63 thesis from category "summary" added the four thesis of category "subject" resulted in a total of 67 related thesis.

Table 1 – Result of search for the term "seafood" in the categories "subject" and "word of the abstract"

Search category	Total	Selected thesis	% of selected thesis
Issue	43	04	10%
Abstract	179	63	35%
TOTAL	222	67	30%

Source: MARTINS et al. (2015)

An important item that should be observed by the authors during the thesis submission is the definition of keywords. Indexing policy should be understood as a philosophy and not only as a technical activity, especially as a task, relevant to the information retrieval (Rubi and Fujita, 2006), this corroborates with the result of this study, several research centres, are not included in the search result through this methodology of information retrieval. The non-occurrence of the academic scientific production of these research centers as a result of this search is because the indexing is performed with terms and descriptors different of "seafood" or its production is not available. This demonstrates that the indexing process must be entered in the administrative context of the institutions (Carneiro, 1985). This is an

activity that has been developed only by public institutions in the context of the present study (Table 2).

The University of São Paulo was the institution which more studies developed with the use of this term, during the period approached, and the graduate programs with higher performance in this segment of the research were Food Science and Technology from “Luiz de Queiroz” College of Agriculture and Experimental Epidemiology Applied to Zoonosis from School of Veterinary Medicine and Animal Science both from University of São Paulo with 23 thesis (37%) and 5 thesis (18.5%) respectively.

Table 2 – Scientific academic production by institutions

Institutions	Quantities	%
Universidade de São Paulo – USP	27	40,30%
Universidade Federal Rural do Rio de Janeiro - UFRRJ	5	07,46%
Universidade Federal da Paraíba – UFPB	4	05,97%
Universidade Federal de Alagoas – UFAL	4	05,97%
Universidade Federal do Ceará	4	05,97%
Universidade Federal do Rio Grande do Sul – UFRS	4	05,97%
Universidade Federal Rural de Pernambuco – UFRPE	4	05,97%
Universidade Federal de Minas Gerais – UFMG	3	04,48%
Universidade Federal de Santa Maria	3	04,48%
Fundação Universidade Federal do Rio Grande - FURG	2	02,99%
Instituto Nacional de Pesquisa da Amazônia – INPA	1	01,49%
Universidade de Brasília – UnB	1	01,49%
Universidade Estadual do Oeste do Paraná - UniOeste	1	01,49%
Universidade Federal da Bahia – UFBA	1	01,49%
Universidade Federal de Pernambuco UFPE	1	01,49%
Universidade Federal do Mato Grosso do Sul – UFMS	1	01,49%
Universidade Regional de Blumenau – FURB	1	01,49%
TOTAL	67	100,00%

Source: MARTINS et al. (2015)

This result is similar to those presented by Carvalho *et al.* (2010) about scientific production indexed with the term Nephrology, with most studies developed by USP, similar to the study of Cardoso *et al.* (2007) reviewing the master's programs in Accounting. Hayashi *et al.* (2007) they found similar participation of USP (45%) in thesis and dissertations defended available on BDTD indexed with the descriptor “Jesuit Education in Brazil”. In General, the present study does not differ from studies conducted by Hisi (2011) about demographics of Brazilian technological and

scientific development, where the Southeast and São Paulo universities are more expressive in different line researches, statement reinforced by University of São Paulo (USP, 2000) while defending the performance of the Brazilian public Universities and the post-graduate programs, classifying them as the birthplace of the national scientific production, concept that is defended a decade later, demonstrating the activities of these institutions in the context of Brazilian science (Guimarães, 2011).

We can say that the promotion of this activity by the Brazilian Government has become evident. In addition to researches conducted, the period of 2000 to 2010 was marked by several events, We can mention the creation of the Ministério da Pesca e Aquicultura - MPA (Brasil, 2009a), publication of environmental licensing and use of water (Brasil, 2009b) and the creation of sector councils with participation of civil society (Almeida, 2010).

The works produced over the years included in this study can be viewed (Figure 1). The trend demonstrates growth. The decrease in the number of theses in the last two years is related to the submission process and index this phenomena is commonly noted (Gallon *et al.*, 2007; Félix *et al.*, 2008; Urbizagastegui, 2008; Bhona *et al.*, 2011).

Figure 1 – Thesis production between 2000 and 2014

Source: MARTINS et al. (2015)

The period from 2008 to 2010 showed a different growth in relation to other periods from time series, keeping score for a year, preceding considerable decrease. In a Brazilian post-graduate assessment, this period is referred by Guimarães (2011), the author pointed a several government programs in order to boost and promote the research in Brazil.

For all these reasons, when studying the growth of literature is recommended to study it with the accumulated data. When there is data accumulation there is a different picture of the cloud, as can be seen below (Figure 2).

Figure 2 – Accumulated data about thesis production over the years.

Source: MARTINS *et al.* (2015)

If we estimate this growth through Year regression model, we can observe that the estimated values are very close to the observed values and the standard deviations are minimal and within the expected (Table 3):

Table 3 – Observed values, estimated values and standard deviation.

Years	Accumulated year	N. of thesis	Accumulated thesis	Estimated thesis	Standard deviation
2013	12	7	67	6.364.835	335.165
2012	11	3	60	5.795.055	204.945
2011	10	10	57	5.225.275	474.725
2010	9	10	47	4.655.495	0.44505
2009	8	7	37	4.085.714	-385.714
2008	7	3	30	3.515.934	-515.934
2007	6	7	27	2.946.154	-246.154
2006	5	5	20	2.376.374	-376.374
2005	4	4	15	1.806.593	-306.593
2004	3	4	11	1.236.813	-136.813
2003	2	4	7	667.033	0.32967
2002	1	1	3	.97253	202.747
2001	0	2	2	-472.527	672.527

Source: MARTINS *et al.* (2015)

A preliminary graphical analysis was performed, by building a scatter plot. This chart was able to demonstrate the kind of relationship (linear), although not perfect, but giving us an excellent notion about the variability associated to variables and about atypical or discrepant points (Figure 3).

Figure 3 - Scatter plot for the thesis production according to years

Source: MARTINS *et al.* (2015)

The linear growth is a characteristic of fields in development. Surely is not yet a consolidated field in Brazilian research and there are still no specific lines in most universities, however searches are isolated and depend on the personal interest of researchers.

The summary model provides to us an adjusted R^2 equal to 0.971, a good fit. This means that at 97.1% of the cases we are completely certain that the production of theses and dissertations in Brazil is growing linearly (Figure 4).

Figure 4 – Statistic model summary

R	R^2	R^2_a	Estimated standard error
.987	.974	.971	3.821

Source: MARTINS *et al.* (2015)

About the degree, we can be observes, that the quantity of Master dissertations outnumber the PhD thesis (Figure 5). This is have been occurring in Brazilian post-graduation programs, in different areas of science, there are a few decades such shows Garcia (1980), with strong expansion, creation of new research programs and increase the number of places (Guimarães, 2011).

Figure 5 – Thesis indexed with term seafood between 2000 and 2014

Source: MARTINS *et al.* (2015).

It may be noted that the amount of dissertations presents a value extremely greater than the thesis (Table 5), this fact is related to the researchers market

absorption, especially because the demand for specialists in the various Brazilian regions.

Table 4 – Master dissertations and PhD thesis indexed with the descriptor “seafood” on the BDTD between 2000 and 2014.

Degree	Quantity	% thesis
Master	56	83,58%
PhD	11	16,42%
TOTAL	67	100,00%

Source: MARTINS *et al.* (2015).

In the Northeast region there is the major number of institutions researching this field, Southeast had the highest number of thesis published (Table 5). Historically there is a difficulty of the least-favoured regions in competing for federal resources and to employ new scientists (Silva, 2000). Between nine globally recognized research institutions, six are in the Southeast (USP, UNICAMP, UNESP, UFRJ, UFMG), two in the South (UFRGS and UFSC), one in the northeast (UFPE), one in the Midwest (UnB) and none in the North (Steiner, 2005).

Table 5 – Universities by region and its thesis production

Region	Thesis	% Thesis	Universities	% of Universities
Outtheast	35	52,24%	3	17,65%
Northeast	19	28,36%	6	35,29%
South	11	16,42%	5	29,41%
North	1	1,49%	1	5,88%
Mid-west	1	1,49%	2	11,76%
TOTAL	67	100,00%	17	100,00%

Source: MARTINS *et al.* (2015)

The fact of the two species with the highest occurrence in this investigation (table 6), be aquaculture production, reflects the current research world scene. Extractive fishing has been keeping with stable capture around 70 million tons a year ($70 \cdot 10^6$ t/year), however the aquaculture, in the same period progressed to 80 million tons ($80 \cdot 10^6$ t/year) for more than 150 million tons per year ($150 \cdot 10^6$ t/year) (FAO, 2014), namely, aquaculture is an activity in strong expansion that comes demanding technical information and human resources (Cyrino *et al.*, 2004).

Tabela 6 – Number of thesis published and its respective species

Specie	Thesis number	Specie	Thesis number
<i>Oreochromis niloticus</i>	17	<i>Osteoglossum bicirrhosum</i>	1
<i>Litopenaeus vannamei</i>	5	<i>Clarias gariepinus</i>	1
<i>Ramdhia quelen</i>	2	<i>Rachycentron canadum</i>	1
<i>Micropogonias furnieri</i>	2	<i>Brachyplatistoma vaillanti</i>	1
<i>Mugil liza</i>	2	<i>Macrobrachium acanthurus</i>	1
<i>Salmo salar</i>	2	<i>Xiphopenaeus kroyeri</i>	1
<i>Thunnus spp.</i>	2	<i>Cyprinus carpio L.</i>	1
<i>Liposarcus pardalis</i>	1	<i>Panulirus spp.</i>	1
<i>Arius spixii</i>	1	<i>Macrodon ancylodon</i>	1
<i>Sardinella brasiliensis</i>	1	<i>Brycon cephalus</i>	1
<i>Pseudoplatystoma sp.</i>	1	<i>Perna perna</i>	1

Source: MARTINS *et al.* (2015)

In this context, the species most produced by Brazilian aquaculture are the Nile tilapia (*Oreochromis niloticus*), with more than 250.10^3 t.year⁻¹ and the shrimp (*Litopenaeus vannamei*) 65.10^3 t.year⁻¹, 78% of the total Brazilian marine aquaculture (Brazil, 2010).

1.4 CONCLUSION

Through the 67 theses available in BDTD we can conclude that:

1. BDTD is an important data base available to the Brazilian society.
2. It's of the Universities and Research Centres the Responsibility for indexing and corret use of keywords and descriptors, allowing a more efficient search.
3. The indexing process is an important tool for the democratization of information.
4. Investment in research is entirely done by the Government through the Public Universities and Post-Graduation Programs.
5. The development of researches occurs at the same time of the development of aquaculture.
6. The Bibliometric approach was able to illustrate and demonstrate clearly the current panorama of academic scientific production aimed at the seafood theme.

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2. BIBLIOMETRIC STUDY OF SEAFOOD QUALITY LITERATURE

ABSTRACT

This study investigates characteristics of seafood quality literature through application of bibliometric techniques. No previous studies that examined this field of science. The objectives are to examine seafood literature's growth, document types, place/language of publishing, and author productivity patterns (analysed using Lotka's law). A total of 2267 records were retrieved (up to 11 May 2016) from Web of Science and Scopus. Literature grew exponentially from 2000 to 2013 following the development of this field. Values obtained were $c = 1.038$, $g = 1.118$ and $R^2 = 0.946$. Annual growth rate was 11.8%. The bibliography duplicates every 6.2 years. The most common publications were journal articles (64%), as expected. Per country, the U.S.A. made most major contributions, and English was the most-used language. A total of 5,583 authors, including co-authors, were retrieved; every paper's author was given one credit to measure productivity. The majority (75%; 4175 authors) contributed only one article. These data do not fit Lotka's law.

Keywords: Lotka's law. Author. Publications. Productivity. Food.

2.1 INTRODUCTION

The growing demand for food and natural resources promotes global effort to ensure food security. Consequently, scientists develop research seeking to improve upon and discover new techniques to maintain food quality, fully utilize raw materials and promote sustainability in all fields.

The food safety and the food security are subjects that follow the development of seafood quality subject. In the late 1960s and 1970s most of the studies published in the field of seafood quality showed interest in conservation of products (DYER, 1969; RASMUSSE, 1971; GORGA et al., 1979; NICKERSON; RONSIVALLI, 1979; RONSIVALLI et al., 1981). In the 1980s, the researches fuelled by the advent of new technologies and equipment began to focus on research on microorganisms (HACKNEY et al., 1980; ABEYTA, 1983; CHAI, 1983; WARD; HOPSON, 1986; WARD; BAJ, 1988), the use of instruments (JOHNSEN et al., 1987), the identification of contaminants such as mercury (MARTIN, 1988; VONDRUSKA et al., 1988; KHORDAGUI; ALAJMI, 1991).

The awakening of science to the beneficial effects of fish for health began in the 1990s (ACKMAN; GUNNLAUGSDOTTIR, 1992). However, the 1990s was evidenced by the seafood industry's welcome from to food safety management systems, especially HACCP (GARRETT; HUDAKROOS, 1990; 1991; WEDDIG, L., 1994; WEDDIG, L. J., 1994; MOODY, 1996). Consumer choices (ANDERSON; ANDERSON, 1991a; b; ANDERSON; MORRISSEY, 1991) and growing concern about the environment (GATES, 1991), were preponderant factors at this time in order to boost the use of these quality control tools in the industry. This tools are very important until today (HUSS et al., 2003; CORMIER et al., 2007; FEMEENA et al., 2012; DAHLAN et al., 2013; SOMAN; RAMAN, 2016; YADAV et al., 2016)

The 2000s were marked by the advent of new technologies (KIM et al., 2006; LIM et al., 2013; LEE et al., 2015) aimed at logistic control, the fight against fraud and the conservation of species (JAFFRY et al., 2004; KIM, 2008; CHOI et al., 2009), utilization of new technics to evaluation of freshness (COZZOLINO;MURRAY, 2012) and the maintenance of the classical and most important studies in this field: the sanitary quality (COLAKOGLU et al., 2006; SPERANZA et al., 2009; COLAKOGLU et al., 2010; ARIK COLAKOGLU et al., 2011; BROEKAERT et al., 2011; SPERANZA et al., 2013; THI et al., 2013).

Seafood is one of the most complete and healthy foods, with high nutritional value (FAO, 2014A) that makes it a source of energy and protein for most of the world's population (PIGOTT;TUCKER, 1990). Consumption has been increasing in recent decades (FAO, 2014), as well as the volume of international trade (GEPHART;PACE, 2015).

Seafood quality is a field of science that combines biochemistry (JIANG, 2000; 2007), biology (WONG et al., 2015), physics (PIVARNIK et al., 2001), chemistry (TAHERGORABI et al., 2012), economics (KIM, 2008), marketing (KO;NA, 2011), engineering (GREEN-PETERSEN et al., 2012; GIANNOGLOU et al., 2014), geography (MANSFIELD, 2003a; b) and many other areas with the objective of offering the world population a healthy and nutritious food source (SIKORSKI, 1990).

Some scientometrics studies have been carried out in the fields of agriculture (SIEGMEIER;MÖLLER, 2013), fish stocks (ALVES;MINTE-VERA, 2013; CHONG-CARRILLO et al., 2015), scientific academic production concerning seafood (Martins et al., 2015) and sturgeon research (JARIC;GESSNER, 2012). However, to date there are no scientometrics studies on seafood quality.

People, government and industry have demonstrated increasing interest in seafood in the past decades. Aquaculture has provided an increase in raw material for the seafood industry (FAO, 2014). It is important to know where the field's most productive research team are and where it is developing.

This study investigates some characteristics of seafood quality literature through application of bibliometric techniques. The objectives of the study are to examine seafood literature's growth, mode of publication (e.g., journal article, congress, review article, etc.), language, place of publication, and author productivity patterns by Lotka's law.

Lotka's law is related to the productivity of authors and, according to Urbizagastegui (2009) this law explores the relationship between the number of authors and the number of articles published by these, in any scientific field, applying the inverse square $1/n^2$, in other words, in a period of time, analyzing an n number of articles, the number of scientists who write two articles would be equal to $1/4$ the number of scientists who wrote one, the number of scientists who have written three articles would be equal to $1/9$ the number of scientists who have written one, and so on. The first step to Lotka's law enforcement is the quantification of the number of authors with unit contribution, as it is from your product with the one's factor divided

by "n" contributions to the square if gets the amount of authors for this same "n" (URBIZAGASTEGUI, 2009).

2.2 METHODS

This is an exploratory study applying a quantitative approach and bibliometric methods.

A database was created and data were downloaded from Web of Science and Scopus. Web of Science is an online indexing service maintained by Clarivate Analytics. Scopus is a bibliographic database containing abstracts and citations for academic journal articles. It is owned by Elsevier and available online by subscription. Data were collected using the reference management software package ENDNOTE Web, by Thomson Reuters. Information about seafood quality was collected by searching for the keywords 'seafood*quality', 'seafood AND quality' and 'seafood quality' in titles, abstracts and keywords. Articles, reviews, proceedings papers, meeting abstracts, editorial materials and news items were collected during the period between January 2000 and May 2016. Data were processed and tabulated using Microsoft Excel for Windows and IBM SPSS 20.0. The numbers of authors and co-authors were collected using Sticci, a free application for pre-processing and converting bibliometric datasets (Gomez-Jauregui et al., 2014).

The hypotheses of this research are as follows:

H1: This area is under development and there is significant growth in the literature.

H2: The literature studied adheres to Lotka's law.

In assessing literature growth, we can assume that the relationship between the independent variable (years) and the dependent variable (publications) can be modelled. To evaluate the fit of the model, a chart based on the observed data was designed. Exponential growth assumes a concave form, as the values of the variable y form a geometric progression and the corresponding values of the variable x form an arithmetic progression (GUPTA; KARISIDDAPPA, 2000).

To estimate the growth of literature, the nonlinear regression model proposed by Egghe and Rao (1992) was used, as follows (Eq. 1):

$$C(t) = c \cdot g^t \quad (\text{Eq. 1})$$

Where:

$C > 0$; $g > 1$; $yt \geq 0$.

To estimate duplication of the bibliography, the equation described by Urbizagastegui (2009) was employed.

According to Lotka's law, the number of authors $Y(x)$, each with a total of x works, is inversely proportional to x , which is the productivity of each individual author (PAO, 1985).

This is expressed as $x^n \cdot y_x = c$; $x = 1, 2, \dots, x_{\max}$; $c > 0$; $n > 1$, where y_x represents the probability of an author publishing x times in that field; $x_{\max}$ represents the maximum value of productivity; and n and c are two parameters estimated for each specific set of data (Pao, 1985).

For calculation of parameter n , the method proposed by Pao (1985) was used (Eq. 2), where N is the number of pairs considered, X is the logarithm of x and Y is the logarithm of $Y(x)$:

$$n = \frac{N \sum XY - \sum X \sum Y}{N \sum X^2 - (\sum X)^2} \quad ((\text{Eq. 2}))$$

For calculation of parameter c , the method proposed by Pao (1985) was used (Eq. 3):

$$\sum_{x=1}^{\infty} \frac{1}{x^n} = \left[\sum_{x=1}^{p-1} \frac{1}{x^n} + \frac{1}{n-1(p^{n-1})} + \frac{1}{2p^n} + \frac{n}{24(p-1)^{n+1}} \right] \quad (\text{Eq. 3})$$

Finally, to verify the significance of the degree of fit of the model, the statistical test of non-parametric Kolmogorov-Smirnov goodness-of-fit proposed by Pao (1985) was used:

H_0 : The data fit Lotka's law.

H_1 : The data do not fit Lotka's law.

The critical value c.v. was calculated as follows (Eq. 4):

$$c.v. = \frac{1.63}{\sqrt{\sum y}} \quad (\text{Eq. 4})$$

2.3 RESULTS AND DISCUSSION

A total of 2267 records were retrieved (up to 11 May 2016) from Web of Science and Scopus. Web of Science provided 1039 records, and Scopus 1228. After removing duplicate records, 1855 records were considered for analysis. The Web of Science collection starts from 1969 and Scopus collection starts from 1972.

2.3.1 Growth of Literature

Table 1 lists the number of articles published and their accumulated values each year. The collection of seafood quality literature started in 1969, in which year only one article was published.

There was a slight recession in 1995 and in 1998. The number of published articles rose (FAO, 2014b)), the record trade figures in 2013 reflect the strong growth in aquaculture output and the high prices for a number of species, such as salmon and shrimp. This is underscored by firm underlying demand for fish products in the world market.

Table 1 - Annual production of subject indexing literature

Year	No. of Items	Cumulative	Year	No. of Items	Cumulative
1969	1	1	1994	23	123
1971	1	2	1995	13	136
1972	1	3	1996	24	160
1974	1	4	1997	60	220
1975	2	6	1998	28	248
1976	1	7	1999	25	273
1977	1	8	2000	30	303
1978	2	10	2001	25	328
1979	4	14	2002	45	373
1980	2	16	2003	55	428
1981	3	19	2004	57	485
1982	2	21	2005	48	533
1983	3	24	2006	56	589
1984	1	25	2007	75	664
1985	2	27	2008	112	776
1986	5	32	2009	95	871
1987	6	38	2010	129	1000
1988	5	43	2011	128	1128
1989	5	48	2012	154	1282
1990	5	53	2013	196	1478
1991	15	68	2014	187	1665
1992	15	83	2015	150	1815
1993	17	100	2016	40	1855

Source: MARTINS *et al.* (2018)

The sharp growth in 1997 can be attributed to increased use of the World Wide Web for exchange of information (TREMAYNE;DUNWOODY, 2001; EYSENBACH;WYATT, 2002) and to the streamlined processes for submission of periodical publications. The exchange of information between various institutions (HAYTHORNTHWAITE, 1996) and researchers may have been an important factor in development of this field. The development of aquaculture (FAO, 2014) figure 1, and the technological packages (HASAN, 2000), mainly in fish and crustacean nutrition (SOOKYING et al., 2013), boosted the chain that likely demanded further academic investigation, but development of deeper studies to correlate this information is needed.

The growth of literature was exponential from 2000 to 2013, figure 2, following the development of this field.

Figure 1 - World capture fisheries and aquaculture production between 1950–2012 (FAO, 2014)

Source: Adapted by authors from (FAO, 2018)

Figure 2 - Growth of seafood quality literature during 1969–2016 and predicted values

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ws the variance analysis results acquired using SPSS 20.0, showing the sum of squares values, degrees of freedom and estimate mean squares.

The values obtained showed in table 3 are $c = 1.038$, $g = 1.118$ and $R^2 = 0.946$ (R^2 indicates that this model explains 94.6% of the variance of the associations between the independent and dependent variables). The annual growth rate is 11.8%.

Table 2 - Analysis of variance and calculation of R^2

Source	Sum of Squares	Df	Mean Squares
Regression	195176.225	2	97588.112
Residual	7126.775	45	158.373
Uncorrected Total	202303.000	47	
Corrected Total	132213.106	46	

$R^2 = 1: (\text{Residual Sum of Squares}) / (\text{Corrected Sum of Squares}) = 0.946$.

Source: MARTINS *et al.* (2018)

Table 3 - Estimated parameters

Parameters	Estimated	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
c	1.038	0.286	0.461	1.615
g	1.118	0.007	1.104	1.133

Source: MARTINS *et al.* (2018)

Knowing these parameters (i.e., c and g), it is possible to establish the equation that predicts exponential growth of publications in this field (URBIZAGASTEGUI, 2009), as follows (Eq. 5):

(5)

$$n (\log 1.118) = \log 2$$

$$n = (\log 2) / (\log 1.118)$$

$$n = 6.21$$

We consider the bibliography in this field of science to duplicate every 6.2 years.

According to Huggett (2013) looking at a historical overview of the developing world's scholarly publications all regions of the world presented linear growth in absolute quantities of publications. China presented a growth of 23% of Compound Annual Growth Rate (CAGR). The three next most prolific developing countries are India with 9.9% with a strong 14% 2002-2011 CAGR, 5.7% for Brazil with a high 13% 2002-2011 CAGR, and 4.5% for Russia with a very low 2% 2002-2011 CAGR. Lyra and Guimarães (2007) demonstrate the growing of the scientific production in the field of agrarian sciences in the world and in Brazil was linear.

Studies in the field of food technology and nutrition, demonstrate that this is a field of science of growing interest by researchers (VAN RAAN; VAN LEEUWEN, 2002; ALFARAZ; CALVINO, 2004; PICCOLO et al., 2014; TAO et al., 2015), but the exponential growing is not observed in studies about food like in seafood quality. Seafood fisheries (OLIVEIRA et al., 2016) have linear growing, aquaculture too (NATALE et al., 2012; GUO et al., 2016), therefore, in addition to the fact that there are no bibliometric studies on seafood quality, this field is even more interesting because it presents exponential growth.

In a study conducted by Guo et al. (2016), on research conducted with oysters, the authors observed a linear growth of publications in the last twenty years. The authors not applied Lotka's law in the study but an author productivity analysis revealed that a small group of productive authors contributed a large number of publications on oyster research. Of all 23,414 authors who (co)authored at least one publication, 21,791 (93.1 %) contributed with less of five papers. The USA was the most productive countries. The authors developed this study searching papers in the Web of Science and Scopus. The artisanal fisheries, was the object of the investigation conducted by Oliveira et al., (2016) demonstrate the growth in this area, following the other areas previously mentioned. The researchers observed an interesting data, the brazilian authors they do not relate to researchers from the other countries, although they occupy the second place in number of publications in this field, where the USA leads the researches in quantity. The bibliometric analysis of

aquaculture literature was conducted by Natale et al., (2012), the authors observed the growth (linear) of this field and the USA is the country with the highest number of contributions.

2.3.2 Publication Types

The distribution of document types is displayed in table 4. As expected, most common are journal articles, which constitute 64% of the total literature. This is a standard consistent with other areas of science, including social science (GUPTA et al., 2002), digital libraries (SINGH et al., 2007), theoretical population genetics (GUPTA;KARISIDDAPPA, 2000) and automatic indexing (PULGARÍN; GIL-LEIVA, 2004). It is clear that scientific articles are the most widely used document type, followed by reviews and then book chapters. Notably, reviews comprise 13% of the total literature and seem to have become very important, because this area is a developing field and researchers gather new information using the studies that already exist.

Table 4 - Distribution of document types

Document type	No. of Items	%	Cumulative Items	Cumulative %
Article	1193	64	1193	64
Review	250	13	1443	78
Book Chapter	130	7	1573	85
Proceedings Paper	125	7	1698	92
Conference Paper	71	4	1769	95
Book	26	1	1795	97
Article in Press	16	1	1811	98
Short Survey	9	0	1820	98
Meeting Abstract	8	0	1828	99
Undefined	8	0	1836	99
Note	6	0	1842	99
Editorial Material	6	0	1848	100
Conference Review	3	0	1851	100
News	2	0	1853	100
Letter	2	0	1855	100
TOTAL	1855			

Source: MARTINS *et al.* (2018)

It is important to note that, there are 193 scientific journals that have to published papers about seafood quality, and between these journals, 16 are exclusively about seafood.

2.3.4 Place of publication and language

As shown in table 5, most seafood quality literary production is distributed worldwide, with the exception of the African continent. The most productive countries are the United States, China and Spain.

Table 5 - Ten most productive countries according to Web of Science and Scopus

Web of Science			Scopus		
Place of Publication	Publications	%	Place of Publication	Publications	%
United States	342	33.1	United States	302	39.6
Spain	120	11.6	Spain	69	9.1
China	99	9.6	China	65	8.5
Norway	78	7.6	Italy	55	7.2
United Kingdom	75	7.3	Canada	53	7.0
Canada	70	6.8	Australia	51	6.7
Australia	67	6.5	Brazil	44	5.8
Italy	67	6.5	Norway	43	5.6
France	65	6.3	Denmark	42	5.5
India	50	4.8	France	38	5.0
TOTAL	1033	100.0	TOTAL	762	100.0

Source: MARTINS *et al.* (2018)

This is not a surprising scenario, as these countries move high figures annually on imports and exports of fish and has demonstrated significant growth in exterior commerce in recent decades (table 6). The two databases used as sources for this investigation are Western, and concentrate a large number of publications from English-speaking Western countries (table 7).

Table 6 - Top ten seafood importers (FAO, 2014)

Importer	2002 (US\$ millions)	2012 (US\$ millions)	Annual Percentage Growth (%)
Japan	13646	17991	2.8
United States	10634	17561	5.1
China	2198	7441	13.0
Spain	3853	6428	5.3
France	3207	6064	6.6
Italy	2906	5562	6.7
Germany	2420	5305	8.2
United Kingdom	2328	4244	6.2
Republic of Korea	1874	3739	7.2
China, Hong Kong SAR	1766	3664	7.6
Top Ten Subtotal	44830	77998	5.7
Rest of World Total	17323	51390	11.5
World Total	62153	129338	7.6

Source: MARTINS *et al.* (2018)

Table 7 - Publication languages

Language	Publications	%
English	1820	98.0
Portuguese	10	0.5
Spanish	9	0.5
French	5	0.0
German	5	0.0
Japanese	3	0.0
Chinese	1	0.0
Italian	1	0.0
Turkish	1	0.0
TOTAL	1855	100.0

Source: MARTINS *et al.* (2018)

Different from other fields of science, in the seafood quality, Spain presents a production greater than countries such as United Kingdom and Japan. Seafood consumption in Spain rose from 25.85 kg per capita in 1961 to 44.65 kg per capita in 2003 (FAO, 2008). The fishing industry was the first sector business organization of Spain and today is a conglomerate of more than 245 companies of Seafood (ANFACO-CECOPESCA, 2017). The Spanish seafood supply chain has a collaborative network between research institutes and industry. Institutions such as Consejo Superior de Investigaciones Científicas - CSIC, connected to the Ministry of Economy and Competitiveness and The National Association of Canned Seafood Industry - ANFACO CECOPESCA, (ANFACO-CECOPESCA, 2017; CSIC, 2017). Another characteristic of the Spanish Science is the presence of research funding agencies. The Xunta de Galicia and The Spanish Ministry of Economy and Competitiveness are the financial agencies that most often appear in the analysis of results for this category.

The authors with higher frequency of publication in seafood quality according of Web of Science and Scopus belong to the following organizations: CSIC, Universidade Complutense de Madrid, Universidade Santiago de Compostela, Universidade de Vigo, ANFACO CECOPESCA, Instituto Espanhol de Oceanografia, Universidade de Las Palmas de Grand Canaria, Universidade de Vigo, Departamento de Sanidad - Instituto de Agroquímica y Tecnología de Alimentos.

2.3.5 Authors and Lotka's law

A total of 5583 authors, including co-authors, were retrieved, and every author of a paper was given one credit to measure author productivity. The majority (i.e.,

4,175 authors; 75%) contributed only one article. Table 8 illustrates the number of authors contributing one, two or more articles. The percentage of authors contributing only one article is much larger than the 60% from Lotka's original data. This indicates that, as in other fields, the number of authors who publish and then disperse is very significant. The number of authors who have 10 or more articles is expressive when compared to the Lotka's model. The calculation of $n = 3.270792859$ and $c = 0.864972675$ followed the steps showed by Pao (1985). The c.v. obtained by the non-parametric Kolmogorov-Smirnov goodness-of-fit test was 0.021815. The maximum difference $D_{\max}$ between the observed and estimated accumulated frequencies was 0.117167. Thus, we conclude that the data do not fit Lotka's law, because the c.v. is higher than the $D_{\max}$ and rejects the null hypothesis.

For the Lotka's law enforcement, is important to note, are the three possible ways of author's counting: direct, when only the first author is credited; complete, when all authors are credited and fitted, when the credits are split between the authors (URBIZAGASTEGUI, 2009). The result of this research and the Lotka's law enforcement was made considering only the first authors, i.e. direct application.

Table 8 - Author productivity and Kolmogorov-Smirnov test of observed and expected distribution

Publications (x)	No. of Authors (y)	Observed Frequency ($y/\Sigma y$)	$\Sigma (y/\Sigma y)$	Expected Frequency (fe)	Σfe	D max
1	4175	0.747806	0.747806	0.864973	0.864973	0.117167
2	1008	0.180548	0.928354	0.089618	0.954591	0.026237
3	220	0.039405	0.967759	0.023792	0.978383	0.010624
4	79	0.014150	0.981909	0.009285	0.987668	0.005759
5	45	0.008060	0.989970	0.004475	0.992144	0.002174
6	17	0.003045	0.993015	0.002465	0.994609	0.001594
7	16	0.002866	0.995880	0.001489	0.996097	0.000217
8	4	0.000716	0.996597	0.000962	0.997059	0.000463
9	11	0.001970	0.998567	0.000654	0.997714	0.000853
10	1	0.000179	0.998746	0.000464	0.998178	0.000569
11	2	0.000358	0.999104	0.000339	0.998517	0.000587
12	1	0.000179	0.999284	0.000255	0.998772	0.000511
14	1	0.000179	0.999463	0.000197	0.998969	0.000494
15	1	0.000179	0.999642	0.000154	0.999123	0.000518
16	2	0.000358	1.000000	0.000123	0.999246	0.000754

Source: MARTINS *et al.* (2018)

According to Stewart (1994), the attempts to test the Lotka's law have encountered a number of problems like a diversity in their precise formulation; for example, extreme values might be ignored or treated differently (Pao, 1985), additional parameters to the basic equations might be introduced (Griffith, 1988), and

adjustments are needed for the discrete nature of the counts, the data sets often include a diverse mix of scientists of different ages and disciplines, counts including or excluding coauthorships, or measurement over very different time intervals. This diversity makes it unlikely that stable (and comparable) parameters will be estimated (STEWART, 1994).

When the variables are measured in a ten years period or more, the results may to fall the law or not, Potter (1981) checked several works that had Lotka's theoretically methodological basis, he concluded that some fields of science, the statistical results that do not fit the law. It would appear that when the time period covered is ten years or more and the community of authors is defined broadly, author productivity approximates the frequently distribution that Lotka.

Similarly Urbizagastegui (2009) replicated earlier researches using two models of calculation: General Inverse Power and Maximum Probability. Their results revealed that some studies adapt better to a model over another, not showing significant interference because of the period. For the Nicholls (1989) the main element involved in fitting a bibliometric model have been identified as: specification of the model, measurement of the variable, organization of the data, estimation of model parameters and a criterion for assessing goodness-of-fit.

This discussion demonstrates that the elite of numerous fields of research can be exploited from different ways, considering the relationships between researchers and the co-authorships, or applying variations of mathematical treatments like the poisson lognormal or truncated model presented by Stewart (1994). Lotka is an exploration tool that allows a reading of the dynamic of the disciplines of science and the results may provide conclusive opinions or producing perspectives for the future researches.

2.4 CONCLUSION

The majority participation of scientific articles allows us to conclude that originality and timeliness are the most important factors for this field, showing interest in news and indicating the characteristics of development of this area.

The literature on seafood quality has grown in recent decades, surpassing the growth of literature on general sciences and following the interest of society (e.g., industry, academia, government) in seafood and the development of technologies that allow for full exploitation of aquatic organisms as raw material for food production. Exponential growth since early 2000's demonstrates that significant growth occurred only recently.

The large number of authors with only one publication in this field demonstrates that there is an evasion of professionals; however, the number of researchers with high production also is expressive. Lotka's law presented a significant difference with the observed number of authors, and the Kolmogorov-Smirnov test confirmed that Lotka's law cannot be applied to this field of the science.

The research about this topic must be further in the future. This discipline of food science presents bibliographic production, say peculiar, especially the papers production (geographic and authors productivity). Other issues should be explored: acting how long the researchers more productive and what are their ages? It is possible that there are young researchers with an expressive production in emerging countries such as BRIC's?

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3 SEAFOOD SUPPLY ASSESSMENT IN THE 21ST SUPPLY DEPOSIT OF BRAZILIAN ARMY

ABSTRACT

Objectives: The aim of present study was to evaluate the sanitary characteristics associated to the Quality and Identity Standards of the frozen seafood provided for the 2nd MR by 21st SD; Identify strengths, weaknesses, opportunities and threats to optimize the supply process; Propose a strategic approach to mitigate supply non-compliances. Methods: Were performed seven Focus Groups, a SWOT analysis and the swot factors were weighted with the application of the Analytical Hierarchy Process AHP. Results: The frozen seafood supply process of the 2nd MR, centralized in the 21st SD, needs a technical, operational and documental restructuration, to ensure the maximum efficiency in the seafood purchase, storage and distribution; It is very important the participation of specialized Officers in the bind writing process. Conclusion: It is recommended the implementation of FSMS and qualify the staff. The adoption of strategies with focus in the Food Security is necessary to ensure a good and safety nutrition and reaching the results can promote the development of social changes through qualifing officers and soldiers. Keywords: Food Supply, Food Storage, Perishable Foods, Fish Products, Food Preservation

3.1 INTRODUCTION

Twenty-seven Military Organizations (MO) compose the Second Military Region (2nd MR) of the Brazilian Army (BA), established in the State of São Paulo, with a contingent of approximately 9000 public servers, supplied by the 21st Supply Deposit of Brazilian Army (21st SD), logistics unit that operates as a supply deposit and distribution centre (BRASIL, 2010).

To attend the staff, the BA performs the purchase and distribution of food (BRASIL, 2014). Made with the Federal resources, is classified as public purchase (de OLIVEIRA e LUZIO dos SANTOS, 2015; FIUZA e MEDEIROS, 2013), therefore follows the precept of the rational resources use to obtain bests results (OLIVEIRA *et al.*, 2010). However, the public resources optimal use is not intrinsic to the acquisition operations, requiring constant improvements in the storage and distribution operations (BRASIL, 2005, 2015; BRASIL, 2017b).

Between 2015 and 2017 were served 18.10^3 meals day⁻¹ in the 2nd MR. This operation with an average demand of 105,3t per year (BRASIL, 2005), however, the average of denied lots where 81,7t (77,5%), because was identified some kind of non-compliance (sanitary or related to the Quality and Identity Standards), resulting disapproval after being analysed by the 21st SD Food Inspection and Bromatology Laboratory (FIBL). The high disapproval percentage of raw-material (77,5%) is a indicative of non-effective *modus operandi* (BESKE *et al.*, 2014) but the supply system is complex and is necessary to know the details about the system and search solutions. The Supply Chain Management is a widely explored discipline (CHEN e DENG, 2013; PAGELL e WU, 2017), although, there is no literature about seafood supply chain in the Brazilian Army universe.

The aim of present study was to evaluate the characteristics sanitary and related to the Quality and Identity Standards of the frozen seafood provided for the 2nd MR by 21st SD; Identify strengths, weaknesses, opportunities and threats to optimize the supply process; Propose a strategic approach to mitigate supply non-compliances.

3.2 MATERIAL E METHODS

This study was approved by the Research Ethics Committee of the School of Veterinary Medicine and Animal Science, University of São Paulo, under the Protocol n.77150314, and it follows the ethical procedures established by resolution No. 466/2012 (BRASIL, 2012).

This is a cross-sectional study, performed in the 21st SD of BA, São Paulo State, between January 2015 and December 2017. It's an empirical, exploratory and documental case study, performed in the organizational real context (GIL, 20012).

We analysed the Frozen Seafood Supply System, described the specific products, local characteristics and the particular *modus operandi* of the 21st SD. Posteriorly we explored documents searching information about purchase as a Public Bids, qualitative and quantitative supply data as principal non-compliance resulting disapproval lots. The Brazilian Army legal rules were analysed: “Manual de Alimentação das Forças Armadas” (BRASIL, 2010), “Regulamento de Segurança dos Alimentos das Forças Armadas” (BRASIL, 2010).

Seven Focus Group (GLASS *et al.*, 2015) was performed to know the main problems and asymmetry of the seafood supply operation. A focus group is a gathering of principal actors of the Military Organization, who participated in a planned discussion with the purpose that is intended to elicit Brazilian Army Officers perceptions about a seafood supply topics in an receptive environment, following a pre-established program and recording the principal information. The participants were Veterinary Army Office (n=4), Army Office (n=4), Army Sargent (n=1), Army General (n=1) and soldiers (n=2). From these interviews, the outstanding information, referring to the process, were listed statistically and tabulated in order to knows the absolute frequency (BUSSAB e MORETTIN, 2010) (Equation 1):

$$\sum f_i = n \quad (\text{Eq. 1})$$

This information base allowed the identification the main factors related the seafood supply and were identified and grouped into a SWOT matrix. The SWOT analyse (HUMPHREY, 2005) is a systematic framework commonly performed to analyse internal factors of organizations (strengths, weaknesses) and external

(opportunities, threats) and based in decision making (DLBOKIC *et al.*, 2017; ETONGO *et al.*, 2018).

Swot analyses are able to identify and describe internal and external factors of an organization (FRIEDRICHSEN *et al.*, 2017; HATEFI, 2018), however, the analysis does not assign value measures, weights or amounts relating (HOUBEN *et al.*, 1999). So and having as proposal assign values and order the factors¹ with importance scale, it was used a hybrid method: a multiple criterion evaluation methodology *AHP*. The method considers the relative importance among the factors, comparing and determining an overall ranking. The factors are recognized elements (quantitative or qualitative; tangible or intangible), with fundamental importance to the supply system (SAATY, 2008). The factors should receive a relative importance degree (1 to 9). We use only odd numbers (Table 1).

Table 1. Pairwise comparison scale by Saaty (2008)

Numerical value(s)	Options
9	Extremely strong
7	Very strong
5	Strong
3	Marginally strong
1	Equal
2,4,6,8	Intermediate values to reflect inputs

Source: Elaborated by authors with base in Saaty (2008)

The pairwise comparison of the n factors was performed utilizing a square matrix $n \times n$, the criterions were arranged between rows and columns equivalently, implying in the value of a_{ij} represent the importance of the line i criterion related to the column j criterion (Equation 2).

$$a_{ij} = \frac{1}{a_{ji}}, \text{ for } i \neq j \text{ and } a_{ij} = 1, \text{ for } i = j \quad (\text{Eq. 2})$$

Thereby defined the A matrix = $[a_{ij}]$, ($1 \leq i \leq n$; $1 \leq j \leq n$) (Equation 3).

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix} \quad (\text{Eq. 3})$$

¹ Another term for factorize.

Where:

a_{ij} : comparison between a_i and a_j ;

a_i, j : comparison factors;

$a_{ij} = 1/a_{ji}$;

$a_{ii} = 1$.

After the definition of matrix $A = [a_{ij}]$ the matrix was filled with the values showed in the table 1, and the next step was the calculation of the factors weight using the *Eigenvector* and the *Eigenvalue* (SAATY, 2008). For all A matrix is possible calculate the *w vector* as showed (Equation 4):

$$Aw = \lambda_{max}w \quad (\text{Eq. 4})$$

Where:

A: comparison matrix;

w: weight vector;

λ_{max} : maximum matrix priority vector.

The values of the vector w can be obtained by summing the values of each matrix column, followed by the division of each element by the sum of your respective column (Equation 5):

$$w_i = \frac{(\prod_{j=1}^n a_{ij})^{1/n}}{\sum_{k=1}^n \left[(\prod_{j=1}^n a_{kj})^{1/n} \right]} \quad (\text{Eq. 5})$$

The Consistency Index (CI) was calculated and the Consistency Ratio (CR) (Equation 6 e 7):

$$CR = \frac{CI}{CR} \quad (\text{Eq. 6})$$

$$CI = \frac{(\lambda_{max} - n)}{n-1} \quad (\text{Eq. 7})$$

Where :

CI: fixed value ;

n: factor numbers;

λ max: A value

The matrix is considered consistent if the ratio between the value of CI and the CR is less than 10% .

3.3 RESULTS AND DISCUSSION

Private and public organisations have different personalities (theory of administrative law) and could not be compared. However, the examples that will be used to discuss the results don't claim to compare, replace or override the models used in the public and private administrative field. The BA, is subjected to the Food Safety Standards and demand logistics operations as any private organization, so the discussions will target the improvement of the process under a common approach.

The 21st SD is a Quartermaster Unit, performs the distribution operation, attend 27 MO in the São Paulo State (Table 2).

Table 2 – Name and localization of Military Organizations attended by 21st SD

Military Organization	Localization
Hospital Militar de Área – HMASP	SP Capital
Base Administrativa do Quartel General do Exército – BAQG	SP Capital
Centro de Preparação de Oficiais da Reserva de São Paulo – CPOR	SP Capital
Batalhão de Polícia do Exército - 2º BPE	SP Capital
Arsenal de Guerra de São Paulo – AGSP	SP Capital
Depósito de Suprimentos - 22º SD	SP Capital
Batalhão de Infantaria Leve - 4º BIL	SP Capital
Batalhão de Logística - 22º BLOG	SP Capital
Depósito de Suprimentos - 21º SD	SP Capital
Grupo de Artilharia de Campanha Leve - 20º GAC	Barueri – SP
Base de Aviação de Taubaté	Vale do Paraíba
Batalhão de Infantaria Leve - 5º BIL	Vale do Paraíba
Batalhão de Engenharia de Construção - 2º BEC	Vale do Paraíba
Brigada de Infantaria Leve Aeromóvel - 12ª BDA	Vale do Paraíba
Brigada de Artilharia Antiaérea - 1ª BDA	Baixada Santista
Grupo de Artilharia Antiaérea - 2º GAAAE	Baixada Santista
Batalhão de Infantaria Leve - 2º BIL	Baixada Santista
Brigada de Infantaria Leve - 11ª BDA	Campinas – SP
Escola Preparatória de Cadetes do Exército – ESPCEX	Campinas – SP
Companhia de Comunicação Leve - 2ª CIACOM	Campinas – SP
Batalhão de Infantaria Leve - 28º BIL	Campinas – SP
Batalhão de Logística - 2º BLOG	Campinas – SP
Regimento de Cavalaria Mecanizada - 13º RCMEC	Campinas – SP
Batalhão de Infantaria Leve - 37º BIL	Jundiaí – SP
Grupo de Artilharia de Campanha - 12º GAC	Jundiaí – SP
Grupo de Artilharia de Campanha Leve - 2º GAC	Jundiaí – SP

Source: MARTINS *ET AL.* (2018)

The storage logistic adopted in the 2nd MR is centralized. According to Pacheco e Cirqueira (2006), there are a several reasons that some products are centred or not and this operation needs to be examined carefully. According to Maister (1976) products with high added value require a centralized storage in order

to reduce duplication. The value added of seafood is not high. Is recommended to products with low value the decentralized storage (OESER e ROMANO, 2016).

The 21st SD is a MO and a Quartermaster Unit (figure 1), structurally different from a food industry, warehouse or a simple MO. When compared to a civil organization, their food supply departments are similar to a distribution centre. There are no activities of manipulation and transformation of products, only reception, storage and shipment. In the figure 2 the area of supply operation is delimited. We consider and submitted the operations restricted to this area.

Figure 2 – Perimeter of the 21st SD, and places related to the seafood supply.

Source: MARTINS *et al.* (2018)

The O 21st SD, received and stored 316t of seafood between 2015 and 2017, fractioned in 41 lots (table 3).

Table 3 – Seafood quantity (kg) purchased, denied and percentage of rejections of the different species stored in 21st

Item	2015			2016			2017		
	Purchased	Denied	%	Purchased	Denied	%	Purchased	Denied	%
Cod fish	5.725	0	0	8.350	0	0	10.204	5.125	0,2
Weakfish (fillet)	0	0	0	13.000	13.000	100	16.200	12.790	9,0
Salmon (fillet)	155.786	153.920	8,8	55.824	52.399	3,9	50.990	8.000	5,7
TOTAL	161.511	153.920	5,3	77.174	65.399	4,7	77.394	25.915	3,5

Source: MARTINS *et al.* (2018)

There are expressive percentages of rejection, especially for: weakfish and salmon filet. Weakfish purchased decreased 47,9% during the period. The main non-

compliances about these lots where: fillets with skin, liquid weight mislabelled and physical-chemical standards (table 4). According to Portaria nº 1428, November 26, 1993 (BRASIL, 1993) Quality and Identity Standards (QIS) are characteristics declared for each product, related to physical and chemical parameters, labelling, colour and texture.

Is important highlighting that net weight non-compliance is a food fraud in order to increase the price or the final volume (BARBOSA, 2016), and according to Decreto 9.013 March 29, 2017 (BRASIL, 2017a), are characterized as risk activities or hygienic sanitary threat. The over glazing (FAO, 1995), mislabelling and species substitution are the most recurrent frauds in Brazil. (BARBOSA, 2016; LIMA e MESQUITA, 1996; NEIVA *et al.*, 2015).

Table 4 – Frozen Seafood non-compliances assessment between 2015 and 2017 in 41 lots purchased by 2nd MR

Non-compliance	Occurrences	Percentage %
Net weight incompatible	11	26,8
Fish fillets with skin	12	29,3
Incompatible coloring with QIS*	1	2,4
Incompatible texture with QIS*	2	4,9
Potential of Hydrogen pH	2	4,9
Ammonia (NH ₃)	4	9,8
Species substitution	1	2,4
Incomplete invoice	2	4,9
Mislabelling	2	4,9
Surveillance status not proved	1	2,4
TOTAL	38	92,7

*QIS – Quality and Identity Standard (Brasil, 1993)

Source: MARTINS *et al.* (2018)

The expressive percentage of non-compliance showed the weakness of the frozen seafood supply. However, there are strong factors, threats and opportunities. To know which are the specific factors, a swot analyse was performed (Table 6).

The results obtained in the field “Strengths” shows clearly that the human resources is the key (FO1, FO2, and FO6). In this context Schmitt *et al.*, (2012), favour human capital and claim that is better invest in the human resources education instead of in new technologies and information. The access to new technologies and information cannot guarantee the efficient use, considering, in particular, that in developed countries technological advances are based on educational systems that enable the transfer of studies, research, products,

information systems and knowledge in cultural, economic, scientific and social development.

Table 6 – Frozen Seafood Supply matrix *swot* of the 2nd MR

Strengths (internal environment):
(FO1) Veterinary in staff;
(FO2) Experts in transport and storage;
(FO3) Discipline culture;
(FO4) Specialized laboratory;
(FO5) Acquisition of foodstuff in large volumes;
(FO6) Numerous and diverse professional skills;
Weaknesses (internal environment)
(FR1) There's no FSMS;
(FR2) There's no FSMS culture;
(FR3) There's no FS climate;
(FR4) Staff unqualified
(FR5) High energy (kcal) demand
(FR6) Bid text technically unspecified
(FR7) Poor conservation of the cold stores and the buildings integrity status
(FR8) Breaks in the cold chain
Opportunities (external environment):
(O1) Technical Cooperation with universities and research institutes;
(O2) Soldiers and Officers qualification in FS;
(O3) Talents identification and exportation
Threats (external environment):
(A1) Food waste;
(A2) Seafood low acceptance in daily <i>menu</i> .
(A3) Under-utilisation of technical and financial resources
(A4) Foodborne and outbreaks
Source: MARTINS <i>et al.</i> (2018)

The factor Discipline (FO3) is intrinsic of military culture (RÊGO, 2012). If well explored, this factor is good for the FSMS. However, according to Nonaka e Takeuchi (1996) the formal hierarchy presents strong propensity to the control, and can be dysfunctional and harming to the individuals initiative, especially because it is created and developed through the tacit and explicit knowledge and social interaction.

The factors “Specialized Laboratory” (FO4) and “Acquisition of foodstuff in large volume” (FO5) demonstrate the power of the biggest organization. The major of private Brazilian organizations needs to contract laboratory analyse services and the volume traded are small. However, storage and distribution are logistic operations and the militarism is the birthplace of it (DEL RE, 1955). This factor should be used and explored, thereby, If the logistics were practiced in the past as a supply and transport operation, today is interspersed with managerial sciences, so the term Supply Chain Management (SCM) derives from the concept of logistics (SILVA e

FLEURY, 2000). Therefore, only store and distribute currently aren't enough, demonstrating that the activity so held is overrated.

The factors (from FR1 to FR4, FR7 to FR8) are intrinsically related to the implementation of a FSMS. Control and overall monitoring can add a high value to the supply system. As an example we can mention the implementation of ISO 22000:2006 (ABNT, 2006; PANGHALET *al.*, 2018; SOMAN e RAMAN, 2016), especially because all factors mentioned above can be corrected. The factor “High energetic (kcal) demand (FR5) is intrinsic of the organization with numerous staff realizing manual labour. Is important the hygiene and control of food, in this case all staff is dependent of the meals served a long the day, foodborne can compromise the secure routine of MO's.

Bid text technically unspecified (FR6) is related to the non-participation of the Skill Officers (Veterinary) in the bind elaboration process. The valorisation of human resources again is perceived such a very important factor.

The “Poor conservation of the cold stores and the buildings integrity status” and “breaks in the cold chain” (FR7 and FR8) are critical. The maintenance of storage temperature is a Critical Control Point (CCP) (OPAS/INPPAZ/OMS, 2001; PANGHAL *et al.*, 2018).

The opportunities (O1, O2 and O3) are related to cooperation between BA and Universities and Research Institutes. There are a several challenges related a food safety and another disciplines waiting solutions, therefore, both organizations will be working to the development of the society. Qualification to the officers in master and doctoral programs and open house to researchers to work in the real ambient with daily's problems, approaching researchers and officers to change experiences. The qualification of soldiers allows the back to the labour market, after the period of military service, with better conditions and major chances to insertion.

Threats are commonly similar to the all organization of the food chain. The economic and environmental factors (A1, A2 and A3) are trouble with real possibilities of mitigation through the implementation of FSMS. The factor A4 is commonly cited in the bibliography specialized as harmful and it is potential occurrence is powered when the organization operate without FSMS. Every factor are intrinsically related to non-compliances and absence of FSMS

In the AHP analysis, the pairwise comparison using the Saaty's comparison, were made. The results are shown in Table 7. We have determined a strategic

combination to BA seafood supply. Each swot group was weighted and the group Weaknesses obtained the most significant priority (0.367). The factors of this group FR1 and FR2 were the most important factor in the swot analyses with 0,294 priorities inter group to both. This results shows de urgency of the FSMS adoption.

The factors O2 and O3 of the group Opportunities were considered very important. Opportunities are fortuitous events that can promote positive outcomes for BA and for society. Qualification and promotion of people go beyond the frontiers of technical solutions and add social value to the strategy.

Table 7 – Overall priority of the SWOT factors by Analytic Hierarchy Process – AHP

SWOT group	Group priority	Swot factors	Priority inter group	General priority	Consistency ratio (CR)
Strengths	0,123	(FO1) Veterinary in staff;	0,144	0,021	0,06
		(FO2) Experts in transport and storage;	0,065	0,012	
		(FO3) Discipline culture;	0,031	0,009	
		(FO4) Specialized laboratory;	0,400	0,031	
		(FO5) Acquisition of foodstuff in large volumes;	0,334	0,019	
		(FO6) Numerous and diverse professional skills;	0,026	0,010	
Weakness	0,367	(FR1) There's no FSMS;	0,294	0,136	0,01
		(FR2) There's no FSMS culture;	0,294	0,136	
		(FR3) There's no FS climate;	0,055	0,03	
		(FR4) Staff unqualified	0,068	0,034	
		(FR5) High energy (kcal) demand	0,062	0,031	
		(FR6) Bid text technically unspecified	0,079	0,099	
		(FR7) Poor conservation of the cold stores and the buildings integrity status	0,067	0,056	
		(FR8) Breaks in the cold chain	0,081	0,03	
Opportunities	0,365	(O1) Technical Cooperation with universities and research institutes;	0,116	0,039	0,01
		(O2) Soldiers and Officers qualification in FS;	0,405	0,131	
		(O3) Talents identification and exportation	0,479	0,079	
Threats	0,146	(A1) Food waste;	0,227	0,011	0,01
		(A2) Seafood low acceptance in daily menu.	0,305	0,019	
		(A3) Under-utilisation of technical and financial resources	0,468	0,067	

Source: MARTINS *et al.* (2018)

3.4 CONCLUSION

The frozen seafood supply process of the 2nd MR, centralized in the 21st SD, needs a technical, operational and documental restructuration, to ensure the maximum efficiency in the seafood purchase, storage and distribution, offering to the barracks a high biologic value product and using the economic resources by best way;

It is very importante the participation of specialized Officers in the bind writing process;

It is recommended that the 21st SD implements an FSMS and qualify the entire staff so that there is an understanding of this system;

The adoption of strategies with focus in the Food Security is necessary to ensure a good and safety nutrition and reaching the results can promotes the development of social changes through the qualifing of the officers and soldiers.

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4 CRITERIA FOR SEAFOOD SUPPLIERS TO THE BRAZILIAN ARMY: CASE STUDY

ABSTRACT

The aim of this study was to collect data that depict desirable criteria for seafood supply to the Brazilian Army. The results demonstrated that the criteria and their respective importance values (weights) for the 1st level were: price (31.3%), delivery (19.7%), CNPJ linked to the SIF (19.4%), self-control HACCP system (14.8%), geographic location (7.2%), post-sale (4.3%), social responsibility (3%); 2nd level: respect deadlines (31.5%), freezing equipment (28.2%), ISO 22000 (18.7%), traceability (10.8%), packaging and labeling (6.8%), possibility of audit (3.8%); 3rd level: scientific name specification (47.9%), total traceability (40.5%), partial traceability (11,5%). The CNPJ linked to the SIF and the use of scientific name criteria were not present in the available literature, characterizing as a new contribution of the study to the field.

Keywords: supply chain, food, quality, public purchases.

4.1 INTRODUCTION

The Brazilian Army composes the three Armed Forces of Brazil and, for the fulfillment of the Constitutional defense mission of the homeland, the Earth Force maintains an effective higher than 200,000 men and women (Brazil, 2016). With high energy demand, 2,900 kcal/day, being 900 kcal/day higher than Brazilians average a ged between 19 and 24 years, because of the practice of physical activities and the manual labor are inherent characteristics of militarism (Brazil, 2010).

Food supply is an extremely important activity from a logistical, political and defense point of view. (Brazil, 2014). In the Brazilian Army, supply operations are carried out by the Quarter Master Corps, along with the transport and logistics operations companies and the 2nd Military region comprises the state of São Paulo, is held by the 21st Supply Depot (DSUP).

Until October 2016, the Army owned 469 Food and Nutrition Units (FNU) (Brazil, 2014), with a complex food chain distribution (da Silva & Musseti, 2003). This arrangement is challenging, because the food supply in several Brazilian military organizations presents some non-compliance, which are identified and mitigated by the Food Inspection and Bromatology Laboratories (FIBL) (Vidal, Baltazar, Cunha Feio Costa, & Mendonça, 2011).

The Military Academy of Agulhas Negras (MAAN), in Rezende-RJ, in the triennium of 2010 to 2012, inspected 2,816t of food and obtained a non-compliance rate of 20% (562 T), being 224 t of animal products (Ferreia et al., 2013). Other studies have shown that The Brazilian army also faces non-compliances related to water potability (Gallotti et al., 2013) and to the hygiene of manipulators (Campos, Monteiro, de Oliveira & de Figueiredo, 2013). Between the years 2008 and 2010, the highest frequency of disapproval was for seafood (59.7%), showing inadequate reception temperature (74%) and microbiological contamination (62%) (De Andrade Lima & Corrêa, 2013).

The seafood is the food of the extremes, as nutritious as perishable, so it requires strict control along the productive chain (Galvão & Oetterer, 2015). In addition to its more pronounced perishability than other animal protein (Oetterer, 2002), the seafood still suffers with irregular practices along processing, such as inadequate glaciation (Neiva, Matsuda, Machado, Casarini & Tomita, 2015), indiscriminate use of polyphosphates (Mendes et al., 2016), frauds such as exchanges of species and information negligence (Donlan et al., 2017; Horreo, Machado-Schiaffino & García-Vázquez, 2017; Horreo, Ardura, Pola, Martinez & Garcia-Vazquez, 2013; Naaum, Warner, Mariani, Half & Carolin 2016; Willette et al., 2017).

All organizations that produce and offer food assume an unquestionable responsibility associated to the control of commercial and sanitary quality (Gonçalves, 2011), such as the identification of the best processes, packaging, transportation, product identification, cold chain, hygiene, traceability and suppliers selection (Boran, Young, Kurt, & Akay, 2009; Kaie-Chin, 2015; Lima Junior, Osiro, & Carpinetti, 2013).

The selective process of suppliers demands the use of techniques that make the identification of criteria that are significant for the safety of the process easier (Viana & Alencar, 2012), which can be several factors that have a particular degree of importance for each organization and niche (Weber, Current & Benton, 1991). The criteria's evaluation was presented by Dickson (1996), based on the investigation about the elements considered important for suppliers selection. Therefore, the evaluation of suppliers and supplies is multicriteria (Boran, Teen, Wolf & Akay 2009; De Boer, Labro & Morlacchi, 2001; Ho, Xu & Dey, 2010). However, for the adequacy of the model, it is necessary to use new criteria, considering particularities of each case (Weber, 1996; Weber, Current & Benton 1991).

Among the tools available for evaluating supplier or product criteria, there is the method *Analytic Hierarchy Process* (AHP), developed by Tomas L. Saaty by the beginning of the decade of 70, and is widely used in support of decision-making (I've, Xu e Dey, 2010). This method is based on the problem decomposition in criteria of the highest to the lowest level, on a quantitative scale of importance after a pairwise comparison (Saaty, 1988) and allows the application of different weights to be carried out by a group of specialists, according to Lai, Trueblood & Wong (1999) e Lai, Wong & Cheung (2002).

However, there are no records in the literature of the use of these tools in supply chain management operations in the Brazilian Army. Therefore, the objective of this study was to collect data that demonstrate desirable criteria for the supply of seafood to the Southeast Military Command, using multicriteria analysis for decision making for choosing suppliers. The importance of the management of the food supply system and the large contingent benefited by these changes justify the relevance of this study, highlighting the supplier as a critical point of control (Soman & Raman, 2016). It is expected that this study contributes to the field of supply management in organizations.

4.2 MATERIALS AND METHODS

4.2.1 Object of the study

The criteria that make up the vendor model (Dickson, 1996) of seafood to the 2nd region of the Brazilian Army are the object of this study. It is important to highlight that the particularities of this supply chain make the criteria of the supplier model, obtained through a focal group of specialists, differs from those already presented in the literature.

4.2.2 Data collection procedure

Four focus groups were conducted with seven specialists in: Military logistics, army supplies, food inspection, food security and quality control. According to Morgan's recommendations (1996) and Malhotra (2012), as audio recording equipment was used in the meetings for later consultations. The focal groups lasted 90 minutes (Martins, 2011). According to Gil's definition (2002), focal groups are one of the techniques employed in order to explore the background of a certain situation that was experienced by people in specific conditions. Participants are free to discuss and present opinions related to the theme proposed by a moderator. The subject was the main criteria that seafood suppliers should present. The factors exposed by Dickson (1996) were used as examples and the specialists presented new criteria and their respective justifications.

4.2.3 Data analysis Procedure

To assign degrees of importance to the criteria, we used the method *AHP* with the approach given by Saaty (1988, 1989, 2003, 2004, 2008), dividing them ordinally by levels. The first level is recognized by experts as the ones that meet the most relevant criteria and so on, up to the third level. The pairwise comparison of n criteria was performed using a square matrix $N \times N$. The criteria obey an equivalent arrangement between the lines and columns, implying the value a_{ij} , which represents the importance of the line criterion i in relation to the criteria of the column j (Equation 1).

$$a_{ij} = \frac{1}{a_{ji}}, \text{ para } i \neq j \text{ e } a_{ij} = 1, \text{ para } i = j \quad (1)$$

Thus, the matrix $A = [a_{ij}]$ is defined, ($1 \leq i \leq n$; $1 \leq j \leq n$) (Equation 2).

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix} \tag{2}$$

Were:

a_{ij} = comparison between the criteria or alternatives a_i e a_j ; a_i, j : criteria or alternatives for comparison; $a_{ij} = 1/a_{ji}$; $a_{ii} = 1$.

The comparison of the criteria, pairwise, allows determining the relative importance between them and the weight of each in the problem. For this study, a matrix was developed from the focal groups. According to Saaty (2004), the criteria should be given a relative degree of importance ranging from 1 to 9. In this study we will use only the odd numbers (Table 1).

Table 1 - Relative importance proposed by Saaty (2004).

Relative importance	Definition
9	Extremely Importance
7	Very Strongly Importance
5	Strongly Importance
3	Moderate Importance
1	Equal Importance
2,4,6,8	Intermediate values
Reciprocal values	When i receives the same value of j, as reciprocity, j will receive the reciprocal of this value when compared with i.

Source: MARTINS and BALIAN (2018)

After the definition of matrix $A = [a_{ij}]$, the criteria were placed in the same order in the rows and columns, and the matrix was filled with the values of the scales presented in table 1. The next step was calculate the weight of the criteria. In this step we used the calculations of the priority vector of eigen or *Eigenvector* and *Eigenvalue* (Saaty, 2003). We can then affirm that for every matrix A, it is possible to calculate vector w_i , as follows (Equation 3):

$$Aw = \lambda_{max}w \tag{3}$$

Were:

A = comparison matrix;

w = weights vector;

λ_{max} = maximum matrix priority vector.

The values of vector w can be obtained by the sum of the values of each column of matrix A, followed by the division of each element of the matrix by the sum of its respective column (Equation 4):

$$w_i = \frac{\left(\prod_{j=1}^n a_{ij}\right)^{1/n}}{\sum_{k=1}^n \left[\left(\prod_{j=1}^n a_{kj}\right)^{1/n}\right]} \tag{4}$$

The next step in the process is to verify the inconsistency of the data, calculating the Inconsistency Index (CI) and the Consistency Ratio (CR) (equations 5 and 6):

$$CR = \frac{CI}{IR} \quad (5)$$

$$CI = \frac{(\lambda_{max} - n)}{n - 1} \quad (6)$$

Where:

IR = tabulated value (Saaty, 1989);

n = number of criteria and alternatives; λ_{max} = A value, calculated by the sum of the product of each weight value (w) by the product of the sum of the respective column.

Considering the value of CR, it is understood that the level of inconsistency will be greater as the ratio of inconsistency increases. Therefore, the matrix will be considered consistent if the ratio between the value IC and the value of IR is less than 10% (Saaty, 1989).

Applying to the fundamental scale of Saaty (1977), the criteria defined were compared pairwise, assigning the degrees of relative importance. Because it is a group decision (seven individuals), the approach proposed by Lai, Wong & Cheung (2002) was used and the data were gathered in a decision matrix using the calculation of the geometric mean of the judgments.

4.3 RESULTS AND DISCUSSION

Through the focal groups, it was possible to identify several criteria that are presented in the Table 2.

The matrices with the geometric averages of judgments can be observed in the Tables 3, 4 and 5. The values of the priority vector or Eigen vector demonstrated the weight of the factors in the total goal result.

The next step was to verify the consistency of the choices made by the members of the team of specialists. The calculation of the maximum Eigen Value (λ_{max}), that is, the sum of the each element product of the priority vector by the total of the respective column in the original matrix. The results obtained were: 7.56 First Level, 6.55 Second Level and 3.03 Third Level. These values are the basis for calculating the CI consistency index. To verify if the CI is adequate, the calculation of the consistency rate (CR) was performed. The values obtained were: 7.17% First Level 8.93% Second Level and 1.36% Thrid Level, all below 10%, indicating that the matrices are consistent.

Table 2 - Criteria and sub criteria identified, selected and related by Focus Group to compose the decision matrix

Criteria	Acronym
1 st level	
Price	P
Delivery Capacity	CE
Post sale	PV
HACCP	AU
Social Responsibility	RS
CNPJ tied to the SIF	SI
Geographic Location	LG
2 nd level	
Respect Deadlines	RP
Cold store equipment	ER
ISO 22000	IS
Traceability	RA
Packaging and Labelling	ER
Possibility of Audits	PA
3 rd level	
Total Traceability	RT
Partial Traceability	RP
Scientific name specified	NC

Source: MARTINS and BALIAN (2018)

Table 3 – Comparison matrix, standardization, consistency, consistency rate and eigenvector for the criteria of the 1st level.

1 st level															
	Comparison Matrix							Standardization Matrix							
Criteria	P	CE	AU	SI	LG	PV	RS	P	CE	AU	SI	LG	PV	RS	Eigen vector
P	1	3	3	1	5	7	7	0,32	0,49	0,34	0,21	0,32	0,27	0,24	31,33%
CE	0,33	1	3	1	3	5	5	0,11	0,16	0,34	0,21	0,19	0,19	0,17	19,70%
AU	0,33	0,33	1	1	3	5	5	0,11	0,05	0,11	0,21	0,19	0,19	0,17	14,86%
SI	1	1	1	1	3	5	5	0,32	0,16	0,11	0,21	0,19	0,19	0,17	19,45%
LG	0,2	0,33	0,33	0,33	1	3	3	0,06	0,05	0,04	0,07	0,06	0,11	0,1	7,26%
PV	0,14	0,2	0,2	0,2	0,33	1	3	0,05	0,03	0,02	0,04	0,02	0,04	0,1	4,37%
RS	0,14	0,2	0,2	0,2	0,33	0,33	1	0,05	0,03	0,02	0,04	0,02	0,01	0,03	3,03%

Consistency index: 0,09; Consistency rate: 7,17%.
Source: MARTINS and BALIAN (2018)

Table 4 – Comparison matrix, standardization, consistency, consistency rate and eigenvector for the criteria of the 2nd level.

2 nd level													
Comparison Matrix							Standardization Matrix						
Criteria	RP	EC	IS	RT	ER	PA	RP	EC	IS	RT	ER	PA	Eigen vector
RP	1	1	3	3	5	7	0,33	0,31	0,39	0,28	0,29	0,29	31,57%
EC	1	1	3	3	3	5	0,33	0,31	0,39	0,28	0,17	0,21	28,26%
IS	0,33	0,33	1	3	5	5	0,11	0,1	0,13	0,28	0,29	0,21	18,70%
RA	0,33	0,33	0,33	1	3	3	0,11	0,1	0,04	0,09	0,17	0,13	10,83%
ER	0,2	0,33	0,2	0,33	1	3	0,07	0,1	0,03	0,03	0,06	0,13	6,84%
PA	0,14	0,2	0,2	0,33	0,33	1	0,05	0,06	0,03	0,03	0,02	0,04	3,80%

Consistency index: 0,11; Consistency rate: 8,93%.
Source: MARTINS and BALIAN (2018)

Tabela 5 – Comparison matrix, standardization, consistency, consistency rate and eigenvector for the criteria of the 3rd level.

3 rd level							
Comparison Matrix				Standardization Matrix			
Criteria	NC	RT	RP	NC	RT	RP	Eigen vector
NC	1	1	5	0,45	0,43	0,56	47,96%
RT	1	1	3	0,45	0,43	0,33	40,55%
RP	0,2	0,33	1	0,09	0,14	0,11	11,50%

Consistency index: 0,01; Consistency rate: 1,36%.: 0,09;.: 7,17%.
Source: MARTINS and BALIAN (2018)

After the presentation of the obtained values, it was possible to perform the calculations of global priorities for the factors. These values are shown in Figure 1.

Figure 1 – Global priorities from the AHP analysis in percent (%) and their respective levels

Source: MARTINS and BALIAN (2018)

The criteria and their hierarchical levels allow, based on a collective decision, organizations can support their supplier model in a mathematical tool that justifies the choices of factors and are able to simulate scenarios and outcomes, according to

Sayyadi and Awasthi (2013). The subjectivity of decisions cannot be eliminated, However, The greater the number of specialists involved, the greater the probability of assertiveness of the model. It is worth mentioning that, according to Arahonovitz and Vieira (2014), this tool is able to support decisions, but only the application of these decisions in real context is able to forge a supplier model with great features. On the other hand, Rosa, Steiner & Colmenero (2015) affirm that the use of multicriteria analysis makes the process more reliable and transparent, since it uses the subjective judgments of specialists with precision and reliability.

The proximity of the criteria with the strategy chosen by the organization is also a relevant factor, according to Paraguassu and Silva Macedo (2016). However, some criteria are not likely to be assembled in a single supplier or there are simply no suppliers with these attributes (To, Wong & Cheung, 2002; Marins, Souza & Barros, 2009), and as sophisticated as the methods applied, it is difficult to model the preferences of the specialists (Li, Hang, Gao, & Mu, 2017).

The results show that there is a concern to meet the effective military organizations and the lowest cost, respecting deadlines and timelines, that is, supply logistics. Therefore the main criteria that the hierarchical analysis process pointed out are price and delivery capacity. Pink, Steiner & Colmenero (2015) found the price and quality as the main criteria, and Dweiri et al. (2016) found price, quality and delivery service.

The delivery cost services and the benefits of this activity are important in assessing the criterion of delivery capacity (De Castro, dos Reis, Vendrametto & Lopes, 2016), demonstrating that, regardless of the sector, the objective of the companies or public institutions is similar: decrease acquisition costs and costs related to the supply process itself, opting for the most assertive supply (Li, Hang, Gao & Mu, 2017).

The sub criteria regarding deadlines and the use of adequate freezing equipment are therefore important and reinforces the "logistics" element as a criteria of high importance (Days, Fernstenseifer, & Sellitto, 2011; Reis, Vendrametto, Naas, Costabile & Machado, 2016) for food.

The care with the characteristics of hygiene and food Safety were well-quoted criteria in the group decision, since the suppliers who present the system of self-control and registration in the Federal Inspection Service (SIF) with numbering linked to the CNPJ were the most important after price and delivery. Still as a sub criterion, traceability was an element that received importance due to its complementarity with other control and security tools such as HACCP, which are fundamental for the capacity to recall when facing risky situations. All these elements are recommended in the technical literature, in the Brazilian norms and legislation (ABNT, 2006; Barreto, Gomes, Muruci & de Abreu,

2013; Bogason, 1994; SENAC, 2001; Soman & Raman, 2016; Yadav, Mahna & Rekhi, 2016).

The after-sales criterion deserves special attention because it is a guarantee of relationship (Lopes, Nobre, Gomes & Cavalcante, 2015; Pinto, 2015) between suppliers and the Brazilian Army, although in public procurement, the maturity of the trading sessions does not prioritize companies that value it. The simple action of selling a commodity is no longer accepted in most markets in Brazil and worldwide (Ulaga & Loveland, 2014), so the after-sales service can be considered a factor of close relationship with the quality (Subramanian, Gunasekaran, Yu, Cheng & Ning, 2014).

The specification of the scientific name of the fish on the label is necessary since different species are marketed with the same vulgar names. According to Portaria No. 185, of May 13, 1997, in any label of seafood, packaged in the absence of the consumer, must contain concise information about: the scientific name of the species, the trade name and the method of production. Most markets around the world already adopt this measure, such as Spain and Greece (Garcia-Vazquez et al., 2011), United Kingdom and United States of America (Gutiérrez et al., 2012), Portugal and Italy (Caldelli et al., 2014), as a strategy to mitigate fraud in transactions.

The Regulation of Industrial and Sanitary Inspection of Animal Products (RIISPOA), Decreto nº 9.013, of 29 March 2017 (Brasil, 2017), recommends that establishments should have control mechanisms to ensure traceability of raw materials and products. Traceability is the ability to identify the origin and follow the movement of an animal product during the stages of the production chain, being considered total when it encompasses all stages and partial when the information is related to specific stages of the chain (Brasil, 2017).

The combination between focal group and AHP multicriteria analysis proved to be useful in this type of study and suggested its use to identify desirable criteria from suppliers of other food supplies to the Brazilian army and other Public and private organizations.

This study identified a combination of criteria that has not yet been described in the literature: CNPJ linked to the SIF and the scientific name specification. The CNPJ criterion linked to the SIF demonstrates an interest in obtaining supplies produced and marketed by the supplier itself, reinforcing the responsibility on the product and quality assurance. The importance of the official service as co-responsible for the sanitary characteristics of the product and for the compliance with the legislation is evident in this case. This reinforces the relevance of the participation of the official inspection services in the organization of the production chain.

The criteria specifying the scientific name indicate the greatest importance that has been given in trade to fraudulent products, especially with regard to the exchange of species. Fish frauds become increasingly recurrent, a phenomenon that demands strategies in transactions in order to avoid them.

4.4 CONCLUSIONS

The study achieved its objective, we identified two new criteria and described the desirable criteria for Brazilian Army seafood suppliers.

The limitations of this study are the impossibility of applying an ideal supplier model in real conditions. The bidding process does not contemplate the criteria presented here and other mostly bureaucratic are requested. Seafood suppliers present partially the criteria listed, since there are no fish industries in Brazil with the ABNT ISO 22000:2006 standard. Traceability is still a tool little used in this segment and the practice of audits is not common in the Brazilian Army. However, the results of this study may lead to a look at these issues and a change in behavioral culture on both sides of the business.

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5 ASSESSMENT OF FROZEN SEAFOOD GOOD STORAGE PRACTICES IN THE 21ST SUPPLY DEPOSIT OF THE BRAZILIAN ARMY

ABSTRACT

The 21st Supply Deposit of the Brazilian Army (21st SD), located in the São Paulo city provides food raw materials for 16000 meals daily, and among the foodstuffs distributed, is frozen fish. The objective of this study was to evaluate the Good Practices on seafood storage in the 21st SD, identify issues of non-compliance that compromise food quality, and propose solutions. The system was evaluated, applying a checklist (RDC 275/2002) to evaluate the percentage of requirements in compliance with good practices. The 21st SD was classified in Group 3, getting 41% of items in conformance (< 50%) and we found that there is no hygienic-sanitary self-control program for storing cold seafood and other food supplies. The cold stores' temperatures are not able to maintain products within the required standards of conservation. The seafood cold storage protocol of the 21st SD does not guarantee the conformity to temperature. It is necessary to elaborate a hygienic-sanitary self-control program for food supply storage; it should begin with the development of a Food Safety Culture.

Keywords: Food Safety. Self-control program. Good Manufacturing Practices. Cold seafood.

5.1 INTRODUCTION

A large quantity of meals is served daily in the barracks of the Brazilian Army (BA) (BRASIL, 2014b). Until October 2016, the BA had 469 food and nutrition units (FNU) distributed throughout the country (BRASIL, 2014b). In The Second Military Region (2nd MR), the 21st Supply Deposit of the Brazilian Army (21st SD) provided food for the production of 18.000 meals.day⁻¹ in various Military Organizations (MO), demanding approximately 168.000 kg.year⁻¹ of seafood (BRASIL, 2005). Like other food supplies, seafood is purchased through bidding in lowest price modality.

Food Inspection and Bromatology Laboratories (FIBL) are responsible for receiving, storing and distributing food to the MO. The inspection records of the FIBL located in the premises of the 21st SD registered disapproval of seafood for non-compliance, (CAMPOS et al., 2013; de ANDRADE LIMA; CORRÊA, 2013; FERREIRA et al., 2013; GALLOTTI et al., 2013) with respect to the maintenance of the cold chain, appearance, colouring, and other quality attributes, indicating the need to review and improve Good Practices – (GP) of purchase, storage and shipment of the products.

Seafood has high perishability characteristics (HUSS, 1988; OGAWA; MAIA, 1999; GALVÃO; OETTERER, 2015; DEHGHANI et al., 2018), because the high water activity and free amino acid concentration (OETTERER, 2002; DENG et al., 2015; LUO et al., 2018) are ideal for spoilage and pathogenic bacterial proliferation (HUSS, 1997a; b; HUSS et al., 2000; HUSS, 2002; HUSS et al., 2003). Consequently, seafood's rapidly lose their desirable sensory characteristics after capture and become pathogen carriers and histamine producers (SOARES et al., 1998; GOZZI et al., 2011). Their lipid composition provides a favourable condition for oxidation and consequent rancidification (SOCCOL; OETTERER, 2003a; b; ARULKUMAR et al., 2018; ODEYEMI et al., 2018), contributing to the sensory quality loss.

The seafood supply chain needs rigorous practices for distribution, production and storage (OETTERER, 2002) to maintain desirable attributes, whether sensory, nutritional or sanitary (FAO/WHO, 2003; GERMANO; GERMANO, 2013; BRASIL, 2017a), that is, imposing a permanent cold chain control and hygienic practices.

The “Agulhas Negras” Military Academy (AMAN), between 2010 to 2012, inspected 2.816t of food and obtained a 20% rate of non-compliance in animal origin products (FERREIRA et al., 2013). Between 2008 and 2010 seafood was the product most often disapproved by the BA in the barracks of Manaus-AM (59,7%) because inappropriate temperature (74%) and microbiologic contamination (62%) (de ANDRADE LIMA; CORRÊA, 2013). Other studies about GMP in the BA showed non-compliances such

undrinkable water (GALLOTTI et al., 2013) and handler's hygiene (CAMPOS et al., 2013).

It is possible to reduce or avoid non-compliances through the application of self-control programs such as a "Resoluções da Diretoria Colegiada do Ministério da Saúde RDC/MS 275/2002" (BRASIL, 2002), or 216/2004 (BRASIL, 2014a) and the Brazilian standards NBR 15635:2015 (ABNT, 2015). These instruments provide technical regulation about good practices for food services, which carry out activities like storage and distribution at 21st SD. The BA has self-standards (BRASIL, 2015) named "Regulamento de Segurança dos Alimentos das Forças Armadas MD42 R01" (BRASIL, 2015). We have not found any studies about the use of military food storage standards up till date.

Studies about the adoption of GMP are available to FNU (de SÃO JOSÉ et al., 2011; VIDAL et al., 2011), restaurants (de SOUZA GENTA et al., 2005; OLIVEIRA et al., 2016; SANTINI; SEIXAS, 2016), bakeries (GUIMARÃES; FIGUEIREDO, 2010), free-markets (PATRÍCIA et al., 2012) and Meals Production Units (MPU) (MARIANO; MOURA, 2010). However, we did not identify studies about the adoption of GMP in storage places. The logistics of perishable foods like cold seafood represent strategic elements of management and the adoption of tools like traceability, document registration and Hazard Analysis of Critical Control Points (HACCP) (TSIRONI et al., 2008; TSIRONI et al., 2009; GIANNOGLOU et al., 2014; TSIRONI et al., 2016) and mainly do the rigid control of the temperature (never up to -18°C) (BRASIL, 2017a).

The aim of this study was to evaluate GMP of seafood storage in the 21st SD, identify non-compliances, and propose solutions based on the standards of the current legislation.

5.2 MATERIALS AND METHODS

This study was approved by the Research Ethics Committee of the School of Veterinary Medicine and Animal Science, University of São Paulo (FMVZ/USP), under the Protocol n.77150314, and it follows the ethical procedures established by resolution No. 466/2012 (BRASIL, 2012).

This is a cross-sectional study performed in the 21st SD of BA, in the São Paulo State, between May and July 2017. According to Gil (2002) it is an empirical, exploratory and documental case study, performed in a real organizational context. We used primary data, generated with application of check list, and secondary data from the temperature records of the seafood cold stores. From the records of non-compliance, seafood was chosen as the object of this research.

To evaluate the GMP, we used the checklist proposed in the Appendix II of the RDC 275/2002. This tool is composed of five topics: building equipment, furniture, handlers, production and transportation of food, and documentation.

The temperatures of three cold stores (8A, 8B and C3) were recorded during the period from 12 June to 12 July 2017 by analysing the log sheets. The temperature monitoring was carried out daily at 5:30 AM, at 5:00 PM and at 10:00 PM, through the reading of the cold store displays. The records are of air temperatures.

All data collected were organised into worksheets and descriptive statistical analysis was performed considering the average and standard deviation of temperature, daily temperature variation and temperature amplitude. A Pearson's correlation (BUSSAB; MORETTIN, 2010) coefficient (Equation 1) was employed to measure the strength and direction of the linear relationship between the variables time (recorded per hour) and temperature, describing the direction and degree to which one variable is linearly related to another. A Student t-test was used to determine if the value of Pearson correlation coefficient was statistically significant, at a significance level of 5%. The IBM Statistical Package for the Social Sciences SPSS 20.0 was used.

$$r = \frac{\sum(Y_{m-i} - \bar{Y}_m)(Y_{est-i} - \bar{Y}_{est})}{\sqrt{(\sum(Y_{m-i} - \bar{Y}_m)^2)(\sum(Y_{est-i} - \bar{Y}_{est})^2)}} \quad (\text{Eq. 1})$$

Where:

Y_{m-i} is the value of the measured inhibitory activity for compound i (i = 1, 2, ..., n)

$\bar{Y}_m$ is the average of the measured inhibitory activity

Y_{est-i} is the value of the estimated inhibitory activity for compound i

$\bar{Y}_{est}$ is the average of the estimated inhibitory activity.

5.3 RESULTS AND DISCUSSION

According to the RDC 275/2002, the 21st SD was classified in the Group 3 concerning to the GMP compliance (< 50%) (Table 1) (APPENDIX I).

Table 1 – Non-compliance percentage according to the RDC 275/2002 – Department of Experimental Epidemiology Applied to Zoonosis (VPS)/FMVZ/USP, São Paulo (SP) – 2018

Verification items	Nº of items	Non-compliance items	Compliance items	Non-applied items	% percentage of non-compliance
Building	78	51	22	5	65
Equipment and furniture	21	8	7	6	38
Handlers	13	6	7	0	46
Production and Transportation	34	13	9	12	38
Documents	18	18	0	0	100
TOTAL	164	96	45	23	59

Source: MARTINS *et al.* (2018)

Non-compliances found in the item “Building” were principally related to the structure. (Figure 1)The 21st SD was completed in November 07, 1932 and has a long history incorporate to the Lapa’s neighbourhood, known as “The Lapa’s Barrack”.

Figure 1 - External view of the building where are the cold storage

Source: MARTINS, W.S. (2018)

Initially, two distinct units occupied the 21st SD area: The Subsistence Regional Establishment II (ERS II) and the Intendancy Material Regional Establishment II (ERMI II); both responsible to the Southeast Command (CMSE) barracks supply. The ERS II supplied the troops with foodstuff and the ERMI II with uniforms and equipment. The cold store buildings occupied today, were poultry slaughterhouses between the 1940’s and

1960's. The poultry were transported by rail from the BA farms, from the interior of the State of São Paulo.

On June 25, 1962, the Regional Establishment status was changed to Regional Deposit. In June 1991, the units were merged giving rise to the 21st SD. Henceforth, the establishment received, apart from its traditional operations, the burden of supplying the troops with drugs. Operations before this date were carried out by the Regional Health Material Deposit (DRMS II). It partially adapted installations for this purpose, keeping up over several years, based on a model of occupation and preserving the original structure. This building was occupied prior to the publication of the legislation of GMP: Portaria nº 1428/1993 Ministério da Saúde, that approved the Technical Regulation of Food Safety.

The buildings are very important in GMP compliance, especially because the structural problems are directly related to cross-contamination (APLEVICZ et al., 2010), work accidents (VIDAL et al., 2011) and difficulties to maintain satisfactory hygiene (FAO/WHO, 2003). Ferreira et al. (2011) demonstrated that the floor, among other structures of buildings, comprises the most recurring structure with non-compliance in FNU because of the intense transit of employees, equipment and goods. Improper cleaning of floors and walls contributes to the proliferation of micro-organisms thereby compromising food quality and increasing the risk of occurrence of Foodborne Diseases (DTA) (BRASIL, 2014a). Is possible see in the photo below similar condition to those described by the authors (Figure 2).

Da Silva e Correia (2009) claims that food storage buildings should be easy to maintain and clean; thereby preventing access of insects, rodents, birds and others synanthropics animals. According to Fonseca et al. (2010), "buildings" was a critical item in GMP studies, as a similar situation was observed by Akutsu et al. (2005) and Araujo et al. (2016). The warehouses of 21st SD have easy condition to synanthropics animals entering (Figure 3)

The building non-compliance of 21st SD also occurs in the toilets and changing rooms. This non-compliance is frequent in the food industry, supermarkets and small shops as reported by Valente and Passos (2004), the researchers studied 58 supermarkets in southeastern Brazil and found that 79.3% had inadequate toilets and poor hygienic conditions. Toilets and changing rooms should comply with technical specifications regarding sizing, flow and use of specific materials, respecting the users' status (collaborator or visitant) and their gender (BRASIL, 2002; BRASIL, 2014a).

Figure 2 - Floor in poor condition

Source: MARTINS, W.S. (2018)

Figure 3 - Passages for animals

Source: MARTINS, W.S. (2018)

Electrical installations or other operations specific to the food industry in the old buildings constantly exhibit undesirable conditions such as those identified in the 21st SD. Food safety and hygiene are directly related to these conditions and must be considered extremely important. According to Guimarães and Figueiredo (2010) electrical installation problems were observed in 100% of the investigated food establishments in the Federal

District of Brazil. This non-compliance made sanitisation difficult and increased the risk of work accidents (Akutsu et al., 2005; Aplevicz et al., 2010; Brasil, 2014a) (Figure 4).

Equipment and furniture had non-compliance in cold store operations. From local information, it was found that there were no Standard Operating Procedures (SOP's) and preventive equipment maintenance in the 21st SD. SOP's are a prelude to Hard Analysis and Critical Control Point (HACCP) (LEE et al., 2007). A self-control program requires a SOP deployment and preventive equipment maintenance for chilling and freezing equipment, ensuring correct and continuous operation.

Figure 4 - Exposed wiring in cold store

Source: MARTINS, W.S. (2018)

Without the practice of periodic preventive maintenance of the equipment, there would be no safety or correct operation of compressors and evaporators, even in monitoring temperatures. Temperature monitoring is only reliable when the correct operation of the refrigerated equipment is guaranteed (OTHMANE et al., 2011).

Soldiers who work in cold stores do not use appropriate uniforms and disposable accessories. Worst still, there are no hand antiseptic supplies. Soldiers handle food wearing military uniforms, without disposable caps and masks, and they are not educated on good food safety practices (MUTISYA et al., 2016) during the military period (Figure 5).

Figure 5 – Staff working with inappropriate uniform

Source: MARTINS, W.S. (2018)

We did not observe any posters containing instruction about personal hygiene. It must be highlighted that food hygiene should be promoted through military training programs (Yiannas, 2009; Griffith, C. et al., 2010; Griffith, C. J. et al., 2010; Abidin, 2013), and corrective actions should be taken during the workout routines (Griffith, 2013).

Similarly, Campos et al. (2013) reported poor personal hygiene, through a research about *Escherichia coli* on 10th t RM (Ceará and Piauí State) barrack kitchens. They demonstrated that the behaviour of food manipulators is essential to prevent food contamination and spoilage. Almeida et al. (1995) in 1990's, evaluating GMP in university restaurants, found the same non-compliances, highlighting the importance of Food Security education.

The 21st SD has no GMP formal document, these results support and confirm the non-compliances observed, highlighting the need for a protocol to guide food handling. In the agrifoods industry, Girelli et al. (2015), and Fonseca et al. (2010) evaluating restaurants, found a several non-compliance issues related to the absence of GMP programs.

Equally Costa et al. (2011) supported the previous claims after showing that GMP was absent in 48 establishments in the Paraíba State. Furthermore, Oliveira et al. (2016) showed that, in sixteen restaurants around The Federal University of Sergipe, 93.7% of non-compliance was represented by absence of GMP programs. The monitoring and verification of these attributes and parameters, should not be optional or sporadic, but must be permanent and carried out by competent personnel (GERMANO; GERMANO, 2013). Food Safety Management Systems (FSMS) are ineffective if people fail to promote good food safety behaviour (YIANNAS, 2009).

Oliveira et al. (2016) found non-compliance in food stores and restaurants, mainly in transport, storage, handling and delivery. The authors concluded that behavioural deficiency is likely to render FSMS obsolete (BRASIL, 2014a), caused mainly by ignorance of the importance of food safety.

According to Vidal et al. (2011) there are only a few studies regarding GMP in Military Organizations in Brazil, making it impossible to confront these results with other problems experienced in the BA.

The analysis of cold store temperature records (Figure 6) (Table 2), carried out between June 12 and July 12, 2017, demonstrated that the temperature does not comply with the standards (-18° C or less) (BRASIL, 2017a; b).

Table 2 – 21st SD seafood cold stores temperature records – Department of Experimental Epidemiology Applied to Zoonosis (VPS)/FMVZ/USP, São Paulo (SP) – 2018

Cold stores	Daily temperature average °C	Daily temperature amplitude °C	Min value °C	Max value °C
8A	-14,3 ±1,2	-3,0 ±0,9	-13	-16
8B	-16,3 ±2,4	-13,0 ±3,3	-5,6	-18,6
C3	-18,0 ±1,1	-6,8 ±1,0	-14	-21,2

Source: MARTINS et al. (2018)

Figure 1 - Cold store temperature time series during the period
June 12-July 12 UTC Hourly Temperature

Source: MARTINS et al. (2018)

Two out of three cold stores lack maintenance of the cold chain; with fluctuating., temperatures between -5,6 °C and -21,2 °C. This compromises the quality of sensual nutritional parameters (OGAWA; MAIA, 1999; GALVÃO; OETTERER, 2015), thereby and damaging seafood and increasing the potential for health hazards. Storage of fish at this

temperature (up to -18°C) is known to cause extensive quality loss (BURGAARD; JORGENSEN, 2011).

The Pearson’s correlation, showed a strong correlation between the period of cold store activities (5:30 pm) and the temperature rise (Table 3).

Table 3 - 21st SD seafood cold stores temperature amplitude average and correlation – Department of Experimental Epidemiology Applied to Zoonosis (VPS)/FMVZ/USP, São Paulo (SP) – 2018

Period	Cold Store 7		Cold Store 8B		Cold Store C3	
	Average of TA*	Pearson's Correlation	Average of TA*	Pearson's Correlation	Average of TA*	Pearson's Correlation
05:30 am-5:00 pm	4,5±1,7		3,8±4,3		0,6±0,7	
05:00 pm-10:00 pm	3,2±1,9	0,985**	2,3±3,8	0,961**	0,9±1,8	-0,205**
10:00 pm-5:30 am	1,5±1,1		1,6±1,9		0,6±1,0	

*TA - temperature amplitude

**p<0,05

Source: MARTINS *et al.* (2018)

This is indicative of food safety errors. During the application of the check list, long periods of open doors were observed. Other relevant information was the number of workers going through cold stores. The insulation and the number or workers are the important variables in the balance of energy and the thermal load calculation (EVANS et al., 2014; HE et al., 2014; JOHNSTON, 1994). Failure to observe these characteristics compromises the proper functioning of the equipment, causes excessive consumption of energy and compromises the quality of seafood (JOHNSTON, 1994).

The weak correlation observed at the C3 cold store demonstrates that the lower door opening (this cold store is less accessed) does not cause a linear relationship between the period of cold store activities and temperature rise. According to Evans et al., (2014), normal temperature rise occurs because air flow resulting from doors opening, but several amplitudes are characteristic of food safety errors or equipment malfunction.

The temperature increase of frozen and chilled products reduces their shelf life, compromises the original desirable characteristics and encourages spoilage and multiplication of pathogenic microorganisms, thereby increasing the risk of food loss and the occurrence of FBD's (GERMANO; GERMANO, 2003). Daily temperature amplitude is related to equipment malfunction in cold stores or operation inefficiency during the load and unloads operations (MORAGA; MEDINA, 2000).

According to Ronnow et al. (1999) improper maintenance of cold store structures such as roof and wall panels, associated with food safety mistakes during load and unload operations, promotes air change and causes moisture and temperature variations. Door opening impairs the efficiency of the system for the following reasons: It increases the energy demand and total cold refrigeration load (BORDERIAS, 1996),

causes overloading of equipment (PEREIRA et al., 2010), increases loading cost and seafood weight loss (PIGOTT; TUCKER, 1990) and increases lipid oxidation and seafood vitamin loss (HUSS, 2002; HUSS et al., 2003; SORENSEN, 1992).

The lack of a FSMS is a strong indication that critical control points of the process such as a storage temperature or water tank contamination are not controlled and corrected when necessary (BARKER; MCKENZIE, 1997; FAO/WHO, 2003; KHANDKE; MAYES, 1998; OPAS/INPPAZ/OMS, 2001). The World Health Organization, in the late 1990's, predicted the difficulty that the food industry would have in the 21st century, caused by food safety skilled work deficit (WHO, 1999). Several researchers (GRIFFITH et al., 2010; HARVEY et al., 2002; NAYAK; WATERSON, 2017; TAYLOR, 2011; YIANNAS, 2009), defends the adoption of Food Safety Culture educational programs.

A partir dos achados deste estudo, entende-se necessário construir uma CSA no 21^a SD, capaz de criar as condições necessárias para a Segurança dos Alimentos adquiridos, armazenados, distribuídos e processados.

5.4 CONCLUSION

Non-compliances were found in five of five items in the check list used in this study. This result highlights the need for the development of a seafood safety program as a primary program after which it can be extended to other foods. The non-observance of this need would lead to foodborne outbreaks and increase health costs.

The behaviour of workers needs special attention because they are key to the effectiveness of the food safety program application.

The observation of basic principles and maintenance of the Food Safety Culture will aid to improve the program and obtain successful

Basic rules about cold storage needs should be respected. The Good Storage Practices are intrinsic relationship with seafood nutritional and sanitary characteristics.

The employment of GMP will add value to the experience of young military recruits. By experiencing the work with GMP these individuals will return to society with distinguished values, making them better suited for the labour market. Promoting Food Safety Culture represents an improvement of the quality of food products. It further improves the lives of people because is a form of education and social promotion.

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6 TRANSLATION INTO PORTUGUESE, ADAPTATION, AND VALIDITY ASSESSMENT OF THE FOOD SAFETY CLIMATE SELF-ASSESSMENT TOOL

ABSTRACT

The aims of this study were to translate into Portuguese; adapt; and test the reliability, internal consistency, conceptual equivalence, and validity of the food safety climate self-assessment tool. Was performed a translation and back translation, and to test the reliability, internal consistency, conceptual equivalence, and validity of the translated instrument. The process of translating and adapting the tool was completed successfully, and the Portuguese version developed in the present study was confirmed to be similar to the original tool.

PRACTICAL APPLICATIONS

The Food Safety Climate Self –Assessment Tool translated and adaptated to promote the evaluation of the food safety climate in the food industry from Portuguese language cowntries. This tool should be used by industry managers or owners to knows the perception and the culture os food safety between the workers.

6.1 INTRODUCTION

Organizational climate is one of the constructs that have been investigated in organizations, and it is a part of the field of organizational psychology (Gomes Menezes & Passos Gomes, 2010). It pertains to the human environment in which individuals perform work. The quality or properties of the organizational environment that are perceived or experienced by members of the organization have been found to influence their behaviour (Chiavenato, 1992).

In the supply chain of foods, the construct of organizational climate is called as *Food Safety Climate* (Yiannas, 2009), which is related to the behavioural elements of organizational culture. It has been found to include factors such as management style and communication, commitment, job satisfaction, complacency, risk awareness (Harvey et al., 2002). In this context, the concept of *Food Safety Culture* is considered to comprise an even broader framework that is formed by a set of beliefs, dominant attitudes, and values that are stable and may be learned or shared, such that they contribute to the hygiene practiced in relation to food (C. Griffith, K. Livesey, & D. Clayton, 2010; C. J. Griffith, K. Livesey, & D. Clayton, 2010). It includes the set of beliefs that collaborators have about the safety of food and what they think to be right and important in their behaviour (R. B. Martins, 2014).

According to De Boeck (2015), in recent decades, around the world, the food industry has made great efforts to implement quality control tools and food safety management systems, but cases of Food-borne Diseases (FBD) and food poisoning continue to occur. On further investigation, such cases are often found to occur due to shortcomings of handlers and their failure to maintain personal hygiene or follow operational procedures (Powell, Jacob, & Chapman, 2011; Wright et al., 2012). These findings demonstrate that people are the key element of food safety, and it is important for organizations to invest in people management to promote and disseminate the Food Safety Culture (Gilling, Taylor, Kane, & Taylor, 2001; C. J. Griffith et al., 2010; Powell et al., 2011; Taylor, 2011).

Tools to evaluate or assess the food safety culture and climate have been developed and applied worldwide, including the United Kingdom (Wright et al., 2012), Belgium (De Boeck et al., 2015), Canada and the USA (Jespersen, Griffiths, Maclaurin, Chapman, & Wallace, 2016), Serbia, and Greece (Smigic et al., 2016). However, there is no record of such studies in Portuguese-speaking countries, which justifies the need to create such a tool. According to Hambleton et al. (1999) and Tanzer & Sim (1999), the adaptation and translation of existing tools into another language is a more reasonable method of developing and validating new tests. A 28-item tool was developed and

validated by De Boeck et al. (2015), in which each item is rated on a five-point Likert scale (1 to 5: totally disagree to totally agree). This tool assesses food safety climate with reference to the following five components: leadership (6 items), communication (5 items), engagement (6 items), resources (6 items), and risk awareness (5 items). Further, it evaluates the global perception of the food safety climate as well as that for each item. Additionally, it facilitates comparisons between the perceptions of employees with different hierarchical positions in the organization, such as employers and employees, as well as those of individuals from different departments, such as employees from sales functions, quality control, or human resources. Thus, this tool facilitates the identification of imbalances in different sectors in the same company.

The translation and adaptation of assessment tools is a common practice, and both these terms refer to two distinct techniques. The 'adaptation' of tools is encouraged since it includes the processes of cultural adaptation and of preparing a tool that is appropriate for the target population (Hambleton, 2001). In the process of instrument translation and adaptation, is necessary preserve the accuracy of the characteristics of the original tool, like content and metrics (Borsa, Damásio, & Bandeira, 2012). Specifically, the adaptation and translation need to achieve their goal to extract the targeted information accurately, even though the population and culture in which the instruments are being applied are different (Hambleton & Patsula, 1999).

The first review of the organizational climate in Brazil, using original instruments in another language, occurred when De Souza (1977) translated and adapted Litwin and Stringer's model. Later, instead of translating and adapting existing instruments, Martins et al. (2004) developed an instrument to identify the dimensions of organizational climate.

6.2 AIMS AND OBJECTIVES

The aims of this study (Table 1) were to translate into Portuguese; adapt; and test the reliability, internal consistency, conceptual equivalence, and validity of the food safety climate self-assessment tool developed by De Boeck et al. (2015).

Table 1 - Matrix of the steps involved in the present study

Objective	Method	Statistical Analyses	Expected Results
Translate and adapt de questionnaire developed by De Boeck et al. (2015)	Submit the translated version to bilingual specialists to perform back translation and semantic adaptation.	<ul style="list-style-type: none">• Cohen’s Kappa• Pearson’s correlation coefficient• Content validity coefficient (CVC)	Develop a Portuguese version of the questionnaire with maximum similarity to the tool developed by De Boeck et al. (2015), respecting the characteristics of the original instrument
Validation	Pilot test	<ul style="list-style-type: none">• Mean, standard deviation, Cronbach’s alpha internal reliability	The Portuguese version has the same properties as the original version

Source: MARTINS *et al.* (2018)

6.3 METHODS

6.3.1 Ethics

This study was approved by the Research Ethics Committee of the School of Veterinary Medicine and Animal Science, University of São Paulo (FMVZ/USP), under the Protocol n.77150314, and it follows the ethical procedures established by resolution No. 196/96 (BRASIL, 1996). The participants involved in the translation and adaptation (bilingual experts), and the pilot study (professionals in the field of food service), signed and received copy of an informed consent form.

6.3.2 Translation and back translation

The 28 items developed and validated by De Boeck et al. (2015) were translated into Portuguese by two bilingual translators. The generated versions were translated into English, according to the back translation method (Algamdi & Hanneman, 2016; Behr, 2016; Brislin, 1970; Prieto, 1992). Later versions were analysed and adjustments were made to develop a final Portuguese version of the tool. As recommended by Freitas et al. (2001), the back-translated English version produced from the translated version was submitted to Prof. Dra Elien DeBoeck, University of Ghent, Belgium, one of the authors of the original questionnaire (Figure 1), for verification.

6.3.3 Content validation

Seven bilingual specialists (professors from the department of Linguistics of the Faculty of Philosophy, Languages and Literature, and Human Sciences of the University of São Paulo and The Institute of Language Studies of the University of Campinas), responded to a questionnaire to compare the psychometric properties of the instrument (Deliza, Rosenthal, & Costa, 2003). The experts were randomly divided into Group 1 and 2. Following the methodology proposed by Prieto (1992) and that used by Deliza et al. (2003), Group 1 first evaluated the Portuguese version and then evaluated the English version after five days, and vice versa for Group 2. The questions were answered using a five-point Likert scale, as done by the original authors (De Boeck et al., 2015).

To assess the clarity of the scale, the coherence of each item, and the quality of the back translation, we used the Content Validity Coefficient (CVC), as suggested by Hernández-Nieto (2002):

$$Mx = \frac{\sum_{i=1}^J x_i}{J} \quad (1)$$

Where:

$\sum_{i=1}^J x_i$ = sum of the experts' scores, and

J = number of experts

Based on the average, the CVC was calculated for each item (CVC_i):

$$CVC_i = \frac{M_x}{V_{max}} \quad (2)$$

Where:

V_{max} represents the maximum value that the item could receive.

Additionally, error (P_{ei}) was computed for each item, to discount the possible biases of the experts:

$$Pe_i = \left(\frac{1}{J}\right)^J \quad (3)$$

The final CVC of each item (CVC_c) was so calculated:

$$CVC_c = CVC_i - Pe_i \quad (4)$$

For the calculation of the total CVC of the questionnaire (CVC_t), we used:

$$CVC_t = Mcvc_i - Mpe_i \quad (5)$$

Where:

$Mcvc_i$ = average of the CVCs of the questionnaire items.

Mpe_i = average of the questionnaire's error items.

Additionally, four of the seven experts used a five-point Likert scale ranging from 0 (do not agree) to 5 (I completely agree) to assess the clarity, consistency and back translation of each item. The following questions were used, respectively: (1) 'this item is easy to understand', (2) 'this item measures the construct', and (3) 'the original and back-translated versions have equivalent semantic value'. We used the cut off criterion $CVC \geq 0.80$ established by Hernández-Nieto (2002), to determine if the item needed to be modified semantically.

6.3.4 Conceptual equivalence

The conceptual equivalence of the tools was assessed statistically through Cohen's Kappa test (1960) and the Pearson correlation coefficient (Son, Zauszniewski, Wykle, & Picot, 2000). The similarity between the evaluators' notes on the two versions was considered as the index of agreement between the Portuguese and English versions, as suggested by Oquendo et al. (2000). It was computed as the proportion of agreement. According to Deliza et al. (2003) the concordance index and the equivalence index were considered proportional between the two versions if the following condition was met:

$$K = \frac{P_0 - P_e}{1 - P_e} = 1 - \frac{1 - P_0}{1 - P_e} \quad (6)$$

Where:

p_0 = relative acceptance rate

p_e = hypothetical acceptance rate

6.3.5 Internal reliability

The Cronbach's alpha was used as an index of reliability or internal consistency of the test items. It was performed using SPSS 20.0, with all the 28 items, using data from the entire sample (managers and employees). The Cronbach's alpha was computed by correlating the score for each test item with the total score for each observation and then comparing that to the variance for all individual item scores:

$$\alpha = \left(\frac{k}{k-1} \right) \left(1 - \frac{\sum_{i=1}^k \sigma_{y_i}^2}{\sigma_x^2} \right) \quad (7)$$

Where:

k = number of scale items

$\sigma_{y_i}^2$ = variance associated with item i

σ_x^2 = variance associated with the observed total scores

6.4 RESULTS

6.4.1 Translation and adaptation

The first step of translation generated a 28-item questionnaire that was equivalent to the original. Only 10% of the words were not translated, demonstrating that the literal equivalence between the two questionnaires was improved. The phrase ‘in my organization’ was replaced with ‘na organização em que trabalho’, to avoid different interpretations since, in Portuguese, the phrase ‘my organization’ indicates possession and assigns ownership to the person saying it. The words ‘employee’ and ‘operator’ were replaced by ‘colaborador’, to standardize the term that refers to individuals that make up the human capital of food supply chain organizations. This replacement would not generate doubts because, in Portuguese, ‘operator’ implies a specific function that is usually related to one who has the qualification to operate some equipment. The term ‘realistic picture’ is not used in Portuguese, and therefore, it was replaced by ‘visão real’. In the term ‘potential problem’, the word ‘potential’ was deleted because, in Portuguese, it is rarely used to refer to something susceptible to exist or happen but does not exist currently. Instead, this term is usually used in relation to features such as powerful and strong, like mechanical equipment with the ability to move something (force).

6.4.2 Equivalence of the Portuguese and English versions

Table 2 presents the results of the test of Cohen’s Kappa and Pearson’s correlation tests ($p < 0.05$). The intensity of agreement exceeded 80%, except for Item 7, which showed a intensity below 80% because two experts’ responses were different. According to the literature, this variation is considered normal (Oquendo et al., 2000; Son et al., 2000). The Pearson’s correlation coefficient demonstrated that the 28 items presented linearity and similarity in their distributions scores².

² This linear model was based on linear function, a particular case of the affine function with the domain of $\mathbb{R}$ ($f: \mathbb{R} \rightarrow \mathbb{R}$), defined by $f(x) = ax$ for all $x \in \mathbb{R}$, where $a \neq 0$.

Table 2 - Kappa for the intensity of agreement and pearson’s correlations among the 28 items for the english and portuguese versions according to the assessment of seven experts

Question	Kappa IC (95%)	Pearson's r	Question	Kappa IC (95%)	Pearson's r
1	100,0*	1	15	100,0*	1
2	85,7*	1	16	100,0*	1
3	85,7*	1	17	85,7*	1
4	100,0*	1	18	100,0*	1
5	71,4*	1	19	100,0*	1
6	100,0*	1	20	85,7*	1
7	100,0*	1	21	85,7*	1
8	100,0*	1	22	85,7*	1
9	85,7*	0,9	23	100,0*	1
10	100,0*	1	24	100,0*	1
11	100,0*	1	25	100,0*	1
12	85,7*	1	26	100,0*	1
13	85,7*	1	27	85,7*	1
14	100,0*	1	28	85,7*	1

* p > 0.05

Source: MARTINS *et al.* (2018)

With reference to language clarity, as shown in Table 3, CVCt = 0.88, coherence CVCt = 0.94, and fidelity of language of the back-translated version CVCt = 0.95. All CVCt and CVCi values were above the established 0.80 cut off point.

Table 3 - Content validity coefficient for clarity, coherence and back translation

Item	Clarity				Coherence				Back translation			
	Mean	CVCi	Pei	CVCc	Mean	CVCi	Pei	CVCc	Mean	CVCi	Pei	CVCc
1	5.0000	1.0000	0.0039	0.9961	5.0000	1.0000	0.0039	0.9961	5.0000	1.0000	0.0039	0.9961
2	4.5000	0.9000	0.0039	0.8961	5.0000	1.0000	0.0039	0.9961	5.0000	1.0000	0.0039	0.9961
3	4.0000	0.8000	0.0039	0.7961	5.0000	1.0000	0.0039	0.9961	5.0000	1.0000	0.0039	0.9961
4	4.2500	0.8500	0.0039	0.8461	5.0000	1.0000	0.0039	0.9961	5.0000	1.0000	0.0039	0.9961
5	4.2500	0.8500	0.0039	0.8461	4.5000	0.9000	0.0039	0.8961	5.0000	1.0000	0.0039	0.9961
6	4.5000	0.9000	0.0039	0.8961	4.7500	0.9500	0.0039	0.9461	5.0000	1.0000	0.0039	0.9961
7	4.5000	0.9000	0.0039	0.8961	5.0000	1.0000	0.0039	0.9961	5.0000	1.0000	0.0039	0.9961
8	4.5000	0.9000	0.0039	0.8961	4.5000	0.9000	0.0039	0.8961	4.7500	0.9500	0.0039	0.9461
9	4.2500	0.8500	0.0039	0.8461	5.0000	1.0000	0.0039	0.9961	4.5000	0.9000	0.0039	0.8961
10	4.2500	0.8500	0.0039	0.8461	4.7500	0.9500	0.0039	0.9461	5.0000	1.0000	0.0039	0.9961
11	4.2500	0.8500	0.0039	0.8461	5.0000	1.0000	0.0039	0.9961	5.0000	1.0000	0.0039	0.9961
12	4.5000	0.9000	0.0039	0.8961	4.5000	0.9000	0.0039	0.8961	4.7500	0.9500	0.0039	0.9461
13	4.7500	0.9500	0.0039	0.9461	4.5000	0.9000	0.0039	0.8961	5.0000	1.0000	0.0039	0.9961
14	4.5000	0.9000	0.0039	0.8961	4.2500	0.8500	0.0039	0.8461	4.5000	0.9000	0.0039	0.8961
15	4.0000	0.8000	0.0039	0.7961	4.7500	0.9500	0.0039	0.9461	4.5000	0.9000	0.0039	0.8961
16	4.0000	0.8000	0.0039	0.7961	4.7500	0.9500	0.0039	0.9461	4.5000	0.9000	0.0039	0.8961
17	4.2500	0.8500	0.0039	0.8461	5.0000	1.0000	0.0039	0.9961	4.7500	0.9500	0.0039	0.9461
18	4.7500	0.9500	0.0039	0.9461	4.2500	0.8500	0.0039	0.8461	5.0000	1.0000	0.0039	0.9961
19	5.0000	1.0000	0.0039	0.9961	4.5000	0.9000	0.0039	0.8961	5.0000	1.0000	0.0039	0.9961
20	4.2500	0.8500	0.0039	0.8461	4.5000	0.9000	0.0039	0.8961	4.5000	0.9000	0.0039	0.8961
21	4.7500	0.9500	0.0039	0.9461	5.0000	1.0000	0.0039	0.9961	4.5000	0.9000	0.0039	0.8961
22	4.5000	0.9000	0.0039	0.8961	4.7500	0.9500	0.0039	0.9461	4.2500	0.8500	0.0039	0.8461
23	4.0000	0.8000	0.0039	0.7961	5.0000	1.0000	0.0039	0.9961	5.0000	1.0000	0.0039	0.9961
24	5.0000	1.0000	0.0039	0.9961	4.5000	0.9000	0.0039	0.8961	5.0000	1.0000	0.0039	0.9961
25	4.7500	0.9500	0.0039	0.9461	4.7500	0.9500	0.0039	0.9461	4.7500	0.9500	0.0039	0.9461
26	4.2500	0.8500	0.0039	0.8461	5.0000	1.0000	0.0039	0.9961	4.7500	0.9500	0.0039	0.9461
27	4.2500	0.8500	0.0039	0.8461	5.0000	1.0000	0.0039	0.9961	4.7500	0.9500	0.0039	0.9461
28	5.0000	1.0000	0.0039	0.9961	5.0000	1.0000	0.0039	0.9961	5.0000	1.0000	0.0039	0.9961
CVCt				0.8872				0.9497				0.9586

CVCi - Mean Content Validity Coefficient for each item; Pei – Erro; CVCc - Final Content Validity Coefficient for each item; CVCt - Total Content Validity Coefficient

Source: MARTINS *et al.* (2018)

6.4.3 Pilot test

6.4.3.1 Sample

The pilot test was conducted from 07 August to 22 September, 2017, with a sample of 115 individuals, including employees of seven wholesalers of food establishments operating in the Municipal Market of São Paulo (n = 34), two restaurants (n = 44), a fishing industry (n = 27) and a supermarket (n = 10). All establishments had a Food Safety Management System and their employees received regular training on food safety (Table 4).

Table 4 - Socio-demographic characteristics of the sample (% of respondents, n = 115)

Gender	
Male	60.5
Female	39.5
Age	
≤ 25 years	27.1
26 to 35 years	47.1
36 to 45 years	17.6
46 to 55 years	7.1
> 55 years	1.2
Mean (S.D.)	31.8 (9.0)
Education	
Completed Grade School	28.2
Completed High School	64.7
Completed a Bachelor's Degree	7.1
Received food hygiene training	
Yes	74.1
Not	25.9

Source: MARTINS *et al* (2018)

The participants did not receive any notice about the interview. The questionnaire (Table 5) was answered anonymously because information about the organizations was not the objective of the validation; the goal was to evaluate the understanding of respondents and the consistency of the questionnaire. The questionnaire was answered during a work day, after reading and signing a consent form. The questions were read out by an interviewer, and the participants' answers were recorded. There was a predominance of men (60.5%) aged between 26 and 35 years in the sample. The predominant education level was 'completed high school', and majority of the respondents had received some training or instruction about food hygiene (74.1%).

The sample size used for the pilot study was 11.8% of the total number of individuals invited to participate in the main study (N = 974).

6.4.3.2 Descriptive and reliability analysis

The mean total score was 3.85 (*SD* = .78). The internal consistency obtained with the Cronbach’s alpha was .95 for the entire sample, and .94 and .95 for managers and employees, respectively. The present study reproduced a climate assessment following the same technique that was used by the authors of the original instrument (De Boeck et al., 2015) and the mean, standard deviation, and Cronbach’s alpha demonstrate that the version developed in the present study was consistent and accurate, and that if this tool is applied again, there will be little variation in the scores, as evidenced by the standard deviation obtained from the variance.

Table 5 presents individual item scores, SD, corrected item-total correlation coefficients, and Cronbach’s alphas if the item is deleted. Individual item mean scores ranged from 4.44 for Item 9, to 3.06 for Item 20. The corrected item-total correlation coefficients were around the criterion value of .62, except for Item 9 and 18.

Table 5 - Mean scores (m) and standard deviation (sd) for individual items, corrected item-total correlation, and internal consistency (cronbach's alpha) if the item is deleted

	Item	M	SD	Corrected item-total correlation	Cronbach's alpha if item is deleted
Leadership component					
1.	In my organization, leaders set clear objectives concerning hygiene and food safety. (Na organização que trabalho, os líderes definem de forma clara os objetivos relativos à higiene e segurança dos alimentos.)	4.22	0.56	0.71	0.95
2.	In my organization, leaders are clear about the expectations from employees, concerning hygiene and food safety. (Na organização que trabalho, os líderes são claros em relação àquilo que a empresa espera dos funcionários em relação à higiene e segurança de alimentos.)	4.18	0.76	0.77	0.95
3.	In my organization, leaders are able to motivate their employees to maintain high standards of hygiene and food safety. (Os líderes da companhia que trabalho são capazes de motivar seus funcionários a trabalhar de forma higiênica e de um jeito seguro para os alimentos.)	4.05	0.82	0.61	0.95
4.	In my organization, leaders listen to employees' remarks or comments concerning hygiene and food safety. (Os líderes da companhia que trabalho, escutam os funcionários quando eles têm observações ou comentários a respeito de segurança e higiene dos alimentos.)	3.99	0.70	0.47	0.95
5.	In my organization, leaders address hygiene and food safety issues in a constructive and respectful manner. (Na organização que trabalho, questões relacionadas à segurança e higiene dos alimentos são abordadas de forma construtiva e respeitosa por parte dos líderes.)	4.16	0.65	0.49	0.95
6.	In my organization, leaders strive for the continuous improvement of hygiene and food safety behaviours. (Os líderes da organização que trabalho esforçam-se continuamente pela melhoria da higiene e segurança dos alimentos.)	3.94	0.78	0.73	0.95
Communication component					
7.	In my organization, leaders communicate regularly with equipment operators about hygiene and food safety. (Na organização que trabalho, os líderes se comunicam regularmente com os funcionários sobre higiene e segurança de	3.78	0.68	0.60	0.95

	alimentos.)				
8.	In my organization, leaders communicate clearly with equipment operators about hygiene and food safety. (Na organização que trabalho, os líderes se comunicam de forma clara com os funcionários sobre higiene e segurança de alimentos.)	3.88	0.63	0.76	0.95
9.	In my organization, it is possible for equipment operators to communicate about hygiene and food safety with leaders. (Na organização em que trabalho, a comunicação sobre higiene e segurança dos alimentos, entre colaboradores e líderes é possível.)	4.44	0.54	0.22	0.95
10.	In my organization, the importance of hygiene and food safety is permanently present by means of posters, signs and/or icons related to hygiene and food safety. (Na organização em que trabalho, a importância da higiene e da segurança dos alimentos é permanentemente comunicada por meio de pôsteres, placas e símbolos relacionados ao tema higiene e segurança dos alimentos.)	3.33	1.07	0.74	0.95
11.	In my organization, I can discuss problems concerning hygiene and food safety with colleagues. (Posso discutir problemas a respeito de higiene e de segurança dos alimentos com os colegas da organização em que trabalho.)	4.32	0.54	0.36	0.95
Commitment component					
12.	In my organization, leaders consider hygiene and food safety to be of great importance. (Na organização em que trabalho, nota-se com clareza que higiene e segurança dos alimentos é bastante importante para a liderança.)	4.14	0.79	0.84	0.95
13.	My colleagues are convinced of the importance of hygiene and food safety. (Meus colegas de trabalho acreditam que a higiene e a segurança dos alimentos são importantes para a organização em que trabalhamos.)	4.13	0.74	0.50	0.95
14.	In my organization, working in a hygienic and food safe way is recognized and rewarded. (Na organização em que trabalho, há reconhecimento e valorização por quem atua de forma higiênica e segura para com os alimentos.)	3.91	0.91	0.64	0.95
15.	In my organization, leaders set a good example concerning hygiene and food safety. (Na organização em que trabalho, os líderes são exemplares quando se diz respeito à higiene e segurança dos alimentos.)	3.85	0.73	0.79	0.95
16.	In my organization, the leaders act quickly to correct problems/issues that affect hygiene and food safety. (Na organização em que trabalho, os líderes agem rapidamente para resolver problemas ou questões que possam afetar a higiene e a segurança dos alimentos.)	3.82	0.76	0.75	0.95
Resources component					
17.	In my organization, leaders actively involve employees in hygiene and food safety related matters. (Na organização em que trabalho, os colaboradores são efetivamente envolvidos pelos líderes em questões relacionadas à higiene e segurança dos alimentos.)	3.74	0.69	0.75	0.95
18.	In my organization, employees get sufficient time to work in a hygienic and food safe way. (Na organização em que trabalho, os colaboradores tem tempo suficiente para trabalhar com os alimentos de forma higiênica e segura.)	3.72	0.75	0.29	0.95
19.	In my organization, sufficient staff is available to follow hygiene and food safety guidelines. (Na organização em que trabalho, há mão-de-obra suficiente para as atividades relacionadas à higiene e segurança dos alimentos.)	3.44	1.01	0.48	0.95
20.	In my organization, the necessary infrastructure (e.g. good work space and good equipment) is available to work in a hygienic and food safe way. (Na organização em que trabalho, há infraestrutura necessária (e.g. espaços de trabalho e equipamentos adequados) à disposição para garantir a higiene e a segurança dos alimentos.)	3.06	1.11	0.55	0.95
21.	In my organization, sufficient financial resources are provided to support hygiene and food safety (e.g. lab analyses, extern consultants, extra cleaning, and purchase of appropriate equipment).	3.45	0.88	0.54	0.95
	Na organização em que trabalho, há disponibilidade de recursos financeiros para garantir a higiene e a segurança dos alimentos (análises laboratoriais,				

	laudos de terceiros, compra de equipamentos).				
22.	In my organization, sufficient education and training is provide in relation to hygiene and food safety. (Na organização em que trabalho, existe treinamento e processo educacional suficiente em relação à higiene e segurança dos alimentos.)	3.45	1.02	0.69	0.95
Risk awareness component					
23.	In my organization, good procedures and instructions concerning hygiene and food safety are in place. (Na organização que trabalho há boas práticas e instruções relativas à higiene e segurança de alimentos.)	4.11	0.71	0.60	0.95
24.	In my organization, the risks related to hygiene and food safety are known. (Na organização que trabalho o risco relacionado à higiene e segurança de alimentos é conhecido.)	3.80	0.78	0.61	0.95
25.	In my organization, the risks related to hygiene and food safety are under control. (Na organização que trabalho o risco relacionado à higiene e segurança dos alimentos está sob controle.)	3.62	0.95	0.77	0.95
26.	My colleagues are alert and attentive to potential problems and risks related to hygiene and food safety. (Meus colegas de trabalho estão sempre alerta e atentos aos riscos relacionados à higiene e segurança dos alimentos.)	3.62	0.87	0.84	0.95
27.	In my organization, leaders have a realistic picture of the potential problems and risks related to hygiene and food safety. (Na organização que trabalho os lideres têm uma ideia real dos problemas e riscos relacionados à higiene e segurança de alimentos.)	3.98	0.80	0.73	0.95
28.	In my organization, equipment operators have a realistic picture of the potential problems and risks related to hygiene and food safety. (Na organização que trabalho os colaboradores têm uma visão real dos problemas relacionados à higiene e segurança de alimentos.)	3.59	0.88	0.64	0.95

Source: MARTINS *et al.* (2018)

The Cronbach’s alpha for the whole questionnaire and for the components of Leadership, Communication, Commitment, Resources, and Risk awareness have been presented in Table 6.

Table 6 - Cronbach’s alpha for the whole questionnaire and its components

Item	Cronbach's alpha	Cronbach's Alpha for managers	Cronbach's alpha for employees
Whole questionnaire	.95	.94	.95
Leadership component		.85	.88
Communication component		.65	.71
Commitment component		.87	.85
Resources component		.78	.80
Risk awareness component		.86	.90

Source: MARTINS *et al.* (2018)

6.5 DISCUSSION

The present study was the first to perform a translation, adaptation, and validation of a questionnaire evaluating the food safety climate in organizations. Therefore, the discussion refers to other studies that have undertaken the translation, adaptation, and validation of psychometric scales in Portuguese.

The results of the process of translation and back translation were satisfactory since, according to the bilingual translators, the items were semantically similar to the original English version. The translation and back translation is a widely used method (Azari et al., 2017; Dentale et al., 2017; Frayssac et al., 2017; Lin et al., 2017; McCabe, Escoto, Cruz-Ortega, Munoz-Rojas, & Gattamorta, 2017), and it was a very suitable and reliable methodology for the present study, especially considering the high level of expertise of the translators, teachers, and experts in this field of research.

The utilization of Cohen's Kappa coefficients and Pearson's correlation demonstrated that the intensity of agreement was up to 80%, indicating a significant concordance between the two versions. These indices have been used widely in previous studies that developed versions of scales in different languages (de Vilhena, Duarte, & Lopes, 2016; Odunaiya, Louw, & Grimmer, 2017; Oliveira et al., 2016; Yilmaz, Gafuroglu, Ryall, & Yuksel, 2018). In the present study, satisfactory Kappa scores were obtained ($> .70$; $p > 0.05$). Further, the Pearson's correlation coefficients obtained in the present study ($> .80$) were similar to those of instruments in previous translation studies (Eshoj, Bak, Blond, & Juul-Kristensen, 2017; Min, Chang, Lee, Choe, & An, 2017; Rocha & Hershey, 2017) and they indicate good correlations (Malloy-Diniz et al., 2010; Rocha & Hershey, 2017; Tavares & Santos, 2017).

The Content Validation Coefficient (CVC) for clarity (.88), coherence (.94) and language fidelity after translation (.95) observed in the present study demonstrated that there was a good relationship between the original and translated scale (Downe-Wamboldt, 1992; Elo et al., 2014). These scores confirmed that the subsequent findings were obtained because the present questionnaire and the original tool are both systematic and objective means of describing and quantifying the same construct.

The composition of the sample, mostly comprising men (60.5%) aged 26 to 35 years, was different from the composition of the target population in the Brazilian region reported by Rossi et al. (2017) and Araujo et al. (2016). These authors found that food safety related jobs were dominated by women. However, the present composition is consistent with the sample used by Cortese et al. (2016) in their study on food handlers in Florianópolis-SC, which comprised more men. Further, in the present sample, the predominant educational level was 'completed high school', corroborating the findings of

de Rossi et al. (2017) and Araujo et al. (2016) . Majority of the respondents had received some training or instruction on hygiene and food safety (74.1%).

Since long, sample size has been an aspect of divergence of opinions and controversies in the scientific literature, especially with regard to the minimum number of subjects required. Currently, it is strongly believed that the use of large samples tends to provide more accurate results, decreasing the effect of sampling error (MacCallum, Widaman, Preacher, & Hong, 2001), although studies have demonstrated that the stability levels found in some scales can be attributed to the quality of the psychometric instrument and not to the sample size (Barrett & Kline, 1981; MacCallum et al., 2001; MacCallum, Widaman, Zhang, & Hong, 1999). In the present study, the initial sample size used in the pilot test (n=115) did not meet the standard size recommended for instrument validation, especially because the sample size for the pilot study is rarely reported in the literature.

The translation of the Hip Dysfunction and Osteoarthritis Outcome score (HOOS) into German (Arbab, van Ochten, Schnurr, Bouillon, & Konig, 2017) used a sample of 251 patients. Similarly, the adaptation and validation of the Brazilian Longitudinal Study for Adult Health (ELSA-Brasil) used a sample of 261 participants (Santos et al., 2013), while the translation and cross-cultural adaptation of the of the Pain Detect Questionnaire (PDQ) into Hindi (Hi-PDQ) for use in India was conducted on 82 patients (Gudala, Ghai, & Bansal, 2017). Further, the Genetic Counselling Outcome Scale (GCOS-24) was translated and adapted to use in Denmark using a sample of 61 patients (Diness et al., 2017).

Evidently, there is no consensus on the ideal sample size for such studies. However, the relevance of the present sample size lies in the fact that the investigators experienced difficulty in communicating with managers and owners of organizations in the food trade with reference to food safety climate. This may be because while there is no literature on the adherence to food safety standards, the present study indicated that the adherence rate was severely low (11.8%).

Finally it is important to recognize the limitations of the present study. The original English questionnaire was developed and validated with a very small sample (n= 42). Consequently, if an exploratory and confirmatory factorial analysis is conducted on the original questionnaire, some items may be discarded and the questionnaire may be mischaracterized. Additionally, the geographical range of the present sample for the validation of the instrument was very low, as it was limited to the city of São Paulo. This may have restricted the cultural representativeness and the degree of training received by employees to that observed in this region alone (Behrens et al., 2010; Rossi et al., 2017). Further, as Sao Paulo's establishments have been reported to exhibit a higher

degree of food legislation fitness (Saccol et al., 2015), the present sample may have been biased.

6.6 CONCLUSION

The present study was performed to translate into Portuguese and adapt the food safety climate self-assessment tool developed by De Boeck et al. (2015), and to test the reliability, internal consistency, conceptual equivalence, and validity of the translated instrument.

The process of translating and adapting the tool was completed successfully, and the Portuguese version developed in the present study was confirmed to be similar to the original tool. The validation and pilot testing of the new instrument revealed that food safety climate assessment is not adequately accepted by owners and managers in private organizations, and therefore, it was difficult to obtain data from them.

The food safety climate self-assessment tool it is an important instrument that can now be applied in Portuguese-speaking countries and the results can be compared with other studies carried out using the original tool or other language versions of the same. Research on food safety climate is still in its infancy, and with the publication of more studies in this field, the importance of this assessment tool will be perceived.

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7 GENERAL DISCUSSION

It is possible, by reader, to notice, that this study is initiated with unusual way, bibliometric studies are less common rather than reviews. According to Araujo (2006) in Brazil began to be used in 1970's but have been grounded and were again popularized in 1990's, however this popularization occurred between librarians and social scientists. Today the use of this approach in other sciences is quite restricted.

The bibliometric analyse allows a major exploitation of data. Reviews are very important, it is the ordinal history about the scientific advances, however, only by reading and organizing texts we cannot infer and reach precious information.

The bibliometric study shown that the University of São Paulo (USP) is the most productive in this field (seafood), specially the "Luiz de Queiroz" Agriculture College (ESALQ) and School of Veterinary Medicine and Animal Science (FMVZ). This information ensure a security to begins the study, in this sense of feasibility, the geographical localization is a facilitator and to be close to qualified researchers to support and collaborate with the study is critical, mainly because of costs.

The lines of research of these centres are Seafood Technology and Food Security and Hygiene, ideal to support this research. Maybe, if we had found information about specialists and research centres concentrated in the North Region, the strategy would have been different. This information allowed saving time and resources. For instance, if the objective was to investigate the *Ricinus communis* L. would be more prudent to carry out the study with EMBRAPA from Paraíba State (FRANCISCO *et al.*, 2013).

The knowledge generated and properly documented also indicates that the time is ripe to consider performing a research. However, the growth of this field in Brazilian's research is linear (R^2a 0.971) and reveal the field development at this moment. It is an important reason to invest time and resources, with the goal to produce more knowledge, especially about seafood supply for the Military Organizations, non-existent issue in thesis bases until the moment of this research. Aquaculture should be highlighted as an important essay from the bibliometric analysis, this activity is growing and the supply activities at long term will depends of the aquaculture resources, for the Brazilian Army seafood supply, to have stability, is salutary that the preference is for national aquaculture species.

Unlike a classic review, the first chapter of this study supported important decisions such how and where conduct the research and generated several information that will be available to new research. As already discussed in the text of the chapter, the information measured and quantified allows the researcher a differentiated view.

Seafood quality, the theme of the second chapter, was indispensable to understand how the researches have evolved along the time. The 1960's and 1970's were decades of conservation of products (DYER, 1969) and concern about identify damage conditions. The period of prevention would come only in 1990's with the advent of Food Safety Management System (GARRETT; HUDAKROOS, 1990; 1991; WEDDIG, L., 1994; WEDDIG, L. J., 1994; MOODY, 1996). Until today, this is the most effective way to reduce lost, mitigation of non-compliance and ensure a good nutrition and security to consumer. This was actually the core strategy that the study employed to align the Brazilian Army operations with what has more current.

The aquaculture appears again in the second chapter as an important source of seafood. Brazilian's seafood supply at long term operation, can be designed with basis in Brazilian species such a round fishes (OLIVEIRA et al., 2017).

The data about seafood quality that did not fit the Lotka's model this is an indicative of world interest in this theme is heterogeneous. In several parts of the world, researchers conduct studies using different approaches and parameters for fish quality. This reflects the importance of it in many cultures and ethnicities. Seafood has nutritional and economic importance and this is showed in the second chapter, through the information presented about the cooperation of industry and researchers in Spain, making this country one of the most productive in research and with higher indices of consumption of fish, with a high degree of quality. This information reinforces the strategy of this study to establish research partnership to investigate supply phenomena in real environment.

Established the strategy for cooperating with the Brazilian Army, and based on records of purchase processes, was started the relationship between researchers and military officers responsible by the purchase process of seafood, cold storage and freight forwarding. In order to understand the process and knows its intrinsic characteristics were applied classical tools of business administration such showed in the third chapter.

From the third chapter it is possible to get a sense about the dimension of the seafood supply process. A several number of barracks (Military Organizations) and consequently a large number of people served daily by the 21st Supply Deposit. A Quartermaster Unit is different from all other MO, when subjected to an evaluation as storage unit, suffer serious disadvantages because its do not host only this department. The specialized literature about food safety provides information about classical models of industries or warehouses (LUNING *et al.*, 2015; TZAMALIS *et al.*, 2016). The solution was delimiting the perimeter of interest for the study.

Two of the three species employed in the supply process are imported. It's a complicating factor. Its production occurs so far and the commerce performed here, in

Brazil, is realized by representative sales. Once more, the hypothesis about the better conditions of Brazilian aquaculture seafood, for this purpose specifically, should be given.

Still on this chapter, is emphasized the importance of the human being in the whole process and in the capacity to transform it. This finding is in agreement with the most recent literature has been pointed out (HARVEY *et al.*, 2002; YIANNAS, 2009; GRIFFITH *et al.*, 2010; TAYLOR, 2011; ABIDIN, 2013; JESPERSEN *et al.*, 2016; NAYAK e WATERSON, 2017). In order for the staff to understand the concept related to the cold stores temperature, the importance of to note physic-chemical parameters, evaluation of hygiene conditions, dangers and risks, is very important the qualification and periodic actualization.

The third chapter found some factors that later would be explored in subsequent chapters: external supplier and the purchase process, food security standards and human factor.

The bidding document is the principal instrument to the seafood purchase and the only communication instrument between the parts, through this are clarified the relevant issues about the acquisition. The specific terms of contract are technically special, using nomenclatures and international standards of seafood classification (VEISETH KENT *et al.*, 2010; TRAN *et al.*, 2013) since the products are imported. The fourth chapter was focused on the purchase process, the supplier criteria and we identified two unheard of criteria. So far, the fish was purchased without was specified the scientific name. Through historical analysis, it has been found, the problem of species substitutions (CARVALHO *et al.*, 2015; de BRITO *et al.*, 2015).

Substitution species was only one between ten non-compliances pointed in the chapter three, but is unanimous that all non-compliances are problems of external supplier and resulting from the incomplete vision of the concept and the application of the principles of Food Safety Management on 21st SD.

Traceability is a tool that when used in conjunction with Food Safety Management Systems allows control over the entire chain (KARLSEN *et al.*, 2012; LEAL *et al.*, 2015), when a seller of seafood or other food sells the products of a several number of manufactures, the degree of difficulty in controlling lots increases exponentially (ZHANG e BHATT, 2014). In order to mitigate this non-compliance was proposed perform transactions only with organizations that were responsible for an own SIF number. In the specialized bibliography there is no, until the final of research notice about this.

In the fifth chapter the approach was about of Good Manufacturing Practices. According to Huss *et al.*, (2000) the hazards related to contamination and spoilage during processing can be controlled or maintained in acceptable levels. There is data that prove the efficiency of Food Safety Management Systems such Good Manufacturing Practice

(GMP) and a HACCP able in the literature and the systems are recognized such an efficient practices to prevent the growth of pathogenic microorganisms and spoilage during distribution and storage.

Proper application of well-known preservative parameters including temperature is able to control growth of most pathogens and spoilage. Linked to the theme of chapter three, the control of hazards through of GMP depends of the human factor (McINTYRE *et al.*, 2013). Understand the importance of preservative parameters such as temperature requires qualification enabling understanding (JEVŠNIK *et al.*, 2008).

Invest in training is an excellent strategy (BAS *et al.*, 2006) and the gains reflect socially. A fraction of the military working in supply operations are temporary workers such recruits or soldiers. The food safety qualifying contributes efficiently towards the integration or reintegration of these temporary workers to the labour market. However, for the entire staff have power to implement the actions set out in a manner consistent, requires the sharing of a common Food Safety Culture (YANNAS, 2009) and was possible to note, based on the results of Chapter five and outputs as the seafood served in the barracks, that this culture does not exist.

In this sense, with the goal of evaluate the personal relations about the Food Safety and considering the absence of a tool that would enable this performance, the chapter six presents the results of translation, validation and adaptation of a tool to assess the food safety climate. We have strengthened the concept of food safety when addressing a theme thinner, sensitive, but no less necessary. The staff must be qualified, understand the culture at all levels and this communication must find passage through all levels of the hierarchy.

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8 TECHNICAL RECOMENDATIONS

1. The quality and food safety is not negotiable. Military's have a right to feed safely and nourish, for this to happen every effort should be made, putting the issue of food security up the hierarchy and military cultures.
2. Operate with species from Brazilian aquaculture.
3. Specify technical and clear the species (scientific names, product standards) and their desirable characteristics in biddings. For performs it is essential the participation of veterinary officers in the preparation of document and where it is not possible to consult seafood supply experts.
4. Base bids on the concept of lowest price and best quality, lowest price alone have proved to be inefficient.
5. Organizations must take responsibility for its products. The SIF and the CNPJ must be coupled.
6. Prefer organizations that can be audited, are close and adopt FSMS.
7. Traceability must be implemented immediately.
8. FSMS and GMP must be implemented immediately. This includes the preparation of documents and the adoption of practices. The team responsible for the food safety should be multidisciplinary and must be autonomy to guarantee it.
9. Effective training and qualifications for all staff involved in the seafood supply process, regardless of military rank
10. Cold chain is one of the most important elements of this process, the equipment and storage practices of this unit should be reassessed.
11. The food safety management process has no end, should always be revalued, all the time adjustments must be made, improvements and adaptations must be constants.
12. The staff, human capital is the most important and actually is the most deficient component of this process. The social gain is immensurable and must guide such a principal concept for this change to occur.
13. The biggest transformation to be made in the 21st SD is to invest in knowledge for the transformation of available human capital to be able to understand and apply the principles of Food Safety in the food supply chain.

9 GENERAL CONCLUSION

This research is a contribution to the field of the seafood quality, supply chains management and food safety. According to the research found and the exploration of the seafood quality states of art this similar approaches are unpublished, so this is an unprecedented contribution.

This study is conceptual and can be applied to other supply chain, respecting the particular characteristics of each animal origin food, except small details, the concept of food security is similar, based on dangers, risks, control and prevention.

The Brazilian Army have an incomplete vision on the current concept of Food Safety. Despite the existence of internal rules and norms, the concept is not up to date among the staff. This fact became evident by the extremely low participation of the military in responding to the questionnaire on Food Safety. It was not possible to identify the climate of Food Safety in the 21st SD.

The development of this concept in the 2nd MR is a good opportunity to promote a social change. The recruits, traditionally young, comes to the military service without profession, generally could be poor and returns to the labour market without know what career follow. The world trade of food operates with one language, the food safety. Qualifying the young people is to give them an opportunity to perform social ascension.

Other important factor is the nutrition of the military staff. The differentiated demands of energy, intrinsic of the physical effort, make food a strategic element, and condition for the troops to perform their duties. The occurrence of foodborne disease can to cause work stoppage and, other preventable material damage.

Were recognized three central axes of intervention to begin the construction the conception and actions focused on Food Safety in 21st SD: 1^o) the buying process and its mechanisms (biddings, technical words, product standards, seller criteria and use of experts); 2^o) the storage process and its mechanisms (FSMS, GMP, cold chain and qualify and empowerment of the team responsible) and, finally, 3^o) the maintenance and improvement of the system (review of the documents, qualification of staff and constant acculturation).

Admittedly the human element is in all strands. This is currently the main problem and at the same times the key to the solution.

APPENDIX I

NÚMERO: 21 DSUP		ANO: 2017/06/01	
A - IDENTIFICAÇÃO DA EMPRESA			
1-RAZÃO SOCIAL:			
2-NOME DE FANTASIA:			
3-ALVARÁ/LICENÇA SANITÁRIA:		4-INSCRIÇÃO ESTADUAL / MUNICIPAL:	
5-CNPJ / CPF:		6-FONE:	7-FAX:
8-E - mail:			
9-ENDEREÇO (Rua/Av.):		10-Nº:	11-Compl.:
12-BAIRRO: Lapa	13-MUNICÍPIO: S.P.	14-UF:	15-CEP:
16-RAMO DE ATIVIDADE:		17-PRODUÇÃO MENSAL:	
18-NÚMERO DE FUNCIONÁRIOS:		19-NÚMERO DE TURNOS:	
20-CATEGORIA DE PRODUTOS: Pesquisa			
Descrição da Categoria:			
Descrição da Categoria:			
Descrição da Categoria:			
Descrição da Categoria:			
21-RESPONSÁVEL TÉCNICO: TEN. RAQUEL ERICA RODOLFO		22-FORMAÇÃO ACADÊMICA:	
23-RESPONSÁVEL LEGAL/PROPRIETÁRIO DO ESTABELECIMENTO: EXERCITO BRASIL.			
24-MOTIVO DA INSPEÇÃO:			
☐ SOLICITAÇÃO DE LICENÇA SANITÁRIA ☐ COMUNICAÇÃO DO INÍCIO DE FABRICAÇÃO DE PRODUTO DISPENSADO DA OBRIGATORIEDADE DE REGISTRO ☐ SOLICITAÇÃO DE REGISTRO ☐ PROGRAMAS ESPECÍFICOS DE VIGILÂNCIA SANITÁRIA ☐ VERIFICAÇÃO OU APURAÇÃO DE DENÚNCIA ☐ INSPEÇÃO PROGRAMADA ☐ REINSPEÇÃO ☐ RENOVAÇÃO DE LICENÇA SANITÁRIA ☐ RENOVAÇÃO DE REGISTRO ☒ OUTROS: Pesquisa Cooperada Tec. FMVZ-USP			

B – AVALIAÇÃO	S	N	NA	OBS
1. EDIFICAÇÃO E INSTALAÇÕES				
1.1 ÁREA EXTERNA:				
1.1.1 Área externa livre de focos de insalubridade, de objetos em desuso ou estranhos ao ambiente, de vetores e outros animais no pátio e vizinhança; de focos de poeira; de acúmulo de lixo nas imediações, de água estagnada, dentre outros.		X		HA' VEGETAÇÃO
1.1.2 Vias de acesso interno com superfície dura ou pavimentada, adequada ao trânsito sobre rodas, escoamento adequado e limpas.	X			
1.2 ACESSO:				
1.2.1 Direto, não comum a outros usos (habitação).		X		
1.3 ÁREA INTERNA:				
1.3.1 Área interna livre de objetos em desuso ou estranhos ao ambiente.	X			
1.4 PISO:				
1.4.1 Material que permite fácil e apropriada higienização		X

(liso, resistente, drenados com declive, impermeável e outros).		X		
1.4.2 Em adequado estado de conservação (livre de defeitos, rachaduras, trincas, buracos e outros).		X		
1.4.3 Sistema de drenagem dimensionado adequadamente, sem acúmulo de resíduos. Drenos, ralos sifonados e grelhas colocados em locais adequados de forma a facilitar o escoamento e proteger contra a entrada de baratas, roedores etc.		X		
1.5 TETOS:				
1.5.1 Acabamento liso, em cor clara, impermeável, de fácil limpeza e, quando for o caso, desinfecção.		X		NA BOMBAS, PASSAROS
1.5.2 Em adequado estado de conservação (livre de trincas, rachaduras, umidade, bolor, descascamentos e outros).		X		NA
1.6 PAREDES E DIVISÓRIAS:				
1.6.1 Acabamento liso, impermeável e de fácil higienização até uma altura adequada para todas as operações. De cor clara.	X			
1.6.2 Em adequado estado de conservação (livres de falhas, rachaduras, umidade, descascamento e outros).	X			
1.6.3 Existência de ângulos abaulados entre as paredes e o piso e entre as paredes e o teto.		X		RETO
1.7 PORTAS:				
1.7.1 Com superfície lisa, de fácil higienização, ajustadas aos batentes, sem falhas de revestimento.	X			
1.7.2 Portas externas com fechamento automático (mola, sistema eletrônico ou outro) e com barreiras adequadas para impedir entrada de vetores e outros animais (telas milimétricas ou outro sistema).		X		
1.7.3 Em adequado estado de conservação (livres de falhas, rachaduras, umidade, descascamento e outros).	X			
1.8 JANELAS E OUTRAS ABERTURAS:				
1.8.1 Com superfície lisa, de fácil higienização, ajustadas aos batentes, sem falhas de revestimento.		X		
1.8.2 Existência de proteção contra insetos e roedores (telas milimétricas ou outro sistema).		X		
1.8.3 Em adequado estado de conservação (livres de falhas, rachaduras, umidade, descascamento e outros).		X		
1.9 ESCADAS, ELEVADORES DE SERVIÇO, MONTACARGAS E ESTRUTURAS AUXILIARES				
1.9.1 Construídos, localizados e utilizados de forma a não serem fontes de contaminação.			X	ESCALA DO VESTIÁRIO SEM CORRIMÃO LISO
1.9.2 De material apropriado, resistente, liso e impermeável, em adequado estado de conservação.			X	

B - AVALIAÇÃO	S	N	NA	OBS
1.10 INSTALAÇÕES SANITÁRIAS E VESTIÁRIOS PARA OS MANIPULADORES:				
1.10.1 Quando localizados isolados da área de produção, acesso realizado por passagens cobertas e calçadas.	X			
1.10.2 Independentes para cada sexo (conforme legislação específica), identificados e de uso exclusivo para manipuladores de alimentos.		X		O USO É EXCLUSIVO
1.10.3 Instalações sanitárias com vasos sanitários; mictórios e lavatórios íntegros e em proporção adequada ao número de empregados (conforme legislação específica).		X		SÃO 10 COAB
1.10.4 Instalações sanitárias servidas de água corrente, dotadas preferencialmente de torneira com acionamento automático e conectadas à rede de esgoto ou fossa séptica.		X		
1.10.5 Ausência de comunicação direta (incluindo sistema de exaustão) com a área de trabalho e de refeições.	X			

1.10.6 Portas com fechamento automático (mola, sistema eletrônico ou outro).	X		
1.10.7 Pisos e paredes adequadas e apresentando satisfatório estado de conservação.	X		
1.10.8 Iluminação e ventilação adequadas.	X		
1.10.9 Instalações sanitárias dotadas de produtos destinados à higiene pessoal: papel higiênico, sabonete líquido inodoro anti-séptico ou sabonete líquido inodoro e anti-séptico, toalhas de papel não reciclado para as mãos ou outro sistema higiênico e seguro para secagem.	X		
1.10.10 Presença de lixeiras com tampas e com acionamento não manual.	X		
1.10.11 Coleta freqüente do lixo.	X		
1.10.12 Presença de avisos com os procedimentos para lavagem das mãos.	X		
1.10.13 Vestiários com área compatível e armários individuais para todos os manipuladores.	X		
1.10.14 Duchas ou chuveiros em número suficiente (conforme legislação específica), com água fria ou com água quente e fria.	X		
1.10.15 Apresentam-se organizados e em adequado estado de conservação.	X		

1.11 INSTALAÇÕES SANITÁRIAS PARA VISITANTES E OUTROS:

1.11.1 Instaladas totalmente independentes da área de produção e higienizados.	X		
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1.12 LAVATÓRIOS NA ÁREA DE PRODUÇÃO:

1.12.1 Existência de lavatórios na área de manipulação com água corrente, dotados preferencialmente de torneira com acionamento automático, em posições adequadas em relação ao fluxo de produção e serviço, e em número suficiente de modo a atender toda a área de produção.	X		TOURNEIRA NO CANTO com mangueira
1.12.2 Lavatórios em condições de higiene, dotados de sabonete líquido inodoro anti-séptico ou sabonete líquido inodoro e anti-séptico, toalhas de papel não reciclado ou outro sistema higiênico e seguro de secagem e coletor de papel acionados sem contato manual.	X		

1.13 ILUMINAÇÃO E INSTALAÇÃO ELÉTRICA:

1.13.1 Natural ou artificial adequada à atividade desenvolvida, sem ofuscamento, reflexos fortes, sombras e contrastes excessivos.	X		
1.13.2 Luminárias com proteção adequada contra quebras e em adequado estado de conservação. preventiva.	X		NÃO TODAS
1.13.3 Instalações elétricas embutidas ou quando exteriores revestidas por tubulações isolantes e presas a paredes e tetos.	X		EXPOSTO

1.14 VENTILAÇÃO E CLIMATIZAÇÃO:

1.14.1 Ventilação e circulação de ar capazes de garantir o conforto térmico e o ambiente livre de fungos, gases, fumaça, pó, partículas em suspensão e condensação de vapores sem causar danos à produção.	X		
1.14.2 Ventilação artificial por meio de equipamento(s) higienizado(s) e com manutenção adequada ao tipo de equipamento.	X		
1.14.3 Ambientes climatizados artificialmente com filtros adequados.	X		
1.14.4 Existência de registro periódico dos procedimentos de limpeza e manutenção dos componentes do sistema de climatização (conforme legislação específica) afixado em	X		

local visível.				
1.14.5 Sistema de exaustão e ou insuflamento com troca de ar capaz de prevenir contaminações.		X		
1.14.6 Sistema de exaustão e ou insuflamento dotados de filtros adequados.		X		
1.14.7 Captação e direção da corrente de ar não seguem a direção da área contaminada para área limpa.		X		
1.15 HIGIENIZAÇÃO DAS INSTALAÇÕES:				
1.15.1 Existência de um responsável pela operação de higienização comprovadamente capacitado.		X		
1.15.2 Frequência de higienização das instalações adequada.	X			
1.15.3 Existência de registro da higienização.		X		
1.15.4 Produtos de higienização regularizados pelo Ministério da Saúde.		X		
1.15.5 Disponibilidade dos produtos de higienização necessários à realização da operação.	X			
1.15.6 A diluição dos produtos de higienização, tempo de contato e modo de uso/aplicação obedecem às instruções recomendadas pelo fabricante.		X		
1.15.7 Produtos de higienização identificados e guardados em local adequado.	X			
1.15.8 Disponibilidade e adequação dos utensílios (escovas, esponjas etc.) necessários à realização da operação. Em bom estado de conservação.	X			
1.15.9 Higienização adequada.	X			

B - AVALIAÇÃO	S	N	NA	OBS
1.16 CONTROLE INTEGRADO DE VETORES E PRAGAS URBANAS:				
1.16.1 Ausência de vetores e pragas urbanas ou qualquer evidência de sua presença como fezes, ninhos e outros.		X		POMBOS NA BANCA TENDAL
1.16.3 Em caso de adoção de controle químico, existência de comprovante de execução do serviço expedido por empresa especializada.		X		
1.17 ABASTECIMENTO DE ÁGUA:				
1.17.1 Sistema de abastecimento ligado à rede pública.	X			
1.17.2 Sistema de captação própria, protegido, revestido e distante de fonte de contaminação.			X	
1.17.3 Reservatório de água acessível com instalação hidráulica com volume, pressão e temperatura adequados, dotado de tampas, em satisfatória condição de uso, livre de vazamentos, infiltrações e descascamentos.	X			
1.17.4 Existência de responsável comprovadamente capacitado para a higienização do reservatório da água.		X		
1.17.5 Apropriada frequência de higienização do reservatório de água.		X		
1.17.6 Existência de registro da higienização do reservatório de água ou comprovante de execução de serviço em caso de terceirização.		X		
1.17.7 Encanamento em estado satisfatório e ausência de infiltrações e interconexões, evitando conexão cruzada entre água potável e não potável.	X			
1.17.8 Existência de planilha de registro da troca periódica do elemento filtrante.		X		
1.17.9 Potabilidade da água atestada por meio de laudos laboratoriais, com adequada periodicidade, assinados por técnico responsável pela análise ou expedidos por empresa terceirizada.		X		
1.17.10 Disponibilidade de reagentes e equipamentos				

VERIFICAÇÃO
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necessários à análise da potabilidade de água realizadas no estabelecimento.		X		
1.17.11 Controle de potabilidade realizado por técnico comprovadamente capacitado.		X		
1.17.12 Gelo produzido com água potável, fabricado, manipulado e estocado sob condições sanitárias satisfatórias, quando destinado a entrar em contato com alimento ou superfície que entre em contato com alimento.			X	
1.17.13 Vapor gerado a partir de água potável quando utilizado em contato com o alimento ou superfície que entre em contato com o alimento.			X	

B - AVALIAÇÃO	S	N	NA	OBS
1.18 MANEJO DOS RESÍDUOS:				
1.18.1 Recipientes para coleta de resíduos no interior do estabelecimento de fácil higienização e transporte, devidamente identificados e higienizados constantemente; uso de sacos de lixo apropriados. Quando necessário, recipientes tampados com acionamento não manual.	X			
1.18.2 Retirada freqüente dos resíduos da área de processamento, evitando focos de contaminação.	X			
1.18.3 Existência de área adequada para estocagem dos resíduos.		X		
1.19 ESGOTAMENTO SANITÁRIO:				
1.19.1 Fossas, esgoto conectado à rede pública, caixas de gordura em adequado estado de conservação e funcionamento.	X			
1.20 LEIAUTE:				
1.20.1 Leiaute adequado ao processo produtivo: número, capacidade e distribuição das dependências de acordo com o ramo de atividade, volume de produção e expedição.	X			
1.20.2 Áreas para recepção e depósito de matériaprima, ingredientes e embalagens distintas das áreas de produção, armazenamento e expedição de produto final.	X	X	X	
2. EQUIPAMENTOS, MÓVEIS E UTENSÍLIOS				
2.1 EQUIPAMENTOS:				
2.1.1 Equipamentos da linha de produção com desenho e número adequado ao ramo.			X	
2.1.2 Dispostos de forma a permitir fácil acesso e higienização adequada.			X	
2.1.3 Superfícies em contato com alimentos lisas, íntegras, impermeáveis, resistentes à corrosão, de fácil higienização e de material não contaminante.			X	
2.1.4 Em adequado estado de conservação e funcionamento.			X	
2.1.5 Equipamentos de conservação dos alimentos (refrigeradores, congeladores, câmaras frigoríficas e outros), bem como os destinados ao processamento térmico, com medidor de temperatura localizado em local apropriado e em adequado funcionamento.		X		
2.1.6 Existência de planilhas de registro da temperatura, conservadas durante período adequado.	X			
2.1.7 Existência de registros que comprovem que os equipamentos e maquinários passam por manutenção preventiva.	X			
2.1.8 Existência de registros que comprovem a calibração dos instrumentos e equipamentos de medição ou comprovante da execução do serviço quando a calibração for realizada por empresas terceirizadas.	X			
2.2 MÓVEIS: (mesas, bancadas, vitrines, estantes)				

Verificar
→

2.2.1 Em número suficiente, de material apropriado, resistentes, impermeáveis; em adequado estado de conservação, com superfícies íntegras.		X		
2.2.2 Com desenho que permita uma fácil higienização (lisos, sem rugosidades e frestas).		X		
2.3 UTENSÍLIOS:				
2.3.1 Material não contaminante, resistentes à corrosão, de tamanho e forma que permitam fácil higienização: em adequado estado de conservação e em número suficiente e apropriado ao tipo de operação utilizada.			X	
2.3.2 Armazenados em local apropriado, de forma organizada e protegidos contra a contaminação.			X	
2.4 HIGIENIZAÇÃO DOS EQUIPAMENTOS E MAQUINÁRIOS, E DOS MÓVEIS E UTENSÍLIOS:				
2.4.1 Existência de um responsável pela operação de higienização comprovadamente capacitado.		X		
2.4.2 Frequência de higienização adequada.	X			
2.4.3 Existência de registro da higienização.		X		
2.4.4 Produtos de higienização regularizados pelo Ministério da Saúde.		X		
2.4.5 Disponibilidade dos produtos de higienização necessários à realização da operação.	X			
2.4.6 Diluição dos produtos de higienização, tempo de contato e modo de uso/aplicação obedecem às instruções recomendadas pelo fabricante.		X		
2.4.7 Produtos de higienização identificados e guardados em local adequado.	X			
2.4.8 Disponibilidade e adequação dos utensílios necessários à realização da operação. Em bom estado de conservação.	X			
2.4.9 Adequada higienização.		X		
3. MANIPULADORES				
3.1 VESTUÁRIO:				
3.1.1 Utilização de uniforme de trabalho de cor clara, adequado à atividade e exclusivo para área de produção.		X		USAM FARDA DA SECA
3.1.2 Limpos e em adequado estado de conservação.	X			
3.1.3 Asseio pessoal: boa apresentação, asseio corporal, mãos limpas, unhas curtas, sem esmalte, sem adornos (anéis, pulseiras, brincos, etc.); manipuladores barbeados, com os cabelos protegidos.	X			
3.2 HÁBITOS HIGIÊNICOS:				
3.2.1 Lavagem cuidadosa das mãos antes da manipulação de alimentos, principalmente após qualquer interrupção e depois do uso de sanitários.		X		VAI DE CADA UM
3.2.2 Manipuladores não espirram sobre os alimentos, não cospem, não tosem, não fumam, não manipulam dinheiro ou não praticam outros atos que possam contaminar o alimento.		X		
3.2.3 Cartazes de orientação aos manipuladores sobre a correta lavagem das mãos e demais hábitos de higiene, afixados em locais apropriados.		X		
3.3 ESTADO DE SAÚDE:				
3.3.1 Ausência de afecções cutâneas, feridas e supurações; ausência de sintomas e infecções respiratórias, gastrointestinais e oculares.	X			
3.4 PROGRAMA DE CONTROLE DE SAÚDE:				
3.4.1 Existência de supervisão periódica do estado de saúde dos manipuladores.	X			

3.4.2 Existência de registro dos exames realizados.	X			
3.5 EQUIPAMENTO DE PROTEÇÃO INDIVIDUAL:				
3.5.1 Utilização de Equipamento de Proteção Individual.	X			
3.6 PROGRAMA DE CAPACITAÇÃO DOS MANIPULADORES E SUPERVISÃO:				
3.6.1 Existência de programa de capacitação adequado e contínuo relacionado à higiene pessoal e à manipulação dos alimentos.		X		HA INSTRUÇÃO DE PR.1 E SER NO RESULT
3.6.2 Existência de registros dessas capacitações.				
3.6.3 Existência de supervisão da higiene pessoal e manipulação dos alimentos.	X			
3.6.4 Existência de supervisor comprovadamente capacitado.		X		
4. PRODUÇÃO E TRANSPORTE DO ALIMENTO				
4.1 MATÉRIA-PRIMA, INGREDIENTES E EMBALAGENS:				
4.1.1 Operações de recepção da matéria-prima, ingredientes e embalagens são realizadas em local protegido e isolado da área de processamento.		X		
4.1.2 Matérias - primas, ingredientes e embalagens inspecionados na recepção.	X			
4.1.3 Existência de planilhas de controle na recepção (temperatura e características sensoriais, condições de transporte e outros).	X			
4.1.4 Matérias-primas e ingredientes aguardando liberação e aqueles aprovados estão devidamente identificados.	X			
4.1.5 Matérias-primas, ingredientes e embalagens reprovados no controle efetuado na recepção são devolvidos imediatamente ou identificados e armazenados em local separado.	X			
4.1.6 Rótulos da matéria-prima e ingredientes atendem à legislação.	X			
4.1.7 Critérios estabelecidos para a seleção das matérias-primas são baseados na segurança do alimento.	X			
4.1.8 Armazenamento em local adequado e organizado; sobre estrados distantes do piso, ou sobre paletes, bem conservados e limpos, ou sobre outro sistema aprovado, afastados das paredes e distantes do teto de forma que permita apropriada higienização, iluminação e circulação de ar.	X			
4.1.9 Uso das matérias-primas, ingredientes e embalagens respeita a ordem de entrada dos mesmos, sendo observado o prazo de validade.		X	X	
4.1.10 Acondicionamento adequado das embalagens a serem utilizadas.			X	
4.1.11 Rede de frio adequada ao volume e aos diferentes tipos de matérias-primas e ingredientes.		X		
4.2 FLUXO DE PRODUÇÃO:				
4.2.1 Locais para pré - preparo ("área suja") isolados da área de preparo por barreira física ou técnica.			X	
4.2.2 Controle da circulação e acesso do pessoal.	X			
4.2.3 Conservação adequada de materiais destinados ao reprocessamento.			X	
4.2.4 Ordenado, linear e sem cruzamento.		X		
4.3 ROTULAGEM E ARMAZENAMENTO DO PRODUTO-FINAL:				
4.3.1 Dizeres de rotulagem com identificação visível e de acordo com a legislação vigente.			X	
4.3.2 Produto final acondicionado em embalagens adequadas e íntegras.			X	
4.3.3 Alimentos armazenados separados por tipo ou grupo, sobre estrados distantes do piso, ou sobre paletes, bem			X	

conservados e limpos ou sobre outro sistema aprovado, afastados das paredes e distantes do teto de forma a permitir adequada higienização, iluminação e circulação de ar.			X	
4.3.4 Ausência de material estranho, estragado ou tóxico.			X	
4.3.5 Armazenamento em local limpo e conservado			X	
4.3.6 Controle adequado e existência de planilha de registro de temperatura, para ambientes com controle térmico.			X	
4.3.7 Rede de frio adequada ao volume e aos diferentes tipos de alimentos.			X	
4.3.8 Produtos avariados, com prazo de validade vencido, devolvidos ou recolhidos do mercado devidamente identificados e armazenados em local separado e de forma organizada.		X		
4.3.9 Produtos finais aguardando resultado analítico ou em quarentena e aqueles aprovados devidamente identificados.		X		
4.4 CONTROLE DE QUALIDADE DO PRODUTO FINAL:				
4.4.1 Existência de controle de qualidade do produto final.		X		
4.4.2 Existência de programa de amostragem para análise laboratorial do produto final.		X		
4.4.3 Existência de laudo laboratorial atestando o controle de qualidade do produto final, assinado pelo técnico da empresa responsável pela análise ou expedido por empresa terceirizada.		X		
4.4.4 Existência de equipamentos e materiais necessários para análise do produto final realizadas no estabelecimento.	X			
4.5 TRANSPORTE DO PRODUTO FINAL:				
4.5.1 Produto transportado na temperatura especificada no rótulo.		X		
4.5.2 Veículo limpo, com cobertura para proteção de carga. Ausência de vetores e pragas urbanas ou qualquer evidência de sua presença como fezes, ninhos e outros.		X		
4.5.3 Transporte mantém a integridade do produto.		X		
4.5.4 Veículo não transporta outras cargas que comprometam a segurança do produto.		X		
4.5.5 Presença de equipamento para controle de temperatura quando se transporta alimentos que necessitam de condições especiais de conservação.		X		
B – AVALIAÇÃO:				
	S	N	NA	OBS
5. DOCUMENTAÇÃO				
5.1 MANUAL DE BOAS PRÁTICAS DE FABRICAÇÃO:				
5.1.1 Operações executadas no estabelecimento estão de acordo com o Manual de Boas Práticas de Fabricação.		X		
5.2 PROCEDIMENTOS OPERACIONAIS PADRONIZADOS:				
5.2.1 Higienização das instalações, equipamentos e utensílios:		X		
5.2.1.1 Existência de POP estabelecido para este item.		X		
5.2.1.2 POP descrito está sendo cumprido.		X		
5.2.2 Controle de potabilidade da água:				
5.2.2.1 Existência de POP estabelecido para controle de potabilidade da água.		X		
5.2.2.2 POP descrito está sendo cumprido.		X		
5.2.3 Higiene e saúde dos manipuladores:				
5.2.3.1 Existência de POP estabelecido para este item.		X		

5.2.3.2 POP descrito está sendo cumprido.		X		
5.2.4 Manejo dos resíduos:				
5.2.4.1 Existência de POP estabelecido para este item.		X		
5.2.4.2 O POP descrito está sendo cumprido.				
5.2.5 Manutenção preventiva e calibração de equipamentos:				
5.2.5.1 Existência de POP estabelecido para este item.				
5.2.5.2 O POP descrito está sendo cumprido.				
5.2.6 Controle integrado de vetores e pragas urbanas:				
5.2.6.1 Existência de POP estabelecido para este item.				
5.2.6.2 O POP descrito está sendo cumprido.				
5.2.7 Seleção das matérias-primas, ingredientes e embalagens:				
5.2.7.1 Existência de POP estabelecido para este item.				
5.2.7.2 O POP descrito está sendo cumprido.				
B - AVALIAÇÃO:	S	N	NA	OBS
5.2.8 Programa de recolhimento de alimentos:				
5.2.8.1 Existência de POP estabelecido para este item.				
5.2.8.2 O POP descrito está sendo cumprido.				

C - CONSIDERAÇÕES FINAIS

D - CLASSIFICAÇÃO DO ESTABELECIMENTO

Compete aos órgãos de vigilância sanitária estaduais e distrital, em articulação com o órgão competente no âmbito federal, a construção do panorama sanitário dos estabelecimentos industrializadores de amendoim processados e derivados, mediante sistematização dos dados obtidos nesse item. O panorama sanitário será utilizado como critério para definição e priorização das estratégias institucionais de intervenção.

() GRUPO 1 - 76 A 100% de atendimento dos itens

() GRUPO 2 - 51 A 75% de atendimento dos itens

☒ GRUPO 3 - 0 A 50% de atendimento dos itens

E - RESPONSÁVEIS PELA INSPEÇÃO

Local e data:

Nome e assinatura do responsável Matrícula:

Nome e assinatura do responsável Matrícula:

F - RESPONSÁVEL PELA EMPRESA

Local e data: 2º Depósito de Suprimentos 1/06/2017

Nome e assinatura do responsável pelo estabelecimento.

Erica Vidal de Almeida

ERICA VIDAL DE ALMEIDA
2º Ten Veterinária
IDT 020298847-3

Diogo Augusto Freitas Cordeiro dos Santos
Diogo Augusto Freitas Cordeiro dos Santos - 2º Ten Int
Idt 020073267-5

APPENDIX II

```
RELIABILITY
/VARIABLES=Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA
/STATISTICS=DESCRIPTIVE SCALE
/SUMMARY=TOTAL MEANS VARIANCE.
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Reliability

Notes		
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Comments		
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	Weight	<none>
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	N of Rows in Working Data File	115
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE /SUMMARY=TOTAL MEANS VARIANCE.
Resources	Processor Time	00:00:00,02
	Elapsed Time	00:00:00,04

[Conjunto_de_datos0]

Warnings
The determinant of the covariance matrix is zero or approximately zero. Statistics based on its inverse matrix cannot be computed and they are displayed as system missing values.

Scale: ALL VARIABLES

Case Processing Summary			
		N	%
Cases	Valid	115	100,0
	Excluded ^a	0	0,0
	Total	115	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,950	,951	28

Item Statistics			
	Mean	Std. Deviation	N
Q1	4,22	,564	115
Q2	4,18	,759	115
Q3	4,05	,815	115
Q4	3,99	,699	115
Q5	4,16	,652	115
Q6	3,94	,777	115
Q7	3,78	,679	115
Q8	3,88	,625	115
Q9	4,44	,544	115
Q10	3,33	1,073	115
Q11	4,32	,539	115
Q12	4,14	,789	115
Q13	4,13	,737	115
Q14	3,91	,908	115
Q15	3,85	,732	115
Q16	3,82	,759	115
Q17	3,74	,693	115
Q18	3,72	,750	115
Q19	3,44	1,005	115
Q20	3,06	1,106	115
Q21	3,45	,880	115
Q22	3,45	1,018	115
Q23	4,11	,708	115
Q24	3,80	,784	115
Q25	3,62	,951	115
Q26	3,62	,873	115
Q27	3,98	,801	115
Q28	3,59	,877	115

3,85 ,789

Summary Item Statistics							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3,846	3,059	4,435	1,376	1,450	,105	28
Item Variances	,644	,291	1,223	,932	4,205	,061	28

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1	103,47	202,657	,710		,948

Q2	103,52	197,467	,766	,947
Q3	103,65	199,660	,610	,948
Q4	103,71	204,448	,473	,949
Q5	103,53	204,728	,495	,949
Q6	103,75	197,855	,729	,947
Q7	103,92	202,315	,601	,948
Q8	103,81	200,488	,763	,947
Q9	103,26	210,646	,218	,951
Q10	104,36	191,258	,740	,947
Q11	103,38	208,523	,358	,950
Q12	103,55	195,250	,839	,946
Q13	103,56	203,415	,496	,949
Q14	103,79	197,312	,637	,948
Q15	103,85	197,631	,788	,946
Q16	103,87	197,828	,749	,947
Q17	103,95	199,283	,747	,947
Q18	103,98	207,547	,290	,951
Q19	104,26	199,646	,483	,950
Q20	104,64	196,234	,546	,949
Q21	104,25	200,236	,537	,949
Q22	104,25	193,879	,687	,947
Q23	103,59	201,864	,598	,948
Q24	103,89	200,310	,607	,948
Q25	104,07	193,090	,771	,946
Q26	104,07	193,209	,841	,946
Q27	103,72	197,276	,731	,947
Q28	104,11	197,905	,637	,948

Scale Statistics			
Mean	Varianc e	Std. Deviation	N of Items
107,69	214,382	14,642	28

SORT CASES BY Role.
SPLIT FILE SEPARATE BY
Role. RELIABILITY
/VARIABLES=Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA
/STATISTICS=DESCRIPTIVE SCALE
/SUMMARY=TOTAL MEANS VARIANCE.

Reliability

Notes		
Output Created		10-NOV-2017 11:41:45
Comments		
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	N of Rows in Working Data File	115
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE /SUMMARY=TOTAL MEANS VARIANCE.
Resources	Processor Time	00:00:00,05
	Elapsed Time	00:00:00,04

[Conjunto_de_dados0]

Warnings
For split file Role=management, the determinant of the covariance matrix is zero or approximately zero. Statistics based on its inverse matrix cannot be computed and they are displayed as system missing values.
For split file Role=Colaborator, the determinant of the covariance matrix is zero or approximately zero. Statistics based on its inverse matrix cannot be computed and they are displayed as system missing values.

Scale: ALL VARIABLES

Role = management

Case Processing Summary ^a			
		N	%
Cases	Valid	30	100,0
	Excluded ^b	0	0,0
	Total	30	100,0

- a. Role = management
b. Listwise deletion based on all variables in the procedure.

Reliability Statistics ^a		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,944	,943	28

a. Role = management

Item Statistics ^a			
	Mean	Std. Deviation	N
Q1	4,05	,605	30
Q2	4,05	,826	30
Q3	4,00	,858	30
Q4	3,95	,826	30
Q5	4,30	,571	30
Q6	3,85	,813	30
Q7	3,70	,801	30
Q8	3,80	,768	30
Q9	4,35	,489	30

Q10	3,15	1,268	30
Q11	4,20	,616	30
Q12	4,00	,858	30
Q13	3,90	,852	30
Q14	3,75	,910	30
Q15	3,65	,671	30
Q16	3,65	,813	30
Q17	3,60	,754	30
Q18	3,70	,801	30
Q19	3,70	1,031	30
Q20	3,10	1,119	30
Q21	3,70	,923	30
Q22	3,20	,894	30
Q23	4,00	,725	30
Q24	3,70	,801	30
Q25	3,40	1,142	30
Q26	3,35	,988	30
Q27	3,80	,834	30
Q28	3,35	,933	30

a. Role = management

Summary Item Statistics ^a							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3,748	3,100	4,350	1,250	1,403	,107	28
Item Variances	,732	,239	1,608	1,368	6,714	,091	28

a. Role = management

Item-Total Statistics ^a					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1	100,90	217,674	,644		,942
Q2	100,90	211,884	,706		,941
Q3	100,95	216,997	,466		,944
Q4	101,00	217,263	,476		,944
Q5	100,65	224,239	,290		,945
Q6	101,10	210,832	,764		,941
Q7	101,25	216,934	,506		,943
Q8	101,15	212,239	,746		,941
Q9	100,60	226,463	,192		,946
Q10	101,80	200,695	,758		,941
Q11	100,75	225,145	,217		,946
Q12	100,95	207,734	,851		,940
Q13	101,05	219,313	,376		,945
Q14	101,20	209,221	,739		,941
Q15	101,30	212,958	,823		,941
Q16	101,30	209,800	,810		,940
Q17	101,35	212,134	,766		,941
Q18	101,25	225,039	,160		,947
Q19	101,25	214,197	,473		,944
Q20	101,85	210,555	,545		,943
Q21	101,25	213,566	,560		,943
Q22	101,75	210,303	,710		,941
Q23	100,95	218,471	,491		,943
Q24	101,25	215,776	,557		,943
Q25	101,55	202,155	,802		,940
Q26	101,60	202,568	,924		,938
Q27	101,15	211,503	,715		,941
Q28	101,60	212,463	,595		,942

a. Role = management

Scale Statistics ^a			
Mean	Variance	Std. Deviation	N of Items
104,95	229,524	15,150	28

a. Role = management

Role = Colaborator

Case Processing Summary ^a			
		N	%
Cases	Valid	85	100,0
	Excluded ^b	0	0,0
	Total	85	100,0

a. Role = Colaborator

b. Listwise deletion based on all variables in the procedure.

Reliability Statistics ^a		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,952	,953	28

a. Role = Colaborator

Item Statistics ^a			
	Mean	Std. Deviation	N
Q1	4,28	,545	85
Q2	4,22	,739	85
Q3	4,06	,808	85
Q4	4,00	,661	85
Q5	4,12	,673	85
Q6	3,97	,770	85
Q7	3,80	,642	85
Q8	3,91	,579	85
Q9	4,46	,561	85
Q10	3,38	1,011	85
Q11	4,35	,513	85
Q12	4,18	,768	85
Q13	4,20	,689	85
Q14	3,95	,909	85
Q15	3,91	,744	85
Q16	3,88	,740	85
Q17	3,78	,673	85
Q18	3,72	,740	85
Q19	3,35	,991	85
Q20	3,05	1,110	85
Q21	3,37	,858	85
Q22	3,52	1,047	85
Q23	4,14	,704	85
Q24	3,83	,782	85
Q25	3,69	,883	85
Q26	3,71	,824	85
Q27	4,03	,790	85
Q28	3,66	,853	85

a. Role = Colaborator

Summary Item Statistics ^a							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3,876	3,046	4,462	1,415	1,465	,111	28

Item Variances	,617	,263	1,232	,969	4,677	,059	28
----------------	------	------	-------	------	-------	------	----

a. Role = Colaborator

Item-Total Statistics ^a					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1	104,26	198,665	,729		,950
Q2	104,32	193,472	,785		,949
Q3	104,48	194,660	,659		,950
Q4	104,54	200,846	,473		,951
Q5	104,42	198,747	,577		,951
Q6	104,57	194,218	,715		,949
Q7	104,74	198,227	,637		,950
Q8	104,63	197,237	,774		,949
Q9	104,08	206,353	,216		,953
Q10	105,15	188,757	,734		,949
Q11	104,18	204,028	,400		,952
Q12	104,35	191,826	,834		,948
Q13	104,34	199,290	,534		,951
Q14	104,58	194,122	,601		,950
Q15	104,63	193,518	,777		,949
Q16	104,66	194,665	,724		,949
Q17	104,75	195,813	,738		,949
Q18	104,82	202,559	,335		,953
Q19	105,18	194,747	,522		,952
Q20	105,49	191,879	,554		,952
Q21	105,17	195,737	,570		,951
Q22	105,02	189,484	,679		,950
Q23	104,40	197,244	,628		,950
Q24	104,71	195,991	,619		,950
Q25	104,85	190,820	,761		,949
Q26	104,83	190,955	,814		,948
Q27	104,51	193,441	,732		,949
Q28	104,88	194,110	,645		,950

a. Role = Colaborator

Scale Statistics ^a			
Mean	Variance	Std. Deviation	N of Items
108,54	210,159	14,497	28

a. Role = Colaborator

RELIABILITY
/VARIABLES=Q1 Q2 Q3 Q4 Q5 Q6
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA
/STATISTICS=DESCRIPTIVE SCALE
/SUMMARY=TOTAL MEANS VARIANCE.

Reliability

Notes		
Output Created		10-NOV-2017 11:46:09
Comments		
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	N of Rows in Working Data File	115
Missing Value Handling	Matrix Input	
	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=Q1 Q2 Q3 Q4 Q5 Q6 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE /SUMMARY=TOTAL MEANS VARIANCE.
Resources	Processor Time	00:00:00,03
	Elapsed Time	00:00:00,04

[Conjunto_de_datos0]

Scale: ALL VARIABLES

Role = management

Case Processing Summary ^a			
		N	%
Cases	Valid	30	100,0
	Excluded ^b	0	0,0
	Total	30	100,0

a. Role = management

b. Listwise deletion based on all variables in the procedure.

Reliability Statistics ^a		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,850	,849	6

a. Role = management

Item Statistics ^a			
	Mean	Std. Deviation	N
Q1	4,05	,605	30
Q2	4,05	,826	30
Q3	4,00	,858	30
Q4	3,95	,826	30
Q5	4,30	,571	30
Q6	3,85	,813	30

a. Role = management

Summary Item Statistics ^a							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items

Item Means	4,033	3,850	4,300	,450	1,117	,023	6
Item Variances	,575	,326	,737	,411	2,258	,032	6

a. Role = management

Item-Total Statistics ^a					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1	20,15	8,661	,794	,771	,804
Q2	20,15	7,397	,840	,852	,782
Q3	20,20	8,063	,626	,772	,829
Q4	20,25	7,987	,682	,747	,816
Q5	19,90	10,411	,303	,301	,875
Q6	20,35	8,345	,606	,822	,832

a. Role = management

Scale Statistics ^a			
Mean	Variance	Std. Deviation	N of Items
24,20	11,853	3,443	6

a. Role = management

Role = Colaborator

Case Processing Summary ^a			
		N	%
Cases	Valid	85	100,0
	Excluded ^b	0	0,0
	Total	85	100,0

a. Role = Colaborator

b. Listwise deletion based on all variables in the procedure.

Reliability Statistics ^a		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,884	,889	6

a. Role = Colaborator

Item Statistics ^a			
	Mean	Std. Deviation	N
Q1	4,28	,545	85
Q2	4,22	,739	85
Q3	4,06	,808	85
Q4	4,00	,661	85
Q5	4,12	,673	85
Q6	3,97	,770	85

a. Role = Colaborator

Summary Item Statistics ^a							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	4,108	3,969	4,277	,308	1,078	,015	6
Item Variances	,497	,297	,652	,355	2,196	,016	6

a. Role = Colaborator

Item-Total Statistics ^a					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1	20,37	8,580	,767	,689	,859
Q2	20,43	7,687	,754	,804	,854
Q3	20,58	7,497	,718	,720	,862
Q4	20,65	8,420	,643	,654	,873
Q5	20,52	8,347	,649	,576	,872
Q6	20,68	7,753	,695	,506	,865

a. Role = Colaborator

Scale Statistics ^a			
Mean	Variance	Std. Deviation	N of Items
24,69	11,326	3,369	6

a. Role = Colaborator

```
RELIABILITY
/VARIABLES=Q7 Q8 Q9 Q10 Q11
/SCALE('ALL VARIABLES') ALL
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/STATISTICS=DESCRIPTIVE SCALE
/SUMMARY=TOTAL MEANS VARIANCE.
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Reliability

Notes		
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	Split File	Role
	N of Rows in Working Data File	115
Missing Value Handling	Matrix Input	
	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=Q7 Q8 Q9 Q10 Q11 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE /SUMMARY=TOTAL MEANS VARIANCE.
Resources	Processor Time	00:00:00,05
	Elapsed Time	00:00:00,05

Scale: ALL VARIABLES

Role = management

Case Processing Summary ^a		
Cases	Valid	N
	Excluded ^b	%
	Total	

- a. Role = management
- b. Listwise deletion based on all variables in the procedure.

Reliability Statistics ^a		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.651	.684	5

a. Role = management

Item Statistics ^a			
	Mean	Std. Deviation	N
Q7	3,70	,801	30
Q8	3,80	,768	30
Q9	4,35	,489	30
Q10	3,15	1,268	30
Q11	4,20	,616	30

a. Role = management

Summary Item Statistics ^a							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3,840	3,150	4,350	1,200	1,381	,222	5
Item Variances	,692	,239	1,608	1,368	6,714	,289	5

a. Role = management

Item-Total Statistics ^a					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q7	15,50	4,579	,583	,404	,513
Q8	15,40	4,358	,709	,734	,456
Q9	14,85	6,239	,304	,750	,646
Q10	16,05	3,629	,411	,631	,654
Q11	15,00	6,316	,170	,723	,683

a. Role = management

Scale Statistics ^a			
Mean	Variance	Std. Deviation	N of Items
19,20	7,221	2,687	5

a. Role = management

Role = Colaborator

Case Processing Summary ^a		
Cases	Valid	N
	Excluded ^b	%
	Total	

- a. Role = Colaborator
- b. Listwise deletion based on all variables in the procedure.

Reliability Statistics ^a		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.713	.734	5

a. Role = Colaborator

Item Statistics ^a			
	Mean	Std. Deviation	N
Q7	3,80	,642	85
Q8	3,91	,579	85
Q9	4,46	,561	85
Q10	3,38	1,011	85
Q11	4,35	,513	85

a. Role = Colaborator

Summary Item Statistics ^a							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3,982	3,385	4,462	1,077	1,318	,191	5
Item Variances	,470	,263	1,022	,758	3,878	,098	5

a. Role = Colaborator

Item-Total Statistics ^a					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q7	16,11	3,441	,674	,734	,584
Q8	16,00	3,406	,804	,790	,546
Q9	15,45	4,532	,257	,337	,735
Q10	16,52	2,816	,478	,490	,705
Q11	15,55	4,532	,304	,312	,720

a. Role = Colaborator

Scale Statistics ^a			
Mean	Variance	Std. Deviation	N of Items
19,91	5,460	2,337	5

a. Role = Colaborator

```
RELIABILITY
/VARIABLES=Q12 Q13 Q14 Q15 Q16 Q17
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA
/STATISTICS=DESCRIPTIVE SCALE
/SUMMARY=TOTAL MEANS VARIANCE.
```

Reliability

Notes		
Output Created		10-NOV-2017 11:47:46
Comments		
Input	Active Dataset	Conjunto_de_datos0
	Filter	<none>
	Weight	<none>
	Split File	Role
	N of Rows in Working Data File	115
Missing Value Handling	Matrix Input	
	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=Q12 Q13 Q14 Q15 Q16 Q17 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE /SUMMARY=TOTAL MEANS VARIANCE.
Resources	Processor Time	00:00:00,05
	Elapsed Time	00:00:00,04

[Conjunto_de_datos0]

Scale: ALL VARIABLES

Role = management

Case Processing Summary ^a		N	%
Cases	Valid	30	100,0
	Excluded ^b	0	0,0
	Total	30	100,0

- a. Role = management
- b. Listwise deletion based on all variables in the procedure.

Reliability Statistics ^a		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,873	,878	6

a. Role = management

Item Statistics ^a			
	Mean	Std. Deviation	N
Q12	4,00	,858	30
Q13	3,90	,852	30
Q14	3,75	,910	30
Q15	3,65	,671	30
Q16	3,65	,813	30
Q17	3,60	,754	30

a. Role = management

Summary Item Statistics ^a							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3,758	3,600	4,000	,400	1,111	,025	6
Item Variances	,662	,450	,829	,379	1,842	,018	6

a. Role = management

Item-Total Statistics ^a					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q12	18,55	10,050	,696	,684	,848
Q13	18,65	11,503	,406	,558	,897
Q14	18,80	9,326	,795	,659	,829
Q15	18,90	10,726	,774	,797	,840
Q16	18,90	10,305	,692	,775	,848
Q17	18,95	10,366	,750	,714	,840

a. Role = management

Scale Statistics ^a			
Mean	Variance	Std. Deviation	N of Items
22,55	14,576	3,818	6

a. Role = management

Role = Colaborator

Case Processing Summary ^a		N	%
Cases	Valid	85	100,0
	Excluded ^b	0	0,0
	Total	85	100,0

- a. Role = Colaborator
- b. Listwise deletion based on all variables in the procedure.

Reliability Statistics ^a		
	Cronbach's Alpha	N of Items
	,853	6

a. Role = Colaborator

Item Statistics ^a			
	Mean	Std. Deviation	N
Q12	4,18	,768	85
Q13	4,20	,689	85
Q14	3,95	,909	85
Q15	3,91	,744	85
Q16	3,88	,740	85
Q17	3,78	,673	85

a. Role = Colaborator

Summary Item Statistics ^a							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3,985	3,785	4,200	,415	1,110	,029	6
Item Variances	,574	,453	,826	,373	1,824	,018	6

a. Role = Colaborator

Item-Total Statistics ^a					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q12	19,72	8,078	,739	,691	,808
Q13	19,71	9,429	,471	,464	,856
Q14	19,95	8,013	,594	,526	,841
Q15	20,00	8,000	,794	,734	,798
Q16	20,03	8,655	,619	,560	,831
Q17	20,12	8,860	,645	,585	,828

a. Role = Colaborator

Scale Statistics ^a			
Mean	Variance	Std. Deviation	N of Items
23,91	11,898	3,449	6

a. Role = Colaborator

RELIABILITY
/VARIABLES=Q18 Q19 Q20 Q21 Q22 Q23
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA
/STATISTICS=DESCRIPTIVE SCALE
/SUMMARY=TOTAL MEANS VARIANCE.

Reliability

Notes		
Output Created		10-NOV-2017 11:48:36
Comments		
Input	Active Dataset	Conjunto_de_datos0
	Filter	<none>
	Weight	<none>
	Split File	Role
	N of Rows in Working Data File	115
Missing Value Handling	Matrix Input	
	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=Q18 Q19 Q20 Q21 Q22 Q23 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE /SUMMARY=TOTAL MEANS VARIANCE.
Resources	Processor Time	00:00:00,05
	Elapsed Time	00:00:00,05

[Conjunto_de_datos0]
Scale: ALL VARIABLES

Role = management

Case Processing Summary ^a			
		N	%
Cases	Valid	30	100,0
	Excluded ^b	0	0,0
	Total	30	100,0

a. Role = management

b. Listwise deletion based on all variables in the procedure.

Reliability Statistics ^a		
	Cronbach's Alpha	N of Items
	,789	6

a. Role = management

Item Statistics ^a			
	Mean	Std. Deviation	N
Q18	3,70	,801	30
Q19	3,70	1,031	30
Q20	3,10	1,119	30
Q21	3,70	,923	30
Q22	3,20	,894	30
Q23	4,00	,725	30

a. Role = management

Summary Item Statistics ^a							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3,567	3,100	4,000	,900	1,290	,119	6
Item Variances	,856	,526	1,253	,726	2,380	,072	6

a. Role = management

Item-Total Statistics ^a					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q18	17,70	12,432	,339	,388	,798
Q19	17,70	9,379	,720	,742	,707
Q20	18,30	9,168	,674	,580	,720
Q21	17,70	9,484	,818	,825	,685
Q22	18,20	9,958	,750	,757	,706
Q23	17,40	14,674	-,038	,503	,857

a. Role = management

Scale Statistics ^a			
Mean	Variance	Std. Deviation	N of Items
21,40	14,989	3,872	6

a. Role = management

Role = Colaborator

Case Processing Summary ^a			
		N	%
Cases	Valid	85	100,0
	Excluded ^b	0	0,0
	Total	85	100,0

a. Role = Colaborator

b. Listwise deletion based on all variables in the procedure.

Reliability Statistics ^a		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,800	,793	6

a. Role = Colaborator

Item Statistics ^a			
	Mean	Std. Deviation	N
Q18	3,72	,740	85
Q19	3,35	,991	85
Q20	3,05	1,110	85
Q21	3,37	,858	85
Q22	3,52	1,047	85
Q23	4,14	,704	85

a. Role = Colaborator

Summary Item Statistics ^a							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3,526	3,046	4,138	1,092	1,359	,140	6
Item Variances	,849	,496	1,232	,736	2,484	,091	6

a. Role = Colaborator

Item-Total Statistics ^a					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q18	17,43	12,249	,481	,345	,786
Q19	17,80	9,694	,747	,658	,720
Q20	18,11	9,285	,705	,634	,730
Q21	17,78	11,140	,595	,416	,761
Q22	17,63	10,643	,519	,499	,781
Q23	17,02	13,234	,304	,352	,816

a. Role = Colaborator

Scale Statistics ^a			
Mean	Variance	Std. Deviation	N of Items
21,15	15,288	3,910	6

a. Role = Colaborator

RELIABILITY
/VARIABLES=Q24 Q25 Q26 Q27 Q28
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA
/STATISTICS=DESCRIPTIVE SCALE
/SUMMARY=TOTAL MEANS VARIANCE.

Reliability

Notes		
Output Created		10-NOV-2017 11:49:02
Comments		
Input	Active Dataset	Conjunto_de_dados0
	Filter	<none>
	Weight	<none>
	Split File	Role
	N of Rows in Working Data File	115
Missing Value Handling	Matrix Input	
	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=Q24 Q25 Q26 Q27 Q28 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE /SUMMARY=TOTAL MEANS VARIANCE.
Resources	Processor Time Elapsed Time	00:00:00,03 00:00:00,04

[Conjunto_de_datos0]

Scale: ALL VARIABLES

Role = management

Case Processing Summary ^a			
		N	%
Cases	Valid	30	100,0
	Excluded ^b	0	0,0
	Total	30	100,0

- a. Role = management
b. Listwise deletion based on all variables in the procedure.

Reliability Statistics ^a		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,862	,866	5

a. Role = management

Item Statistics ^a			
	Mean	Std. Deviation	N
Q24	3,70	,801	30
Q25	3,40	1,142	30
Q26	3,35	,988	30
Q27	3,80	,834	30
Q28	3,35	,933	30

a. Role = management

Summary Item Statistics ^a							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3,520	3,350	3,800	,450	1,134	,046	5
Item Variances	,898	,642	1,305	,663	2,033	,070	5

a. Role = management

Item-Total Statistics ^a					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q24	13,90	10,411	,660	,488	,841
Q25	14,20	8,484	,702	,586	,833
Q26	14,25	8,618	,839	,744	,790
Q27	13,80	9,958	,724	,589	,825
Q28	14,25	10,408	,529	,303	,870

a. Role = management

Scale Statistics ^a			
Mean	Variance	Std. Deviation	N of Items
17,60	14,463	3,803	5

a. Role = management

Role = Colaborator

Case Processing Summary ^a			
		N	%
Cases	Valid	85	100,0
	Excluded ^b	0	0,0
	Total	85	100,0

- a. Role = Colaborator
b. Listwise deletion based on all variables in the procedure.

Reliability Statistics ^a		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,909	,910	5

a. Role = Colaborator

Item Statistics ^a			
	Mean	Std. Deviation	N
Q24	3,83	,762	85
Q25	3,69	,883	85
Q26	3,71	,824	85
Q27	4,03	,790	85
Q28	3,66	,853	85

a. Role = Colaborator

Summary Item Statistics ^a							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3,785	3,662	4,031	,369	1,101	,023	5
Item Variances	,684	,612	,779	,167	1,274	,005	5

a. Role = Colaborator

Item-Total Statistics ^a					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q24	15,09	8,523	,746	,618	,894
Q25	15,23	7,774	,810	,679	,880
Q26	15,22	7,859	,867	,758	,868
Q27	14,89	8,410	,765	,644	,890
Q28	15,26	8,477	,672	,515	,910

a. Role = Colaborator

Scale Statistics ^a			
Mean	Varianc e	Std. Deviation	N of Items
18,92	12,541	3,541	5

a. Role = Colaborator

DESCRIPTIVES VARIABLES=Total
/STATISTICS=MEAN STDDEV MIN MAX.

Descriptives

Notes		
Output Created		10-NOV-2017 11:52:59
Comments		
Input	Active Dataset	Conjunto_de_datos0
	Filter	<none>
	Weight	<none>
	Split File	
	N of Rows in Working Data File	115
Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	All non-missing data are used.
Syntax		DESCRIPTIVES VARIABLES=Total /STATISTICS=MEAN STDDEV MIN MAX.
Resources	Processor Time	00:00:00,00
	Elapsed Time	00:00:00,02

[Conjunto_de_datos0]

Role = management

Descriptive Statistics ^a					
	N	Minimum	Maximum	Mean	Std. Deviation
Total	30	81	139	107,85	14,511
Valid N (listwise)	30				

a. Role = management

Role = Colaborator

Descriptive Statistics ^a					
	N	Minimum	Maximum	Mean	Std. Deviation
Total	85	83	140	107,65	14,794
Valid N (listwise)	85				

a. Role = Colaborator

FACTOR
/VARIABLES Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28
/MISSING LISTWISE
/ANALYSIS Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28
/PRINT INITIAL KMO EXTRACTION ROTATION
/FORMAT SORT
/PLOT ROTATION
/CRITERIA FACTORS(5) ITERATE(25)
/EXTRACTION PC
/CRITERIA ITERATE(25)
/ROTATION VARIMAX
/METHOD=CORRELATION.

Factor Analysis

Notes		
Output Created		10-NOV-2017 12:35:03
Comments		
Input	Active Dataset	Conjunto_de_datos0
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	115
Missing Value Handling	Definition of Missing	MISSING=EXCLUDE: User-defined missing values are treated as missing.
	Cases Used	LISTWISE: Statistics are based on cases with no missing values for any variable used.
Syntax		FACTOR /VARIABLES Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 /MISSING LISTWISE /ANALYSIS Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 /PRINT INITIAL KMO EXTRACTION ROTATION /FORMAT SORT /PLOT ROTATION /CRITERIA FACTORS(5) ITERATE(25) /EXTRACTION PC /CRITERIA ITERATE(25) /ROTATION VARIMAX /METHOD=CORRELATION.
	Initial	VARIMAX
Q1	1,000	/METHOD=CORRELATION.
Q2	1,000	,821
Q3	1,000	,804
Q4	1,000	,742
Q5	1,000	,655
Q6	1,000	,776
Resources	Processor Time	00:00:00,16
Q7	1,000	,881
Q8	1,000	,911
	Maximum Memory Required	92384 (90,219K) bytes

[Conjunto_de_datos0]

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,569
Bartlett's Test of Sphericity	Approx. Chi-Square	3917,451
	df	378
	Sig.	0,000

Communalities		
Q9	1,000	,772
Q10	1,000	,740
Q11	1,000	,698
Q12	1,000	,890
Q13	1,000	,792
Q14	1,000	,593
Q15	1,000	,726
Q16	1,000	,676
Q17	1,000	,672
Q18	1,000	,741
Q19	1,000	,842
Q20	1,000	,758
Q21	1,000	,852
Q22	1,000	,670
Q23	1,000	,830
Q24	1,000	,677
Q25	1,000	,923
Q26	1,000	,876
Q27	1,000	,679
Q28	1,000	,739

Extraction Method: Principal Component Analysis.

Total Variance Explained										
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings			
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
1	12,767	45,595	45,595	12,767	45,595	45,595	6,034	21,549	21,549	
2	3,198	11,421	57,016	3,198	11,421	57,016	5,533	19,761	41,309	
3	2,190	7,820	64,836	2,190	7,820	64,836	3,726	13,306	54,615	
4	1,870	6,677	71,513	1,870	6,677	71,513	3,148	11,242	65,856	
5	1,501	5,362	76,875	1,501	5,362	76,875	3,085	11,018	76,875	
6	1,177	4,205	81,080							
7	1,121	4,003	85,082							
8	,794	2,836	87,918							
9	,646	2,308	90,226							
10	,479	1,711	91,937							
11	,456	1,629	93,566							
12	,373	1,333	94,899							
13	,283	1,012	95,912							
14	,232	,828	96,740							
15	,204	,729	97,469							
16	,171	,611	98,079							
17	,156	,558	98,638							
18	,107	,382	99,019							
19	,081	,291	99,310							
20	,070	,248	99,558							
21	,046	,166	99,724							
22	,035	,126	99,850							
23	,017	,060	99,911							
24	,012	,044	99,955							
25	,009	,032	99,987							
26	,002	,008	99,995							
27	,001	,003	99,998							
28	,001	,002	100,000							

Extraction Method: Principal Component Analysis.

Component Matrix ^a						
	Component					
	1	2	3	4	5	
Q28	,891	-,128	-,094	-,220	-,100	
Q12	,887	-,246	-,112	,002	-,175	
Q2	,835	-,340	,048	,012	-,075	
Q15	,828	-,124	,046	,095	-,119	
Q8	,819	-,123	,050	-,384	,275	
Q10	,801	-,234	-,149	-,122	,082	
Q25	,800	,092	-,336	-,401	,018	
Q16	,782	-,015	-,104	-,233	,037	
Q1	,779	-,266	,451	,027	-,127	
Q6	,776	-,113	,141	-,105	,360	
Q27	,771	-,014	,002	-,063	-,285	
Q17	,765	,222	,147	-,123	,025	
Q22	,707	,093	-,156	,141	-,341	
Q24	,680	-,360	-,261	-,130	-,001	
Q23	,675	-,357	,408	,282	,027	
Q3	,661	-,311	-,058	,509	-,089	
Q14	,653	,180	,153	,266	-,201	
Q7	,644	,055	,119	-,359	,454	
Q28	,644	-,196	-,405	,071	-,342	
Q20	,523	,519	-,397	,097	,221	
Q4	,519	-,173	,320	,513	,279	
Q5	,515	,090	,324	,356	,387	
Q18	,243	,765	,103	,159	,245	
Q13	,483	,644	,203	-,213	-,240	
Q19	,440	,619	-,278	,434	-,009	
Q9	,212	,607	,518	-,301	,023	
Q11	,357	,465	,454	-,022	-,384	
Q21	,524	,258	-,582	,272	-,313	

Extraction Method: Principal Component Analysis.
a. 5 components extracted.

Rotated Component Matrix ^a						
	Component					
	1	2	3	4	5	
Q8	,886	,236	,224	,050	,134	
Q7	,807	-,042	,220	,145	,213	
Q25	,759	,473	-,131	,302	,120	
Q6	,717	,163	,457	,126	,100	
Q26	,673	,614	,164	,085	,114	
Q10	,660	,473	,245	,121	-,078	
Q16	,655	,431	,124	,172	,134	
Q24	,582	,512	,137	,045	-,237	
Q17	,514	,342	,258	,214	,424	
Q12	,521	,723	,300	,079	-,013	
Q22	,194	,712	,159	,266	,171	
Q28	,197	,711	-,067	,425	,100	
Q27	,393	,657	,181	,071	,235	
Q15	,421	,599	,407	,105	,119	
Q2	,533	,596	,424	-,046	-,022	
Q14	,109	,501	,404	,227	,340	
Q4	,138	,121	,832	,129	-,011	
Q23	,291	,376	,758	-,162	,058	
Q5	,234	-,027	,703	,266	,185	
Q3	,114	,594	,604	,167	-,211	
Q1	,426	,487	,589	-,247	,265	
Q21	,290	,222	,112	,818	-,192	
Q19	-,088	,292	,153	,809	,265	
Q20	,299	,173	,006	,783	,163	
Q18	,022	-,170	,146	,620	,553	
Q9	,188	-,169	,026	,041	,840	
Q13	,199	,270	-,068	,255	,781	
Q11	-,047	,295	,134	-,003	,769	

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser
Normalization.
a. Rotation converged in 8 iterations.

GRAPH
 /SCATTERPLOT(BIVAR)=VAR00002 WITH VAR00003
 /MISSING=LISTWISE.

Graph

Notes

Output Created	16-MAY-2016 17:10:06	
Comments		
Input	Active Dataset	Conjunto_de_dados0
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	48
Syntax	GRAPH /SCATTERPLOT(BIVAR) =VAR00002 WITH VAR00003 /MISSING=LISTWISE.	
Resources	Processor Time	00:00:00,75
	Elapsed Time	00:00:04,58

[Conjunto_de_dados0]

COMPUTE PRED_=c * g ** VAR00002.
 NLR VAR00003
 /OUTFILE='C:\Users\TEMP\AppData\Local\Temp\spss2692\SPSSFNLR.TMP'
 /PRED PRED_
 /SAVE PRED RESID DERIVATIVES
 /CRITERIA SS CONVERGENCE 1E-8 PCON 1E-8.

Nonlinear Regression Analysis

Notes

Output Created	16-MAY-2016 17:20:44	
Comments		
Input	Active Dataset	Conjunto_de_dados0
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	48
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any variable used. Predicted values are

Syntax	<p>calculated for cases with missing values on the dependent variable.</p> <pre> MODEL PROGRAM c=0. 5 g=1.5. COMPUTE PRED_=c * g ** VAR00002. NLR VAR00003 /OUTFILE='C:\Users\TEMP\AppData\Local\Temp\spss2692\SPSS FNLR.TMP' /PRED PRED_ /SAVE PRED RESID DERIVATIVES /CRITERIA SSCONVERGENCE 1E-8 PCON 1E-8. </pre>	
Resources	Processor Time	00:00:00,00
	Elapsed Time	00:00:00,09
Variables Created or Modified	PRED_	Predicted Values
	RESID	Residuals
	D.c	d(Pred)/d(c)
	D.g	d(Pred)/d(g)
Files Saved	Parameter Estimates File	C:\Users\TEMP\AppData\Local\Temp\spss2692\SPSS FNLR.TMP

[Conjunto_de_datos0]

Iteration History^b

Iteration Number ^a	Residual Sum of Squares	Parameter	
		c	g
1.0	1,606E+16	,500	1,500
1.1	94197518,82	3,966E-005	1,500
2.0	94197518,82	3,966E-005	1,500
2.1	11877351,15	3,964E-005	1,469
3.0	11877351,15	3,964E-005	1,469
3.1	525095,705	8,171E-005	1,406
4.0	525095,705	8,171E-005	1,406
4.1	153525,472	,000	1,281
5.0	153525,472	,000	1,281
5.1	196319,671	,004	1,156
5.2	142833,702	,003	1,228
6.0	142833,702	,003	1,228
6.1	77933,765	,019	1,201
7.0	77933,765	,019	1,201
7.1	57064,719	,061	1,175
8.0	57064,719	,061	1,175
8.1	44770,188	,173	1,150
9.0	44770,188	,173	1,150

9.1	31156,106	,438	1,129
10.0	31156,106	,438	1,129
10.1	11037,874	,830	1,120
11.0	11037,874	,830	1,120
11.1	7176,253	1,042	1,118
12.0	7176,253	1,042	1,118
12.1	7126,789	1,035	1,118
13.0	7126,789	1,035	1,118
13.1	7126,775	1,038	1,118
14.0	7126,775	1,038	1,118
14.1	7126,775	1,038	1,118
15.0	7126,775	1,038	1,118
15.1	7126,775	1,038	1,118

Derivatives are calculated numerically.

a. Major iteration number is displayed to the left of the decimal, and minor iteration number is to the right of the decimal.

b. Parameter Estimates

Parameter	Estimate	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
c	1,038	,286	,461	1,615
g	1,118	,007	1,104	1,133

Correlations of Parameter Estimates

	c	g
c	1,000	-,995
g	-,995	1,000

ANOVA^a

Source	Sum of Squares	df	Mean Squares
Regression	195176,225	2	97588,112
Residual	7126,775	45	158,373
Uncorrected Total	202303,000	47	
Corrected Total	132213,106	46	

Dependent variable: VAR00003

a. R squared = 1 - (Residual Sum of Squares) / (Corrected Sum of Squares) = ,946.

GRAPH (OVERLAY)=VAR00001
 /SCATTERPLOT(OVERLAY)=VAR00001 VAR00000 WITH VAR00003 PRED_ (PAIR)
 /MISSING=LISTWISE.

Graph

Notes

Output Created		16-MAY-2016 17:32:54
Comments		
Input	Active Dataset	Conjunto_de_dados0
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	48
Syntax		GRAPH /SCATTERPLOT VAR00003 PRED_ (PAIR) /MISSING=LISTWISE.
Resources	Processor Time	00:00:00,12
	Elapsed Time	00:00:00,13

[Conjunto_de_dados0]