



**Elasticity and prices transmission of Nile tilapia and black pacu on the Penedo and Porto Real do Colégio street markets, Alagoas - Brazil**

**Elasticidade e transmissão de preços da tilápia do nilo e do tambaqui nas feiras livres de Penedo e Porto Real do Colégio, Alagoas - Brasil**

Daniel de Magalhães Araujo<sup>1</sup>

André Maia Gomes Lages<sup>2</sup>

José Crisólogo de Sales Silva<sup>3</sup>

Alyson do Nascimento Cardoso<sup>4</sup>

Fernanda Gomes Lemos<sup>5</sup>

Elíne Monteiro Calazans<sup>6</sup>

**Abstract**

Fish farming is an important economic activity in the Lower São Francisco River (BRSF), mainly for family farmers. The fish produced in the BRSF in Alagoas are sold mainly in municipal free markets, which are their main marketing channel. Thus, the purpose of this work was to analyze the process of commercialization and prices formation of the two main species of Brazilian fish farming (Nile tilapia and black pacu) in two municipalities in Alagoas

<sup>1</sup> Doctor of Zootechny by Universidade Estadual Paulista (UNESP), R. da Matança, 176, Poeira, Mal. Deodoro - AL, CEP: 57160-000. E-mail: [daniel.araujo@ifal.edu.br](mailto:daniel.araujo@ifal.edu.br) Orcid: <http://orcid.org/0000-0003-0700-9836>

<sup>2</sup> Doctor of Economics of Industry and Technology by Universidade Federal do Rio de Janeiro (UFRRJ), Av. Lourival Melo Mota, s/n, Tabuleiro do Martins, Maceió - AL. E-mail: [amglages@feac.ufal.br](mailto:amglages@feac.ufal.br) Orcid: <https://orcid.org/0000-0002-7447-9734>

<sup>3</sup> PhD in Chemistry and Biotechnology by Universidade Federal de Alagoas (UFAL), Universidade Estadual de Alagoas (UNEAL), Rua Governador Luiz Cavalcante, Alto do Cruzeiro, Arapiraca - AL, CEP: 57312-270. E-mail: [jose.crisologo@uneal.edu.br](mailto:jose.crisologo@uneal.edu.br) Orcid: <https://orcid.org/0000-0001-8687-0952>

<sup>4</sup> Graduated in Biological Sciences from Universidade Federal de Alagoas (UFAL), Av. Lourival Melo Mota, s/n, Tabuleiro do Martins, Maceió - AL. E-mail: [alysonloucoporti@hotmail.com](mailto:alysonloucoporti@hotmail.com) Orcid: <https://orcid.org/0009-0006-7857-9296>

<sup>5</sup> Master in Environmental Technologies by Instituto Federal de Alagoas (IFAL), R. da Matança, 176, Poeira, Mal. Deodoro - AL, CEP: 57160-000. E-mail: [ferrnandagomes@hotmail.com](mailto:ferrnandagomes@hotmail.com) Orcid: <https://orcid.org/0000-0001-8688-3913>

<sup>6</sup> Master in Environmental Technologies by Instituto Federal de Alagoas (IFAL), R. da Matança, 176, Poeira, Mal. Deodoro - AL, CEP: 57160-000. E-mail: [elinecalazans15@hotmail.com](mailto:elinecalazans15@hotmail.com) Orcid: <https://orcid.org/0009-0009-1215-5337>

- Brazil: Penedo (PEN) and Porto Real do Colégio (PRC). For that, a semi-structured questionnaire was used to interview vendors of the studied species in street markets in order to obtain primary data. The data obtained were analyzed using descriptive statistics, as well as a traditional method of econometric analysis to understand the composition and behavior of prices. Current prices for both species were higher in PEN and also had a higher market value than tilapia in both municipalities. The proposed econometric model proved to be consistent and the results were compatible with the differences observed between species in the commercialization channel, demonstrating the specificities of the small market structures for Nile tilapia and black pacus..

**Keywords:** *Colossoma macropomum*. Competition. *Oreochromis niloticus*. Marketer. Perishability.

### Resumo

A piscicultura é uma importante atividade econômica praticada na região do Baixo Rio São Francisco (BRSF), principalmente para os agricultores familiares. Os peixes produzidos no BRSF alagoano são vendidos principalmente nas feiras livres municipais, sendo estas o seu principal canal de comercialização. Assim, o objetivo com este trabalho foi analisar o processo de comercialização e formação de preços das duas principais espécies da piscicultura brasileira (tilápia do Nilo e tambaqui) em dois municípios alagoanos, Penedo – PEN e Porto Real do Colégio – PRC. Para tanto, foi utilizado um questionário semiestruturado visando entrevistar os comerciantes das espécies estudadas nas feiras livres a fim de obter os dados primários. Os dados obtidos foram submetidos à análise estatística descritiva, bem como foi aplicado um tradicional método de análise econométrica para o entendimento da composição e comportamento dos preços. Os preços correntes de ambas as espécies foram superiores em PEN e o tambaqui possuía maior valor de mercado que a tilápia em ambos os municípios. O modelo econométrico proposto se mostrou consistente e os resultados foram compatíveis com as diferenças observadas entre as espécies no canal de comercialização, demonstrando as especificidades das pequenas estruturas de mercado para tilápias do Nilo e tambaquis.

**Palavras-chave:** *Colossoma macropomum*. Concorrência. *Oreochromis niloticus*. Feirante. Percibilidade.

## Introduction

Aquaculture is one of the livestock activities that accumulates the biggest indexes of growth in the world. According to FAO (2016), aquaculture's production more than doubled since 1995. Fishing and aquaculture, together, involved around 56.6 million people in their direct activities, being responsible for employing hundreds of thousands of citizens, considering all of the productive chains with direct interaction. In its directory, FAO (2016) also highlights a mark to the fish farming: the overcoming of fishing in the supply of fish to human food. Thus, the organization considers fishing and fish farming important means of subsistence for the populations, contributing for their food security and for the reduction of poverty. This will become more of a reality as the price of these goods is lowered in retail, before the relative comparison with substitute goods. For this, studies on marketing channels are of the utmost relevance.

The growth of aquaculture comes from a professionalization of the activity, following the steps already conquered by poultry and pig farming, for example. Investments in research, development, and innovation in the areas of handling, nutrition, reproduction, genetics, and sanity of the cultivable species have been fundamental to give support to the expansion of the production of aquatic organisms. However, the last steps of the productive chain, namely processing and commercialization, have not received the same attention.

Recent data about the production of aquatic organisms in Brazil were published by the Brazilian Institute of Geography and Statistics, IBGE, (2015), that refer to the year of 2015. According to the document, all 27 Brazilian states (2,095 counties) showed some information about aquaculture production. On the document, IBGE describes that R\$4.39 billion were negotiated, added among the main products of the activity, with fish production corresponding to 69.9% and shrimp farming to 20.6% of this total. The available data show that the total fish production of Brazilian aquaculture was of 483.24 thousand tons in 2015, being 1.5% superior to the year before.

Fish production in Alagoas is very representative of what happens in the country, being focused on the two main species cultivated in Brazil, Nile Tilapia and Black Pacu. In this unity of the Federation almost all of the commercial production happens in excavated nurseries and is concentrated in the region of the Baixo Rio São Francisco, BRSEF, that encompasses the counties of Penedo (PEN) and Porto Real do Colégio (PRC). In riverside cities, street markets have a preponderant role in the commercialization of fish that is sold fresh and whole, whether they come from fishing or fish farming. It is of note that such cities belong to the mesoregion

of Alagoas' east, where the Atlantic forest biome prevails. In the caatinga, from the mesoregion of Alagoas' hinterland, the system of production tank-net prevails, using mainly the waters from São Francisco river.

To Julio; Bessa (2016), even if the fish (in natura) can be acquired in many kinds of commercial establishments (fish markets, markets, supermarkets, fish distributors, among others), the street market is the most traditional place. These authors highlight that the commercialization of fish, especially in natura, in markets, deserves special attention, from the acquisition of the product by the marketer to the final consumer, highlighting the questions of the perishability.

In a national scope, little is known about fish commercialization, especially if the utilization of economic analysis tools like econometrics is considered, even with the most important species to Brazilian's fish farming. Thus, in this study, it was sought to accomplish a general characterization of the commercialization of Nile Tilapia and Black Pacu in the street markets of PEN and PRC, and also to determine the elasticity and transmission of prices.

### **Materials and Methods**

The work was executed at the street market of the county of Penedo, in the region of the Baixo Rio São Francisco, Alagoas. The choice of the county is due to the vocation to the activity of fish farming and to being integrant, at the time, of the counties of Alagoas' Local Productive Arrangement of Fish Farming (Arranjo Produtivo Local de Piscicultura de Alagoas). The choice of the species, Nile Tilapia and Black Pacu, comes from the importance of both to the aquaculture in local and national levels, being the two species with the biggest production in the county. The counties are located by the margins of the river São Francisco.

The first stage of the work consisted of a literature review about the commercialization of fish in Brazil. This review had as finality to search a bigger understanding of the commercialization process, as well as of the formation of prices and margins of fish commercialization. Previously, it was possible to verify that the studies about the process of fish commercialization in the country are scarce, especially considering the economic aspects and using economic tools.

The second stage of the work, that consisted of the effective data collect, was done between September and November of 2013. To the attainment of data, semi-structured forms were made, and they were used as a tool to interview the marketers of the targeted species of the study in the street markets of Penedo. In the forms were identified: the fish marketers,

their gender, county of origin, age and scholarship. However, the main questions were origin of the fish, buying and selling prices – at the beginning and at the end of the street market, average weight of the whole and the eviscerated fish. These data passed on by the marketers were utilized for the calculations. When they approached the marketers, the researchers introduced themselves, explained the goals of the work and how the info would be used, assuring that the data disclosure would not allow for any individual identification of the marketers. All the interviewees authorized the use of the collected data for the work.

The third stage of the work consisted of the tabulation of the data, using electronic spreadsheets, and the application of the econometrics tests. The total values were calculated, turned into averages or percentages, according to the necessity of each variable, so that afterwards the econometrics analysis could be done. It is an exploratory and descriptive research, where it aims to identify the price transmission in specific markets: of the Nile Tilapia and Black Pacu, commercialized in street markets of the Alagoas' counties of Penedo and Porto Real do Colégio. Because of these specificities, the exploratory researches almost always assume the format of a case study, where the factors present in one case in question are analyzed. However, besides being exploratory, this research is also descriptive. Insofar as it has as goal the description of the characteristics of a population, phenomenon, or experience, according to Gil (2008).

Thus, this work also has a quantitative nature, because an analysis of the behavior of the prices over the channel of commercialization is done, but inside populational data, under statistic support, insofar as all of the marketers that commercialized both species were interviewed. For such, and inside the methodological rules of this model, the number of observations was adequate for the application of the t test of Student. Besides, the collected data are of primary nature.

The analytical tool used in this work is the Simple Regression, utilizing the method of the Minimum Ordinary Squares (MOS). In it, it is verified the dependency of a variable (dependent) in relation to the other variable, named independent, using a logarithmic model, as shown next. For so much, the method of Braule (2001) and Gujarati (2000) is used as base. In this context, the log-log model is used; it allows the extraction of elasticities from its angular coefficient, what answers the goals of the method and the results that are sought to be answered.

Adopted as dependent variable is the selling price ( $P_v$ ), and as independent variable the buying price ( $P_c$ ). The coefficient  $\beta_1$ , from the regression through the log-log model done with the data collected for this research, will show the behavior of the elasticity with price

transmission for both species of fish in both counties in question, analyzed jointly for each species.

In general terms, it can be determined by how much the price of retail or selling ( $P_v$ ) will vary when the price of buying ( $P_c$ ) varies in 1%. When there is  $\beta_1 < 1$ , it is said that the variations on the selling price are less than proportional to the variations in the buying price, configuring an inelastic transmission of prices. In the same sense, when there is  $\beta_1 > 1$ , the  $P_c$  variations are transmitted more than proportionally to  $P_v$  (elastic transmission). And, finally, when  $\beta_1 = 1$ , the variations are transmitted in the same proportions of  $P_c$  to  $P_v$ . Observe that developing the approach with logarithms, it is had that:

$$\ln Y = \alpha + \beta \ln X \quad (1)$$

Making the derivative in relation to X in both sides:

$$\frac{\frac{d(\ln Y)}{dx} = \frac{1}{Y} \frac{dy}{dx}}{\frac{d(\alpha + \beta \ln X)}{dx} = \beta \frac{1}{X}} \quad (2)$$

With this, it is evidenced that:

$$\frac{1}{Y} \frac{dy}{dx} = \beta \frac{1}{X}$$

$$\beta = \frac{X}{Y} \frac{dy}{dx} = \frac{\frac{dy}{Y}}{\frac{dx}{X}} \quad (3)$$

Thus, it can be understood that, according to what is expected,  $\beta$  is proven to represent elasticity, based on Gujarati (2000).

Among the interviewees in both counties, as it can be seen in Table 1, in PEN there are less men marketers commercializing Nile Tilapia, while there are more men commercializing Black Pacu. Meanwhile, there are only men selling the studied species in PRC. Only one of the Nile Tilapia and Black Pacu marketer did not live in PEN (he resided in Igreja Nova – AL). On the other hand, in PRC 11 of the 14 Nile Tilapia marketers and 10 of the 13 marketers of Black Pacu were not residents of the county, being most of them from

Sergipe's counties.

Maybe, the bigger participation of women in fish commercialization in PEN is influenced precisely by the predominance of residents of the county among the marketers. However, the situation is inverted in PRC, where there were not women commercializing fish. There are two important things to highlight; the first is that PRC and Propriá are neighbor counties, frontier between Alagoas and Sergipe. The second is that, as in the Alagoas' counties studied, in Sergipe's county the fish production is also an important livestock activity. And so, the proximity makes the transit of the marketers easier to negotiate their products in Alagoas' street markets, and vice versa.

The age average of the marketers varies from 33.35 to 46.64 years old and most of them has only complete primary education. Only 20% of Nile Tilapia marketers and 22.22% of Black Pacu marketers in PEN declared to have complete primary education, while no marketer in PRC has finished this level of education and none of the interviewees had finished higher education. In a study done in the same counties where this research was made, Araujo et al. (2019), when interviewing consumers in the street markets that had the Black Pacu as their favorite species, they observed a low level of formal scholaryity among them, being that most of these costumers had not finished the primary education (66.66% in PEN and 74.07% in PRC). Specifically according to the marketers, low scholaryity was also observed by Golin et al (2016) in Santa Maria – RS, where 51.43% of these had unfinished primary education, showing that this characteristic of the marketers goes beyond the regional differences in the country and appears to be a national pattern.

The most part of marketers from PEN (66% for Nile Tilapia sellers and 61.11% for Black Pacu sellers) affirmed that had other employment or income, thus, the did not rely solely on the income from the fish selling. This indicates a peculiarity in a particular sense here, of not depending only on one source of income. In PRC, there is a lot of balance between those who have and those who have not another economic activity.

In the time of the interviews, the street market in PEN was daily, but Saturday was the day that concentrated the selling of the fish, and the street market from PRC happened on Fridays. With this, it was expected that more marketers from PRC had another job or source of income, comparing to PEN. It can be considered that, about obtaining and composing income, the findings in PEN diverge from the data obtained by Julio; Bessa (2016) in Palmas – TO, where the marketers, in their majority, obtained from the fish selling their only source of income. Campos et al. (2017), studying the street markets in Juiz de Fora – MG, corroborated the tendency, affirming that 64% of the marketers have as their only source of

income the work at the street market.

	NILE TILAPIA		BLACK PACU	
	PEN	PRC	PEN	PRC
<b>Number of interviewees</b>	15	14	18	13
<b>Gender</b>				
Masculine	47.00%	100%	55.56 %	100.00%
Feminine	53.00%	0.00%	44.44 %	0.00%
<b>Age (years old)</b>	34.40	46.64	33.35	42.65
<b>Scholarity</b>				
Never studied	7.00%	28.57%	5.56 %	23.08%
Complete primary education	73.00%	71.43%	72.22 %	76.92%
Complete high school education	20.00%	0.00%	22.22 %	0.00%
Complete higher education	0.00%	0.00%	0.00%	0.00%
<b>Has another profession or income?</b>				
Yes	67.00%	50.00%	61.11%	53.85%
No	33.00%	50.00%	38.89%	46.15%
<b>Pays rate or tax to commercialize at the street Market? If affirmative, how much?</b>				
Yes	100% (R\$ 10.53)	92.86% (R\$ 3.54)	100% (R\$ 9.82)	92.31% (R\$ 4.77)
No	0.00%	7.14%	0.00%	7.69%
<b>Buys the fish</b>				
From the fish farmer	60.00%	85.71%	50.00%	61.54%
From the middleman	40.00%	35.71%	50.00%	46.15%
Does not buy, produces	0.00%	21.43%	0.00%	23.08%
<b>The fish was raised in</b>				
Tank-net	40.00%	85.71%	21.05%	7.69%
Excavated nurseries	60.00%	14.29%	73.68%	92.31%
Other system	0.00%	0.00%	5.26%	0.00%
<b>Distance from the fish farms to the street markets</b>	39.27 Km	76.72 Km	43.11 Km	56.68 Km
<b>The fish was stored:</b>				
In ice	0.00%	7.14%	0.00%	0.00%
Without ice	0.00%	0.00%	0.00%	0.00%
Alive	100.00%	92.86%	100.00%	100.00%
<b>At what time were the fish received?</b>	05h:58min	4h:57min	06h:03min	4h:06min
<b>How much for the Kg of fish</b>	R\$ 6.40	R\$ 6.35	R\$ 5.69	R\$ 4.78
<b>Selling price (Beginning of the market)</b>	R\$ 8.27	R\$ 7.71	R\$ 7.40	R\$ 6.36
<b>Selling price (Ending of the market)</b>	R\$ 6.53	R\$ 5.96	R\$ 5.67	R\$ 4.50



<b>What is the average weight of the whole fish?</b>	1.100 kg	1.150 kg	1.570 kg	1.240 kg
<b>What is the average weight of the eviscerated fish?</b>	0.916 kg	1.050 kg	1.340 kg	1.040 kg

**Table 1. General characterization of the sellers and the aspects of the commercialization of Nile tilapias and black pacus in the street markets of Penedo (PEN) and Porto Real do Colégio (PRC) – Alagoas.**

\*In the questions where the percentage of answers is bigger than 100% the sellers could choose more than one answer. Example: When they sold the fish they produced themselves, as fish farmers.

Source: Data collected by the authors during interviews at street markets in the municipalities studied

About the payment of a tax to commercialize the fish, in PEN the value paid by the marketers is bigger, when one marketer from PRC that worked with both species affirmed to not pay any tax, what reduced the average value. It's important to highlight that this disparity happened because some sellers had more than one stand. Another important fact to be registered is that some marketers circulated in neighbors' counties markets, where they also had stands, becoming intermunicipal marketers. Thus, the pluriactivity is observed in Alagoas' counties, mainly in Penedo. It is important to highlight that the pluriactivity in the small family agricultural production, mainly, has the role of softening the oscillation of the family income associated, many times, to the seasonality of the agriculture production and/or biological cycle of the production.

Still in Table 1 there is some general information about the studied fish's commercialization. Among the marketers from PEN there was no fish farmer negotiating Nile Tilapias or Black Pacus produced by themselves, being 40% of the Tilapias and 50% of the Pacus acquired through middlemen. In PRC, 21,43% of Tilapia marketers and 23.98% of Black Pacu were commercializing fish produced in their own fish farms, reducing the percentage of fish acquisition through middlemen. Apparently, the supply of fish for the marketers in both counties has less asymmetric and more linear relations; however, a common point is the problematic about the organization of the wholesaler sector to the supply of stock to the marketers, situation that seems aggravated in Alagoas, where it is practically inexistent. In this sense, even though it was not a question in the data collect tool, many of the marketers that sold Black Pacu in PEN affirmed in the interviews to have bought the fish from one producer of the region.

About the production systems of the commercialized fish, it was identified that most of the Black Pacu from both counties and the Tilapia from PEN are cultivated in nurseries, most traditional model of cultivation in the studied region. However, it was verified that most part of the Tilapia sold in the street market of PRC, according to the marketers, comes from

outside the state of Alagoas, with 85.71% being cultivated in tank-net. In the reports from the marketers, some counties from Bahia were cited, where there is the cultivation in tank-net, like in Paulo Afonso, for example. It is important to highlight, however, that there was a lot of doubt and insecurity from the marketers in identifying the form of cultivation of the fish, what may have caused imprecisions in the percentages of this variable.

The average distances calculated between the counties where the fish came from and the counties where the market happened shows that the Tilapia sold in PRC traveled the biggest distances to commercialization, almost double than the distance of the Tilapia commercialized in PEN. To arrive alive at the places of selling, the fish were transported in trucks or pickup trucks with live fish transport boxes, what increases the cost of transportation and can be considered as an important component of the price of the fish, that the marketer passes along to the consumer. About fruits and vegetables transportation, Foscales et al. (2012) draw attention to the perishability and susceptibility of the produce to damages, factors that, for fish, specially the ones transported alive, lack attention.

As evidenced (ARAÚJO et al., 2015a; 2015b), the fish consumers that go to both street markets, in their majority, prefer to acquire the fish alive, rather than in any other type of presentation of the fish, what demands the marketers to have live fish available for selling. It was also noted that, as the fish die and the end of the market comes, the prices are gradually lowered, both because of the costumers' preference for live fish, and because of the incapacity of the marketers to store the frozen fish, factor that forces them to commercialize the fish for a lowered price, so there is not a bigger loss. This means that the perishability issue affects the commercialization margins. (MENDES; PADILHA JUNIOR, 2007).

The commercialized Tilapia weighted in average 1.100Kg and 1.150Kg, while the Black Pacu weighted 1.570Kg and 1.240Kg in PEN and PRC, respectively. In general, it was observed that the buying prices for the marketers and the commercialization price of the kilogram of Tilapia for the costumers were superior than the prices of Black Pacu, and the fish sold in PEN had higher prices than in PRC.

Regarding the econometrics analysis (Table 2), the log-log model for the Tilapia presents 29 observations, with elasticity in the value of  $\epsilon_{ti} = 0.52$ . This means that there is a case of  $\epsilon < 1$ . It is observed that the model presents significance of the parameters. Test F is also significative, showing the consistency of the model, despite of the low degree of determination. This aspect will better be explained later on. About the serial autocorrelation, Durbin Watson statistic was adopted. According to Gujarati (2000), observed the five hypotheses for the test application, statistic d should be between 0 and 4, and the value of d =

2 will determine the absence of serial autocorrelation. In both cases, Nile Tilapia and Black Pacu, autocorrelation was not verified.

The log-log model for the Black Pacu case presents 31 observations. As seen, it has elasticity for the price transmission of  $\epsilon_{tm} = 0.59$ . It presents a significance of the parameters, and test F is also significant, showing the validity of the model, even though it has a determination degree considerably inferior in relation to the Nile Tilapia.

It must be observed that the elasticity allows to conclude that the prices transmission is slightly higher regarding the Black Pacu. This can be explained, maybe, by the fact that the degree of competition is superior for the Tilapia, preventing a bigger transfer of the buying price to the selling price in this last case. It must be remembered that it was verified in the research and in this work that many marketers from Penedo buy Black Pacus from an only seller.

	Coefficient	Standard error	Reason-t	P-value
<b>NILE TILAPIA</b>				
Constant	1.11359408	0.237232696	4.6941	6.93E-05
1_Pre_X	0.52066537	0.128248096	4.059829	0.000377717
Dependent Variable Average	1.82	E.P. Var. Dependent		0.237232696
Square Waste Sum	0.16433469	Regression E.P.		0.078015832
R-square	0.37905645	R-square adjusted		0.356058541
F	15.1905	Significance F		0.000377717
Durbin Watson ( <i>d</i> )	1.6			
<b>BLACK PACU</b>				
Constant	0.95854191	0.342841067	2.795878	0.009246
1_Pre_X	0.58594135	0.206119045	2.842733	0.008257
Dependent Variable Average	1.93	E.P. Var. Dependent		0.206119045
Square Waste Sum	0.48193886	Regression E.P.		0.131194901
R-square	0.22397107	R-square adjusted		0.196255754
F	8.0811	Significance F		0.008256957
Durbin Watson ( <i>d</i> )	1.5			

**Table 2. Results of the model log-linear for Nile tilapia and black pacu commercialized in the street markets of Penedo and Porto Real do Colégio – Alagoas.**

Source: Data collected by the authors during interviews at street markets in the municipalities studied

On the other hand, in general, it can be affirmed that the data analysis presented in this study is similar to that made by Lustosa et al. (2008), despite the methodological differences and the factor that the authors only analyzed the commercialization in the city of PEN. Still, it can be concluded, again, that the margins of relative commercialization, obtained only in algebraic form, show that it is much higher regarding Black Pacu than Nile Tilapia. It can be said, informally and far from a more rigorous appreciation of this nature, that there were signs of a “monopoly power” bigger with Black Pacu than with Nile Tilapia. Observe that, in the case appointed by Lustosa et al. (2008), the percentual values of the commercialization

margins would be of 20.30 for the Black Pacu against only 11.80 for the Nile Tilapia. It is clear that an only offerer influences in this result, as it is registered in Lustosa et al. (2008), that informed that in PEN the marketers made most of their buying from one Black Pacu producer, what gave him an almost monopolist power of bargaining.

### **Conclusions**

The buying prices for the marketers, as the prices commercialized to the final consumer are bigger for the fish negotiated in the street market in Penedo, being higher the price of Black Pacu in both studied counties. Since a considerable percentage of the fish, especially Black Pacu, commercialized in both counties has the same origin, it is possible to consider that there is a lesser degree of competition between the producers, causing a bigger selling price. This reflects in a bigger “monopoly power”, certainly. This compels the marketers to make up for this with bigger commercialization margins.

The price transmission was slightly bigger with the Black Pacu. The econometrics model signals this clearly through the elasticity. This implies that there is a bigger competition among Tilapia producers, because there is a bigger diversity of offerers in the region, as this article confirms. This allows to be said that the market challenge itself stops a bigger price transfer with the Tilapia. It must be clear that Penedo and Porto Real do Colégio are neighbor counties.

This kind of study is of a paramount importance, because this knowledge can bring an improvement to the commercialization channels that can allow for a cheapening of the retail price, without bigger losses for the marketers. It must be clear that the street markets in many counties of Brazil’s countryside is the main channel of commercialization for the local population.

Lastly, it can be informed that the low degree of determination of the econometrics model is due to the fact that, maybe, it higher the number of independent variables, which, however, does not disqualify the model, considering the utilized tests and the results obtained.

### **Acknowledgment**

This paper is dedicated to the memory of our dear co-worker André Maia Gomes Lages, who passed away while this paper was being peer-reviewed.

## References

- ANSELMO, Amauri; JUNIOR, Marco Antonio Alves de Souza. GESTÃO DE COMPRAS: estratégias usadas como forma reduzir custos. *INTERFACE TECNOLOGIA, SÃO PAULO*, ano 2021, v. 18, 31 jul. 2021.
- ARAUJO, Daniel de Magalhães; LINS, João Lucas Farias; TAVARES, Adriano da Silva; BORDINHON, André Moreira; PINTO, Luis Gabriel Quintero (2015a) Aspectos de aquisição e consumo de peixes na feira livre da cidade de Penedo - Alagoas. *Boletim do Instituto de Pesca*, 41(2): 429-440.
- ARAUJO, Daniel de Magalhães; LINS, João Lucas Farias; TAVARES, Adriano da Silva; SILVA, Joseane da; SILVA, Valdeí Marcelino.; BORDINHON, André Moreira. (2015b) Aspectos de aquisição e consumo de peixes na feira livre de Porto Real do Colégio - Alagoas. *Boletim do Instituto de Pesca*, 41(4): 961-973.
- ARAUJO, Daniel de Magalhães; CARDOSO, Alyson do Nascimento; SILVA, Valdeí Marcelino.; SANTOS, Wellington Araújo; SILVA, Joseane; LINS, João Lucas Farias. (2019) Perfil socioeconômico e preferências de consumidores de tambaquis comercializados em feiras livres do Baixo Rio São Francisco, em Alagoas – Brasil. *Revista Principia - Divulgação Científica e Tecnológica do IFPB*, 47: 122-132.
- BRAULE, Ricardo. *Estatística Aplicada com Excel*. Rio de Janeiro: Editora Campus, 2001. 224p.
- CAMPOS, Isabel Cristina Soares; FIGUEIREDO, Priscila Cintra; RIBEIRO, Natália Ruza; MARTINS, Brenda Xavier; MARQUES, Nadine Piller Albino; BINOTI, Mirella Lima. (2017) Perfil e percepções dos feirantes em relação ao trabalho e segurança alimentar e nutricional nas feiras livres. *HU Revista*, 43(2): 247-254.
- FAO, 2016. *FAO Yearbook: Fishery and Aquaculture Statistics 2016*. Fisheries and Aquaculture Department, Food and Agriculture Organization of the United Nations.
- FOSCACHES, Caroline Acosta Lezcano; SPROESSER, Renato Luiz; QUEVEDO-SILVA, Filipe; LIMA-FILHO, Dário de Oliveira. (2012) Logística de frutas, legumes e verduras (FLV): um estudo sobre embalagem, armazenamento e transporte em pequenas cidades brasileiras. *Informações Econômicas*, 42(2): 37-46.
- GIL, Antônio Carlos. *Como elaborar projetos de pesquisa*. 5. ed. São Paulo: Atlas, 2010. 184p.
- GOLIN, Anieli; CODEN, Marjorie Aparecida Silva; ROLIM, Renata Irineu; BERTAGNOLLI, Silvana Maria Michelin; MARGUTTI, Karen Mello de Mattos; BASSO, Cristiana. (2017) Qualidade higiênico-sanitária e o perfil de feirantes e usuários das feiras-livres de Santa Maria – RS. *Disciplinarum Scientia. Série: Ciências da Saúde*, 17(3): 423-434.
- GUJARATI, D.N. *Econometria Básica*. 3ª Edição, São Paulo, Makron books, 2000. 846p.
- INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA – IBGE. *Produção da pecuária municipal 2015*. Rio de Janeiro, 2015, v.43, 49p.
- JULIO, Ingrid Gianotti; BESSA, Kelly. (2016) As redes de comercialização de peixes in

natura nas feiras municipais de Palmas (TO). *GeoTextos*, 12(2): 135-170.

LUSTOSA, Maria Cecília Junqueira; LAGES, André Maia Gomes; ARAUJO, Juliana Seyla de; COSTA, Fábio José Castelo Branco da. *O Velho Chico e sua Nova Cadeia Produtiva*. Maceió: Edufal, 2008. 100p.

MENDES, Judas Tadeu Grassi; PADILHA JUNIOR, João Batista. *Agronegócio: uma abordagem econômica*. São Paulo: Prentice Hall Brasil, 2007. 369p.

MARQUES, Pedro Valentim; AGUIAR, Danilo Rolim Dias de. *Comercialização de Produtos Agrícolas*. São Paulo: Edusp, 1993, 295p.

VARIAN, Hal R. *Microeconomic Analysis*. W. W. Norton & Company: New Yoek, 1992. 555p

Submetido em: 17.07.2023

Aceito em: 16.08.2023