THE IMPORTANCE OF ARTISANAL FISHING IN THE ECONOMY OF CEARÁ

1 INTRODUCTION

The state of Ceará shows significant importance as a fish producer in the Northeastern and Brazilian contexts (Fonseca, 2019). According to the latest data from the Ministry of Fisheries and Aquaculture, Brazil (2011), Ceará registers the third highest fish production in the Northeast, behind only Bahia and Maranhão. It is identified that artisanal fishing in Ceará has great economic and social importance, but it presents problems, one of which is the absence of a data collection program (Vidigal et al., 2021).

In this context, it becomes opportune to understand the contribution of the artisanal fishing production chain in Ceará as a way to collect data and information for the sector. Although the artisanal fishing production chain brings significant economic and social importance (FAO, 2017), such information is still unknown. According to Ngok, Ndjamen and Jiongo (2005), not knowing this information results in numerous consequences, including low government funds, few stakeholders representing artisanal fishing in the responsible bodies for territorial management, inconsistencies in access policies to fishery resources, which end up causing harm to artisanal fishing.

Thus, the following question is sought to be answered: What is the contribution of the artisanal fishing production chain to the economy of the state of Ceará? The study will provide valuable socio-economic information to stakeholders in the artisanal fishing sector and encourage further research on its contributions.

2 THEORETICAL FRAMEWORK

Carneiro, Diegues, and Vieira (2014) defined the production chain in artisanal fishing as a set of integrated production and distribution operations carried out by various components. The fishing chain can follow the following sequence: supply of inputs, fish capture and cultivation, transformation and distribution of fish, whether processed or fresh, commercialization, and final consumption.

Various forms of analysis can be carried out in the production chain, including socio-economic context analysis, product demand analysis, institutional analysis, market analysis, functional analysis, and economic analysis (Bellù, 2013). Among the analyses mentioned, the most suitable for the research objective is economic analysis.

The goal of economic analysis is to determine the ways in which value added is created and distributed (Bellù, 2013). According to the author, through the created value added, it is possible to identify the contribution of the chain to the Gross Domestic Product (GDP). Value added is distributed to the pillars of the economy: salaries for families, interest for financial institutions, government taxes, and profits for companies (Bockel & Tallec 2005, Fabre, Dabat, & Orlandoni, 2021).

The production-exploration account is structured as follows: on the right side is production, while on the left side of the account is intermediate consumption (goods and services used as inputs and completely "consumed" in the production process) and value added. After consolidating the accounts, the impact of the production chain on the economy can be assessed (Fabre et al., 2021).

It is necessary to calculate both direct and indirect value added. Direct value added is the total value produced by all actors operating within the value chain's limits. Indirect value added is the total value produced by all suppliers outside the production chain. The sum of both gives the total value that can be used to calculate the trade balance, income distribution, the chain's impact on economic growth, and other indicators (Fabre et al., 2021).

In Brazil, studies using this methodology are still incipient (Costa, Fontenele, Brito, Matias, & Sousa, 2022a, Costa, Fontenele, Matias, Sousa, & Sancho, 2022b). However, some

studies were found in Gambia (Avadí, Deme, Mbaye, & Ndenn, 2020), the Union of Comoros (Dabat, Avadí, Sfez, & Saïd, 2023), Senegal (Dione, Sy, & Ndiaye, 2005), Mali (Dolo, Sako, & Diarra, 2005), and Cameroon (Ngok et al., 2005).

3 METHODOLOGY

The study is descriptive in terms of objectives, uses a case study in terms of procedures, and adopts a quantitative approach. The state of Ceará is used as the reference for analysis. Located in the Northeast region of Brazil, the state is composed of 184 municipalities and 14 Planning Regions.

Data were collected from June to December 2022. For the fishing model, the production data estimation technique based on calibrated proportions and moving averages was used. Two reports were used to construct the base table for applying the proportions: the FINAL TECHNICAL REPORT OF MONITORING FISHING ACTIVITY ON THE BRAZILIAN COAST, resulting from the SEAP/PROZEE/IBAMA agreement: 109/2004 (marine extractive fishing) and the STATISTICAL BULLETIN OF FISHING IN LARGE REGIONS AND UNITS OF THE FEDERATION editions from 2005 to 2011 of the Ministry of the Environment (continental extractive fishing). Intermediate consumption (local and imported) and value added were obtained from the study by Costa (2022) and Vieira (2010).

The research uses the Effects Method to achieve its objectives. This method is divided into five phases. The phases of the model are as follows: 1st phase – definition of the production chain agents; 2nd phase – construction of the production-exploration accounts of the agents (financial analysis); 3rd phase – consolidation of the production-exploration account of the production chain (economic analysis); 4th phase – calculation of direct, indirect, and primary effects; and 5th phase – impact evaluation criteria for the contribution of the production chain to the economy.

All data were tabulated in an Excel spreadsheet and subsequently transferred to Microsoft Power BI for the construction of a dashboard, which assisted in the analysis of the results in the 5th phase.

4 RESULTS AND DISCUSSION

The results will be presented according to each phase of the model. It is important to note that, as in Costa et al. (2022b), due to the inability to collect data for all chain actors, only the production and input supply stages were worked on, excluding processing and commercialization.

4.1 1st PHASE – DEFINITION OF THE PRODUCTION CHAIN AGENTS

To simplify the construction of the economic model and the dashboard's operability in phase 5, a coding system was created where each code represents an agent. The organization was made in the following sequence to facilitate the identification of desired combinations and perform different analyses: Municipalities, Area, Craft Type, and Resources.

Thus, in the coding system, the following were defined: Municipalities: the IBGE classification was used, and municipalities were coded according to the municipality code in alphabetical order from Abaiara (2300101) to Viçosa do Ceará (2314102); Area: fishing can be carried out in marine (AM) and continental (AC) areas; Vessel: for extractive fishing, the types of vessels were coded from 1 to 9; Fishing type: for the purpose of the economic model of the effects method, the classification used was: Extractive fishing (PE); and Resources: resources were coded according to the most produced species types in the state, with sequential numbering from 1 to 17. For unidentified resources, a category called Fish (03) was used.

4.2 2nd PHASE – ESTABLISHMENT OF NATIONAL ACCOUNTING PRODUCTION AND EXPLORATION ACCOUNTS FOR AGENTS

To establish the national accounting production and exploration accounts for agents, the first step is to list all the items that make up intermediate consumption, value added, and the gross production value categories.

In this research, the items that make up intermediate consumption are: water, food, battery, fuel, ice, bait, fishing equipment, and medication. The items that make up value added are: salaries, taxes/licenses, RBE, and subsidies. Finally, the gross production value categories are: artisanal fishing (fish) and self-consumption.

4.3 3rd PHASE – CONSOLIDATION OF NATIONAL ACCOUNTING PRODUCTION AND EXPLORATION ACCOUNTS FOR AGENTS (ECONOMIC ANALYSIS)

In a consolidated manner, production-exploration accounts represent the sum of agents' accounts in a single account. According to Bockel and Tallec (2005), to consolidate the accounts of different agents, it is enough to aggregate them into one, representing the production chain. This aggregation allows evaluating, among other aspects, the chain's impact on the economy (Fabre et al., 2021). In this research, a consolidated account was created.

4.4 4th PHASE – CALCULATION OF DIRECT, INDIRECT, AND PRIMARY EFFECTS

According to Fontenele (2018), the direct, indirect, and primary effects of the production chain should be calculated after consolidating the individual accounts.

4.4.1 Direct effects

The calculation of direct effects consists of directly obtaining from the consolidated production-exploration account obtained in the 3rd phase the elements of the direct income distribution of different economic agents.

In this research, the total direct value added was R$ 592,069,437.18, representing 96.46% of extractive fishing production. It is noted that extractive fishing has a high proportion of value added concerning the production value.

4.4.2 Indirect effects

The indirect effects of the production chain are economic activities induced by agents. They are calculated by separating value chains or using an input-output matrix with import content. In the case of Ceará, values were obtained from the input-output matrix (MIP) with import content from the state of Ceará (IPECE, 2021), adjusted to calculate the coefficients of local intermediate consumption items.

In this research, R$ 1,377,065.09 was obtained for indirect imports and R$ 346,810.15 for indirect value added.

4.4.3 Primary effects

Primary value added (primary effects) corresponds to the sum of direct and indirect value added. In this research, the primary value added corresponds to R$ 592,416,247.33.

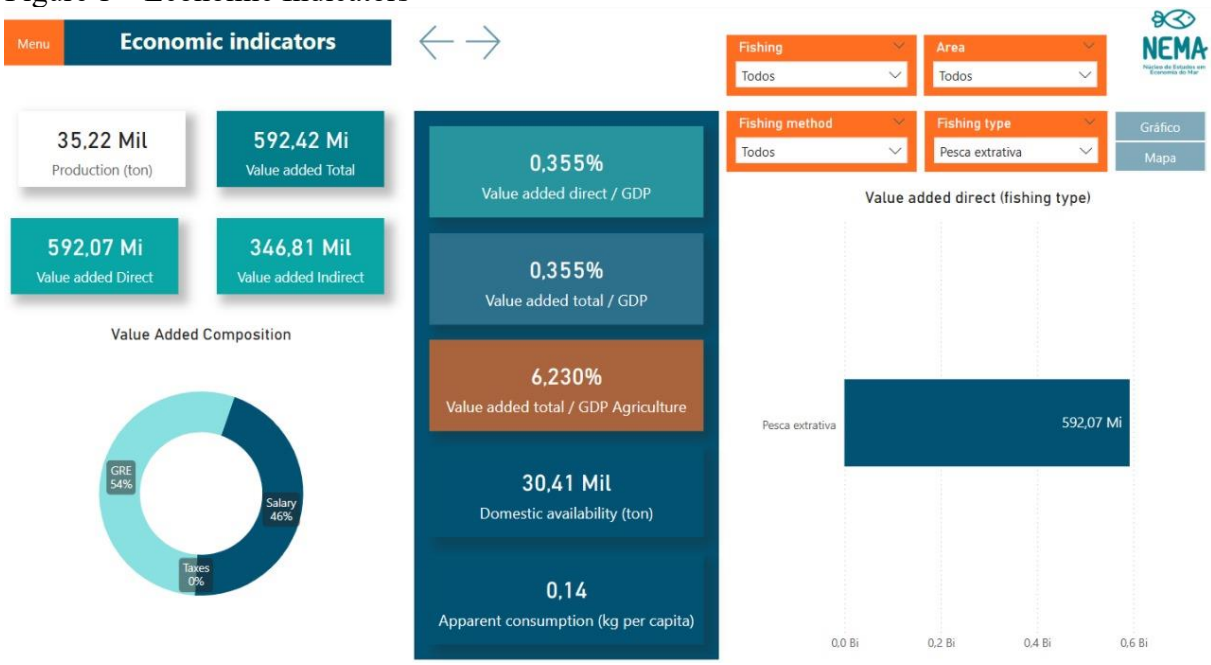
The value of primary imports is obtained by adding the value of direct imports with the value of indirect imports. As there were no direct imports, the value of primary imports is R$ 1,377,065.09.

4.5 5th PHASE – IMPACT EVALUATION CRITERIA FOR THE CONTRIBUTION OF THE ARTISANAL FISHING PRODUCTION CHAIN TO THE ECONOMY

4.5.1 Impact on Ceará's GDP

This criterion indicates the importance of the production chain to Ceará's GDP, calculated by dividing the primary value added by the state's GDP. Ceará's GDP in 2020 was R$ 166,915 million. Figure 1 shows the contribution of extractive fishing to Ceará's GDP, indicating that it contributes 0.355% to Ceará's GDP.

Figure 1 – Economic Indicators



Source: authors.

There are no data on this participation for other Brazilian states. However, some authors have researched other countries, for example, in Gambia, the participation was 6.5% in the country's GDP (Avadí et al., 2020), in the Union of Comoros, the participation was 5.8% in the national GDP (Dabat et al., 2023), in Senegal, the participation was 4.08% in the country's GDP (Dione et al., 2005), in Mali, the participation was 3.7% in the total country's GDP, and they concluded that the contribution of fishing to the country's economy could be improved with data dissemination (Dolo et al., 2005), and in Cameroon, the participation was 1.7% in the country's GDP (Ngok et al., 2005).

4.5.2 Impact on Agricultural GDP

This criterion indicates the importance of the production chain to agricultural GDP, calculated by dividing the primary value added by the agricultural GDP of Ceará.

Figure 1 shows the contribution of extractive fishing to agricultural GDP, indicating that it contributes 6.230% to agricultural GDP. There are no data on this participation for other Brazilian states. However, some authors have researched other countries and obtained values for the contribution of extractive fishing to agricultural GDP, for example, in Gambia, the participation was 20.10% in agricultural GDP (Avadí et al., 2020), in the Union of Comoros, the participation was 12.90% in the primary sector GDP (Dabat et al., 2023), and in Senegal, the participation was 13.70% in the primary sector GDP (Dione et al., 2005).

4.5.3 Income distribution

In addition to the impact on Ceará's GDP and agricultural GDP, it was also possible to verify income distribution through the composition of value added, i.e., how income is distributed to the production chain agents. According to Figure 1, most income is distributed as RBE (54%), followed by salaries (46%).

The data show that all income distribution in the extractive fishing production chain in Ceará comes from salaries and RBE. This suggests that the sector has a strong impact on generating income for families.

5 CONCLUSIONS

This study aimed to evaluate the contribution of the artisanal fishing production chain to the economy of the state of Ceará. The results obtained in the fifth stage of the analytical model show that artisanal fishing contributes 0.36% to Ceará's economy. Considering that the chain members are generating revenue and value added, it can be concluded that the sector is economically viable and sustainable.

This study is relevant both for stakeholders in the fishing sector and academia, encouraging future research to expand knowledge about the economic contribution of fishing. Among the study's limitations is the scarcity of data, which required estimates.

In conclusion, it is suggested that future studies adopt similar methodologies to analyze fishing in other Brazilian states. This approach would provide public policymakers and fishing sector authorities with a broader understanding and facilitate comparisons with the results of this research.

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