Social-Economic Impacts of the Marine Shrimp Culture in Selected Brazilian Cities

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1. INTRODUCTION

The expansion of marine shrimp agribusiness in Brazil is chacacterized for the high rate of expansion of production and of exportations (Rocha, Rodrigues and Amorim, 2004; Costa, Sampaio and Albuquerque, 2004). This expansion resulted in substantial generation of jobs and absorption of the local population with low formal instruction (Costa and Sampaio, 2003). It must also have had a sizable income impact. The income increase must re-echo, in turn, in the rise of the municipal direct and indirect tax collection. The increase in income and jobs propitiate ample possibilities of increases in the consumption levels and well-being of the populations.

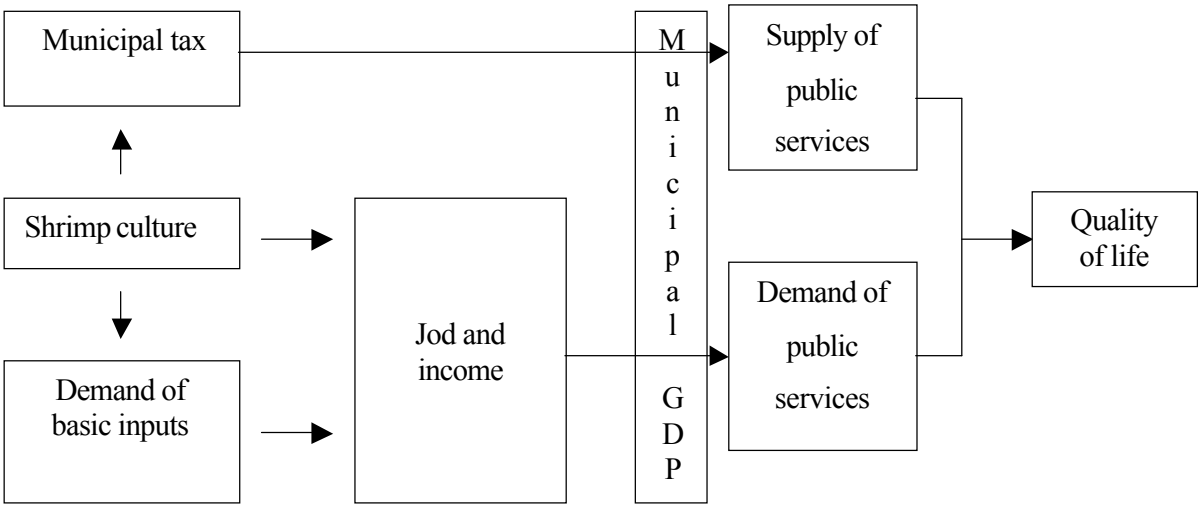
This work is turned toward the analysis of the social-economic impact of the shrimp culture in some selected municipalities of Brazil: the direct, indirect and induced impacts on employment, income and tax collection that the shrimp culture generates.

2. AN IMPACT MODEL OF THE MARINE SHRIMP CULTIVATION ON MUNICIPAL LEVEL, DATA AND METHODS

The impact model presented in Figure 1, represents the net of causalities that binds the shrimp cultivation to the quality of life in the municipality taking in consideration the direct and indirect effect of the activity. However, it is also necessary to determine which impacts are retained in the municipality and which ones transcend it.

The shrimp cultivation affects t he municipal income and the quality of life of the population of direct and indirect form. In a direct way, it generates job and income, the income representing the a ddition of the wage bill and the other expenditures made in the city. It contributes, a lso, with municipal taxes, directly for licenses an d service ta xes - and indirectly through state and federal transferences. It also impacts through input suppliers, located in the city, and processors and traders of shrimp production. Also, through induction, commerce is stimulated, and as a consequenc e it demands products, hires personnel and pays taxes. Everything added, t he municipal GDP is increased by the product generated of direct and of indirect form. The additional tax c ollection propitiates an increase of expenses of the municipal government, integrating a new chain of multipliers of jobs and income. Finally, from one side, the employment and income direct, indirect and induced expansion, impacts the demand for goods and services connected to the improvement of the q uality of the life; from the other side, it stimulates the expansion of services, provided either by the public or the private sector.

Figure 1. A Model of Mari ne Shrimp Cultivation Impacts at the Municipal Level.



Source: authors.

To analyze the impacts of the shrimp cultivation some simplifications are adopted. One assumes that consumption (C) is a function of income (Y) (for simplification, of the product): C = f(Y), and that the direct taxes (Td) are a function of the municipal product: Td = Td (Y). The transferences of the federal and state governments are also affected by the municipal production (added value, in the case of the ICMS, for example). It is assumed that the marine culture affects the municipal income (ΔY), through the direct payments, profits and the government budget. Adding the direct and indirect impacts on income, ΔY is calculated.

Ten municipalities were selected: Cajueiro da Praia, Acaraú, Aracati, Canguaretama, Pendências, Porto do Mangue, Goiana, Itapissuma, Jandaíra and Valença. These ten municipalities represent a sizable part of the production of shrimp cultivated in its respective states: 82% in Bahia, 75% in Pernambuco, 56% in Ceará, 52% in Rio Grande do Norte and 49% in Piauí.

The year base is 2003, for which data is provided from the Census of the Marine Shrimp Culture. These basic data include information on the farms, laboratories and processing centers in each municipality. Data on the municipal tax collection was collected from the municipal finance service and on state transferences from the State Finance Secretariats. The municipal GDP was estimated using methodology developed for IPEA (Vergolino and Maia Gomes, 1999).

The generated total income is the addition of the value of the production, at the municipal level. The income that is kept in the municipality is the addition of the paid wage bill, of the inputs acquired at the municipal level and of the parcel of the net income of the producers and companies that is spent in the municipality. The indirect income is obtained

through an input-output matrix for the Northeast (BNB, 2001) and based mainly in the work of Rodriguez and Guilhoto (1998).

Initially, the generated direct income, Xn, was partitioned, Xn = Xni + Xnj, where, Xni is the aggregate value retained in the municipality and Xnj is the aggregate value expend out of the municipality.

As consequence, the vector of income multipliers and job were equally partitioned. In the case of income, $Y = \sum ai\ bi + \sum aj\ bj$, where ai is an element of the line in the matrix corresponding to income and bi represents the elements of the inverse Leontief matrix $[(I - A)^{-1}]$.

The origin of each input / expense was considered at farm, laboratory and center of processing level, to isolate the sectors of the matrix that represent municipal expenses.

On the basis of the partitioned values, indirect income and employment impacts are estimated.

Taking the income case, a closed Leontief input-output matrix may be defined as:

$$A^* = \begin{bmatrix} A & c' \\ c'y & 0 \end{bmatrix}$$

where, A is a matrix of Leontief technical coefficients, C is a vector of sector structure of marginal consumption and c'y is a vector of marginal propensities to consume.

Taking the vector of coefficients of value added by unit of production (y), it is defined 0 as the equivalent vector in the closed Leontiel model,

$y^* = (y : 0)$

The direct and indirect income requirements (input and output) by unit of production are given by:

$$Y^* = y^* (I - A^*)^{-1}$$

The shrimp culture generates an additional input and intermediary consumption demand on n sectors,

$$X^a = [X_1^a, X_2^a, ..., X_n^a]$$

This demand, it is reminded, is partitioned in Xi e Xj, representing the demand generated within and out of the municipality.

Thus, indirect input and consumption impact, on income, is given by $Y^* X^{a'}$. Adding this indirect impact to the direct one, on the own sector, the total impact (direct and indirect) of shrimp culture on income is obtained,

$$Y^t = Y^a + Y^* X^{a'}$$

That is partitioned within and out of the municipality.

In a similar way, total (direct, indirect and induced) employment impacts were obtained.

3. DIRECT, INDIRECT AND INDUCED IMPACTS ON EMPLOYMENT

The direct, indirect and induced employment generated by the shrimp agribusiness is provided in Table 1. In some municipalities, the shrimp culture is the single most important activity responsible for employment generation. It is the case, for example, of Cajueiro da Praia, in which the second activity in the rank is public emploYment. The same occurs in Valença, Jandaíra, Pendencias and Porto do Mangue.

For comparison, it is provided the total and within the municipality indirect and induced employment. As pointed, only the smaller part of the inter-sectorial linkings has intra-municipal impact and even with the upward bias, the indirect and induced job that is generated in each municipality varies of less than 7% to a maximum of 69 %.

Total employment is also given as a percentage of Economically Active Population (EPA). In relation to the EPA the percentages are smaller, because unemployment and mainly under employment is very expressive. Still, in five municipalities the shrimp culture has significant expression: Porto do Mangue, Pendencias, Canguaretama, Cajueiro da Praia and Aracati.

Table 1.

Direct, Indirect and Induced Employment – Total and within the Municipality, 2003.

Municipality	Direct	Indirect and Induced Total	Within the Municipality	Total Employment	% da EPA
Cajueiro da Praia	363	515	79	442	12,4
Acaraú	699	1.649	1.132	1.831	6,7
Aracati	1.746	2.981	1.911	3.657	9,8
Canguaretama	1.391	2.398	544	1.935	12,8
Pendências	1.989	2.233	180	2.169	30,9
Porto do Mangue	715	1.618	110	825	34,5
Goiana	525	988	104	629	1,4
Itapissuma	292	410	33	325	2,6
Valença	830	1.085	165	995	2,1
Jandaíra	438	1.052	145	583	10,7

Source: authors, based on Censo da ABCC (2003).

In municipalities located by the coast, in which farming has minor expression, the marine culture has great participation in the job in the sector, in accordance with the RAIS data: 100% in Cajueiro da Praia, above of 90% in Acaraú, Aracati, Itapissuma and Jandaíra, tending to 80% in Valença, around 60% in Pendencias, between 40% and 50% in Canguaretama and Porto do Mangue, and approaching 20% in Goiana, this last municipality strongly tied to the sugar and alcohol industry. This data shows that the shrimp culture has increasing importance, in the formal job, from 1999 to 2003, following the expansion in area in production and in total production.

It can be concluded that, notwithstanding the indirect and induced impacts that drain out of the municipality, the shrimp culture has great expression in formal jobs in almost all the municipalities and significant expression, in relation to the EPA, exception only for Goiana.

4. IMPACTS ON MUNICIPAL ECONOMIC PRODUCT

The income effect adds the direct (it can be taken either the value of the production or the added value) and the indirect and the induced income. In the case of regions or countries, the indirect and induced effects are almost integral. But, in relation to municipalities, they are limited, because the linkages impact other municipalities more strongly. As a consequence, it is estimated that the intra-municipal linkages answer for only 2% of the total indirect impact.

As for the induced effect, the income that is spent in the municipalities is limited almost exclusively to the values paid as wages and the part of the expenditures made in the municipality. It is assumed that the net income generated by all small farms (less than 10

hectares) is spent in the municipalities and that in the case of Acaraú and Araca ti, in which the headquart ers of the companies primordially are located and exert great local l eadership, all net income is consumed within the municipality.

The indirect and induced total effects are reported in Table 2. The appropria te effect is bigger in the case of Acaraú and Aracat i, due to internalization of most of the income.

Analyzing the partic ipation of the appropr iate income - intra-municipal effect – the shrimp culture is distinguished for t he high contribution to the municip al GDP, in Cajueiro da Praia, Porto do Mangue, Acaraú, Aracati, Pende ncias and Canguaretama. Still it has expression in Jandaíra. But it represents little for Itapissuma, Valença and Goiana. The calculated effect excee ds the estimated GDP in Cajueiro da Praia; two hypotheses are raised: part of th e wage bill, corresponding to employees who inhabit in other municipalities, predominantly, Parnaíba, a large regional center, is expend out; and/or, the estimated GDP presents a downward bias.

Table 2.

Total Income Effect (Direct, Indirect and Induced) and Inner Municipality Effect (R$ 1.000 of 2003).

Municipality	Total Effect	Intra-Municipal Effect	Municipal GDP	% of GDP
Cajueiro da Praia	21.015	2.726	2.216	123
Acaraú	67.354	39.178	82.384	48
Aracati	121.795	66.128	174.534	38

Canguaretama	97.965	18.813	64.471	29
Pendências	91.221	6.220	24.824	25
Porto de Mangue	66.078	3.810	7.852	49
Goiana	40.350	3.592	673.883	1
Itapissuma	16.744	1.121	52.898	2
Valença	44.321	5.698	201.781	3
Jandaíra	41.543	5.033	36.029	14

Source: authors.

Another interesting aspect relates to the relative size of each municipality. The case of Cajueiro da Praia is emblematic. Even considering only the wage bill, given the fragility of the offering of goods and services and the regional weight of Parnaíba, the shrimp culture is, by far, the main component activity of the municipal GDP. In the other extreme, Goiana, a regional center with a large commerce and several sugar mills, the activity adds less than 1% to the municipal GDP.

Given the expressive participation of the shrimp culture in the municipal GDP it is expected that the expansion of the shrimp production has had an impact in the evolution of the GDP (ΔY). For such it is compared the evolution of the municipal GDP with the one of the corresponding micro-region. The analysis of the data of the evolution of the GDP shows that it present a higher increase, in relation to the microregion, in Porto do Mangue, Canguaretama and Jandaíra. The increase is similar in Acaraú and Aracati and less than that of the micro-region in the other municipalities.

5. IMPACTS ON M UNICIPAL TAX COLLECTION

The municipal tax collection is affected in a direct and in an indirect way, through increases in municipal tributes, collected from farms, laboratories and centers of processing, and increases in municipal income and on transferences from the federal and state governments.

The municipal tributes that apply directly on the shrimp cultivation are limited: the business license, annual, and the ISS, a service tax collection - in general 5% of the value of the given services.

In the case of the federal and state transferences, the effect of the shrimp activity is little visible. ICMS is an example. The federal legislation establishes that, of the collected total, 25% belong to the cities. Of these 25%, three parts are repassed to the cities as a function of the aggregate value. The aggregate value is estimated by the difference between shrimp sales and purchases out of the municipality. This value is computed even if the activity has not collected ICMS. The remaining part (1/4) of 25%, or 6.25% of the ICMS collected, is distributed to the cities taking in account social-environmental variables.

The shrimp exportation is exempt. Internal sales are taxed in 17%. But the states have granted tax benefits that have practically exempted the activity. But even if no tax is applied, the added value is computed, for effect of the redistribution to the municipalities of 18.75 % of the total collected value. Although it is difficult to identify clearly the effect of the shrimp contribution to the value received by the municipality from ICMS, it is obtained taking the derivative of the ICMS quota with respect to the additional municipal aggregate value:

$$\frac{\partial(\text{Quota ICMS}_i)}{\partial \text{Va}_i} = \frac{\text{ICMS}.0{,}1875[\Sigma \text{Va}_i + \text{Va}_i/(\Sigma \text{Va}_i)^2]}{(\Sigma \text{Va}_i)^2}$$

where Va_i is the value added in the municipality i.

The variation in the quota of ICMS depends: (a) on the variation in the total tax collection, which depends on the variation of total ICMS collected in the State as a whole; and, (b) on the variation in the percentage of the municipality, which depends on the variation of the value added attributed to the city in relation to the total aggregate value.

In the case of the exportations, the states and municipalities are compensated by the resignation in tax collection. But, again, only 18.75% of the value received as compensation is passed to the municipality.

In Table 3, the value of the direct tax collected from the shrimp culture is presented and its percentage in relation to the total direct tax. The direct collection has greater expression in smaller cities, in which the ISS collection is limited, due to the fragility of the economy and the local commerce. It is the case of the municipalities of Porto do Mangue, Cajueiro da Praia and Jandaíra. Acaraú and Pendencias present a less expressive but still significant participation. In the other municipalities, the collection proceeding from the shrimp culture is around 3%.

Table 3.

Marine Shrimp Culture Contribution to Municipal Direct Tax Collection, in R$.

Municipality	Licenses	ISS	Total	% of Direct Taxes
Cajueiro da Praia	500	17.791	18.291	30,0

Acaraú	3.360	57.021	60.381	10,1
Aracati	85.986	62.364	148.350	11,7
Canguaretama	*	82.938	82.938	Nd
Pendências	*	77.227	77.227	14,5
Porto do Mangue	3.600	55.941	59.541	58,2
Goiana	1.326	34.160	35.486	3,3
Itapissuma	*	14.176	14.176	2,8
Valença	1.142	37.521	38.663	3,3
Jandaíra	*	36.376	36.376	25,6

Source: authors.

*Authorized by municipal law but not st ill applied.

The ICMS quota, as shown, varies with the total ICMS collection and the variation of the participation of the municipality in the total aggregate value. It is possib le to infer the evolution of the two variations by comparing the growth of the total I CMS and of the quota received by the municipality. Until 2000, in no municipality the quota part presented a higher growth than that of the total ICMS. From 2000 on, the picture is inverted: the growth is well superior in Aracati, Pendencias, It apissuma, Valença and Jandaíra; the only exception is Goiana. But in Goiana, the main activity, the sugar mills, at the time were in crisis, what justifies a decrease in the added v alue. These data show that the variation of the aggregate value of the municipality is the main responsible for the rise of th e ICMS quota. The magnitude of the variation shows that the impact is substantial.

Additionally, as shrimp exportations are exempt, states and municipalities are compensated by the loss of the export tax collection. Analyzing the evolution of these quotas, the growth is expressive for Aracati, Jandaíra, Pendencias, Itapissuma. Although the total value is small, in relation to the total public municipal revenue, it is well superior when taken in relation to the direct taxes. For 2002, for example, it is 41% for Itapissuma, 38% for Cajueiro da Praia, 31% for Jandaíra, 10% for Valença, 9% for Pendencias, 8% for Aracati and 6.5% for Acaraú. That is, the compensation for the resignation of export taxes adds more to the public revenue than all the direct taxation of the shrimp activity.

In summary, the marine shrimp culture impact municipal tax collection mainly through the ICMS quota and through the export compensation quota and in a lesser scale through direct tax, that is business licenses and ISS service tax.

6. MARINE SHRIMP IMPACTS ON THE MUNICIPAL ECONOMY

The undertaken study, allows to illuminate the impacts of the shrimp culture. There are visible and fully recognized impacts at a municipal level and impacts little observed and less known but of substantial importance.

The contribution to employment expansion is fully recognized. The participation in formal jobs is of great magnitude and the fact of the majority of the jobs to be formal brings great stability to workers. Total employment is of great importance in the smaller municipalities, in which shrimp producers are, by far, the biggest employers even if almost no indirect and induced impact occur within the municipality. In the cities where these linkages are more solid, good part of the induced jobs occurs inside of the municipality, as a result of the retention of the income and its consumption in the city.

The impact in the municipal income is less visible but still recognized by some. It is pointed out again that the effect in the municipality is only one fraction of the total income effect. That is, the contribution for regional income is many times superior. Even with these sizable leakages the generated income has expressive participation in the municipal GDP. In some of these municipalities the shrimp culture has been determinative for the fast growth of the GDP.

The impact in the municipal tax collection is not visible nor recognized in the majority of the municipalities. This can be attributed to several causes: (a) the small participation of direct tax in the public revenue; (b) lack of clarity of the relation between the aggregate value and the ICMS quota. This contribution is not visible and, as a consequence, is not recognized, but substantially increase total transferences and public revenue. But it is one of the major contributions of the shrimp culture to the municipal income; (c) the complete absence of analysis on the contribution of shrimp exports for the increase of the compensatory quotas due to the exemption of tributes on exports. It represents an additional flow of resources to municipal finances.

As a consequence, there are evidences to conclude that the shrimp culture, in the analyzed municipalities, contributes to the employment and income increase and stability, to the increase of the municipal revenue and lastly to the improvement of the quality of life.

7. REFERENCES

ABCC - Censo da Carcinicultura Brasileira - 2003, Final Report, 2003.

BNB. Macroeconomia do Nordeste: 1970 -1998, Fortaleza, Banco do Nordeste, 2001.

Costa, E. F. e Y. Sampaio. Geração de Empregos Diretos e Indiretos na Cadeia Produtiva do Camarão Marinho Cultivado, Economia Aplicada, 8 (2), 1-19, 2004.

Costa, E.F., Y. Sampaio e E. Albuquerque. A Carcinicultura Brasileira: Expansão Recente e Perspectivas no Comércio Mundial, RBCE, 8 , 86-95, 2004.

Rocha, I., J. Rodrigues e L. Amorim. A Carcinicultura Brasileira em 2003, Revista da ABCC, 6(1), 30-36, março 2004.

Rodriguez, M.T. e J.J. M. Guilhoto. Eficiência Alocativa do Fundo Constitucional de Financiamento do Nordeste (FNE) – Uma visão de insumo-produto, REN, 29 (3), 319-348, 1998.

Vergolino, J. R. e G. M. Gomes. Estimação dos PIBS Municipais para Municípios do Brasil, Brasília-DF, IPEA, 1999.