

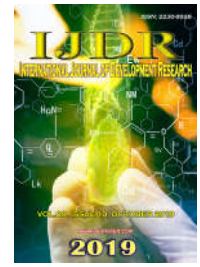


ISSN: 2230-9926

Available online at <http://www.journalijdr.com>

IJDR

International Journal of Development Research
Vol. 09, Issue, 10, pp. 30874-30876, October, 2019



RESEARCH ARTICLE

OPEN ACCESS

REVERSE LOGISTICS ANALYSIS APPLIED TO VEGETABLE OILS IN A FOOD DISTRIBUTOR- CASE STUDY

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ARTICLE INFO

Article History:

Received 17th July, 2019

Received in revised form

30th August, 2019

Accepted 20th September, 2019

Published online 30th October, 2019

Key Words:

Biodiesel, Recycling, Sustainability, Financial Management, Environment.

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ABSTRACT

The objective of this research was to analyze the viability and development of vegetable oil recycling (in post-consumer and post-sale phases), in the production of biodiesel for use and consumption in a company in the logistic operator branch of food distribution. Under the perspective of the company's reality, regarding the search for solutions for the correct disposal of its waste, the research was based on a case study in on-site data collection and questionnaires - with answers referring to stocked products, valuations of monthly movements and physical damages to the products, thus adding cyclical value to their operations, through the recycling of their tailings. With the results, it was possible to conclude that the vegetable oil, when discarded incorrectly, pollutes the environment, at the same time, its recycling is profitable.

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Citation: Elaine Cristina Brasilino de Albuquerque and Daniele de Castro Pessoa de Melo. 2019. "Reverse logistics analysis applied to Vegetable oils in a Food Distributor- Case Study", *International Journal of Development Research*, 09, (09), 30874-30876.

INTRODUCTION

The evolution of globalization and the activities of production and consumption significantly increase many wastes that, depending on the destination, result in negative impacts on the environment (MIGUEL, 2018). These residues, which according to their composition may vary the time of their decomposition in the environment, and the fate of these residues become complex as the population increases and the depletion of disposal sites of these materials (BOTEGA, 2018).

MATERIALS AND METHODS

Study site: he Food Distributor, where the research was conducted, is located in the metropolitan region of Recife, Pernambuco State, in an area considered a commercial / industrial center of 600 m²; It currently occupies an area of 6000 m² and has a staff of approximately 300 employees, of

which (a number of 70 employees in the logistics sector, and 03 responsible for reverse logistics); the others in other areas. The company status is medium sized. Its current branches: João Pessoa, Paraíba, and another, in Caruaru, Pernambuco's wild, serving even the Alto Sertão region.

Research method

The data used in this research were based on the application of on-site questionnaires that addressed the physical and operational structure of the company. For the interpellation samples, the employees who work and answer for the logistics sector were interviewed. The interviews took place in three phases (visits) between 2017 and 2018. The period of sample verification occurred in the first visit, of 2017, while the second and third in 2018, morning and night, respectively. Two complementary questionnaires were applied to each other, with questions in the objective (two questions) and subjective (seventeen) modalities, totaling 19 questions.

Applied Method

In the application of the questionnaires: The interviews in phase I (exploration questions) were based primarily on the understanding of the modus operandi of the company's existing Reverse Logistics process, its problems (weaknesses of the system, productive aspects that cause the most damage, and which were potentially harmful to the company's operations, as well as to the environment). In phase II, the results of employees' opinions are presented, specifically regarding the destination for recycling of segregated products.

RESULTS AND DISCUSSION

Reverse logistics in the company: Through the answers obtained from the elaborated questionnaires, it is possible to establish a profile of the 70 employees and the 03 supervisors responsible for the logistics area in the food distributor cooking oil reuse data. Thus it was well understood and accurately that there are reasons for losses in the Reverse Logistics Sector, thus working with a loss margin around 2% of the total products that go through its operations, being part for external reasons (already arrive damaged or expired warehouse), and part of the damage occurs within the distributor's own warehouse. The dates (expiration dates) and the physical state of the goods are monitored weekly. Based on the responses of the employees of Distribuidora de Alimentos, employed in the reverse logistics sector, it is concluded that the handling and storage of food cargo has an estimated monthly capacity of about 100 tons per day of numerous products, ie represents a total customer stock of approximately 1000 tonnes. Approximate revenue of 100 million reais (R \$) in annual turnover. Of this total, 2% represents waste, that is, for each tonne of cargo handled, 20 kg is loss for reasons beyond the control of customers or the logistics operator.

Project Results: To survey the production capacity and viability of transesterificators, machines from three continents were researched, along with their costs; the machines are electric, with diesel production capacities - by recycling post-use or post-consumption cooking oil (ie, no matter the quality or purity of the oil), - in liters per minute, with prices ranging from R \$ 18,900.00 to 21,700.00, and foreign machines must be increased by customs taxes, which increase the value around 44.34% of market quotation values.

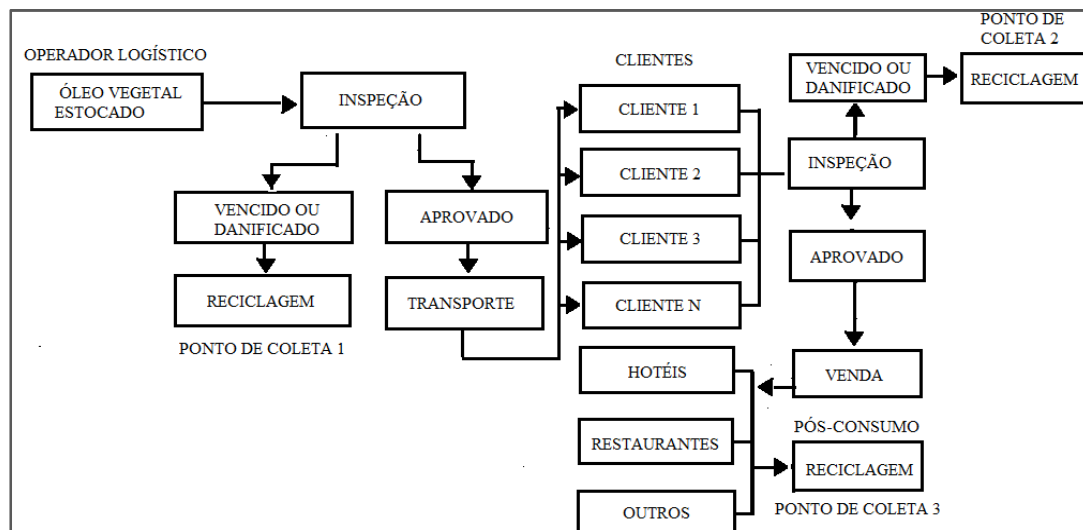
Feasibility and value added - productivity estimation : The demonstration of biodiesel production is presented, through the use of cooking oil from the post-use of partner restaurants, and after consumption; The data that have been collected demonstrate the advantages of using this technology that is highly conducive to environmental preservation, and that gives sustainability, according to the ramifications of partnerships in the quest to improve the use of highly recyclable resources: production estimates are raised at three intervals. measuring time: day, month and year; considering the work in 22 working days, every 30 days, and considering 12 months in the year, and regarding the referential value of diesel being R \$ 2.68 in the average of the gas stations; The prospects listed are the average production need, the production capacity of the transester plants, the required production time and the just-in-time of the company's operations and biodiesel production.

Variable cost analysis of recycling production: The representation of the variable cost analysis represents the average amount spent on diesel in relation to operations. The variables are the current values of diesel in the domestic market and the value of biodiesel production. Considering that current diesel costs R \$ 2.68 and the production cost of biodiesel is R \$ 0.70, the statement shows the financial savings on what is spent on fossil diesel and the less polluting renewable diesel (Table 1).

Table 1 . Variable cost of diesel production - comparison of oil and vegetable modalities

PRODUCTION CAPACITY	DAY	MONTH	YEAR
Average Need Generation	509,10 L	11.200 L	134.400 L
1 - Amount (R \$) spent at intervals (Petroleum Diesel) at 2.68 reais / liter			
Average Need Generation	1.364,40	30.016,00	360.192,00
1 - Amount (R \$) spent at intervals (Petroleum Diesel) at 2.68 reais / liter			
2 - Amount (R \$) spent at intervals (Vegetable Diesel) expectation at 0.7 reais / liter.	356 ,37	7.840,00	94.080,00
3 - ProductionEconomics (1 - 2)	1.008,03	22.176,00	266.112,00

Source: Author's data (2018).



Source: The author, 2018.

Figure 2 . Partnership process flow to oil collection point

With this exposure, we realize that there is a savings of 283% as shown above, ie recycled biodiesel is a proven viable solution that reduces fuel costs by almost three times. Renewable fuel self-sufficiency is an affordable return on business and environmental benefits (Figure 1). Disbursable amounts justify recycling. From this, it can be seen that the collection of the oil is in three points: in the after sales phase, it is presented in two points: during the quality inspection while in the logistics operator's warehouse and when in the premises of owners, but for reasons such as damage or expiration of that location, they represent collection points 1 and 2 (Figure 2). In the post-use phase, employees store used oil in vats supplied by the distributor, which represents over 99.73% of the diesel to be produced at this location. According to data from SABESP (2018), for each liter of vegetable oil used and discarded in the wild, about 20,000 liters of water are polluted, so 360,552 liters of oil would no longer pollute more than 7.2 billion liters of water in the nature, a major reduction in the degradation of fauna and flora.

Final considerations

It is understood, with the development of the work, that there is viability for investment in structure and human resources in biodiesel recycling, according to the demonstration of its production, the highly polluting post-use and post-consumption cooking oil. is, in fact, a potentially profitable reserve, the processed data reveal the possibility of sustainability of operations, with autonomy of fuel production in the studied modality. Incorrect disposal of damaged vegetable oil is highly harmful to the environment. Diesel fuel requirements for the company's vehicles annually are known to be approximately 134,400 liters; The savings generated by each liter of biodiesel produced is 283% of the market value of petroleum diesel. The annual and average cost of the company's internal and external cargo handling operations is around R \$ 360,192.00; In contrast, the cost of biodiesel would be around R \$ 94,080.00, totaling a significant savings of R \$ 266,112.00 annually. One of the most common questions would be the power source for the power generation of this micro plant; Therefore, the company would have a monthly expense of 200 hours per year to meet the demand for biodiesel for its activities, totaling an average energy expenditure of around R \$ 2,400 per year. As the volume of liters discarded by the normal operations (due to packaging damage and expired validity) of vegetable oils is insufficient for biodiesel production, partnerships with companies that use considerable volumes of the product are necessary, and feel the need to discard. Correctly the same This led to an annual volume of 360 liters discarded (representing 2% of the company's after-sales operations, which represents the market average for logistics operators). Therefore, recycling, as an instrument of sustainability and environmental preservation, is one of the most recommended and viable resources for the growth of institutions, and of society as a whole.

It is hoped that this work has contributed its share to the company and society as a whole, to promote ecological and business awareness, and to help in the production of other important projects in the development of reverse logistics and responsible resource management natural.

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