






# Eco-business and its influence on the environmental awareness of the traders of a supply market: The case of Ancieta market in Lima, Peru

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**Abstract**– Environmental awareness is a worrying factor that needs to be strengthened by raising public awareness in order to reduce environmentally damaging habits and attitudes. To this end, the research studied the influence of eco-business on the environmental awareness of traders in the "Ancieta" supply market in Lima, Peru. To assess the influence of eco-business, awareness-raising activities were carried out and evaluated on the basis of questionnaires for both a pre-test and a post-test in 59 traders. These awareness programs were related to environmental practices (efficient use of electrical energy, reduction of single-use plastic, recovery of used vegetable oil and waste management) and types of consciousness (conative, cognitive, active and affective). The results of the pretest showed that 91.5% of the merchants had a low level of environmental practices and in the posttest they obtained high and very high levels, corresponding to 84.7% and 15.3%, respectively. Concerning environmental awareness, initially, 86.4% of the merchants presented a low level of environmental awareness and in the post-test they obtained high and very high levels corresponding to 42.4% and 57.6%, respectively. Finally, it is concluded that eco-business had a positive influence on traders, suggesting that awareness programs are a strategy to improve workers' environmental awareness.

**Keywords**– eco-business, traders, awareness programmes, environmental awareness, environmental education

## I. INTRODUCTION

Globally, it was estimated that 242 million tons of plastic waste was generated in 2016, which corresponds to 12% of the total solid waste generated. Furthermore, over the next 30 years, global waste generation will increase from 2010 million to 3400 million tons of waste [1]. In the United Kingdom, an average of 220 million tons of waste is generated per year, which is equivalent to 9% of the total generated by the European Union [2]. Likewise, regions such as East Asia and the Pacific generate 23% of this waste, and it is estimated that by 2050 waste generation in the regions of South Africa and South Asia will double and triple [1].

In Peru, approximately 19 thousand tons of municipal solid waste are generated per day, and 50% of this waste is produced in Metropolitan Lima and the province of Callao. Of the total waste segregated in the country, 54% is recoverable

organic waste, 20% is recoverable inorganic waste, 19.9% is non-recoverable and 7% is hazardous waste. It is also known that 52% of this waste is disposed of in sanitary landfills and 48% is dumped in unauthorized dumps, which endanger the quality of the environment and people's health. On the other hand, the use of plastic in Peru is approximately 30 kg/person/year, equivalent to 3 billion bags per year. In this sense, the aforementioned statistics show that there is poor solid waste management by municipalities and private institutions, which should prioritize awareness and environmental practices in order to mitigate environmental effects and climate change [3].

Peru's Ministry of the Environment (MINAM) and the Assessment and Environmental Control Agency (OEFA) identified 92 districts in the country that require urgent action to improve solid waste management and cleaning services. The districts were identified based on the volume of accumulated waste and the increase in critical points in public spaces. Most of the waste comes from wholesale markets, food markets and households. El Agustino is one of the districts with a deficit in solid waste management and an increase in critical points; since, in the 2019 municipal waste characterization studies, the average waste collection was 280 tons per day [4].

In this context, eco-business includes the development of activities aimed at generating economic benefits through the protection of the ecosystem by means of environmental programs that help to promote environmental awareness in the community; that is, eco-business not only seeks economic sustainability but also social and environmental sustainability by appealing to a fair benefit [5]. Therefore, the implementation of eco-business benefits the population, the economy and the environment through environmental actions such as the efficient use of natural resources. Thus, this research determined the influence of eco-business on the environmental awareness of the traders of the "Ancieta" supply market of the District Municipality of "El Agustino" in Lima, Peru.

## II. METHODOLOGY

### A. Type and Design of Research

The research was quantitative, applied and with a pre-experimental design. A pre-test and a post-test were used; that

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is, the study variables were measured both before and after applying the stimulus. The level of the research was causal correlational and explanatory since the results of the work were analyzed to show the relationship between eco-business and environmental awareness.

*B. Population, Sample, Data Collection Techniques and Instruments*

The population consisted of 70 traders from the "Ancieta" supply market in the district of "El Agustino" in Lima, Peru. Fig. 1 shows the location of the market, with geographical coordinates of 12° 2' 34.90" S, 77° 0' 5.14" W.

The study sample consisted of 59 traders, and was taken probabilistically (Equation 1).

For data collection, the survey technique was used and a questionnaire of 20 questions related to the eco-business with polynomial response options was elaborated as an instrument.

$$n = \frac{Z^2 pqN}{E^2 (N - 1) + Z^2 pq} \tag{1}$$

Where: n, sample size; N, population size (70 traders); Z, confidence level (1.96); p, approximate proportion of the phenomenon under study in the reference population (50 %); q, proportion of the reference population without the phenomenon under study (1 -p); E, absolute level of precision (5 %).



Fig. 1 Location of the "Ancieta" supply market in the "El Agustino" district in Lima, Peru

*C. Evaluation of Eco-Business in the Traders of the "Ancieta" Supply Market*

In this study, an eco-business awareness program was developed and implemented in a supply market to influence the environmental awareness of the traders. To evaluate the influence of the awareness program, a pre-test was conducted, and after 30 days a post-test was conducted to confirm whether the changes in the environmental awareness of the traders were

significant. Fig. 2 shows the awareness process applied to traders in the supply market.

*D. Data Analysis*

To evaluate the influence of the eco-business on the traders of the "Ancieta" supply market, the Kolmogorov-Smirnov normality test was used because the sample had more than 50 elements, and a significance level of 5% ( $\alpha = 0.05$ ) was considered. The established hypothesis was evaluated

using the Wilcoxon test;  $H_0$ , the null hypothesis and  $H_a$ , the alternative hypothesis.

$H_0$ : Eco-business does not have a positive influence on the environmental awareness of traders in the "Ancieta" supply market, Lima, 2021.

$H_a$ : Eco-Business has a positive influence on the environmental awareness of traders in the "Ancieta" supply market, Lima, 2021.



Fig. 2 Awareness talks applied to traders of the "Ancieta" supply market

### III. RESULTS

#### A. Influence of Eco-Business on the Environmental Practices of Traders in the "Ancieta" Supply Market

Table I shows the results on the influence of the eco-business on the traders of the "Ancieta" supply market, both before and after the implementation of the awareness program.

Before implementing the eco-business, environmental practices in the traders of the "Ancieta" supply market did not

have adequate levels, noting that 3 traders (5.1%) presented a very low level, 54 traders (91.5%) had a low level, 2 traders (3.4%) with a regular level and no trader presented a high or very high level. After the implementation of the eco-business, traders improved their environmental practices, reaching high and very high levels with percentages of 15.3% and 84.7%, respectively. The above described showed that the application of the awareness programs is a main factor that helps to improve the environmental habits of the people.

TABLE I  
ECO-BUSINESS AT THE TRADERS OF THE "ANCIETA" SUPPLY MARKET

Level	Pre-test		Post-test	
	Frequency (No. of traders)	Percentage (%)	Frequency (No. of traders)	Percentage (%)
Very high	0	0	9	15.3
High	0	0	50	84.7
Regular	2	3.4	0	0
Low	54	91.5	0	0
Very low	3	5.1	0	0

On the other hand, Table II shows the results of the influence of the eco-business on the different environmental practices of the traders of the "Ancieta" supply market. These environmental practices are related to the efficient use of

electricity, reduction of single-use plastic, recovery of used vegetable oil and solid waste management.

TABLE II  
INFLUENCE OF ECO-BUSINESS ON THE DIFFERENT ENVIRONMENTAL PRACTICES OF THE TRADERS OF THE "ANCIETA" SUPPLY MARKET

Level	Efficient use of electrical energy				Reduction of single-use plastic				Valorization of used vegetable oil				Solid waste management			
	Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Very high	0	0	34	57.6	0	0	7	11.9	0	0	0	0	1	1.7	52	88.1
High	0	0	25	42.4	0	0	38	64.4	0	0	20	33.9	2	3.4	7	11.9
Regular	21	35.6	0	0	9	15.3	14	23.7	1	1.7	31	52.5	31	52.5	0	0
Low	34	57.6	0	0	28	47.5	0	0	20	33.9	5	8.5	25	42.4	0	0
Very low	4	6.8	0	0	22	37.3	0	0	38	64.4	3	5.1	0	0	0	0

\*n = No. of traders

B. Influence of Eco-Business on the Environmental Awareness of Traders in the "Ancieta" Supply Market

1) *Efficient use of electrical energy:* Before the application of the awareness programmes, the traders of the "Ancieta" supply market did not use electricity efficiently, with very low (4 traders, 6.8%), low (34 traders, 57.6%) and regular (21 traders, 35.6%) levels. After the application of the awareness programmes, the levels achieved in energy savings by the traders were high (25 traders, 42.4%) and very high (34 traders, 57.6%).

2) *Reduction of single-use plastic:* The traders of the "Ancieta" supply market frequently used single-use plastic bags for the sale of their products, and their levels of reduction in the use of these polymers were very low (4 traders, 6.8%), low (28 traders, 47.5%) and regular (9 traders, 15.3%). After the implementation of the awareness programmes, the levels of reduction in the use of single-use plastics achieved by the

traders were regular (14 traders, 23.7%), high (38 traders, 64.4%) and very high (7 traders, 11.9%).

3) *Valorization of used vegetable oil:* Regarding the valorization of used vegetable oil, the traders of the "Ancieta" supply market showed very low (38 traders, 64.4%), low (20 traders, 33.9%) and regular (1 trader, 1.7%) levels. After the implementation of the awareness programs, the levels achieved in the valorization of used vegetable oil by the traders were very low (3 traders, 5.1%), low (5 traders, 8.5%), regular (31 traders, 52.5%) and high (20 traders, 33.9%).

4) *Solid waste management:* The management of solid waste by the traders of the "Ancieta" supply market was not adequate and few of them did a good segregation and recovery, with low (25 traders, 42.4%), regular (31 traders, 52.5%), high (2 traders, 3.4%) and very high (1 trader, 1.7%) levels. After the application of the awareness programs, the levels achieved in waste management by the traders were high (7 traders, 11.9%) and very high (52 traders, 88.1%).

TABLE III  
ENVIRONMENTAL AWARENESS AMONG TRADERS AT THE "ANCIETA" SUPPLY MARKET

Level	Pre-test		Post-test	
	Frequency (No. of traders)	Percentage (%)	Frequency (No. of traders)	Percentage (%)
Very high	0	0	34	57.6
High	0	0	25	42.4
Regular	6	10.2	0	0
Low	51	86.4	0	0
Very low	2	3.4	0	0

On the other hand, Table IV shows the results of the evaluation of the different types of consciousness (conative, cognitive, affective and active), before and after the implementation of the eco-business awareness program in the traders of the "Ancieta" supply market.

1) *Conative consciousness:* Before the application of the awareness program, the traders of the "Ancieta" supply market did not have the interest or predisposition to participate in environmental activities inside and outside their

establishments, since their conative consciousness was mainly at low (13 traders, 22%) and regular levels (43 traders, 72.9%), and few at high level (3 traders, 5.1%). After the development of the awareness programs, the traders took more interest in the implementation of the environmental activities and presented a very high (28 traders, 47.5%), high (25 traders, 42.4%) and regular (6 traders, 10.2%) levels of conative consciousness.

2) *Cognitive consciousness*: The traders of the "Ancieta" supply market had very little knowledge of environmental practices; therefore, their cognitive consciousness was at very low (4 traders, 6.8%), low (24 traders, 40.7%), regular (30 traders, 50.8%) and high (1 trader, 1.7%) levels. After the implementation of the awareness programs, the traders improved their knowledge of environmental activities and presented cognitive consciousness at regular (14 traders, 23.7%), high (18 traders, 30.5%), very high (27 traders, 45.8%), and very high (27 traders, 45.8%) levels.

3) *Affective consciousness*: The affective consciousness of the traders in the "Ancieta" supply market was very low (27 traders, 45.8%) and low (32 traders, 52.4%) at the beginning. After the implementation of the awareness programs, the affective consciousness of the traders showed an improvement with regular (36 traders, 61%) and high (23 traders, 39%) levels.

4) *Active consciousness*: The traders of the "Ancieta" supply market did not carry out environmental actions or behaviors within their establishments since their active consciousness was at very low (44 traders, 74.6%), low (13

traders, 22%) and regular (2 traders, 3.4%) levels. After the application of the awareness programs, the traders improved their environmental actions and behaviors, presenting an active consciousness at regular (11 traders, 18.6%), high (23 traders, 39%) and very high (25 traders, 42.4%) levels

*B. Influence of Eco-Business on the Environmental Awareness of Traders in the "Ancieta" Supply Market*

Table III shows the changes in the environmental awareness of traders at the "Ancieta" supply market, both before and after the implementation of the awareness programs.

Before the implementation of the awareness programs, the traders of the "Ancieta" supply market had very low (2 traders, 3.4%), low (51 traders, 86.4%) and regular (6 traders, 10.2%) levels of environmental awareness. After the implementation of the environmental awareness programs, traders showed improvements in environmental awareness, reaching high and very high levels with percentages of 42.4% and 57.6%, respectively bracket [3].

TABLE IV  
INFLUENCE OF ECO-BUSINESS ON THE DIFFERENT TYPES OF ENVIRONMENTAL AWARENESS IN THE TRADERS OF THE "ANCIETA" SUPPLY MARKET

Level	Conative consciousness				Cognitive consciousness				Affective consciousness				Active consciousness			
	Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Very high	0	0	28	47.5	0	0	27	45.8	0	0	0	0	0	0	25	42.4
High	3	5.1	25	42.4	1	1.7	18	30.5	0	0	23	39	0	0	23	39.0
Regular	43	72.9	6	10.2	30	50.8	14	23.7	0	0	36	61	2	3.4	11	18.6
Low	13	22	0	0	24	40.7	0	0	32	52.4	0	0	13	22	0	0
Very low	0	0	0	0	4	6.8	0	0	27	45.8	0	0	44	74.6	0	0

*C. Statistical Analysis*

According to the Kolmogórov-Smirnov normality test, a significance level equal to 0.000 was obtained, which proved that the data are not normal; therefore, the hypothesis tests were nonparametric. In this sense, the Wilcoxon statistical test was used. Table V shows the Wilcoxon test that was used to determine the influence of the eco-business on the environmental awareness of the traders of the "Ancieta" supply market.

TABLE V  
WILCOXON TEST FOR THE STATED HYPOTHESIS

Influence of eco-business on the environmental awareness of traders	
Z	7.053 <sup>b</sup>
Asymptotic sig. (bilateral)	.000

b\*: Based on negative ranges

From Table V, a value of 0.000 (<0.05) was observed, which indicates an asymptotic significance (bilateral), rejecting the null hypothesis (H0). Therefore, the alternative hypothesis (Ha) is accepted, indicating that the eco-business positively influences the environmental awareness of the traders of the "Ancieta" supply market in Lima, Peru.

III. DISCUSSION

The awareness programs applied in the traders of the "Ancieta" supply market showed a positive and significant effectiveness, indicating that each trader improved their environmental practices through eco-business from a low level (54 traders, 91.5%) to a high level (50 traders, 84.7%). Similarly, Ref. [6] showed that students improved their commitment to the environment by exercising activities that fully involve the use of recycled material. These results contemplated that an improvement in people regarding the reduction of single-use plastics and active awareness is

possible by applying appropriate strategies. On the other hand, Ref. [7] evaluated the environmental practices in energy saving of residential and commercial consumers in Shanghai-China with the dissemination of environmental events such as the World Environment Day and the National Energy Saving Publicity Week, observing significant savings in electricity consumption from 1.35 to 0.6 kWh<sup>-1</sup>. This showed that environmental education is a key tool for improving eco-business practices, and are activities carried out within the framework of meeting the Sustainable Development Goals [8].

Regarding the results obtained in environmental awareness, the merchants presented a significant improvement, going from a low level (51 traders, 86.4%) to a very high level (34 traders, 57.6%). These results also reflected the improvement changes in the different types of consciousness of the traders that were evidenced in their pro-environmental attitudes and in their environmental knowledge. Ref. [9] mentions that achieving sustainability education significantly improves environmental awareness, indicating that the use of awareness programs can effectively influence the environmental awareness of the population. Similarly, Ref. [10] determined the influence of a recycling program on the development of environmental awareness, and showed that it significantly influenced the improvement of environmental awareness, increasing from 3 to 64%. Ref. [11] showed in his study that environmental awareness does not significantly influence ( $p>0.1$ ) the purchase decision, since it is the economic motives that prevail in consumers. Therefore, he emphasizes the relevance of a correct dissemination of eco-business to improve environmental awareness, taking into account the study population; that is, traders are subject to price competition, a reason that drives the achievement of a sustainable and economically competitive service.

#### IV. CONCLUSIONS

The research showed that the eco-business achieved a positive influence on the traders of the "Ancieta" supply market, improving their environmental habits through the application of awareness programs that involved environmental practices for the valorization of used vegetable oil, reduction of single-use plastic, efficient use of electric energy and waste management. The results also showed positive changes in the different types of consciousness (conative, cognitive, affective and active), which was reflected in the improvement of the merchants' knowledge, behaviors and attitudes on environmental practices. All this confirms that awareness programs promote eco-business practices and consequently improve environmental awareness. It is also important to keep a detailed record of the different activities related to the eco-business in order to identify gaps and implement improvement strategies.

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#### REFERENCES

- [1] S. Kaza, L. Yao, P. Bhada-Tata, and F. Van Woerden, *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*. The World Bank, 2018.
- [2] ICEX, "Gestión de residuos en Reino Unido," España Export. e Inversiones, 2019.
- [3] "Ministerio de Economía y Finanzas - MEF," Programa de incentivos a la mejora de la gestión municipal 2019, 2019. [Online]. Available: [https://www.mef.gob.pe/contenidos/presu\\_public/migl/metadatos/Presentacion\\_Residuos\\_B.pdf](https://www.mef.gob.pe/contenidos/presu_public/migl/metadatos/Presentacion_Residuos_B.pdf).
- [4] "Ministerio del Ambiente - MINAM," Ministerio del Ambiente identifica 92 distritos que requieren tomar acciones para mejorar el manejo de residuos sólidos, 2018. [Online]. Available: <https://www.minam.gob.pe/notas-de-prensa/ministerio-del-ambiente-identifica-92-distritos-en-situacion-de-riesgo-por-manejo-de-residuos-solidos/>.
- [5] "Ministerio del Ambiente - MINAM," Resolución Ministerial N° 046-2020-MINAM, 2020. [Online]. Available: [https://cdn.www.gob.pe/uploads/document/file/522975/RM\\_046-2020-MINAM.pdf](https://cdn.www.gob.pe/uploads/document/file/522975/RM_046-2020-MINAM.pdf).
- [6] A. Espejel Rodríguez and A. Flores Hernández, "Experiencias exitosas de educación ambiental en los jóvenes del bachillerato de Tlaxcala, México," *Luna Azul*, vol. 44, pp. 294–315, Jan. 2017.
- [7] X. Shen, Y. Qiu, L. Luo, and X. Zheng, "The impacts of special environmental events on short-run electricity-saving behaviors," *Environ. Res. Lett.*, vol. 16, no. 9, 2021.
- [8] M. Pecci-Oviedo, "Good practices towards the fulfillment of SDG 7 'Affordable and Clean Energy,'" *Rev. Científica la UCSA*, vol. 7, no. 3, pp. 72–75, Dec. 2020.
- [9] Q. Kalsoom, "ESD literacy-based model for preservice elementary teachers: a focus on critical and environmental consciousness and effective teacher development," *Lahore College for Women University*, 2017.
- [10] I. Calle Aguilar, "Reciclaje y conciencia ambiental en el mejoramiento de la sostenibilidad del planeta," *UCV - HACER Rev. Investig. y Cult.*, vol. 5, no. 1, pp. 34–43, 2016.
- [11] A. de V. Bittar, "Selling remanufactured products: Does consumer environmental consciousness matter?," *J. Clean. Prod.*, vol. 181, pp. 527–536, Apr. 2018.