

Socioeconomic Factors Influencing Cocoa Consumption in Amazonas

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ABSTRACT: Cocoa, a key ingredient in chocolate production, represents a significant crop in the Amazon region, mostly for export. This study examines the socio-economic factors that influence local cocoa consumption. Using a non-experimental explanatory correlational design and a sample of 505 respondents, data were analyzed using descriptive statistics and a binary logistic regression model. The results indicate that age is the only significant factor influencing cocoa consumption (p -value = 0.045), while other variables such as income, educational level, and occupation did not show statistical significance. This work highlights the importance of understanding consumption patterns in cocoa-producing regions, which could inform local market strategies and policies. This study fills a gap in the literature by addressing the factors that impact consumption in a key cocoa-producing region in Peru.

Keywords: socioeconomic factors, consumption, cocoa, consumer behavior, logistic regression analysis.

I. INTRODUCTION

Cocoa cultivation has great socioeconomic importance in Latin America and the Caribbean since it is one of the main export products, either as raw material or processed [1, 2]. The current interest in cocoa is notable, its recent worldwide consumption is significant, not only as chocolate [3-5], but also as a basic ingredient, due to the revaluation of the exquisiteness of its grains for a healthy diet [6-8]. Chocolate consumption trends are on the rise [9, 10], now, consumers are willing to pay more for fine and aromatic cocoa [11, 12]; European markets such as Belgium, France, Germany, Italy, Switzerland, and the United Kingdom show increasing demand for specialty chocolates [13].

Although the cocoa produced in Latin America tends to meet market demands, its production is still very low [14], as its demand has increased due to its quality [15], the European market is becoming the largest consumer of this product, which is used for fine sweets and candies that have high prices [16-18]. In 2018, Latin American cocoa sales reached 81 thousand metric tons, a decrease of around 6.7% from the previous year's 86.7 thousand tons [19]. However, the production of cocoa and its derived products is affected by the infrastructure and connectivity to integrate the productive chain, that is, the connection between the farmer and the processing companies or factories [20].

Cocoa production in Ecuador has been increasing, making it one of the largest cocoa exporters in the world, which has generated opportunities and benefits for producers [21]. The promotion of the cultivation of both the fine varieties, Cacao Nacional, and the hybrid (CCN-51) has contributed to the increase in yields. For the 2022/23 campaign, production is expected to rise to 400 thousand tons, representing a year-on-year increase of 10%. For its part, in Brazil, after the heavy rains were recorded, production would be estimated at 210 thousand tons. Projections for production in Colombia and the Dominican Republic remain unchanged at 70 thousand and 80 thousand tons, respectively [22].

In Peru, national cocoa bean production has experienced an average annual growth of 10.1%; Cocoa production is based on three main varieties: 53.3% of the Trinitario variety (Junín), 37.3% of Amazonian Forastero (Cusco and Ayacucho) and 9.4% of Criollo (northern area of San Martín, Amazonas and Cajamarca). Production in the first half of 2023 shows a drop of 4.8% compared to the same period in 2022, resulting in a volume of 86.2 thousand tons, which is due to the lower production of the main regions such as San Martín, Junín, Huánuco, and Cusco [22]. Peru is one of the main producers and suppliers of fine and aroma cocoa [23]. Additionally, it is the second-largest producer of organic

cocoa worldwide [24]. Furthermore, 60% of the existing cocoa biodiversity, in terms of genetic material, is found in our country.

During the first half of 2023, 46.7 thousand tons of cocoa and derivatives were exported for a value of US\$162.8 million, with which the exported value grew by 20.7%, and the volume by 12.3% compared to what was reported in the first half of 2022. This would be explained especially by the greater external demand for chocolate and other preparations (82.2% increase), followed by cocoa beans (26.8%) and cocoa powder (21.2%) [22]. Shipments were mainly destined for Malaysia, Italy, and Mexico [25].

Current consumption trends and potential health benefits of cacao are influenced by its rich bioactive compounds, such as flavonoids, theobromine, and polyphenols, which offer various health advantages [23, 26]. Studies show that cocoa consumption is associated with potent antioxidant effects, anti-inflammatory properties, and cardiovascular benefits, including improved blood flow, reduced cardiovascular disease risk, and enhanced endothelial function [27-30]. In regions like La Chontalpa, and Tabasco, Mexico, homemade chocolate consumption is prevalent due to perceived mental and physical health benefits, including improved mood, and energy levels, and relief from illnesses like headaches and stomach aches [26]. Research suggests that cacao products may help in managing dyslipidemia by positively impacting lipid profiles, such as total cholesterol, LDL, HDL, and TG, through their antioxidant properties and effects on blood flow and cardiovascular health [27, 30].

Studies highlight the potential of cacao by-products for developing functional products in various industries [31]. The genetic diversity of cacao in Peru and other countries in the region is crucial for the sustainability of cacao cultivation, emphasizing the need for better conservation and utilization of genetic resources [32]. Peruvian chocolate was found to contain high levels of polyphenols, theobromine, and antioxidants, which are beneficial for cardiovascular health, although moderation is advised due to its energy and fat content [33]. Furthermore, the fermentation process of Peruvian cacao beans influences the levels of phenolic compounds, methylxanthines, and antioxidant activity, showing the impact of post-harvest processing on the bioactive compounds present in cacao [34].

However, the consumption of cocoa, either directly or indirectly through its derivatives, is related to certain socioeconomic factors [35], which allows the consumer to make or not make the decision to consume the cocoa product [30, 36]. New trends in consumers seeking healthy lifestyles have produced changes in eating habits [37]. In this sense, the research asks: What socioeconomic factors influence cocoa consumption? How do factors such as age, gender, income level, occupation, and level of education influence cocoa consumption patterns among inhabitants of the Amazonas region in Peru?

In Latin America, cocoa is recognised for its socio-economic importance due to its role in the export economy. However, domestic consumption patterns in producing regions such as Amazonas have been little studied. Although factors such as income and education are known to impact food consumption, there is a lack of research examining these variables in the context of rural cocoa-producing regions. Socioeconomic factors are crucial for cocoa consumption in different regions [38]. Cocoa consumption is determined by socioeconomic factors such as consumer behavior, income, education, and market accessibility. Analyzing and understanding these factors is essential to promote sustainable practices in cocoa production and consumption worldwide. For this reason, the present research aims to Identify the socio-economic factors that influence cocoa consumption in the Amazon region. Analyse local consumption patterns and how these relate to local culture and economic conditions; and, propose recommendations to promote local consumption and the development of value chains in the region.

II. LITERATURE REVIEW

Theories of consumption provide important tools to explain how consumers interact with cocoa products. For example, those of Rochon & Rossi's [39] provide a useful framework for the analysis of consumer behavior patterns in this market. Research such as that of Ahenkora & Adarkwa [40] highlights how factors such as attitude, social norms, and perceived behavioral control influence the intention to purchase locally produced chocolates in cocoa-producing countries. Likewise, Sahu [41] analyzes what motivates the purchase and consumption of chocolate, highlighting the role of enjoyment, celebrations, and the feeling of affinity that this product arouses. Gavrilova's [42] points out the global relevance of cocoa production, identifying countries such as Ghana, Ivory Coast, and Nigeria as the main players in this market. The integration of these findings provides a more complete view of the application of consumer theories to cocoa, allowing the identification of consumer preferences, market trends, and possible strategies for action by the sector's agents [43].

Consumer theories provide multiple frameworks for analyzing chocolate consumption. Expected Utility Theory elucidates how consumers assess the advantages of cocoa relative to its expense [44], whereas the Theory of Planned Behavior facilitates the examination of attitudes and norms that affect consumption [45]. Maslow's Hierarchy of Needs, updated by Bridgman et al. [46], could illustrate how cocoa satisfies different levels of needs, and Consumer Culture Theory explains the influence of cultural factors [47]. The Diffusion of Innovations Theory is pertinent for examining

the uptake of novel cocoa goods [48], whilst the Cognitive Dissonance Theory elucidates how customers rationalize their usage despite health or sustainability apprehensions [49]. Ultimately, Consumer Information Processing Theory elucidates the mechanisms underlying purchasing decisions about cocoa items [50]. Implementing these theories necessitates targeted research that tailors these notions to the specific context of cocoa and its derivatives.

Del Prete & Samoggia [43] offer a comprehensive model that integrates conventional economic parameters with social and psychological variables to elucidate cocoa consumption. Their research indicates that while price is a crucial issue, quality perception, health awareness, and ethical consumption patterns are increasingly influencing purchasing decisions. Health awareness and ethical consumption patterns are increasingly influencing purchasing decisions. On the contrary, Reina & Rodríguez [51] argue that the analysis of cocoa consumption should be situated within the paradigm of extended rational choice theory, which encompasses elements such as accessible information, social preferences, and cultural norms. Its research conducted in several Latin American countries indicates that cocoa consumption indicates that cultural traditions and perceived health advantages significantly determine cocoa consumption.

Socioeconomic factors have a significant impact on cocoa consumption habits in different regions [52]. Aspects such as trends in consumer behavior, product innovation, and economic conditions are determinants in consumption patterns [53]. In the case of Russia, demand for cocoa products is driven by consumer preferences for new options and by the influence of global trends on domestic consumption, particularly in the confectionery sector [38]. In Colombia, the socioeconomic conditions of cocoa farmers, such as the income generated by their crops, educational level, and access to technical assistance, influence the competitiveness of farms and the adoption of technologies, which has an impact on both cocoa production and consumption [54]. On the other hand, in regions such as Central Sulawesi, Indonesia, factors such as certification programs, the age and educational level of farmers, as well as debts linked to traders, play a crucial role in the success of such programs, affecting the quality and marketing of cocoa products [54].

Smith & Brown [55] conducted a comprehensive study on cocoa consumption patterns across different demographic groups. Their findings reveal that young adults (25-35 years) consume 30% more cocoa products than other age groups. Additionally, Pintor et al. [56] corroborate that women tend to consume 20% more dark chocolate and cocoa products considered healthy than men. Complementing these findings, R. López & García [57] found that preference for different types of cocoa products varies significantly with age. Daymond et al. [58] reveal in their study that consumers over 50 prefer chocolates with lower cocoa content and more sugar, while younger consumers opt for chocolates with high cocoa content and organic options.

De La Cruz & Otoyá [59] demonstrated a strong correlation between income level and consumption of high-quality cocoa products. Their research, which spanned five countries, including Peru, found that for every 10% increase in household income, spending on premium cocoa products increased by 15%. Additionally, Frizky et al. [27] explored the income elasticity of demand for different cocoa products in Latin America. Their results indicate that high-quality dark chocolate has a positive income elasticity greater than 1, which classifies it as a luxury good in many markets in the region. These findings highlighted the influence of income on consumer preferences for premium cocoa products, indicating a strong association between rising incomes and the consumption of high-quality chocolate products [27, 59].

Studies have shown that individuals with a higher level of education, particularly college-educated individuals, consume 40% more cocoa products than those with lower educational levels [60]. Furthermore, occupations in the health and education sectors are linked to increased cocoa consumption and a better understanding of its nutritional advantages [30]. Regarding cocoa consumption preferences based on occupation, office workers and liberal professionals tend to consume more dark chocolate and cocoa products during work hours, attributing benefits such as enhanced mood and concentration [61]. These findings highlight the influence of education and occupation on cocoa consumption habits, with higher education levels and specific job types correlating with increased consumption of cocoa products, especially dark chocolate, for cognitive and mood-related benefits.

Educational attainment plays a crucial role in influencing consumption patterns, including the intake of cocoa products [62]. Studies have shown that education not only influences consumption levels and structures but also influences consumption modes and concepts [63]. Studies on cocoa consumption among university students in Spain and Portugal indicate that a higher level of education is associated with an increase in cocoa consumption, showing a positive relationship between education and consumption of cocoa products [64]. On the other hand, in areas where cocoa production represents an important economic activity, such as in the Alto Beni region of Bolivia, it has been identified that the educational level of producing families favorably influences production, suggesting a relationship between education, labor activities and agricultural practices related to cocoa cultivation [65].

Various studies have shown that the growing interest in healthy lifestyles has had a significant impact on cocoa consumption, with 65% of consumers surveyed indicating that health benefits are a key factor in their decision to purchase cocoa-based products [66]. In addition, these investigations analyzed how the perception of cocoa's health benefits varies according to educational and socioeconomic levels [67]. It was found that consumers with a higher educational and socioeconomic level have a greater knowledge about the antioxidant properties and cardiovascular benefits of cocoa, which positively influences their consumption habits [68, 69]. Likewise, the studies underlined the relevance of understanding consumer behavior towards cocoa and chocolate products, highlighting factors such as personal preferences, product characteristics, sociodemographic aspects, and economic conditions that influence consumption decisions [43].

At the local level, the specific literature on cocoa consumption in the Amazon and nationally in Peru is limited and lacks research, there is also a lack of studies investigating the reasons for low regional consumption, despite cocoa being one of the main export-oriented productive activities, this study seeks to contribute to closing knowledge gaps and provide an overview for future research on the issue of per capita consumption of cocoa in the region.

Research conducted in several cocoa-producing regions of Peru, including the Amazonas, reveals that cocoa consumption in these areas is mainly influenced by tradition and availability, rather than factors such as income or education, which contrasts with urban consumption patterns [69]. Socioeconomic factors such as age, gender, income level, occupation, and education significantly influence cocoa consumption, and trends toward healthier options are more prevalent among groups with higher educational and socioeconomic levels [70]. This suggests that consumer preferences for cocoa are influenced by a combination of cultural traditions, ease of access, and the growing trend towards healthy lifestyles. This underscores how various socioeconomic factors intertwine very complexly to shape consumption patterns in different regions and demographic groups, particularly among those with higher educational attainment and socioeconomic status.

III. MATERIAL AND METHOD

The research design was non-experimental correlational, cross-sectional, and explanatory, with a quantitative approach. This design is adequate for analyzing the relationships between variables without manipulating them; it was also carried out at a specific moment in time. The study population was delimited to residents between 18 and 64 years of age in the capital cities of each province of the Amazonas region, using stratified probability sampling to obtain statistical representativeness. Data collection was carried out through the application of a survey, guaranteeing both the reliability and confidentiality of the information received. This collection procedure is adequate for the quantitative approach of the study, allowing the collection of standardized data from the sample and complying with the corresponding ethical considerations.

3.1 DATA COLLECTION

Data collection was carried out during May to July of this year, taking into account the distribution of the study population, which is described in table 1:

Table 1. Distribution of the research sample by provincial capitals.

Capitals of Provinces of the Amazon region	Population	Sample	Surveyed
Chachapoyas	21,125	377	73
Bagua	16,094	375	73
Jumbilla	4,020	351	69
Santa María de Nieva	2,509	333	73
Lamud	1,344	299	72
San Nicolas	2,713	337	72
Bagua Grande	2.2686	338	73
Total		2,410	505

Note: National Institute of Statistics and Informatics (INEI)-National Census 2017.

The stratified sampling technique using the finite population formula:

$$n = \frac{Z^2 PQN}{E^2(N-1) + Z^2 PQ} \quad (1)$$

Where: N is the population in each province, n is the sample size, and E is the estimation error (0.05). P is the probability of success (0.5), Q is the probability of failure (0.5), and Z is the value according to the statistical table (95% confidence).

Stratified probability sampling was used to ensure the representativeness of the sample. The provincial capitals of Amazonas were selected as study areas due to their population density and socio-economic diversity. The target population included residents aged 18-64, stratified by age and gender to reflect the demographic composition of the region, with data based on the 2017 National Census of the National Institute of Statistics and Informatics (INEI). Participants were randomly selected within each stratum.

The collection instrument was a questionnaire validated by expert judgment, who reviewed its content for relevance and clarity. Subsequently, a pilot test was conducted on a sub-sample of 50 people, which allowed for the adjustment of ambiguous questions and to ensure the general comprehension of the instrument. The reliability of the questionnaire was assessed with Cronbach's alpha coefficient ($\alpha = 0.798$), indicating high internal consistency. This instrument was administered in person in the cities of each province. During the data collection process, some challenges were faced: many of the people approached were unaware of the study topic or did not wish to participate. As a result, the total number of respondents was less than the initially calculated sample size. Despite this limitation, the number of completed surveys was sufficient to conduct a meaningful analysis. The final sample (505) remains representative of the population studied, allowing valid and reliable results to be obtained for the research objectives.

During the data collection process, potential sources of bias, such as non-response, were identified. To minimize this impact, several attempts were made to contact selected participants. In addition, sampling controls were implemented to ensure that non-response did not disproportionately affect any key demographic group. For example, response rates were checked to ensure that response rates were similar across different age and gender strata. Finally, we assessed the data for patterns of non-response and found no evidence of systematic biases that could compromise the validity of the results. The study complied with ethical guidelines, including informed consent, anonymity, and privacy of data collected.

3.2 RESEARCH DESIGN

The design corresponds to a correlational model, using the Binary Logit (BBL) regression model, which is a statistical technique used to analyze and predict a binary dependent variable (which can only take two values, usually 0 and 1) based on one or more independent variables. The BBL model extends the binary logit model to analyze two correlated binary responses, making it suitable for studying complex relationships in cocoa consumption patterns [71]. Factors such as land area, farmer's age, education level, debt linkage with traders, cocoa production, income, traders' domicile, and merchant service patterns have been identified as significant influencers in the success of cocoa certification programs, indicating their potential impact on cocoa consumption behaviors [72]. Additionally, the use of parametric link functions, including asymmetric links, in binary response data analysis can provide a flexible and insightful approach to understanding cocoa consumption patterns and the socioeconomic determinants involved [73].

IV. DATA ANALYSIS

The data collected were processed using descriptive and inferential statistics. SPSS software was used for the descriptive analysis of the socioeconomic data, while EViews was used for inferential statistics. The latter was applied both for the correlational analysis and to determine and execute the regression model, to identify the factors that influence cocoa consumption. This combination of methods and tools allowed for a comprehensive analysis of the data, integrating the description of the socioeconomic characteristics of the sample with the predictive model for cocoa consumption. To determine the socioeconomic factors that influence cocoa consumption, the following variables were identified, which are described in Table 2.

Table 2. Identification of cocoa or chocolate consumption variables in the province of Chachapoyas.

Variables	Definition	Quantification
Cocoa consumption (Cons)	Dependent variable that represents the consumption of cocoa or its derivatives such as chocolate	0= No 1= Yes

Gender (Ge)	Independent variable representing the gender of the respondent	0=Female 1=Male
Age (Ed)	Independent variable representing the Age of the respondent	1= 18 to 24 2= 25 to 49 3= 50 to 70 4= 70 or more
Education level (Edu)	Independent variable that represents the educational level of the respondent	1= Primary 2= Secondary 3= Higher technical 4= Incomplete university 5= Complete university 6= Postgraduate
Occupation (Oc)	Independent variable that represents the occupation carried out by the respondent	1= Student 2= Housewife 3= Employed 4= Unemployed 5= Farmer 6= Independent 7= Retired
Income (Eng)	Independent variable that represents the income level of the respondent	1= 400 to 600 2= 600 to 1000 3= 1000 to 1500 4= 1500 to 2000 5= 2000 or more

4.1 Model estimation

The Logit binary regression model has been widely used in various domains, including software testing quality management [74]. In the context of cocoa production, socio-economic factors such as farm area, income from cocoa yields, income from other agricultural production, family labor, schooling of farmers, land tenure, and gender can be accurately predicted using the Logit regression model [54, 75]. Additionally, the Logit model has been applied in innovation analysis to predict dichotomous dependent variables, addressing issues like multicollinearity in economic variables [76]. Therefore, by leveraging the Logit regression model, researchers and practitioners can effectively forecast and manage socio-economic aspects related to cocoa consumption, enabling better decision-making and resource allocation in the cocoa farming industry.

Based on the information, the regression model is defined as follows:

$$\text{Logit (cocoa consumption)} = \beta_0 + \beta_1 \text{Ge} + \beta_2 \text{Ed} + \beta_3 \text{Edu} + \beta_4 \text{Oc} + \beta_5 \text{Ing} + \varepsilon \quad (2)$$

Where β_0 is the model constant, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are the coefficients of the independent variables, Ge is the Gender variable, Ed is the variable Age, Edu is the variable Education level, Oc is the Occupation variable, Ing is the variable Income, and ε is the error term.

V. RESULTE

5.1 DESCRIPTIVE STATISTICS

It can be seen in Figure 1 that in the capitals of the provinces of the Amazonas region, which are: Bagua, Bagua Grande, Chachapoyas, Jumbilla, Lámud, San Nicolás, and Santa María de Nieva, an average of 87.3% of those surveyed consume cocoa products, while the remaining 12.7% do not consume them due to various factors such as health concerns, among others. However, most of the cocoa production from this region is destined for export as raw material, with no processing or industries adding value to this product. Therefore, the consumption that occurs in this region is artisanal, in various forms such as chocolates, liqueurs, cocoa butter, etc. See the socioeconomic description in Table 3.

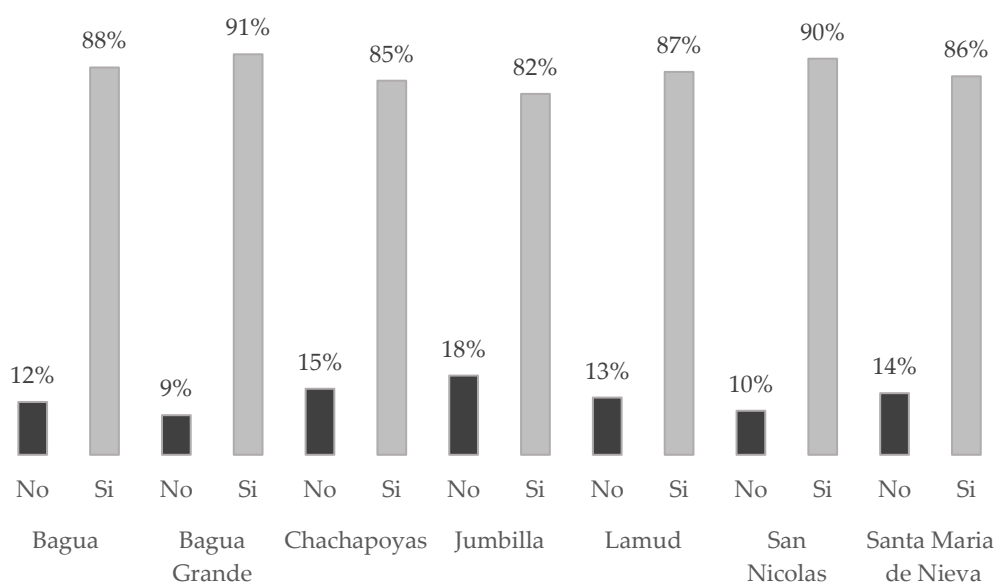


FIGURE 1. Percentage of cocoa consumption in the capitals of the provinces of the Amazonas Region.

Table 3. Socioeconomic data.

Variables	Quantification	Frequency	Percentage
Cocoa consumption	No	64	12.7%
	Yeah	441	87.3%
Gender	Female	246	48.7%
	Male	259	51.3%
Age	18 to 24	86	17.0%
	25 to 49	268	53.1%
	50 to 70	126	25.0%
	70 or more	25	5.0%
Education level	Primary	86	17.0%
	Secondary	210	41.6%
	Technical superior	126	25.0%
	incomplete university	53	10.5%
	Complete university	30	5.9%
Occupation	Postgraduate	86	17.0%
	Student	46	9.1%
	Housewife	110	21.8%
	Employee	76	15.0%
	Unemployed	10	2.0%
Income	Farmer	51	10.1%
	Independent	202	40.0%
	Retired	10	2.0%
	400 to 600	96	19.0%
	600 to 1000	147	29.1%
	1000 to 1500	126	25.0%
	1500 to 2000	80	15.8%
	2000 or more	56	11.1%

It is important to consider age when conducting various studies. In this case, 53.1% of those surveyed are between 25 and 49 years old, 25% are between 50 and 70 years old, 17% are between 18 and 24 years old, and only 5% are over 70 years old.

Regarding the educational level of the respondents, the results reveal that the majority (41.6%) have completed secondary education, representing the largest group. Notably, almost a third (30.9%) have accessed higher education

(technical, university, or postgraduate), while a significant percentage (17%) have only primary education. This distribution suggests considerable diversity in educational levels in the region, with an emphasis on secondary education and a significant proportion of individuals with higher education, which could have implications for consumption patterns of cocoa and its derivatives.

The analysis of the respondents' monthly income reveals that 19% earn between 400 and 600 soles, 29.1% earn from 600 to 1000 soles, 25% report income from 1000 to 1500 soles, 15.8% receive between 1500 and 2000 soles, and only 11.1% exceed 2000 soles per month. These data indicate that the majority of participants (48.1%) are concentrated in the low to medium-income ranges (400-1000 soles), while a smaller proportion (26.9%) reaches incomes greater than 1500 soles. This distribution suggests significant economic disparity in the region, with potential implications for consumption patterns, including that of cocoa and its derivatives.

5.2 REGRESSION ANALYSIS

Table 4 presents the results of the binary logit model regression, executed using the Eviews software, which analyzes the factors influencing cocoa consumption in the Amazon region. The model includes the following independent variables: age (Ed), income (Ing), educational level (Edu), occupation (Oc), and gender (Ge), with cocoa consumption (CONS) as the dependent variable.

Table 4. Factors that influence cocoa consumption in the Amazon Region

Dependent Variable: CONS				
Method: ML - Binary Logit (Newton-Raphson / Marquardt steps)				
Date: 08/31/22 Time: 10:34				
Sample: 1 505				
Included observations: 505				
Convergence achieved after 3 iterations				
Coefficient covariance computed using observed Hessian				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	1.173735	0.493705	2.377403	0.0174
Ed	-0.261549	0.130560	-2.003285	0.0451
Eng	0.019748	0.077375	0.255228	0.7985
Ed	0.016040	0.077774	0.206240	0.8366
Oc	0.068750	0.055280	1.243663	0.2136
Ge	0.049575	0.191165	0.259333	0.7954
McFadden R-squared	0.9031	Mean dependent var		0.728713
SD dependent var	0.445065	SE of regression		0.445121
Akaike info criterion	1.182274	Sum squared resid		98.86810
Schwarz criterion	1.232466	Log-likelihood		-292.5241
Hannan-Quinn criter.	1.201961	Deviance		585.0482
Restriction deviance	590.3802	Restriction log likelihood		-295.1901
LR statistics	5.331967	Avg. log likelihood		-0.579256
Prob (LR statistic)	0.0023			
Ob. with Dep=0	137	Total, obs		505
Ob. with Dep=1	368			

The results of the logistic model indicate that education (Ed) is the only significant factor ($p=0.0451$) that negatively influences cocoa consumption in the Amazon region, with a coefficient of -0.261549, suggesting that for each unit increase in education level, the probability of consuming cocoa decreases, holding all other variables constant; this finding is supported by an excellent model fit (McFadden $R^2=0.9031$, standard error 0.445121, Akaike 1.182274 and Schwarz 1.232466 information criteria) and overall statistical significance ($p=0.0023$, $LR=5.331967$), confirming that education is a robust determinant of cocoa consumption among the 505 participants (72.87% consumers), suggesting the need to consider differentiated consumption promotion strategies according to educational levels.

The findings have important theoretical implications: the negative relationship between education and cocoa consumption in the Amazon suggests that socio-economic and cultural factors may be mediating this relationship, possibly due to changes in food preferences or perceptions of cocoa as educational level increases. This contradicts

traditional economic theory that suggests a positive relationship between education and income with consumption of traditional goods. The statistical robustness of the model supports the need to reconsider existing theoretical frameworks on consumption patterns in Amazonian contexts, where cultural and educational dynamics may have different effects from those expected in conventional consumer theory.

VI. DISCUSSION

The study revealed that while 74.9% of respondents consume cocoa products, most of the cocoa produced in Amazonas is exported as raw materials rather than processed locally. This agrees with the findings of the Ministry of Agrarian Development and Irrigation [22], which shows a very low consumption of chocolate per capita in Peru (5 grams/year) compared to European countries. It also agrees with Quintero & Díaz [78], who pointed out that the largest consumers of cocoa are not the main producing countries, but rather European nations.

Some non-consumers cited health reasons such as diabetes for avoiding cocoa products. However, this contrasts with studies such as those by Lares et al. [79] and Orozco et al. [80], who found possible cardiovascular and cognitive benefits of dark chocolate consumption, especially for older adults. The reluctance of some respondents to consume cocoa for health reasons contrasts with the findings of Muhammad et al. [67], who found that 65% of consumers considered health benefits crucial in their decision to purchase cocoa products. This discrepancy suggests a possible lack of knowledge about the potential health benefits of cocoa among the Amazonas population.

Regression analysis revealed that age is the only statistically significant factor influencing cocoa consumption. This coincides with other studies, such as those by Smith & Brown [55], which found that young adults consume 30% more cocoa products than other age groups. It also aligns with Daymond et al. [58], which shows age-based preferences for different types of cocoa products. The age-based consumption patterns are consistent with broader food consumption trends, such as those found by Rodríguez [81] in Colombia regarding fruit and vegetable intake across age groups. R. López & García [57] also found that preference for different types of cocoa products varies significantly with age, which reinforces our results. This consistency in the findings highlights the importance of age as a determining factor in the consumption of cocoa and its derivatives. The predominance of age as a significant factor in our study also contrasts with the findings of [43], who proposed an integrated model that combines traditional economic factors with social and psychological variables to explain cocoa consumption. The results suggest that, in Amazonas, the dynamics of cocoa consumption could be simpler, with age as the main determinant.

It is interesting to note that, unlike other studies cited in the literature review, the analysis did not find a significant influence of factors such as income level or education. For example, Singh et al. [30] demonstrated a strong correlation between income level and consumption of high-quality cocoa products in several countries, including Peru. The absence of this relationship in our study could indicate unique characteristics of the cocoa market in Amazonas, possibly related to the mainly artisanal nature of local production and the limited variety of products available. Similarly, Liu et al. [61] found that individuals with a university education consumed 40% more cocoa products than those with lower educational levels. The lack of significance of education in our study suggests that, in Amazonas, cocoa consumption could be more influenced by cultural traditions and local availability than by educational level, as suggested by Chavez et al. [70] in their study on cocoa-producing regions in Peru.

The research findings indicate that age is not the only factor influencing cocoa consumption [43, 81]. Other significant factors include region, educational status, price of tea beverage, year of residency, sex of respondents, how often respondents switch cocoa beverage, level of education, monthly income, monthly income of spouse, recommendations of friends, brand of chocolate, and personal experience [43, 68]. Policymakers in the cocoa industry can use these insights to tailor marketing strategies, product development, and pricing to target specific demographic groups effectively. For instance, focusing on promoting cocoa beverages to certain age brackets, regions, or income levels can increase consumption. Additionally, emphasizing brand loyalty and leveraging social influences like recommendations from friends can enhance consumer engagement and loyalty within the cocoa industry, ultimately driving growth and sustainability in the sector.

While income and education level were not statistically significant in this study, other research such as that of Singh et al. [30] has shown strong relationships between income and consumption of premium cocoa products. The non-significance in this case may warrant further investigation in the local context. Although the study did not focus specifically on cultural factors, the high percentage of consumption of artisanal cocoa products indicates a strong cultural influence, similar to that observed by Chavez et al. [70] in other cocoa-producing regions of Peru. This highlights the importance of considering local traditions in any initiative to increase or diversify cocoa consumption.

The discrepancies between the results and the existing literature underline the importance of considering the local context in the study of cocoa consumption. The Amazon region, as a cocoa-producing area with a mainly artisanal local market, has its own characteristics that influence consumption patterns. However, the lack of importance of other factors commonly cited in the literature suggests the need for further research to fully understand the unique dynamics

of cocoa consumption in producing regions such as Amazonas. The results have important implications for the development of marketing strategies and public policies aimed at increasing local consumption of cocoa and its derivatives in the region.

VII. CONCLUSION

The study has shown that age is the most influential factor in cocoa consumption in the Amazon region of Peru. This underlines the importance of taking into account the differences between generations in consumption habits and preferences when developing strategies for the cocoa sector in the region. The statistical significance of age in the regression model indicates that marketing and product development strategies should be carefully tailored to different age groups to maximize their effectiveness.

Unlike previous studies in other contexts, factors such as income level, education, and occupation did not show a statistically significant influence on cocoa consumption. This suggests that consumption dynamics in this cocoa-producing region may differ from those observed in more developed or urban markets. This divergence could be attributed to the fact that local production is predominantly artisanal and to deep-rooted cultural traditions in the region, which may influence consumption decisions more than the socioeconomic factors traditionally considered.

The study highlights the importance of targeting educational programs on the health benefits of cocoa specifically to older adults. Given that age was found to be the most significant factor in cocoa consumption, and considering that older adults may be more reluctant to consume cocoa due to unfounded health concerns, it is critical to develop educational campaigns tailored to this demographic. These initiatives should focus on clarifying misconceptions about cocoa and chocolate, highlighting their potential benefits for cardiovascular and cognitive health, as recent studies have shown [78, 79]. In addition, these programs could include practical workshops on how to incorporate cocoa into a healthy and balanced diet, tailored to the nutritional needs of older adults.

The results suggest that strategies to increase local cocoa consumption should focus on addressing the specific preferences and needs of different age groups while working on consumer education and the development of a stronger local value chain. This could be done by implementing educational programs in schools on the cultural and economic importance of cocoa, developing innovative products that respond to the demands of different age groups, and creating consumer spaces that showcase the region's rich cocoa tradition.

To promote local cocoa consumption in Amazonas, it is recommended to develop a line of cocoa products adapted to different age groups, such as chocolates with lower sugar content for older adults and organic options for younger consumers. In addition, a “cocoa ambassadors” program could be implemented, in which local producers conduct demonstrations and tastings in schools, community centers, and local fairs. The creation of a cocoa tourism route in Amazonas, including visits to cocoa farms, artisanal production workshops, and tastings, can foster interest and appreciation for local cocoa. It is also advisable to encourage the incorporation of local cocoa products into regional gastronomy by working with restaurants and hotels to develop menus and culinary experiences centered on cocoa.

Future studies could extend the analysis to other cocoa-producing regions in Peru to identify possible differences in the factors influencing consumption. It is recommended that additional variables, such as cultural habits, market access and product perception, be included to obtain a more complete model. Investigating interactions between socioeconomic factors, such as income and education, would allow a better understanding of the dynamics of cocoa consumption in different populations.

Author Contributions

Conceptualization, OCC; methodology, OCC.; software, ESB; validation, ECV, JNAT, and AJSP; formal analysis, OCC and JNAT; investigation, ESB and YCMR; resources, ECV.; data curation, OCC and YCMR; writing—original draft preparation, CFCC and AJSP; writing—review and editing, OCC; ESB and YCMR; visualization, ECV and JNAT; supervision, CFCC; project administration, AJSP; funding acquisition, ESB and YCMR. All authors have read and agreed to the published version of the manuscript.

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The data is available upon request from the main author.

Conflicts of Interest

The authors declare no conflict of interest.

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