Application of the Extended Theory of Planned Behavior Model to Analyze Purchase Intention Determinants of Sustainable Argane Oil Among Moroccan Consumers

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Article

Application of the Extended Theory of Planned Behavior Model to Analyze Purchase Intention Determinants of Sustainable Argane Oil Among Moroccan Consumers

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Abstract

The global demand for argane oil has grown considerably in recent years, creating economic opportunities while raising concerns about ecosystem degradation and the sustainability of production systems. To support long-term viability, several initiatives have promoted environmentally friendly practices and fair value-chain models. However, the effective market integration of these initiatives depends on understanding consumer behavior and preferences toward sustainable products. This study aims to identify the determinants influencing consumers' purchase intention for sustainable argane oil using an extended framework of the Theory of Planned Behavior (TPB). A structural equation modeling approach was applied to analyze responses from adult consumers with a minimum secondary education level. The results show that consumer attitude, perceived behavioral control, and willingness to pay have significant positive effects on purchase intention, while ecological literacy exerts an indirect influence through attitude, social norms, perceived behavioral control, and willingness to pay. In contrast, ecological literacy has no significant direct impact. These findings improve the understanding of behavioral mechanisms underlying green product consumption and offer insights for designing marketing strategies that align with sustainability values and promote responsible consumer choices.

Keywords: theory of planned behavior; structural equation modeling; argane oil; sustainable development; consumer behavior; eco-friendly products; green marketing; ecological literacy; ecological concern; willingness to pay; purchase intention

1. Introduction

The contemporary era is witnessing a notable transformation in consumer habits worldwide, a change deeply rooted in a rising awareness of environmental issues and an inclination towards eco-friendly products [1–3]. This trend, which is particularly noticeable in the food sector, is being driven by a growing concern for environmental issues such as climate change, pollution and the depletion of natural resources, leading to increased interest in eco-friendly products [4,5]

In this global context, Morocco presents itself as fertile ground for the study of eco-responsible consumption [6], particularly with regard to eco-friendly argane oil, a product rooted in Morocco's agricultural heritage and driven by a range of national initiatives and policies aimed at sustainability and conservation.

The argane oil value chain in Morocco has seen considerable expansion, supported by growing global demand for this unique and valuable product [7]. Nevertheless, increased argane oil

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production has generated significant pressure on the natural argane forest, raising concerns about ecosystem degradation [8,9].

To address these challenges and promote sustainable practices, various initiatives and programs have been implemented, including the forest rehabilitation program, the development of argane farming, participatory forest management, the circular economy project, the emergence of the RBA eco-label and the ongoing establishment of raw product "Affiache" collection units [8].

The aim of these initiatives is to ensure the long-term viability of the argan tree value chain by integrating ecological and sustainable practices into the production process. As a result, the outcome of all these initiatives is an argan oil that we prefer to call, for the purposes of our research, "sustainable argane oil". This distinctive product is obtained through a combination of environmentally friendly farming techniques, responsible resource management, and preservation of the argane forest ecosystem.

It is also an oil derived from a supply chain that ensures fair compensation for the rightful owners, the guardians of the natural argane forest. A fairer compensation for the raw material, which is higher than the current market price, will inevitably affect the price of the final products (oil and other derived products).

However, the successful integration of these initiatives into the market poses its own challenges. These challenges include understanding how consumers perceive eco-friendly products and whether they are willing to pay a higher price for them. The higher cost of sustainable argane oil, resulting from fair compensation and environmentally friendly practices, must be justified to consumers.

It is vital to comprehend consumer behavior and preferences towards eco-friendly products. By analyzing the factors that influence consumers' intention to buy this eco-friendly oil, effective marketing strategies can be developed that align with their values and preferences. This understanding will help in creating a market where consumers appreciate and are willing to pay for the added value of sustainable and fairly traded argane oil.

The Theory of Planned Behavior provides a valuable framework for studying consumers' behavioral intentions and willingness to pay for eco-friendly argan oil [10]. According to this theory, consumers' attitudes towards eco-friendly products, subjective norms and perceived behavioral control play a significant role in determining their purchase intention. By analyzing these factors, we can gain valuable insights into consumer perceptions and develop effective strategies for positioning and promoting eco-friendly argan oil on the market.

The purpose of this study is to understand the determinants of Moroccan consumers' intention to buy ecological argan oil. The research's specific objectives are as follows:

- How do consumers' attitudes, subjective norms, and perceived behavioral control shape their intention to purchase eco-labeled products?
- What is the mediating role of willingness to pay in the relationship between behavioral factors and green purchase intention?
- How do ecological literacy and ecological concern influence consumers' pro-environmental attitudes and behavioral intentions?

2. Theoretical Background and Hypotheses Development

The structure of the proposed conceptual framework is presented in Figure 1. In total, fourteen hypotheses are derived from seven constructs: attitude towards purchasing green products, subjective norm, perceived behavioral control, willingness to pay, ecological concern, ecological literacy, and purchase intention for green products.

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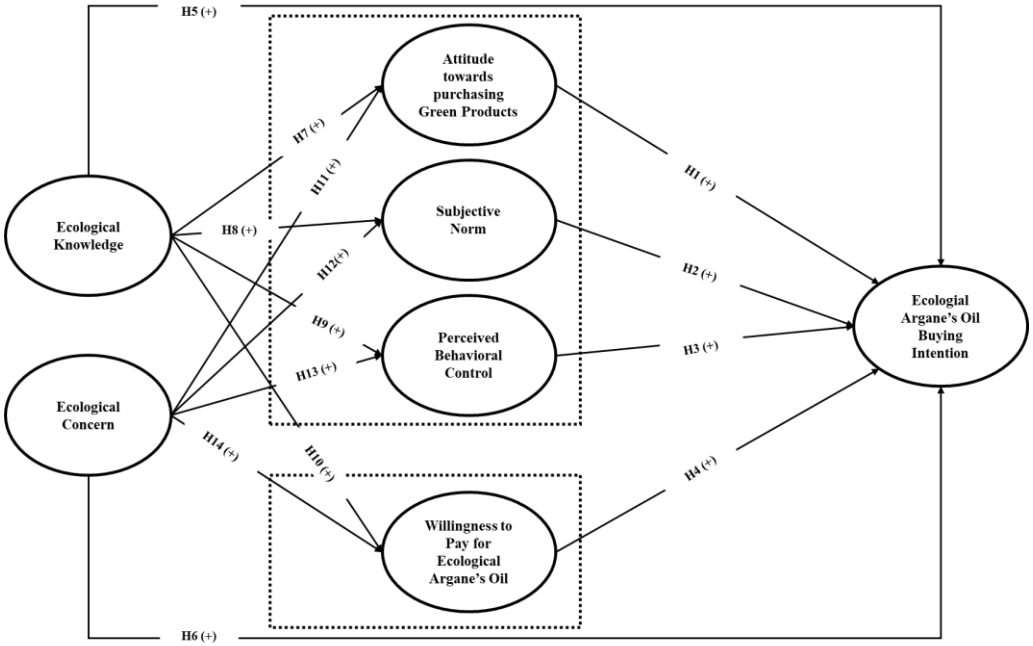

Figure 1. Proposed research framework.

2.1. Attitude Towards Purchasing Green Products

According to the Theory of Planned Behavior (TPB), attitude, defined as the degree to which individuals evaluate a behavior favorably or unfavorably, is an essential determinant of behavioral intention [10]. Attitude is shaped by individual beliefs about the perceived consequences of a behavior and the evaluation of these consequences. Several studies have confirmed the crucial role of attitude as an antecedent of behavioral intention [11–13]. However, the relationship between attitude and environmental behavioral intention is more complex from an ecological perspective, with research showing contradictory results [12,14–18]. The explanation often lies in the influence of habits on certain behaviors, a point supported by various studies [19–21].

In the field of green purchasing and consumption, numerous studies have used TPB to measure attitudes toward behavior, particularly to better understand green purchasing behaviors across different cultural and social contexts. For example, Yadav and Pathak [22] examined this behavior among Indian consumers; Maichum et al. [23] investigated Thai consumers; Mohammed et al. [24] and Auza and Mouloudj [25] studied young Saudi and Algerian consumers, respectively; and Qi and Ploeger [26] analyzed Chinese consumers during the COVID-19 pandemic. Collectively, these studies confirm that attitude positively and significantly influences behavioral intention within the TPB framework.

The hypothesis formulated for future research is as follows:

H1. *Attitude positively and significantly influences consumers' behavioral intention to purchase eco-friendly argane oil.*

2.2. Subjective Norm

The subjective norm, the second determinant of behavioral intention according to the TPB, is described as the "perceived social pressure" an individual feels to adopt or avoid a particular behavior [10]. This norm arises from social factors and results from the perceived expectations of people or groups significant to the individual, as well as from the motivation to satisfy these expectations [27–29]. Its determining role in behavioral intention is well established in several contexts, including consumer behavior and marketing [30–32].

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Many studies have confirmed the positive influence of subjective norm on behavioral intention in the purchasing and consumption of eco-friendly products [22–26].

The subjective norm tends to be more influential in collectivist societies like Morocco, where adherence to social expectations is paramount. However, in more individualistic societies, although the subjective norm still exerts influence, personal attitude may predominate in shaping green purchasing intention [15,27,33]. Given that Morocco is perceived as a collectivist society [34], it is relevant to explore the influence of subjective norms on Moroccan consumers' intention to purchase eco-friendly argan oil.

H2. *Subjective norm positively and significantly influences consumers' behavioral intention to purchase sustainable argane oil.*

2.3. Perceived Behavioral Control

Perceived behavioral control (PBC), identified by Ajzen as the third determinant of behavioral intention within the TPB framework, refers to individuals' perceptions of the *ease or difficulty* of performing a behavior [10]. PBC is shaped by control beliefs related to the perceived availability of the resources and opportunities required to execute the behavior. These include factors such as available time, financial means, necessary skills, and self-confidence in performing the action, as highlighted by Ajzen and Fishbein [27], Armitage and Conner [35], and Han and Kim [15].

In the context of purchasing green products, multiple studies have shown that PBC exerts a significant positive influence on consumers' behavioral intentions, including work by Auza and Mouloudj [25], Maichum et al. [23], Qi and Ploeger [26], Vazifehdoust et al. [36], and Yadav and Pathak [22].

H3. *Perceived behavioral control positively and significantly influences consumers' behavioral intention to purchase sustainable argane oil.*

2.4. Willingness to Pay

Willingness to pay (WTP) represents a central concept in economic valuation and reflects the maximum amount an individual is prepared to spend for a good or service. It is widely used to assess both the financial and emotional value consumers assign to products [37,38]. Prior research shows that consumers often express a greater willingness to pay higher prices for environmentally friendly products, driven by perceived environmental and social benefits [39–42]. Ng et al. [43] further demonstrated a positive and significant relationship between consumers' willingness to pay a premium and their intention to purchase green products. In addition, a global survey conducted by Nielsen reported that more than 55% of consumers were willing to pay a premium to support environmentally responsible companies, and 52% had purchased at least one product or service from such companies within the preceding six months [44].

Based on Ng et al. [43] and the Nielsen survey [44], we propose the following hypothesis:

H4. *Willingness to pay positively and significantly influences consumers' behavioral intention to purchase sustainable argane oil.*

2.5. Ecological Literacy

Ecological literacy, defined as the ability to identify ecological symbols, concepts, and behaviors [45], influences several stages of the decision-making process by shaping positive or negative attitudes toward certain behaviors [46]. Promoting pro-environmental behavior requires raising awareness and improving consumers' understanding of the environmental impacts of products and production processes.

Prior research has shown that higher levels of environmental knowledge may increase the likelihood of strong purchase intention [47,48], and that ecological literacy exerts a positive influence

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on the intention to purchase green products [49,50]. Based on this evidence, we formulate the following hypothesis:

H5. *Ecological literacy will positively and significantly influence Moroccan consumers' behavioral intention to purchase eco-friendly argan oil.*

Additional studies have suggested that ecological literacy is positively associated with attitudes toward environmentally friendly products [49,51,52], leading to the second hypothesis:

H7. *Ecological literacy will be positively related to attitudes toward purchasing eco-friendly argan oil.*

Furthermore, subjective knowledge can motivate individuals to act upon what they believe they know [53], and may also relate to subjective norms, as individuals who conform to social expectations tend to expand their knowledge base [54]. Therefore, we propose:

H8. *Ecological literacy will be positively associated with subjective norm.*

An increase in knowledge may also strengthen individuals' beliefs regarding their ability to control a situation, thereby enhancing perceived behavioral control [55]. Thus, we formulate:

H9. *Ecological literacy will be positively associated with perceived behavioral control.*

Finally, consumers must be well informed about environmental issues and recycling practices to accurately evaluate the ecological benefits of green products [56,57]. Greater knowledge enhances their perception of the added value of environmentally friendly alternatives. Consequently, we propose the final hypothesis:

H10. *Higher ecological literacy, reflecting a deeper understanding of environmental issues, will be positively associated with the willingness to pay for eco-friendly argan oil.*

2.6. Ecological Concern

Environmental concern, defined as individuals' awareness of and support for efforts aimed at addressing environmental problems, is recognized as a key determinant in consumer decision-making processes regarding sustainable products [58]. It has been widely acknowledged as a major motivational driver for green purchasing behavior, as shown in several studies [56,59,60]. Empirical work, including that of Irawan and Darmayanti , has demonstrated that higher levels of environmental concern positively influence consumers' intention to purchase environmentally friendly products, which leads to the following hypothesis:

H6. *Environmental concern will positively and significantly influence Moroccan consumers' behavioral intention to purchase eco-friendly argan oil.*

Environmental concern has also been associated with the development of favorable attitudes toward ecological products [22,61], which subsequently shape purchase intention [49,61,62]. Bamberg [62] and Hartmann & Apaolaza-Ibáñez [63] established significant links between environmental concern, attitude, and intention to purchase ecological products. Hence, we propose the following hypothesis:

H11. *Environmental concern will be positively associated with attitude toward purchasing ecological argan products.*

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Furthermore, Bamberg [62] suggested that environmental concern also shapes subjective norms by reinforcing perceived social support for ecological behavior. Thus, the following hypothesis is proposed:

H12. *Environmental concern will be positively associated with subjective norm.*

Finally, previous studies have indicated a relationship between environmental concern and perceived behavioral control, which in turn influences purchase intention [62,64]. Accordingly, the following hypothesis is formulated:

H13. *Environmental concern will be positively associated with perceived behavioral control.*

Individuals with strong environmental concerns are generally more active in initiatives aimed at environmental protection [65,66]. Given the increasing ecological challenges, such individuals are likely to exhibit heightened motivation to act responsibly as consumers, favoring environmentally friendly and ethically produced goods [62,66,67]. Therefore, we propose the following hypothesis:

H14. *Environmental concern (EC) will positively and significantly influence willingness to pay for eco-friendly argan oil.*

3. Materials and Methods

3.1. Sample and Data Collection

The research prioritized online and email-based surveys due to their accessibility, convenience, ability to reduce respondent bias, cost-effectiveness, and methodological similarity to traditional questionnaires. Although online sampling can overrepresent individuals who are comfortable with the Internet, this limitation is mitigated by Morocco's high Internet penetration rate—69% of the population—who spend an average of 3 hours and 31 minutes online daily.

To complement the online survey, face-to-face interviews were conducted in shopping centers in Inzegane and Agadir to gather contextual insights related to argan oil, a product with strong regional significance. This mixed-mode approach allowed the collection of nuanced behavioral data specific to the local context.

The study ensured broad national coverage, capturing diverse lifestyles and consumer behavior patterns related to eco-friendly argan oil. Structural Equation Modeling (SEM) was adopted as the primary analytical method, following the recommendations of Kline [68] and Hair et al. [69] for sample adequacy and model specification. A robust total sample of 881 respondents was obtained well above the minimum required for the 31 parameters analyzed ensuring strong statistical validity.

The sampling strategy relied on simple random sampling using institutional and organizational databases, supplemented by personalized email invitations and a snowball recruitment method to broaden participation. Convenience sampling was additionally applied to the online questionnaire, while face-to-face interviews strengthened representativeness. Together, these methods provided a reliable foundation for exploring Moroccan consumers' interest in and purchasing patterns of ecological argan oil.

A pre-test was conducted from September 30 to October 2, 2020, involving four master's students, two PhD candidates, ten full-time employees, and two retirees. These participants were selected to ensure varied demographic and experiential profiles. They completed the questionnaire and provided feedback on clarity, comprehension, and structure. The average completion time was approximately 12 minutes. Insights from the pre-test helped identify and correct ambiguities, ensuring that the final questionnaire was clear and accessible for all respondents.

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Table 1. Profile of respondents.

Variable	Grouped sample (881)		Online survey (761)		Direct interview (120)	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Gender						
Male	382	43,4	327	43,0	55	45,8
Female	499	56,6	434	57,0	65	54,2
Age						
46 or over	67	7,6	59	7,8	8	6,7
36 - 45 years old	137	15,6	121	15,9	16	13,3
26 - 35 years old	395	44,8	338	44,4	57	47,5
18 - 25 years old	282	32,0	243	31,9	39	32,5
Academic level						
Doctorate or higher	162	18,4	153	20,1	9	7,5
Bac+5	540	61,3	461	60,6	79	65,8
Bac+3	124	14,1	106	13,9	18	15,0
Bac+2	51	5,8	38	5,0	13	10,8
Baccalaureate	4	,5	3	0,4	1	,8
Household size						
More than 10 pers	3	0,3	3	0,4	0	0
7 to 10 people	48	5,4	42	5,5	6	5,0
4 to 6 persons	406	46,1	342	44,9	64	53,3
Less than 4 pers	424	48,1	374	49,1	50	41,7
Net annual income						
More than 360 001	20	2,3	18	2,4	2	1,7
240 001 - 360 000	39	4,4	33	4,3	4	3,3
180 001 - 240 000	38	4,3	34	4,5	14	11,7
130 001 - 180 000	111	12,6	97	12,7	13	10,8
110 001 - 130 000	105	11,9	92	12,1	11	9,2
90 001 - 110 000	98	11,1	87	11,4	7	5,8
70 001 - 90 000	48	5,4	41	5,4	14	11,7
50 001 - 70 000	71	8,1	57	7,5	4	3,3
30 001 - 50 000	40	4,5	36	4,7	11	9,2
0 - 30 000 dirhams	311	35,3	266	35,0	45	37,5

3.2. Measures

In the conducted research, conceptual variables were evaluated using a predominant 7-point Likert scale, while a 5-point scale was reserved for assessing willingness to pay. The Likert scale is a widely recognized tool for measuring agreement intensity in the social sciences, ensuring balanced and equitable data for both positive and negative response points [70]. The selection of a 7-point scale was guided by its ability to allow respondents to express more nuanced opinions [71] and its tendency to yield larger variances, thereby increasing measurement reliability [72]. Furthermore, using a more extensive scale is particularly advantageous when applying advanced statistical techniques such as Structural Equation Modeling (SEM), where the precision of correlations between variables is essential.

The conceptual model of the study includes six central variables: (1) ecological literacy, (2) environmental concern, (3) attitudes toward green products, (4) subjective norms, (5) perceived behavioral control, and (6) purchase intention of ecological argan oil. Each construct, derived from a comprehensive literature review, is measured using dedicated items, with all measurement indicators presented in Table 4.3, providing clear definitions of the concepts under investigation.

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Table 2. Development of measurement items.

Variables		Mean	Standard deviation	Factor saturation
Ecological literacy [23,49]				
LE 1	You prefer to check eco-labels and certifications on green products before you buy.	5,14	1,77	0,57
LE 2	You prefer to get information about green products before you buy them.	5,7	1,62	0,52
LE 3	Your environmental knowledge helps you buy eco-friendly products and packaging.	4,99	1,93	0,55
LE 4	You know about biodegradable products and packaging	4,68	2,04	0,61
Environmental concerns [73]				
PE 1	You prefer to check eco-labels and certifications on green products before buying them.	5,51	1,86	0,59
PE 2	You prefer to obtain information on green products before buying them.	5,94	1,73	0,65
PE 3	Your environmental knowledge helps you buy eco-friendly products and packaging.	5,97	1,72	0,65
PE 4	You know about biodegradable products and packaging	5,9	1,78	0,61
Attitudes towards environmentally-friendly products [23,74]				
APRE 1	Protecting the natural ecosystem is important to you when you decide to buy a product.	5,2	1,85	0,52
APRE 2	Would you prefer an ecological product to a conventional one?	5,98	1,42	0,55
APRE 3	The adoption of environmentally-friendly techniques is necessary for the preservation of the natural ecosystem.	6,35	1,08	0,56
APRE 4	You think that buying ecological products is a positive step	6,1	1,24	0,52
Subjective norms [75]				
NS 1	Does your family share your eco-friendly attitude?	4,94	1,66	0,54
NS 2	Do your friends share your respect for the environment?	4,41	1,60	0,55
NS 3	Your family shares your decision to buy ecological products	4,93	1,76	0,50
NS 4	Your friends share your decision to buy eco-friendly products	4,48	1,72	0,53
Perceived behavioral control [23]				
CCP 1	You think you'll be able to buy eco-friendly products in the future.	4,68	1,78	0,51
CCP 2	You have the financial resources to buy eco-friendly products	4,56	1,86	0,56
CCP 3	You have the will to buy eco-friendly argane products.	4,23	1,79	0,58
CCP 4	You are likely to have many opportunities to buy eco-friendly argane products.	4,38	1,78	0,58
Willingness to pay for sustainable argane oil "For sustainable argane oil, I am willing to pay a premium price higher than the conventional argane oil price of:"				
CAP 1	Between 0 and 10 dirhams	3,51	1,55	0,55
CAP 2	Between 10 and 20 dirhams	3,43	1,47	0,52
CAP 3	Between 20 and 30 dirhams	3,31	1,45	0,61

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CAP 4	Between 30 and 40 dirhams	2,77	1,38	0,67
CAP 5	Between 40 and 50 dirhams	2,46	1,32	0,62
CAP 6	Between 50 and 100 dirhams	2,17	1,26	0,54
CAP 7	Between 100 and 200 dirhams	1,93	1,17	0,57

Purchase intention for sustainable argane oil [76]

INT 1	You are likely to buy eco-friendly argane oil rather than conventional argane oil.	4,44	1,90	0,62
INT 2	You plan to buy eco-friendly argane oil the next time you need argane oil.	5,02	1,87	0,65
INT 3	You would actively look for eco-friendly argane oil when shopping.	4,88	1,72	0,72
INT 4	You will choose eco-friendly argane oil when it is available.	4,86	1,64	0,74
INT 5	You intend to purchase eco-friendly argane oil in the near future.	4,93	1,65	0,79

3.3. Tools for Analysis

Data were analyzed using SPSS 23.0 and AMOS 23.0 software to meet the study objectives and test the proposed hypotheses. Descriptive analyses were conducted in SPSS to summarize demographic characteristics and initial data trends. Reliability analysis was performed using Cronbach's alpha (α) to assess the internal consistency of all measurement scales.

Subsequently, Confirmatory Factor Analysis (CFA) was performed in AMOS to evaluate the validity of the measurement model and verify both convergent and discriminant validity among constructs. Finally, Structural Equation Modeling (SEM) was employed to test the hypothesized causal relationships and assess the overall model fit. This sequential analytical approach enabled rigorous testing of the theoretical framework, ensuring the robustness and interpretability of the empirical findings.

4. Results

4.1. Testing of Reliability and Validity of the Measurement Model

The measurement model fit was evaluated using Confirmatory Factor Analysis (CFA) to verify the factor loadings of the seven constructs: Attitude (ATT), Subjective Norm (SN), Perceived Behavioral Control (PBC), Environmental Concern (EC), Ecological Literacy (EL), Willingness to Pay (WTP), and Purchase Intention (PI) for green products. Convergent and discriminant validities, as well as the overall model fit, were assessed to ensure the reliability and validity of the measurement structure.

Internal consistency for each construct was examined using Cronbach's alpha (α). As shown in Table 3, α values ranged from 0.701 to 0.951, exceeding the minimum threshold of 0.700 recommended in the literature [77]. These results confirm that all constructs exhibit acceptable internal consistency and reliability.

According to Hair et al. [69], factor loadings above 0.700 were considered satisfactory. The standardized loadings obtained through CFA revealed a strong factorial structure across most items, with the majority exceeding the 0.7 threshold, thereby confirming solid convergent validity. A few items displayed moderate loadings (between 0.5 and 0.7), indicating reasonable contributions to their latent constructs, while a small number showed loadings below 0.5, suggesting weaker associations.

Common method bias (CMB) was examined using Harman's single-factor test [78]. The first unrotated factor explained less than 26% of the variance, far below the 50% threshold. Therefore, CMB is unlikely to threaten the validity of our results.

Construct reliability was further assessed using Composite Reliability (CR) and Average Variance Extracted (AVE). The CR measures the internal consistency of items associated with a given

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construct, while AVE evaluates the proportion of variance explained by the construct relative to the measurement error. Following the recommendations of Hair et al. [69], CR and AVE values should exceed 0.700 and 0.500, respectively. As shown in Table 3, CR values ranged from 0.730 to 0.950, while AVE values ranged from 0.430 to 0.830.

Although certain AVE values were slightly below the conventional threshold, the consistently high CR values (greater than 0.700) provide sufficient evidence of construct reliability. This robustness compensates for minor AVE deviations and confirms that the constructs were measured with satisfactory precision and stability, adequately capturing their theoretical dimensions.

The discriminant validity of the measurement model was assessed using the Heterotrait–Monotrait ratio of correlations (HTMT), following the recommendations of Henseler et al. [79]. Table 4 presents the HTMT values for all construct pairs. All coefficients are below the threshold of 0.90, indicating that each latent variable is empirically distinct from the others.

These results confirm that the constructs share more variance with their own indicators than with other constructs, thus supporting the discriminant validity of the measurement model.

Overall, the CFA results confirmed that the measurement model demonstrated acceptable convergent and discriminant validity. The hypothesized structure was therefore considered reliable and suitable for further structural analysis.

Following the recommendations of kline [68], the adequacy of the model was assessed using multiple goodness-of-fit indices. A satisfactory model should exhibit values greater than 0.900 for the Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), Relative Fit Index (RFI), Comparative Fit Index (CFI), and Normed Fit Index (NFI), while the Root Mean Square Error of Approximation (RMSEA) and Root Mean Square Residual (RMR) should remain below 0.080.

As summarized in Table 5, the CFA results yielded the following statistics:

$\chi^2 = 1210.989$, $df = 270$, $p < 0.001$, resulting in a χ^2/df ratio of 4.485, which lies within the acceptable range of 2–5 [80]. Additional indices showed values of GFI = 0.905, RFI = 0.914, NFI = 0.928, CFI = 0.943, and RMSEA = 0.063, all exceeding the commonly accepted thresholds. The AGFI value (0.876) and RMR value (0.0812) were slightly below the ideal limits (0.90 and 0.08, respectively).

Despite these minor deviations, the overall fit indices confirm the robustness and reliability of the measurement model. The results indicate a reasonable fit between the hypothesized framework and the observed data, while identifying marginal areas for improvement in future model refinements.

Table 3. Reliability and validity of the constructs.

	Question item	Cronbach's α	Standardized Factor Loading	Composite Reliability	Average Variance Extracted
Attitude towards purchasing green products (APRE)	APRE1	0,729	0,592	0,75	0,43
	APRE2		0,818		
	APRE3		0,544		
	APRE4		0,651		
Perceived behavioral control (CCP)	CCP1	0,805	0,502	0,79	0,51
	CCP2		0,429		
	CCP3		0,881		
	CCP4		0,905		
Subjective norm (NS)	NS1	0,833	0,764	0,88	0,64
	NS2		0,755		
	NS3		0,72		
	NS4		0,947		
Eco-literacy (LE)	LE1	0,701	0,717	0,73	0,48
	LE2		0,736		
	LE3		0,609		
Environmental concern (PE)	PE1	0,951	0,783	0,95	0,83
	PE2		0,942		

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	PE3		0,987		
	PE4		0,926		
Willingness to pay for sustainable argane's oil (CAP)	CAP1	0,896	0,346	0,88	0,53
	CAP2		0,469		
	CAP3		0,644		
	CAP4		0,851		
	CAP5		0,979		
	CAP6		0,871		
	CAP7		0,704		
Intention to buy sustainable argane's oil	INT 1	0,893	0,646	0,80	0,65
	INT 2		0,673		
	INT 3		0,853		
	INT 4		0,894		
	INT 5		0,916		

Table 4. Discriminant Validity (HTMT Matrix).

	CAP	PE	LE	NS	CCP	APRE
CAP	—					
PE	0.112	—				
LE	0.052	0.291	—			
NS	0.129	0.037	0.307	—		
CCP	0.125	0.022	0.366	0.170	—	
APRE	0.169	0.216	0.592	0.453	0.259	—

Table 5. Measurement model fit indices.

Fit indices	Criteria	Indicators	Source
Chi-square	p > 0,05	1210,989	[68]
Chi-square/df	< 5,00	4,485	
Goodness of Fit Indix (GFI)	> 0,90	0,905	
Adjusted Goodness of Fit Indix (AGFI)	> 0,90	0,876	
Relative Fit Indix (RFI)	> 0,90	0,914	
Normed Fit Index (NFI)	> 0,90	0,928	
Comparative Fit Index (CFI)	> 0,90	0,943	
Root Mean Square Error of Approximation (RMSEA)	< 0,08	0,063	
Root Mean Square Residual (RMR)	< 0,08	0,0812	

4.2. Testing of the Structural Equation Model

The Structural Equation Model (SEM) was estimated using AMOS 23.0 with the maximum likelihood estimation method to evaluate the hypothesized conceptual framework of this study (Figure 2). As shown in Table 6, the ratio of chi-square to degrees of freedom (χ^2/df) was 4.46, which is below the recommended upper threshold of 5, indicating an acceptable model fit. Furthermore, all estimated fit indices (CFI = 0.931, IFI = 0.931, TLI = 0.921, RMSEA = 0.063, and SRMR = 0.090) fall within acceptable ranges, supporting the plausibility and robustness of the structural model. However, it is noteworthy that the GFI (0.884) and AGFI (0.857) values are slightly below the conventional acceptance threshold of 0.90.

The results of the structural model assessing the intention to purchase sustainable argane oil (Figure 2) are summarized in Table 7. Of the fourteen causal paths specified in the initially proposed model, seven were found to be statistically significant, indicating the relative influence of these factors on consumers' sustainable purchase intentions.

The results show that Attitude (ATT) towards green purchasing exerts a positive and significant impact on consumers' intention to purchase sustainable argane oil, confirming Hypothesis H1. The

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Subjective Norm (SN), however, does not demonstrate a significant positive relationship with purchase intention; thus, H2 is rejected. Hypothesis H3, proposing a positive relationship between Perceived Behavioral Control (PBC) and purchase intention, is confirmed. Similarly, Hypothesis H4, which suggests a positive relationship between Willingness to Pay (WTP) and purchase intention, is supported.

In contrast, Hypotheses H5 and H6, which posited positive relationships between Ecological Literacy (EL), Environmental Concern (EC), and purchase intention, were rejected due to negative and statistically insignificant effects.

Further analysis revealed that Hypotheses H7, H9, H11, and H13, which proposed positive and significant relationships between EL, ATT, SN, PBC, and WTP, were confirmed. Conversely, Hypotheses H8, H10, and H12, which proposed links between EC and the three constructs of the TPB, were rejected. Finally, Hypothesis H14, suggesting a positive relationship between EC and WTP, was confirmed.

Overall, these findings validate the extended TPB framework in explaining sustainable purchase behavior. ATT, PBC, and WTP emerged as the primary determinants influencing consumers' intention to purchase sustainable argane oil, while EL and EC exerted indirect or limited effects.

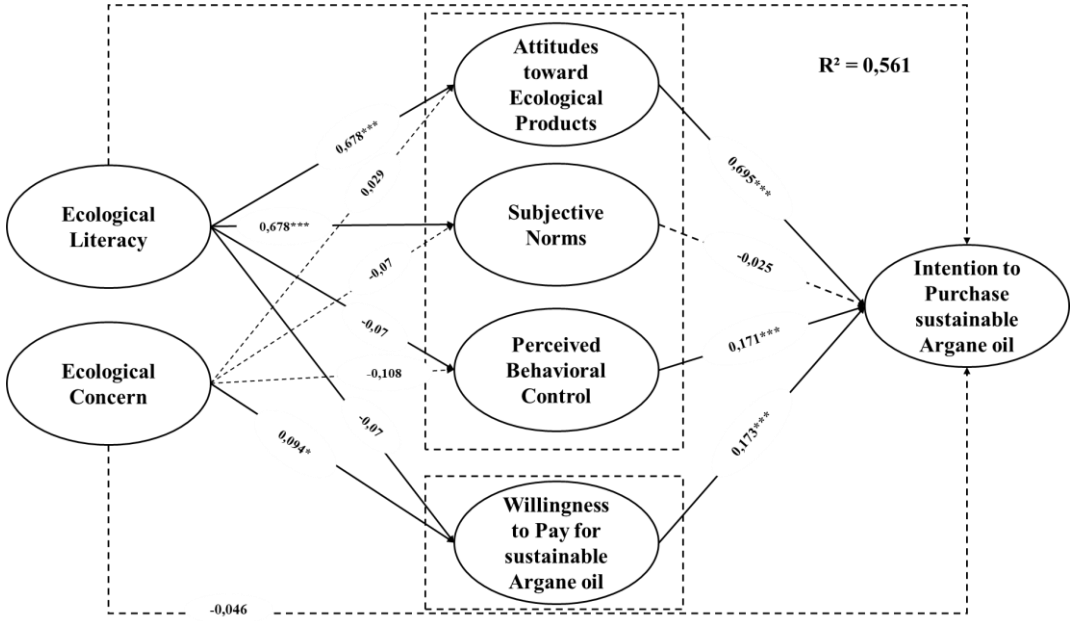

Figure 2. The results of the research model (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$).

Table 6. Goodness-of-fit indices of the research model.

Fit indices	Criteria	Indicators	Source
Chi-square	p > 0,05	1802,531	
Chi-square/df	< 5,00	4,462	
Goodness of Fit Indix (GFI)	> 0,90	0,884	
Adjusted Goodness of Fit Indix (AGFI)	> 0,90	0,857	
Relative Fit Indix (RFI)	> 0,90	0,900	[68]
Normed Fit Index (NFI)	> 0,90	0,913	
Comparative Fit Index (CFI)	> 0,90	0,931	
Root Mean Square Error of Approximation (RMSEA)	< 0,08	0,063	
Root Mean Square Residual (RMR)	< 0,08	0,090	

Table 7. Hypotheses result for the structural model.

Hypothèses	Chemins	Estimation	Effet	Sig.	Décision

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		standardisée (β)	proposé	niveau (P)	
H1 (+)	APRE → INT	0,695	Positive	***	**Acceptée**
H2 (+)	NS → INT	-0,025	Négative	0,334	**Rejetée**
H3 (+)	CCP → INT	0,171	Positive	***	**Acceptée**
H4 (+)	CAP → INT	0,173	Positive	***	**Acceptée**
H5 (+)	LE → INT	-0,02	Négative	0,743	**Rejetée**
H6 (+)	PE → INT	-0,046	Négative	0,126	**Rejetée**
H7 (+)	LE → APRE	0,678	Positive	***	**Acceptée**
H8 (+)	PE → APRE	0,029	Positive	0,444	**Rejetée**
H9 (+)	LE → NS	0,367	Positive	***	**Acceptée**
H10 (+)	PE → NS	-0,07	Négative	*	**Rejetée**
H11 (+)	LE → CCP	0,441	Positive	***	**Acceptée**
H12 (+)	PE → CCP	-0,108	Négative	**	**Rejetée**
H13 (+)	LE → CAP	0,101	Positive	**	**Acceptée**
H14 (+)	PE → CAP	0,094	Positive	*	**Acceptée**

4. Discussion

This study examined an extended framework of the TPB by integrating WTP, EC, and EL as additional antecedents of consumers' PI for sustainable argane oil. The objective was to analyze the behavioral determinants influencing consumers aged 18 and above in their intention to purchase environmentally friendly argane oil. The results indicate that ATT, PBC, and WTP directly and significantly predict PI.

The proposed model explained 56.1% of the variance in PI, exceeding the average variance reported in TPB-based studies, which typically account for around 39% [35]. This result highlights the improved explanatory capacity obtained by extending the traditional TPB with ecological and economic constructs.

A significant positive relationship was found between ATT and PI, confirming that favorable attitudes play a key role in promoting green purchasing behavior [23,81]. This emphasizes the importance of developing positive consumer attitudes through communication and awareness campaigns that highlight the environmental and social benefits of sustainable argane oil.

In contrast, SN did not significantly influence PI, which is consistent with some previous studies [46,82] but differs from others that emphasized social influence as a major factor in ecological consumption [14,64]. This finding suggests that consumers' decisions to purchase eco-friendly products are more internally motivated than socially driven. The weak influence of SN may stem from limited environmental discourse, lack of collective awareness, or the perceived high cost of ecological products.

The relationship between PBC and PI was significant, indicating that consumers who feel capable of making environmentally friendly choices are more likely to purchase eco-products [22,83,84]. Greater access to eco-labeled products and confidence in their authenticity enhance the likelihood of actual purchasing behavior.

Although EL did not have a direct effect on PI, it exerted significant indirect effects on ATT, SN, PBC, and WTP, confirming its mediating role. This suggests that EL increases consumers' understanding of environmental issues, which in turn shapes positive attitudes, enhances confidence in sustainable choices, and raises willingness to pay a price premium [85]. However, this observation diverges from findings showing weak or inconsistent relationships between EL and PI [41].

Previous research also confirmed that EL is positively related to ATT toward green products [86–89]. However, some studies in developing contexts revealed that knowledge alone does not necessarily lead to eco-friendly purchasing behavior, depending on socio-economic and contextual factors [64].

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Concerning EC, no direct effect on PI or ATT was found, but it significantly affected SN, PBC, and WTP, indirectly influencing PI [90]. Consumers with high environmental concern tend to be less influenced by social expectations but are more willing to pay an additional cost for environmentally responsible products [23,46,91]. These findings are consistent with studies showing that EC indirectly shapes behavioral intention through cognitive and motivational mediators such as PBC and WTP [92–95].

Overall, these results confirm the robustness of the extended TPB model in explaining sustainable consumption behavior. ATT, PBC, and WTP emerged as the most influential predictors of PI, while EL and EC act as indirect drivers through perceptual and motivational pathways

5. Conclusions

This study provides both theoretical and managerial contributions. Theoretically, it represents an advanced application of the TPB to analyze consumers' PI for eco-friendly argane oil. The findings validate the TPB as a robust framework and demonstrate the added value of incorporating WTP, EL, and EC, thereby enhancing the understanding of how cognitive, affective, and motivational variables shape sustainable consumption.

From a managerial perspective, the results provide valuable insights for stakeholders in the argane oil sector. Strengthening ATT through sustainability communication, increasing PBC by ensuring accessibility and authenticity, and improving EL through educational initiatives can increase WTP and strengthen market demand for eco-friendly argane oil. Policymakers and cooperatives can use these findings to design eco-labeling schemes, transparent pricing strategies, and public awareness programs highlighting the ecological and social value of sustainable argane production.

Future research should explore cross-cultural applications of the extended TPB, assess moderating variables such as trust and perceived quality, and integrate complementary theoretical frameworks such as the VBN or NAT models to further enrich the understanding of sustainable consumer behavior.

6. Limitations and Future Directions

The study explained 53.2% of the variance in Moroccan consumers' intention to buy eco-friendly argane oil using the Theory of Planned Behavior (TPB). The extended TPB model explained 56.1% of the variance.

However, it is important to note that these models remain incomplete, leaving a significant amount of variance unexplained. Variables not included in this research, such as perceived consumer efficacy, perceived product attributes, and perceived trust in eco-labels, could also influence purchase intention. Their inclusion in future research could provide further insights.

In addition, questions remain about the measurement of subjective norms and their relationship with purchase intention. Alternative measurement items could be explored to better understand these links.

Finally, although the study adopted a quantitative, cross-sectional approach, it does not capture consumer attitudes and behaviors in depth. Further qualitative research is recommended to explore consumers' motivations, beliefs, and experiences regarding the purchase of eco-friendly argane oil in more detail.

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Institutional review board statement: Ethical review and approval were waived for this study because this research is minimal-risk, non-interventional, and fully compliant with international and Moroccan ethical standards. It exclusively collected anonymous opinions and perceptions from Moroccan consumers regarding eco-friendly argane oil through questionnaires. Under Moroccan Law 28-13, only clinical research involving human health, medical experimentation, or identifiable patient data requires approval from an ethics committee. This study does not fall under any category requiring med cal or clinical ethics oversight. This study falls outside the scope of Law 28-13.

Informed consent statement: This study involved voluntary participation through two data collection methods: online questionnaires and face-to-face interviews. For the online survey, participants were informed of the study purpose, anonymity, confidentiality, and their full right to refuse or discontinue participation at any moment. Proceeding to the questionnaire constituted their electronic informed consent. For the face-to-face interviews, verbal informed consent was obtained prior to participation. Verbal rather than written consent was used because the interviews collected non-sensitive, non-identifiable opinions, consistent with standard practices for minimal-risk social research. No personal, medical, or identifying data were collected at any stage of the study. All answers were fully anonymized and used strictly for academic research purposes.

Data availability statement: The data supporting the findings of this study are not publicly available at this stage, as the research has not yet been publicly defended and remains part of an ongoing doctoral dissertation. Data may be made available by the corresponding author upon reasonable request.

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