



The effects of applying Total Quality Management's techniques on the production of olive oil in Algeria and Tunisia

آثار تطبيق تقنيات إدارة الجودة الشاملة على إنتاج زيت الزيتون في الجزائر وتونس

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Abstract

Keywords

The Quality Management (QMS) Applications in olive oil industry comprises many phases that include olive fruits extraction, processing, packaging, and distribution to consumers. This research shades the light on the olive oil industry Quality Management (QMS) Applications process and its phases prevalent in Algeria and Tunisia. we have adopted A quantitative approach using a conjoint analysis method. We collected data via a face-to-face questionnaire in Algeria and Tunisia. At total, 168 between Farmer, Olive wine press owner, Consumer, Vendors and Others. The research identifies important stages with respect to olive oil Quality Management (QMS) Applications process; these are the quality of olive fruits and oil, organizing the olive farming systems and throw light on the necessity of consumer's, farmers and various parties awareness regarding understanding differences in the variety of olive oils. The study likely to help practitioners, researchers, academicians, and managers to get an overview of using multi-criteria decision methods for improving Quality Management (QMS) Application process of the olive industry particularly in Algeria .

olive oil; Quality Management's techniques; production; quality.

JEL Classification Codes : Q17 ; M18 ; L15 ; D2 ; M11

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1. Introduction :

The olive tree has been cultivated for thousands years, and because of its importance as a crop, it has spread throughout the world, and at the present time families depend on this product in all their foods. Many olive cultivation countries around the world depend on olive oil production in their economy. Because of the absence of solutions of the production of olive oil line, the efforts of the productive institutions and farmers focus on increasing production; either on the new traditional methods or on old natural processing methods. The improvement of traditional methods during recent years has led to a significant decrease in the various components of olive oil, also on the quality in general because of the lack of periodic monitoring as well as the lack of maintenance and technical requirements, which negatively affected the quality of the product to be studied, especially in Algeria.

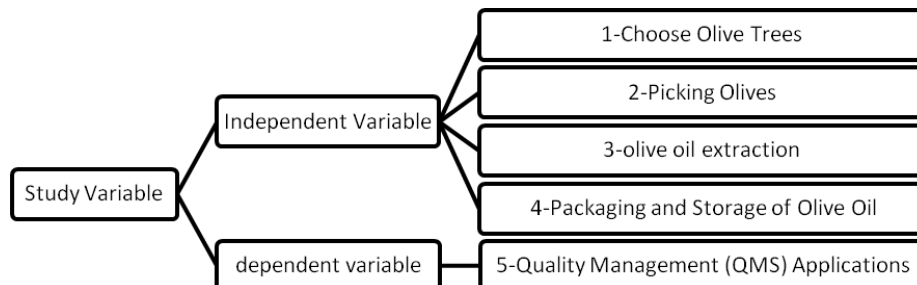
producing companies of olive oil in all countries seek to protect the value of the product by maintaining the essential elements of the oil, through the application of total quality management at every stage of its production. As there are many fundamental differences in the olive oil under study, despite a trees Olives are one, they differ in several attributes, because of the stages that they pass through, starting by planting varieties to caring for them, then the stage of reaping the fruits and ending with manufacturing, packaging and storage. Any failure in doing the previous stages affects negatively on the products and leads to a decrease in the quality of the product and the loss of some of its specifications, such as taste, color and smell, we will discuss this in the study:

The extent of compatibility of the application of total quality management in the stages followed in the cultivation and extraction of olive oil.

The difference in interest in the stages of cultivation and olive oil's extraction for farmers and press's owners in Algeria and Tunisia. Quality level of olive oil in Algeria and Tunisia.

As this study derives its importance from the privacy of this international product. The demand rate is very high because it is considered as an important, healthful and economic commodity in manufacturing many products. The results will help farmers and press's owners to develop the quality of products, especially those we met during the period of study and these results will meet The needs of local and international consumers, we will seek to analyze the relationship between the stages of olive oil's production and the applications of total quality management. The objectives of the study clarify the compatibility between the stages of oil's production and the applications of total quality management in Algeria and Tunisia, as well as we will treat the factors that affect the olive oil, and access to the best ways and means to maintain it and identify the basic differences in the cultivation of olive trees and the extraction of oil in Algeria and Tunisia; and the variables of study will be summarized in the following form.

Fig.1 :Study variable



2. Context and Literature Review:

2.1. Legal definition of olives:

For commercial trading, olive fruits must conform to obligatory standards that mainly refer to fruit appearance and uniformity in addition to the presence of different defects. Quality standards for table olives were issued by the International Olive Council (IOC, 2004) According to this standard, table olives are defined as the product with the following characteristics: (Luis Ralloa et al, 2018)

(a) prepared from the sound fruits of varieties of the cultivated olive tree (*Olea europaea* L.) that are chosen for their production of olives whose volume, shape, flesh-to-stone ratio, fine flesh, taste, firmness and ease of detachment from the stone make them particularly suitable for processing;

(b) treated to remove its bitterness and preserved by natural fermentation, or by heat treatment, with or without the addition of preservatives;

(c) packed with or without covering liquid.

Since olive oil has great benefits, it is mentioned in the Quranic verse; Allah said:

"God is the Light of the heavens and the earth. The parable of His Light is as (if there were) a niche and within it a lamp: the lamp is in a glass, the glass as it were a brilliant star, lit from a blessed tree, an olive, neither of the east nor of the west, whose oil would almost glow forth (of itself) though no fire touched it. Light upon Light! God guides to His Light whom He wills. And God sets forth parables for mankind, and God is All-Knower of everything." Surat An-Noor (The Light), (Verse 35). In another verse, Allah swear on the olive tree "By the fig and the olive ". Surat El Teen(The Fig),(verse 1).

The early legislative reference dealing with olive oils in Europe dates back to 1966 within the framework of the European Economic Community (EEC) Regulation 136/66, published on 22 September 2013, when the EEC was made up of six countries, and definitions were established for . (Ramón Aparicio et al, 2013)

Table 1 : Definition of oils extracted from olives, as established by Article 35 of Regulation EEC 136/66

Name	Definition
Virgin olive oil^a	Natural olive oil obtained solely by mechanical processes, enclosed pressure. Any admixtures with different oils and with oils by different technologies are forbidden
	<u>Extra</u> Olive oils with perfect sensory characteristics whose content of free fatty acids, expressed as oleic acid, cannot exceed 1 g/100 g
	<u>Fino</u> Olive oil whose characteristics are the same of extra except for free fatty acid content, which cannot exceed 1.5 g/100 g
	<u>Ordinary^b</u> Olive oil whose taste is good except for free fatty acid content, which cannot exceed 3.3 g/100 g
	<u>Lampante</u> Olive oil whose taste is not perfect or whose free fatty acid content as oleic acid exceeds 3.3 g/100 g
Refined olive oil^c	Olive oil obtained by refining of VOOs
Pure olive oil	Oil obtained by mixing virgin olive oil and refined olive oil
Olive marc oil	Oil obtained by solvent extraction of byproduct listed at TARIC category ex 23.04 described by Article 1, Paragraph 2, Letter E
Refined olive	Edible oil obtained by refining of oil described at point 4

marc oil	
Refined marc and olive oil	Oil obtained by mixing refined marc oil and virgin oil
Olive marc oil for technical purposes	Any other oil extracted from products listed in Custom Category
EEC European economic community a The expression “pure virgin olive oil” was admitted as well bThe term “semifino” was also admitted cThe expression “pure refined olive oil” was admitted as well	

source : (Ramón Aparicio, John Harwood , 2013)

Other categories of oils extracted from olives as well. Table 1 reports the original definitions of Regulation (EEC) 136/66, now deeply modified. The first amendment was Regulation (EEC) 2658/87 (EC, 1987), which modified the definitions of VOOs, although the authentic milestone for EEC quality and purity definitions of olive oils was Regulation (EEC) 2568 published on 11 July 1991 (EC, 1991). This regulation established (1) the parameters that had to be checked to assess purity and quality; (2) the limit for each parameter, depending on olive oil category; (3) and the methods that had to be applied to check whether a sample met the limits for its category. Also, Regulation (EEC) 2568/91 deeply changed the analytical approach to olive oil control. Thus, the regulation officially proposed, for example, the use of gas chromatographic open tubular columns, which were then introduced in several national official methods, and the methodology for the sensory evaluation of virgin oils by applying the so-called panel test method. VOO was the first food with legislation that included conducting a sensory evaluation (Ramón Aparicio et al, 2013). Tables 2 show the limits established for each quality and purity criterion of EVOO as well as the objective of its implementation. It is important to note that VOO is the only oil whose sensory characteristics are used as quality criteria (Antonios Kanavouras et al, 2006). The sensory assessment (so-called panel test) contributes to distinguish between VOO categories only. Thus, it is important to bear in mind that according to the EU regulation, sensory assessment is used only to classify the sample as extra virgin or virgin or lampante, but not to establish a quality score inside the same category of the European regulation. A sample, for instance, is classified as extra virgin if its median of defect is zero (Ramón Aparicio et al, 2013) and at the same time its median of the fruity attribute is higher than zero. Chemical parameters, on the other hand, which are qualified by their maximum or minimum limits detectable in the oil by chromatographic means (Cevik, 2014), are used to classify all the olive oil designations as well as to check purity by measuring the maximum admitted concentration of some selected compounds that are typical of oils of different botanical origins (Casini, 2014). Thus, the analytical methods have fixed limits, maxima, or minima, for the percentages of certain FAs and sterols, total of trans-oleic isomers (Rosa, 2016), total of trans-linoleic and trans-linolenic isomers, trilinolein, triterpene dialcohols (erythrodiol and uvaol), and saturated FAs of triglycerides in position 2 (Samia Akli et al, 2019). The total content of waxes, sterols, halogenated solvents, and stigmastadienes are also limited by maximum or minimum values. The chromatographic results are supplemented with the measurement of quality parameters, such as peroxide value, free acidity, and spectrophotometric values of K232, K270, and ΔK. (Ramón Aparicio et al, 2013)

Table 2 : Quality criteria established for EVOOS; limits of parameters

Table 2 – Quality criteria established for EVOOs, limits of parameters		
Parameter	EU limit	Explanation of quality criteria
Free acidity	≤ 0.8 g % w/w ^a	The higher the value, the worse the olive quality
		The processing of unhealthy olives increases free acidity
Peroxide value	≤ 20 meq O ₂ /kg oil	After extraction from olives, oil undergoes oxidation depending on several external variables
		Management of olive oil storage should be checked
K ₂₃₂	≤ 2.50	Oxidation products absorb at this wavelength
		The higher the oxidative status, the higher the value
K ₂₇₀	≤ 0.22	Oxidation products absorb at this wavelength
		The higher the oxidative status, the higher the value
ΔK	≤ 0.01	The higher the oxidative status, the higher the value
Panel test	Me (sensory defects) = 0	Sensory defects induce rejection of VOO by consumers
	Me (fruity attribute) > 0	EVOOs must have a fragrant fruity odor
		A low value does not fit with extra-virgin designation
Alkyl esters	^(b)	EVOOs should have no ethyl esters or at trace level
		High values characterize lampante olive oils
Me median value, FAME fatty acid methyl esters, FAEE fatty acid ethyl esters ^aAs oleic acid ^bΣ(FAME + FAEE) ≤ 75 mg/kg or [75 mg/kg < Σ(FAME + FAEE) ≤ 150 mg/kg and (FAEE/FAME) ≤ 1.5]		

source : (Ramón Aparicio, John Harwood , 2013)

2.2. Review on Current Status of Olive Oil in Tunisia and Algeria:

The primary goal of olive oil orcharding is to produce large quantities of very high-quality olive oil efficiently, economically, and consistently. This means having an annual production of between 1,000 and 2,000 kg of oil per hectare that receives recognition from oil judges, buyers, and consumers, with the costs of production being well below the going price for the specific target market. The farmer must have the right climate then manipulate the choice of cultivars, tree spacing, pruning, fruit thinning, irrigation, fertilizing, pest control, harvest timing, and harvest method in order to maximize quality and keep costs low. When making these decisions, having a good knowledge of the production and quality characteristics of each cultivar is important. To a large extent the cultivar will dictate fruit yield, oil yield, the fatty acid profile, and color and flavor characteristics based on the profile and concentration of pigments, phenols, volatiles, and other phytochemicals present. Ideally each cultivar's genetic capacity would be matched to the climate,

general environment, and specific farm site in order to maximize production and quality (Vossen Paul, 2013)

- **Tunisia:** Olive is the most important agricultural export commodity in Tunisia. Nowadays, these exports account for about 20 % of the total export earnings of Tunisia. The country is the largest olive producer in North Africa and the Middle East. It is the most important olive-growing country of the southern Mediterranean region (Ch. Ben Ahmed et al, 2009). Olive-growing occupies 1.68 Million ha which represents 30 % of the Tunisian cultivated land. Tunisia's olive resources are estimated at over 65 million olive trees in 270,000 farms (72 % are less than 10 ha) Though endowed with a vast array of varieties that have adapted to its many environmental conditions, Tunisian oil production mostly relies on two cultivars: Chemlali, representing 70% of the olives employed, and Chetoui, which accounts for 10%. These two varieties are often blended together, to make an extremely balanced oil. There are also many lesser varieties, cultivated from the more northern regions of the country, with a damper climate, to those furthest south, which are more arid and hostile. Chemlali, the most popular cultivar in Tunisia, especially in its central and southern regions, gives a sweet oil, with only the slightest bitterness, and no pungency at all (Molinar Mariangela, 2017). The other variety mentioned, i.e. Chetoui, is mostly cultivated in the North, and gives a more bitter and intensely fruity oil. Most of the orchards have only 50–60 trees/ha with an average yield of 0.8 t/ha. Total production is approximately 150,000 t annually. There are 1,674 processing mills for oil (Vossen Paul, 2013). It is an important source of employment for 269,000 farmers, or 57 % of the country's total. The Châal region, located in Sfax, has the biggest state-owned olive farms by around 300,000 olive trees and is the biggest olive farm in the MENA (Middle East and North Africa) region. (Younes Ben Zaied and Oussama Zouabi, 2016) The high quality of Tunisian olive oil has also been recognised with prestigious awards. In 2018 alone, Tunisian olive oil producers have won over 70 awards, which include two dozen gold awards at international olive oil competitions held in Los Angeles, Athens, Italy, London, New York and Japan. But the best way to judge an exceptional olive oil is through the palates of olive oil lovers and top chefs. Tunisian olive oil is reaching more and more new consumers and now shares shelf space with Italian and Spanish oils at gourmet food shops and in the kitchens of Europe's best-known chefs (Isabel Putinja, 2018) The Tunisian olive oil producing system is composed of three coexisting olive oil extracting systems: the traditional method, the super-press and the continuous chains (the modern method). A few olive oil mills have more than one type of processing unit; these mills are called mixed units. According to the Ministry of Agriculture and Hydraulic Resources in Tunisia, there were 1,723 olive oil mills in 2012, of which 628 were traditional units, 388 were super-press units and 709 continuous chains. These figures suggest the rate of diffusion of the continuous chains is around 41% (David Jackson et al, 2015), olive oil extraction in Tunisia with modern equipment currently represents 31%. In contrast, it is 70%-80% in Italy, Greece and Spain. Thus, although the government is promoting the number of continuous chains, Tunisia's remains the lowest of the four main olive oil producers and exporters (Kenichi et al, 2016).

-**Algeria:** is one of the biggest producers of olive oil in the world (9th place), but its quality leaves much to be desired. this oil is potentially good however, some farmers lack knowledge and others, lack means. in 2006, the area covered by olive trees was 263,352 ha with a production of 196,258 tons (17.8 l of oil/quintal of olives) with orchards typically yielding 2 t of fruit/ha. the main oil variety is chemlal. there are 1,650 mills, of which 165 have modern continuous-flow processing machinery (VOSSEN PAUL, 2013) according to international olive oil council (i.o.c.) data, the algerian production of olive oil, in 2017, was 684460 tons, while the italian production was 490,000 tons (FAO, 2019) and the european community production was 2,030,800 tons of oil (APS, 2019).

the oliviculture is concentrated mainly in the center of the country, the “kabylie” with 58.4% of the total oliviculture area (153,708 ha). in this study, it was demonstrated that algerian olive oil has all the potential to be a good oil, however it must be improved, quantitatively and qualitatively, mainly regarding the harvest and the transformation of olives and the conditioning techniques of oil. actually, the use of ancient practices determines the low chemical quality and especially the deficiency of organoleptic properties, but where the technological improvements exist, the quality is good. the difficulty that we faced in this study was to find official information about the situation of oliviculture in algeria and about quality and characteristics of algerian olive oil. Algerian olive growing is part of a centuries-old tradition. Many historians have describes olives and olive oil were the subject of intense exchange with Rome. This olive growing grounds the landscape and the culture itself populations of certain producing regions such as small and large Kabylie. It is possible to identify two types of production system: modern and traditional, with a strong predominance of the latter (L. LOUADJ, A.M. GIUFFRÈ, 2010). The depth history is an element of distinction between the system modern newer and traditional old enough. The Algerian olive-growing is one of the least competitive of the Mediterranean basin. Reasons are historical at the same time, political and institutional. Already in years On 1940, the section head of arboriculture (Mr. Rebour) the inability of Algeria underlined to spread its orchard oléicole contrary to Tunisia which could make it in spite of difficult conditions. Production has so regularly lowered owing to the phenomena of insecurity, the weak-willed person increase of outputs, absence of care and of renewal of orchards, competition of others vegetable oils and of loss of fondness towards the olive-growing. In the hilly zones, the olive-growing became one product of picking more than food articles culturale. It is a product of exact change for the playing country families an agriculture of subsistence. At present, the same official report can be made and in practice, the same reasons are responsible' s of the situation of actual crisis. The orchard oléicole is aging with weak outputs. It is not much maintained and dedicated in the abandonment and in deterioration in several zones, due to the country exodus and lack of interest of young persons. Irrigation and (chemical) fecundation are quasi absentees. This traditional olive-growing provides a supplementary benefit of come back to the country families. A broad party of production am intended for home consumption. Graded structure show the predominance of three producing varieties oils having particular characteristics: variety CHEMLAL of Kabylie (30 % of the complete areas and 44 % of lands intended for the oil of olive): this local variety, therefore rural (does not require big means for his assertion), is the most spreading in Kabylie, in the Atlas Blidéen, in Mitidja and in region of Bibans. It is very estimated for the manufacture of good quality oil; AZEADJ varieties and BOUCHOUK: they accompany the populations of CHEMLAL and allow pollination; variety ABERKANE: it is spread in region of Seddouk (Bejaia) and deal of satisfactory results in oil mill. The functioning of traditional course of study is comparatively simple. In the upper reaches of course of study, picking of olives is still made in the hand by the peasants, in general women. The transport of harvested olives is made in one difficult conditions (back of female mules), because of weak accessibility fields (hilly relief, distance and crumbling of farms, abrupt ways, absence modern roads, etc) Production is stocked in of at first big plastic bags in the domicile of the producers. It is then transported and delayed in the transformers which use in the majority oil mills traditionnelles⁴. Their weak-willed person capacity of trituration, dilapidation and nonconformity of their equipment in modern norms (stocking, handling), the absence of control quality, the nonexistence of quality-label and the delays of wait harm the quality of oil. The rate of acidity are particularly well brought up (3 - 4 %) what is productive this oil lampante inappropriate to consumption and to exportation (nonconformity in the norms of OCI). However, this oil is very appreciated by the mountain populations for his specific qualities (tastes, smell, texture, therapeutic virtues etc). (Lamara HADJOU et al, 2013)

3. Study Methodology :

A quantitative approach of research was implemented. A personal survey 'face to face' was conducted with the assistance and cooperation of Doctoral students of agricultural sciences in Algeria, while in Tunisia we relied on two frameworks in the Agency for Agricultural Guidance and Training at the Ministry of Agriculture , using a structured questionnaire , what favours data collection and avoids any error of transcription of the answers in the statistical software . The language used in the questionnaire was arabic , but with Study sample with difficulties in understanding technical terms, slang was used. It only affected a very reduced group of Study sample questioned

The fieldwork was done during weekends in two agricultural seasons 2018 and 2019 in the territory of Sfax and Mahdia in Tunis ; and territory of Béjaïa Biskra and mascara in Algeria , it having the Olive Oil farmer , it attracts many consumers and can be considered the epicentre of this territory in terms of olive oil. Potential respondents were intercepted and asked for the voluntary participation in the survey. Confidentiality was also ensured. Interviewers read each question and possible answers to each enquired. A total of 168 valid questionnaires were obtained using a non-probability sampling of convenience in the Algeria and tunisie . The first draft of the questionnaire was revised by a panel of seven experts and professionals on the Cultivation of olive trees and management. The questionnaire was revised and improved according to the suggestions received. The questionnaire was divided into two sections IBM SPSS Statistics Version 21 program was used to carry out the descriptive analysis of the data. Variables were measured on a five-point Likert scale (1: totally disagree, 5: totally agree)

4. Study Results :

The main findings from the fieldwork are detailed below. They are presented in blocks, in a differentiated manner for the different topics addressed. Thus Demographic data of the respondents' firms are summarized as follows. In these parts we're talking about the area, work nature , professional experience, and sex sample; we chose these elements being different in the study area. We're going to make all this clear in the following tables.

Table 3: Distribution of study sample members by region

Country	Number	Percentage
Algeria	76	45.2
Tunisie	92	54.8
Σ	168	

From the previous schedule, the largest percentage of the sample study population in Tunisia represents 54.8 % of the sample study members ; is a logical percentage because Tunisia is one of the leading countries in this field compared to Algeria.

Table 4: Sample study by work nature

work nature	Number	Percentage
Farmer	53	31.5
Olive Wine press Owner	55	32.7
Consumer	24	14.3
Vendors	21	12.5
Others	15	8.9
Σ	168	

We distributed the questionnaire to five categories represented in the highest table, we have taken into consideration the equality between all elements to give credibility to this study, especially the first two categories of importance it represents in the olive oil industry ; As for the professional experience in the field, we focused on the owners of the presses and the farmers, 64 of them had experience from 20 years to 25 years, and the rest have experience over 25 years ; As for the female element, we focused on it through the consumption factor, because they are the ones who judge the quality of the product in both countries, and they are estimated at 49 women out of the total sample of the study.

4.1 Analysis of measurement model

For the analysis and study, the model of Fig. 1 was proposed, which includes the hypotheses presented for this research. The evaluation of the measurement model was carried out by means of the analysis of the validity and reliability of the different constructs, differentiating those that are reflective from the formative ones. The main difference between reflective and formative constructs is that formative measures represent instances in which the indicators cause the construct, whereas reflective indicators are caused by the construct itself. Thus, an attempt was made to evaluate if the theoretical concepts are measured in a precise way by means of the observed variables (José Antonio et al , 2019).

The first step consisted in analysing the individual reliability of the indicators, the internal consistency of the construct, the convergent validity and the discriminant validity of the reflective constructs (Fornell and Larcker, 1981). The results shown in Table 5 indicate an adequate individual reliability of the items, since all the loads are well above the minimum threshold required of 0.505 (Fornell and Larcker, 1981). The analysis also indicated that all charges are statistically significant at the 99.99% level.

4.2 Construct validity

The KMO sampling adequacy measurement was performed to evaluate the applicability of factor analysis for the sampling group. Such an evaluation was conducted before determining the factor structure of the Study Variables. In addition, the Bartlett's test of sphericity was employed to identify if the factor analysis of the sampling group was appropriate and more than zero.

The KMO coefficients of the Study variables scales are 0,903 .0,917 .0,882. 0,907. 0,910 respectively. Moreover, their chi-square value for the Bartlett's test of sphericity are both significant at 1056,792 ($P < 0.05$) ; 1522,202 ($P < 0.05$) ; 2129,296 ($P < 0.05$) ; 11050,266 ($P < 0.05$) ; 20260,329 ($P < 0.05$) with the following elements: 1-Choose Olive Trees, 2-Picking Olives, 3-olive oil extraction, 4-Packaging and Storage of Olive Oil, 5-Quality Management (QMS) Applications ,respectively (Table 5). The findings indicate that the sample size is appropriate for factor analysis.

To determine the reliability of the scales, the values of Cronbach's alpha coefficient (0,937,0,907,0,930,0,919,0,936) respectively, were calculated, where all the figures reached were greater than the minimum threshold of 0.6, thus validating the internal consistency of the model (Fornell and Larcker, 1981)

Table 5 : KMO and Bartlett's test

KMO and Bartlett's Test		Component				
		1	2	3	4	5
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0,903	0,917	0,882	0,907	0,910
Bartlett's test of sphericity	Aprox.ch-square	1056,792	1522,202	2129,296	1050,266	20260,329
	Df	28	36	55	45	91
	Sig	000	000	000	000	000

A correlation matrix was generated during the second stage of the factor analysis. The correlation matrix is a matrix that indicates the relationship between the variables included in the factor analysis. Small correlations in the residual matrix indicate the fit between the observed and generated matrices for a good factor analysis. It was observed in this study that the relationship between the factors was lower than 0.30 which is sufficient ($P < 0.01$).

The variance explained by the initial solution, extracted components, and rotated components is displayed. This first section of the table shows the Initial Eigenvalues.

The Total column gives the eigenvalue, or amount of variance in the original variables accounted for by each component. The % of Variance column gives the ratio, expressed as a percentage, of the variance accounted for by each component to the total variance in all of the variables. The Cumulative % column gives the percentage of variance accounted for by the first components. the cumulative percentage for the second component is the sum of the percentage of variance for the first and second components.

For the initial solution, there are as many components as variables, and in a correlations analysis, the sum of the eigenvalues equals the number of components. You have requested that eigenvalues greater than 1 be extracted, so the first three principal components form the extracted solution.

The second section of the table shows the extracted components. They explain nearly 88% of the variability in the original ten variables, so you can considerably reduce the complexity of the data set by using these components, with only a 12% loss of information .

Table 6: Total Variance Explained

component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5,542	69,272	69,272	5,542	69,272	69,272
2	6,647	73,851	73,851	5,542	69,272	69,272
3	6,168	61,682	61,682	5,951	59,513	59,513
4	5,827	58,268	58,268	5,827	58,268	58,268
5	5,630	70,372	70,372	5,630	70,372	70,372

The order of the factors is in accordance with the highest eigen values and amount of variance explained by each one of them (Table 6). These five factors were named as Features, 1-Choose Olive Trees, 2-Picking Olives, 3-olive oil extraction, 4-Packaging and Storage of Olive Oil, 5-Quality Management (QMS) Applications. The percentages explained by each factor were 73,851%

(Picking Olives), 70,372% (Management (QMS) Applications), 69,272% (Choose Olive Trees) and 58,268% (Packaging and Storage of Olive), 61,682% (olive oil extraction), respectively.

4.3 Item analysis

Item analysis was conducted to evaluate the relationship between individual item and total item scores. This analysis also helped to identify if each item was weighted equally. The analysis also contains a substantive analysis of the levels and trends for the different variables (1-Choose Olive Trees, 2-Picking Olives, 3-olive oil extraction, 4-Packaging and Storage of Olive Oil, 5-Quality Management (QMS) Applications). As Table 7 shows, the item-total score correlations of the items on the child scale are significant at $P < 0.05$. The item-total score correlations were between 0.584 and 0.952, which are above the acceptable threshold for item analysis.

Table 7: Factor loads matrix

Item	Component				
	1	2	3	4	5
Categorie1	0,779				
Categorie2	0,866				
Categorie3	0,809				
Categorie4	0,795				
Categorie5	0,790				
Categorie6	0,845				
Categorie7	0,855				
Categorie8	0,907				
Reap1		0,921			
Reap2		0,872			
Reap3		0,856			
Reap4		0,781			
Reap5		0,846			
Reap6		0,797			
Reap7		0,865			
Reap8		0,869			
Reap9		0,917			
Pressing1			0,952		
pressing2			0,879		
pressing3			0,962		
pressing4			0,924		
pressing5			0,934		
pressing6			0,934		
pressing7			0,951		
pressing8			0,872		
pressing9			0,884		
Pressing10			0,936		
Warehousing1				0,913	
Warehousing2				0,842	
Warehousing3				0,766	
Warehousing4				0,869	
Warehousing5				0,839	
Warehousing6				0,844	
Warehousing7				0,913	
Warehousing8				0,842	
Quality1					0,939

Quality2					0,944
Quality3					0,621
Quality4					0,584
Quality5					0,662
Quality6					0,733
Quality7					0,788
Quality8					0,618

As shown in Table 7, the item-total score correlations are between 0.779 and 0.907 for the Choose Olive Trees ;between 0.781 and 0.921 as to Picking Olives; between 0.872 and 0.952 About the olive oil extraction; between 0.766 and 0.913 As for Packaging and Storage of Olive Oil Finally between 0.584 and 0.944 , which are above the acceptable threshold for items analysis.

5. discussion of results

In this section, once the sample measurement model has been validated, the evaluation of the internal model is carried out. In this way we try to contrast the hypotheses raised between the constructs. So, the value of R^2 and the significance of the paths are analysed (Fornell and Larcker, 1981). The explained variance of the endogenous constructs is calculated by analysing the R^2 , in order to analyse the predictive power of the model, As can be seen in Table 8, This study aimed to identify the Quality Management (QMS) Applications

Table 8 : Measurement; Structural model fit indices

The relationship between the independent variable and the dependent variable	Choose Olive Trees	Picking Olives	olive oil extraction	Packaging and Storage of Olive Oil
Quality Management (QMS) Applications	0,360	0,290	0,092	0,934
R^2	0,130	0,084	0,014	0,889
F	17,330	10,899	1,173	1328,986
Sig	0,000	0,001	0,312	0,000
Qualitative error ξ_i	2,105	1,580	2,101	1,1900
H1 Choose Olive Trees/ Quality Management (QMS) Applications > is supported. H2 Picking Olives / Quality Management (QMS) Applications > is supported. H3 Olive oil extraction / Quality Management (QMS) Applications > is rejected. H4 Packaging and Storage of Olive Oil / Quality Management (QMS) Applications > is supported.				

The model explains 13% of the Choose Olive Trees, 8,4% of the Picking Olives, 1,4% of the Picking Olives and 88,9% of Packaging and Storage of Olive Oil. These data indicate that the model has a high predictive value and is capable of explaining endogenous constructs (Falk and Miller, 1992) Regarding the study of the standardized path coefficients β and the selection of critical values for the Student's t distribution, the values of the β coefficients that relate the constructs of the model, reach values greater than 0.2. These data can be seen in Table 8 where the results for the structural model are presented. The analysis of the meaning of the paths revealed that all the research hypotheses received empirical support from the results, except for hypothesis three ($\beta=0,092$ $p=0,312>0,05$) we find this indicates unearh a statistically insignificant. thus validating the proposed model.

6. Conclusion :

Through analyzing the data, attending seminars and exhibitions in the field of the olive tree, as well as visits to farms and contemporaries during seasons of activity, also meetings with those interested in the field and knowing the natural, climatic and economic conditions of the sample both in Algeria and Tunisia. For the sake of real knowledge of olive oil's production and the extent of progress and improving its quality for local and international competition we came up with the following:

- There are no clear classifications and labels for olive tree varieties, especially in Algeria. As an evidence there is a class of the study sample estimated at 75% from Tunisia, but the designation differs in some regions in Algeria, and this has a negative impact on determining the appropriate varieties for each region in terms of resistance to drought as well as the amount of production and its quality. Especially in Algeria, which is known for the vast area and the different climate prevailing in each region, thus it is difficult to determine the appropriate type for each region, unlike Tunisia.

- Lack of attention to the result of all scientific measurements and tests of varieties according to acidity's characteristics, especially in Algeria, and this has a significant impact on the quality and quantity of the product.

- The high average cost of production in Algeria due to the dependence on primitive methods in the harvesting process

- The absence and lack of marketing information related to the local and international markets, especially those related to the offered and required quantities, the desires of consumers and merchants, prices, specifications, standards and export procedures in Algeria.

- The lack of a price policy, which led to the instability of prices, the absence of organized markets in Algeria, the lack of sufficient experience for marketing, and also the high costs of transportation from the production areas to the extraction areas then to the consumer.

- Lack of technical workforce trained in agricultural and industrial services for olive oil in Algeria and the lack of interest of active peasants in conferences and scientific seminars on olive trees and their cultivation.

The Tunisian authorities have given the necessary importance to the process of managing the quality of olive oil, and this has improved its performance locally and internationally compared to its competitor Algeria.

- the medium and insufficient financial support for agricultural investors in Algeria, in addition to this, the lack of a specialized monitoring body for this category of trees.

The absence of specialized laboratories for managing the overall quality of olive oil in Algeria.

Academic research in Algeria is very few and ineffective, centered mainly on agricultural regions.

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