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Determination of the Change of Agricultural Landscapes Based on CORINE Land Cover Agricultural Land Classes Using GIS and Visual Quality Value with the AHP Method: The Case of Tekirdağ Province

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ABSTRACT

Agricultural landscapes contribute positively to the visual texture of the city and change over time. In this context, this study aims to determine the visual landscape quality of agricultural landscapes based on parameters on expert approach the hypothesis; it is important and necessary to determine the visual landscape values based on the change in agricultural landscapes over time. Within the framework of the developed hypothesis, it aims to make an expert-based visual landscape assessment of the agricultural landscapes of Tekirdağ Province, located in the northwestern part of Türkiye, based on nine subclasses created according to the CORINE land cover (CLC) classes, on the basis of 4 main parameters. Using the AHP technique, the priorities of the parameters and agricultural landscape classes and the relationships between basic parameters and visual preferences were determined. In this direction, the questions; What are the priorities of parameters that are effective in determining the visual quality of agricultural landscapes on the basis of expert approach?; What kind of changes have occurred in agricultural landscapes during the years 1990-2000-2006-2012-2018 in 9 subclasses created according to the CLC classes? and; How should the visual landscape quality values of the agricultural landscape subclasses created according to the CLC classes be ranked? The results of the study can be used as a tool in landscape planning and management studies as a factor in strengthening landscape quality.

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Introduction

Many agricultural areas worldwide are characterised by a mosaic of land cover, crop diversity and structure (Forman, 1995; Bennett et al., 2006). In this sense, agricultural landscapes include cultivated areas that support natural diversity and various semi-natural habitats such as cultivated and uncultivated areas, heathlands, wetlands, etc. (Jonsen&Fahrig, 1997; Robinson et al., 2001; Antrop, 2005; Özgeriş&Karahan, 2022; Kiper, 2023), which are shaped by cropping patterns, plot shapes, structural units (ditches, fences, greenhouses, etc.) and production methods together with human-nature interactions. Rural landscapes, including agricultural landscapes, have been shaped by the combination of building types, vegetation, traditions, gastronomy and many other elements that give the area its distinctive character (Cañas, 1995; Ayuga-Téllez et al., 2021). Traditional/historic European agricultural landscapes represent cultural landscapes with many unique cultural, historical and biodiversity patterns (Agnoletti&Santoro, 2015). Agricultural landscapes have cultural heritage value with the potential to create diverse landscapes that represent the interface between natural conditions and a particular community's aesthetic, ideological and cultural values of a particular community (Meeus, 1993; Olsson& Rønningen, 1999;; Bunce, 2001; Dramstad et al., 2001; Krause, 2001Arriaza et al., 2004). There are many international documents that support the cultural heritage value of agricultural landscapes (The Agenda for Sustainable Development 2030, 2015; European Commission. Rural Development Programms for 2021–2027, 2020; European Green Deal, 2020; European Cultural Heritage Strategy for the 21st Century, 2017; Principles Concerning Rural Landscapes as Heritage, 2017; Globally Important Agricultural Heritage Systems, 2002). At the same time, the valuation of agricultural landscapes is emphasised in the relevant conventions.

Agricultural landscapes have important functions such as production, habitat, recreation and aesthetics in spatial, social, visual and ecological dimensions (Jongeneel et al., 2008; Artsdatabanken, 2021).

Table 1. The numerical distribution of studies on agricultural landscape and visual quality (Agri. Lands. & Vis. Qua.) of agricultural landscapes in WOS and Scopus Database between 1992-2024*

Alls	Agricultural landscapes	Agricultural landscapes & Visual Quality	Agricultural landscapes	Agricultural landscapes & Visual Quality
Years	WOS	WOS	Scopus	Scopus
1992-2002	3970	16	2694	8
2003-2013	18028	101	10487	38
2014-2024	55246	317	23053	75
Total	77244	434	36234	121

*(Elsevier Scopus, 2024; Web of Science, 2024)

Agricultural landscapes traditionally have a resource value for producing food and industrial crops, but they are also homes and workplaces for most people and habitats for wildlife and plants (Chan et al., 2012; Van Zanten et al., 2014). This suggests that agricultural landscapes provide diverse and important benefits to society by generating ecosystem service (ES) values (provisioning services such as food, fibre and fuel, as well as aesthetic, recreational and amenity values) (Zhang et al., 2007; de Groot et al., 2010; Power, 2010; Schaich et al., 2010; Häfner et al., 2018; Van Zanten et al., 2014). However, agricultural landscapes are an important force in shaping rural areas and creating visual landscape values for many urban and suburban dwellers (Walker&Fortmann, 2003; Hurley&Walker, 2004; Wartmann et al., 2021) also found that agricultural landscapes contribute positively to the visual fabric of the city and change over time. The European Union (2005) report 'Agriculture, Environment and Rural Development' emphasises that agriculture has been a factor in shaping many European landscapes for centuries (European Comissión, 2005). In support of this situation, Wartmann et al. (2021) emphasise that agricultural landscapes have a significant impact on landscape quality, Wang and Marafa (2021) emphasise that agricultural landscapes enhance visual quality and Frontuto et al. (2020) and Jongeneel et al. (2008) also identified the ecosystem service value of the aesthetic effect of agricultural landscapes, while Butler and Oluoch-Kosura (2006) and Gobster et al. (2007) defined the aesthetic value of agricultural landscapes as an ecosystem service (Butler&Oluoch Kosura, 2006; Gobster et al., 2007; Jongeneel et al., 2008; Frontuto et al., 2020; Wang & Marafa, 2021).

Taking into account the above mentioned studies and approaches, it has been emphasised that agricultural landscapes have a strong aesthetic value due to their land pattern, product diversity, structural-vegetative characteristics and the need to define the visual landscape quality accordingly. None of these studies aimed to understand the appearance of agricultural landscapes based on the CLC.

From this point of view, the study is based on the hypothesis that "it is important and necessary to determine the visual landscape values based on the change of agricultural landscapes over time" and it aims to determine the visual landscape quality of agricultural landscapes based on parameters based on an expert approach. In this direction, it aims to determine the visual landscape quality of agricultural landscapes based on parameters based on expert approach. What kind of change has occurred in agricultural landscapes in the framework of the years 1990-2000-2006-2012-2018 in 9 subclasses created according to the CLC classes? and "How should the visual landscape quality values of the agricultural landscape subclasses created according to the CLC classes be ranked?

Material and Method

Material

Tekirdağ has been selected as the focus area due to its vision as an agricultural city, prominently featuring agricultural products such as sunflowers, wheat, lavender, and canola, which are also utilized in tourism. The dominance of blue, green, yellow, and purple colors in its agricultural landscape further highlights its suitability for this study. The study area, covering a total of 6,313 km², is located in the northwest of Turkey (Figure 1). It includes eleven municipalities with a total population of approximately 1,113,400. The economy is primarily based on agriculture. The proportions of agricultural land, forests, and pastures are approximately 65.81%, 17.39%, and 5.3%, respectively. According to 2021 TURKSTAT data, 65.81% of the land structure consists of cultivated and planted areas (arable land, fruit land, vegetable land, greenhouses, ornamental plants) (Tekirdağ İli 2022 Yılı Tarım Raporu, 2023). 90% of Tekirdağ's agricultural land falls into arable land classes I-IV (T.C. Trakya Kalkınma Ajansı, 2024).

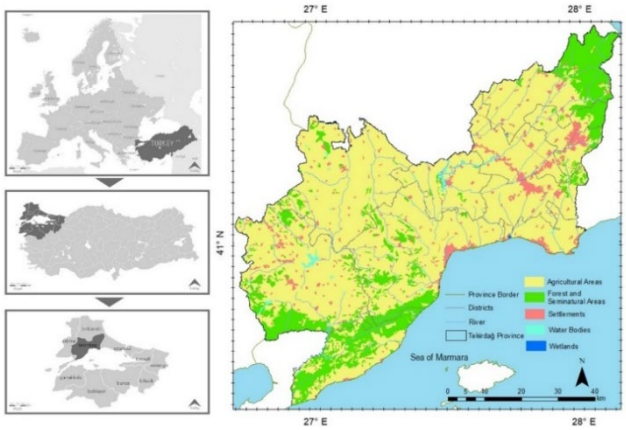


Figure 1. The study area

Study Area

The study was designed to be supported by a detailed methodological process, national and international studies, field studies, expert studies and statistical analysis in order to compare the main aims and objectives. The method's main design is based on the principle of supporting the Visual Landscape Analysis approach with the AHP Technique based on agricultural subregions classified based on CLC data of agricultural landscapes. This situation reveals the originality

of the study. Method solutions are generally supported by programs such as Arc GIS 10.8, MS Office Programmes and Adobe Photoshop CS 6. The developed method process consists of 7 main stages.

Identification of objectives

This paper deals with the visual aspect of the agricultural landscape. The study's main objective is to determine the visual landscape quality of agricultural landscapes based on parameters using an expert approach. Accordingly, three main objectives have been identified in the study.

- To determine the priority and importance of the main components that determine the visual preferences of the experts.
- To determine the changes over time (1990-2000-2006-2012-2018) of landscapes with agricultural sub-uses, created according to the CLC classes.
- Determination of visual quality values of agricultural sub-uses created according to CLC classes in terms of basic components.

Identification of key components for determining visual preferences

In this stage, the parameters that can be used as a basis for assessing the visual quality of agricultural landscapes were defined using recent national and international studies. These were 4 basic parameters (Table 2), namely harmony, scenic beauty, colour effect and uniqueness, the importance and priority of which will be assessed by experts in the AHP process.

Table 2. Basic parameter values and sources

Parameter	References
Harmony	Gonzalo & Hermann, 2014; Pouta et al., 2014; Kiper et al., 2017; Erdi Yakan, 2018; Chen et al., 2023; Molnarova et al., 2023
Landscape Beauty	Pouta et al., 2014;, Molnarova et al., 2023; Junge et al., 2015; Aşur et al., 2020; Stokstad et al., 2020; Górka, 2024
Color Effect	Frontuto et al., 2020; Molnarova et al., 2023; Junge et al., 2015, Luo et al., 2023
Uniqueness	Kiper et al., 2017; Tarolli et al., 2023; Krøgli et al., 2023

Selection of experts

An expert group was formed as part of the AHP technique process. In the selection of the expert group, preference was given to people from planning and design disciplines (urban and regional planning, architecture, painting, landscape architecture) who are competent in agricultural landscaping, have a good knowledge of the study area and have professional and technical skills.

Creation of Agricultural Subclasses According to The CLC Classes and Determination of the Temporal Development of Agricultural Subclasses

The association of land cover, crop diversity and landscape structure with the visual value of agricultural landscapes (Paracchini et al., 2003; Kumaraswamy & Kunte, 2013; Rechtman, 2013; Verburg et al., 2013;) is useful for considering subclasses according to agricultural land use patterns. The CORINE system is one of the most widely used methods in the field of Land Use / Land Cover (LULC). Coordination of Information on the Environment (CORINE) is a system that has been implemented since the mid-1980s within the scope of the EU (European Union) countries for the purpose of periodically determining OER/LAC covering all member countries (Disperati & Virdis, 2015). The purpose of the CORINE programme is to identify and meaningfully categorise land cover (LC) and land use (LU) data, which includes a defined nomenclature coding and the creation of a quality database, necessary for the monitoring, organisation and management of natural resources at regional and national levels. The CORINE Land Cover programme is the most thorough and consistent cartographic programme (TešićA, 2022).

In this context, the subclasses of 9 agricultural areas within the study area were defined by selecting the 3rd level classification method of CORINE to be evaluated within the framework of visual landscape analysis. According to the CORINE method, Land Cover/Land use maps for 9 agricultural landscape areas for the years 1990-2000-2006-2012-2018 were prepared in ArcGIS environment and spatial and temporal land use changes were determined.

Photography of agricultural landscape subclasses

Sample photographs that best represent the agricultural landscapes of the 9 agricultural subregions classified based on CLC level 3 data were selected. The location of each selected photograph was marked on the Tekirdağ Province map, CLC 2018 and Google Earth image.

Application of AHP technique for visual landscape analysis

Visual quality assessment involves the process of determining the visual value of the image and the natural and cultural components of the landscape according to certain parameters. Visual landscape analysis is related to people's perceptions of the landscapes they see and their attitudes towards the visual environment (Teh et al., 2018). The 'Analytic Hierarchy Method' (AHP) was used at this stage, AHP is a technique developed by Thomas Saaty in 1970 and is widely used to select the best alternative based on multiple criteria and sub-criteria (Saaty,1977; Leal, 2020; Pant et al., 2022; Saaty, 1987). It can evaluate quantitative and qualitative criteria in decision making, incorporating the preferences, experiences, intuitions, knowledge, judgments and thoughts of the group or individual in the decision process, and allows complex problems to be solved by considering them in a hierarchical structure (Berrittella, 2009). The algorithmic steps of the AHP method are as follows (Saaty, 1990; Cheng et al., 1999; Özdağoğlu & Özdağoğlu, 2008).

- A decision problem and/or goal is defined.
- Criteria and alternatives are identified and a hierarchical structure is created as shown in Figure 2.
- Using the comparison scale in Table 3, a pairwise comparison of alternatives according to each criterion and a pairwise comparison of the importance levels of individual criteria are made.

- Priority vectors obtained from comparisons are used to find a solution to the decision problem
- Pairwise comparison matrices are normalised and the priority vector is calculated. Each element in the matrix is normalised by dividing by its column sum. The sum of each column in the normalised matrix is 1. The calculation is performed using the following formulae. The normalisation for a priority vector w is done by dividing each element in a given column of the matrix A by the sum of the elements in that column. The elements in each row are then summed and each sum obtained is divided by the degree of matrix A (1).

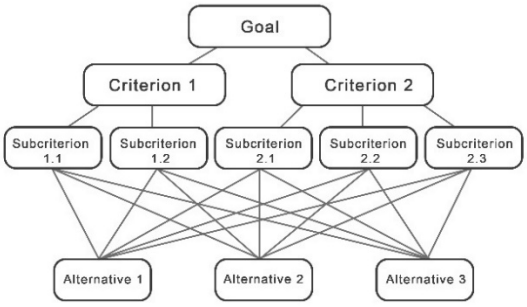


Figure 2. Hierarchical structure prepared according to criteria and alternatives (adapted from (Saaty, 1996)

Table 3. The AHP pairwise comparison scale (Saaty, 1980)

NV	Definitions	Explanation
1	Equal importance	Two elements contribute equally
3	Moderate importance	Experience and Judgment favor one element over another
5	Strong importance	An element is strongly favored
7	Very importance	An element is very strongly dominant
9	Extreme importance	An element is favored by at least an order of magnitude
2, 4,6,8	Moderate values	Used to compromise between two judgments.

NV: Numerical values

$$a_{ij}{}' = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}}, i, j = 1, 2, \ldots\ldots, n \quad (1)$$

Priority vector is calculated (2).

$$w_i = \left(\frac{1}{n}\right) \sum_{i=1}^{n} a_{ij}{}' \text{ , i, j = 1, 2, ….., n} \quad (2)$$

After making pairwise comparisons and determining their priorities, the consistency of the comparison matrices is calculated. According to Saaty's the consistency ratio is 0.1 or less, in which case the comparison matrix is decided to be consistent (Berrittella, 2009; Çoban, 2023). The consistency index (CI) is calculated using the formula below (3).

$$CI = \frac{\lambda_{max} - n}{n-1} \quad (3)$$

n: the rank of the matrix

λ max: the maximum eigenvalue of the comparison matrix (4)

$$\lambda_{max} = \frac{1}{n} \sum_{i=1}^{n} \left(\frac{\sum_{j=1}^{n} a_{ij} w_j}{w_1} \right) \quad (4)$$

Consistency ratio is calculated (5).

$$\text{Consistency Ratio (CR)} = \frac{\text{Consistency index (CI)}}{Random\ index\ (RI)} \quad (5)$$

The Random Index (RI) depends on the rank of the matrix and its values are obtained by randomly generating 500 matrices.

In the AHP process, firstly, the 4 basic parameters defined by the experts to determine visual preferences were scored within the framework of the comparison scale, and then the priority values of the selected agricultural landscapes for each area, divided into 9 subclasses according to the CLC class (2018), were scored according to these 4 parameters. The weight coefficients of the parameters and agricultural landscapes obtained as a result of the expert scoring were calculated by the authors.

Evaluation and Conclusion

At this stage, agricultural landscapes' visual priority and dominance over each other have been assessed. Accordingly, areas with high visual value will have the opportunity to become areas with high aesthetic potential as areas of distinctive landscape character. In this context, the weight coefficients of the agricultural uses calculated by the AHP technique for each area and the weight coefficients of the criteria were multiplied on the basis of basic parameters and the agricultural image value was found by summing the product values for 4 criteria. The agricultural image values obtained for each area were summed and the arithmetic mean was taken and the numerical criteria were determined in 3 equal intervals. Accordingly, the image value of agricultural landscapes in 9 sub-categories was considered as 0.01-0.088 medium impact, 0.089-0.176 strong impact and 0.177-0.264 very strong impact.

Areas with very strong, strong and medium impact on agricultural landscapes were evaluated in terms of their spatial and temporal changes according to CLC for the years 1990-2000-2006-2012-2018.

Results and Discussion

Creation of Agricultural Subclasses According to CLC Classes and Determination of the Temporal Development of Agricultural Subclasses

According to the third level classification method of CORINE, 9 agricultural subclasses were determined in the study area for the years 1990-2000-2006-2012-2018 and CLC maps were created in ArcGIS 10.8 software and spatial and temporal changes of land use were determined (Figure 3, Figure 4). Figure 4 presents a comprehensive analysis of the percentage changes in agricultural land use derived from the 1990-2018 CLC data.

Considering the CLC data, non-irrigated arable land was the most dense in terms of spatial extent and area, while orchards were the least dense. The non-irrigated arable land area decreased intensively from 718173.48 ha in 1990 to 458039.08 ha in 2000. Permanently irrigated land, which was 77604.45 ha in 2000, decreased to

32978.80 ha in 2006 and rice fields, which was 49830.89 ha in 2000, decreased to 12688.83 ha in 2006. According to the 1990 and 2000 CLC data, olive groves are not included in the area, while they have increased in quantity until 2018 and are concentrated in coastal areas. According to the 2000 CLC, there has been a significant decrease in the area of complex cropping patterns. The area of mainly agricultural land with significant areas of natural vegetation has increased steadily after 2000.

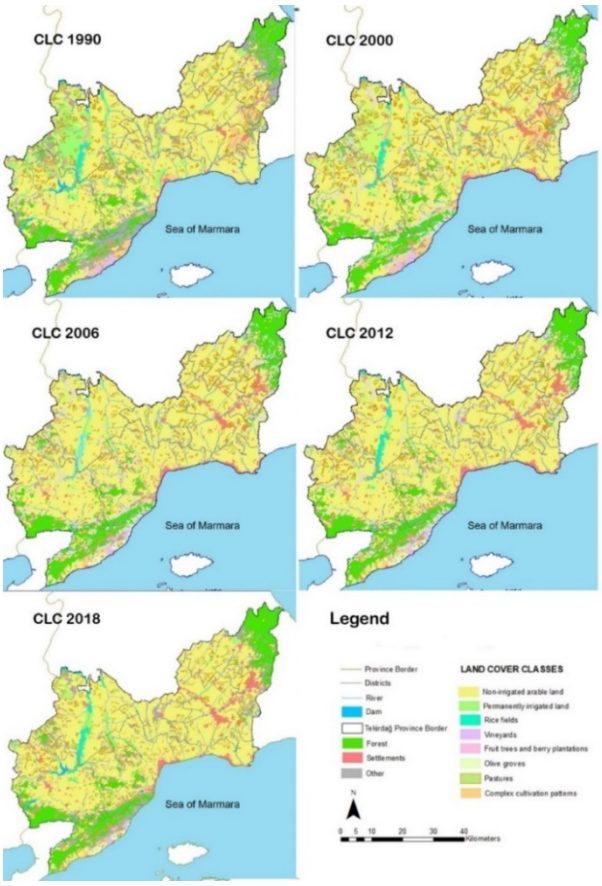


Figure 3. Tekirdağ province CORINE level 3, agricultural land use classification for the years 1990-2018

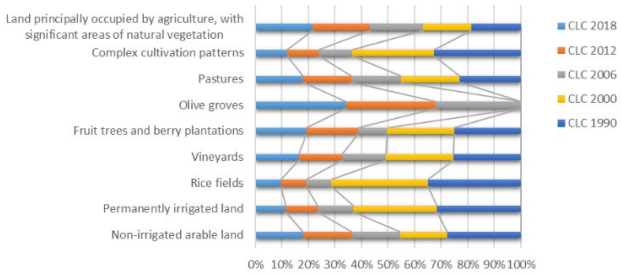


Figure 4. Agricultural land cover changes in Tekirdağ according to CORINE Level 3, agricultural land cover class for the period 1990–2018

Application of AHP Technique for Visual Landscape Analysis

The AHP consistency values of the ratings given by the experts on the basis of 4 main criteria for each area were found to be below 0.1 level (0.02) for each expert. When the areas were evaluated in terms of each criterion, the consistency value was 0.009 for harmony and landscape beauty, 0.007 for colour effect and 0.01 for uniqueness. CLC Level 3 images of agricultural landscape areas including 9 subclasses, their locations and weight coefficients of agricultural uses The weight coefficient of the criteria, agricultural image value and general evaluations are given in the tables (Table 4-12).

The study is based on the approach that "it is important and necessary to determine the visual landscape values based on the change of agricultural landscapes over time". In this context, 4 main parameters were determined for 9 subclasses of agricultural landscapes of Tekirdağ province according to CLC level 3. By determining the priorities of the parameters and agricultural landscape classes with the AHP technique, an expert-based visual landscape assessment was conducted, in which the relationships between the basic parameters and visual preferences were determined. At the same time, the change of agricultural landscapes over of 28 years (1990-2018) was determined in CORINE data. The results of the study are presented below.

Uniqueness (0.468) was the parameter with the highest priority and importance order of the basic components determining the visual preferences of the experts, while harmony (0.111) was the lowest parameter.

The visual quality values of the agricultural sub-uses generated according to the CLC classes in terms of key components were classified as moderate, strong and very strong impact. The results are shown in Figure 5. According to this, olive groves had the strongest impact on the visual quality of the landscape, while vineyards, non-irrigated arable land and permanently irrigated land had the strongest impact. This supports the studies by Stobbelaar et al., 2004; Wang et al. 2024; Serée et al., 2023). Complex cultivation patterns were found to have a moderate effect.

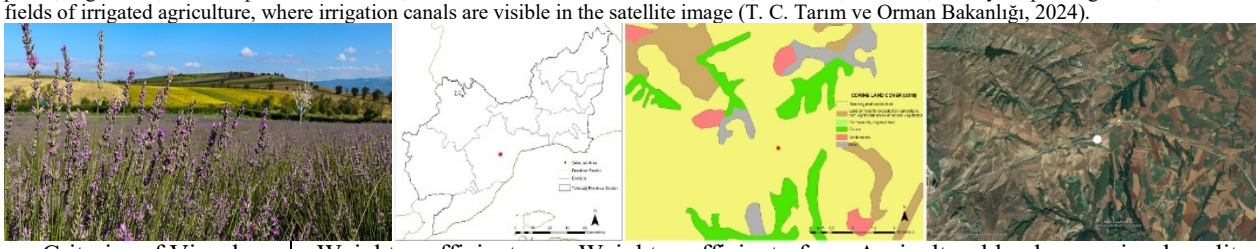
The results of the comparison of 9 sub-classes of agricultural landscapes in terms of 4 main parameters are shown in Figure 6. In terms of harmony, landscape beauty and uniqueness, 'olive groves' showed the strongest effect, while non-irrigated arable land showed the strongest effect in terms of colour effect.

Considering the CLC data, it can be seen that Tekirdağ Province has undergone significant land use/land cover changes in 28 years (1990-2018). Accordingly, non-irrigated arable land has the highest density in terms of spatial and areal extent, while fruit and berry plantations have the lowest density. Non-irrigated arable land has been in intensive decline since 1990. Some of these areas became permanently irrigated land, especially in Hayrabolu district. Permanently irrigated land and rice fields showed an intensive decrease in 2006. According to the 1990 and 2000 CLC data, olive groves are not included in terms of area, while they have increased in quantity until 2018 and are concentrated in coastal areas. Complex cultivation patterns showed a significant decrease after the 2000 CLC. Land principally occupied by agriculture, with significant areas of natural vegetation has increased steadily since 2000. Vineyards have decreased since 2006 and are concentrated in the southwestern coastal areas of the city around Şarköy district. Pastures have decreased since 2000 and are mostly concentrated in the inner and eastern parts of the city.

Table 4. Agricultural landscape visual quality impact assessment of non-irrigated arable land

Image 1: Lavender Garden Photograph (Gazete Arena, 2024)	CORINE Land Cover (2018) Class		
	Level 1	Level 2	Level 3
	Agricultural areas	Arable Areas	Non-irrigated arable land

Non-irrigated arable land: Cereals, legumes, forage products, root crop fields and fallow fields, Flowers, fruit trees and vegetables, aromatic plants, plants used in the pharmaceutical industry and plants used in the kitchen, Asparagus and wild chicory, similar perennial plants, plants grown in flooded fields, semi-permanent crops such as strawberries etc., fields that are temporarily fallow, non-permanent industrial plants, tobacco, spice plants, sugar cane, Flowers planted in rotation, industrial flowers such as lavender etc., nurseries, scattered, mostly striped vegetation, abandoned fields of irrigated agriculture, where irrigation canals are visible in the satellite image (T. C. Tarım ve Orman Bakanlığı, 2024).



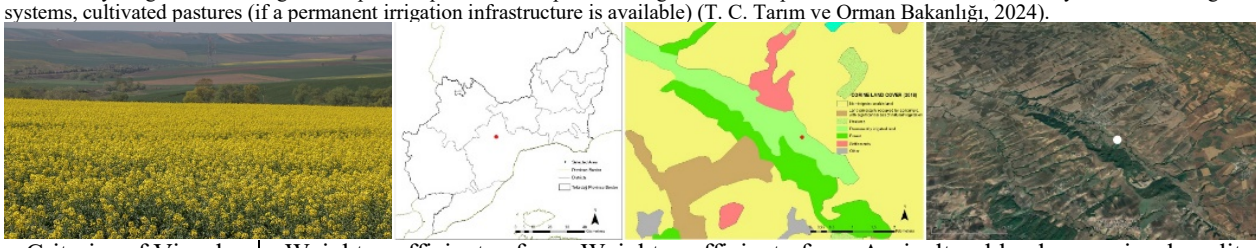
Criteries of Visual Quality	Weight coefficients of agricultural uses	Weight coefficient of criteria	Agricultural landscape visual quality impact value
Harmony	0.139	0.111	0.015
Landscape Beauty	0.140	0.220	0.031
Color Effect	0.201	0.200	0.040
Uniqueness	0.116	0.468	0.054
Agricultural landscape visual quality total impact value			0.140

When non-irrigated arable land was examined in terms of visual quality impact value regarding the agricultural landscape in the relevant group, it was included in the strong impact class. It was found to have the strongest effect in terms of colour effect among the nine other agricultural land uses examined.

Table 5. Agricultural landscape visual quality impact assessment of permanently irrigated land

Image 2: Canola Field Photograph (Bizim Sakarya Gazete, 2024)	CORINE Land Cover (2018) Class		
	Level 1	Level 2	Level 3
	Agricultural areas	Arable Areas	Permanently irrigated land

Permanently irrigated land: Irrigated crops with permanent or periodic irrigation with a permanent infrastructure, recently abandoned irrigation systems, cultivated pastures (if a permanent irrigation infrastructure is available) (T. C. Tarım ve Orman Bakanlığı, 2024).



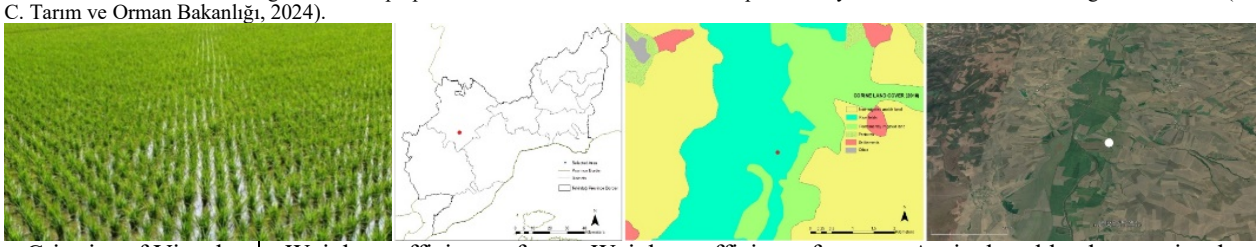
Criteries of Visual Quality	Weight coefficients of agricultural uses	Weight coefficient of criteria	Agricultural landscape visual quality impact value
Harmony	0.680	0.111	0.075
Landscape Beauty	0.081	0.220	0.018
Color Effect	0.147	0.200	0.029
Uniqueness	0.072	0.468	0.034
Agricultural landscape visual quality total impact value			0.156

When permanently irrigated land was examined in terms of visual quality impact value, it was included in the strong impact class. It was found to have the strongest effect in terms of hormony among the nine other agricultural land uses examined.

Table 6. Agricultural landscape visual quality impact assessment of rice field

Image 3: Rice Field Photograph (Kalkınma Galerisi, 2024)	CORINE Land Cover (2018) Class		
	Level 1	Level 2	Level 3
	Agricultural areas	Arable Areas	Rice fields

Rice fields: Flat fields with irrigation canals prepared for rice cultivation. Surfaces are periodically flooded. Rice fields and irrigation channels (T. C. Tarım ve Orman Bakanlığı, 2024).



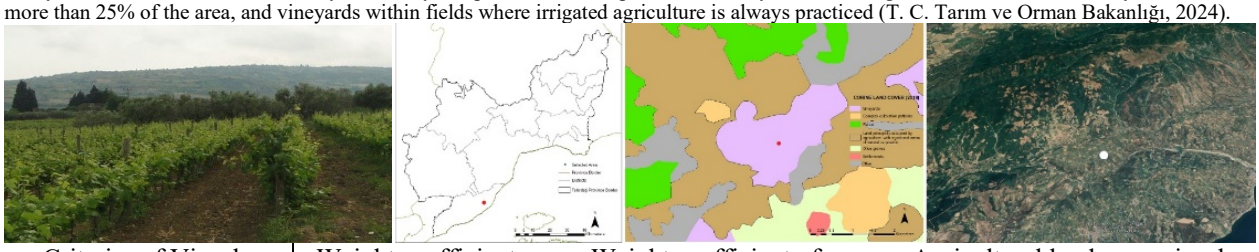
Criteries of Visual Quality	Weight coefficients of agricultural uses	Weight coefficient of criteria	Agricultural landscape visual quality impact value
Harmony	0.065	0.111	0.007
Landscape Beauty	0.054	0.220	0.012
Color Effect	0.061	0.200	0.012
Uniqueness	0.070	0.468	0.033
Agricultural landscape visual quality total impact value			0.064

When rice fields were examined in terms of visual quality impact value, It was included in the medium impact class.

Table 7. Agricultural landscape visual quality impact assessment of vineyard

Image 4: Vineyard Photograph (original,2023)	CORINE Land Cover (2018) Class		
	Level 1	Level 2	Level 3
	Agricultural areas	Permanent Crops	Vineyard

Vineyards: Vine nurseries within vineyards, vineyards planted for wine production, vineyards, mixed agricultural lands where vineyards constitute more than 25% of the area, and vineyards within fields where irrigated agriculture is always practiced (T. C. Tarım ve Orman Bakanlığı, 2024).



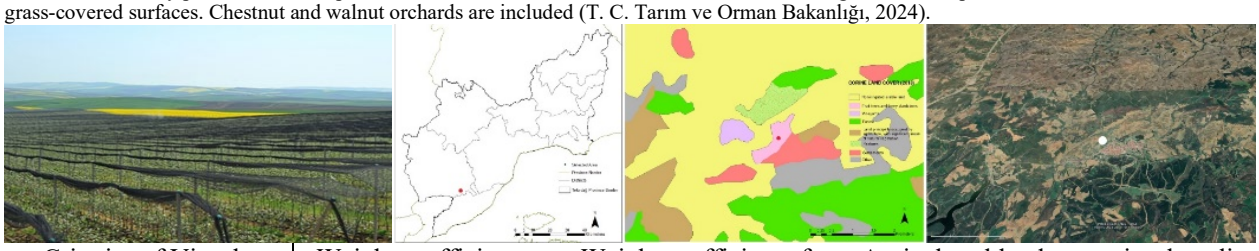
Criteries of Visual Quality	Weight coefficients of agricultural uses	Weight coefficient of criteria	Agricultural landscape visual quality impact value
Harmony	0.149	0.111	0.016
Landscape Beauty	0.133	0.220	0.029
Color Effect	0.115	0.200	0.023
Uniqueness	0.154	0.468	0.072
Agricultural landscape visual quality total impact value			0.140

When vineyards was examined in terms of visual quality impact value, it was included in the strong impact class.

Table 8. Agricultural landscape visual quality impact assessment of fruit trees and berry plantations

Image 5: Fruit trees Photograph (Karfrut Meyve Üretim ve Pazarlama, 2024)	CORINE Land Cover (2018) Class		
	Level 1	Level 2	Level 3
	Agricultural areas	Permanent Crops	Fruit trees and berry plantations

Fruit trees and berry plantations: Plots planted with fruit trees and shrubs consist of fruit trees, single or mixed species, associated with continuous grass-covered surfaces. Chestnut and walnut orchards are included (T. C. Tarım ve Orman Bakanlığı, 2024).



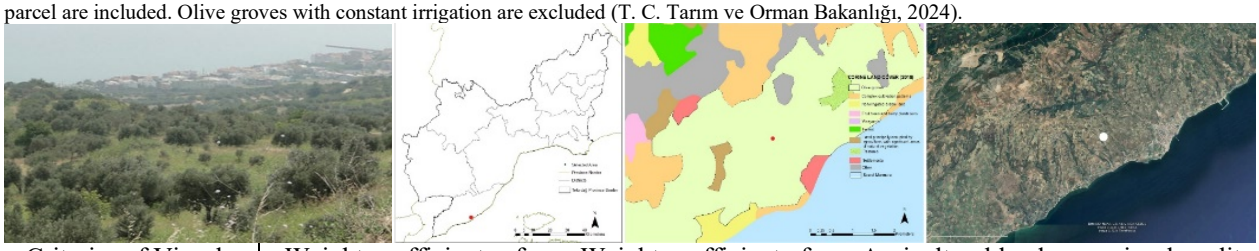
Criteries of Visual Quality	Weight coefficients of agricultural uses	Weight coefficient of criteria	Agricultural landscape visual quality impact value
Harmony	0.081	0.111	0.009
Landscape Beauty	0.088	0.220	0.019
Color Effect	0.088	0.200	0.018
Uniqueness	0.063	0.468	0.029
Agricultural landscape visual quality total impact value			0.075

When fruit trees and berry plantations was examined in terms of visual quality impact value, it was included in the medium impact class.

Table 9. Agricultural landscape visual quality impact assessment of olive groves

Image 6: Olive Groves Photograph (original,2023)	CORINE Land Cover (2018) Class		
	Level 1	Level 2	Level 3
	Agricultural areas	Permanent Crops	Olive groves

Olive groves: Lands planted with olive trees, olive groves shaded by the herbaceous layer, and areas planted with olive trees and vines on the same parcel are included. Olive groves with constant irrigation are excluded (T. C. Tarım ve Orman Bakanlığı, 2024).



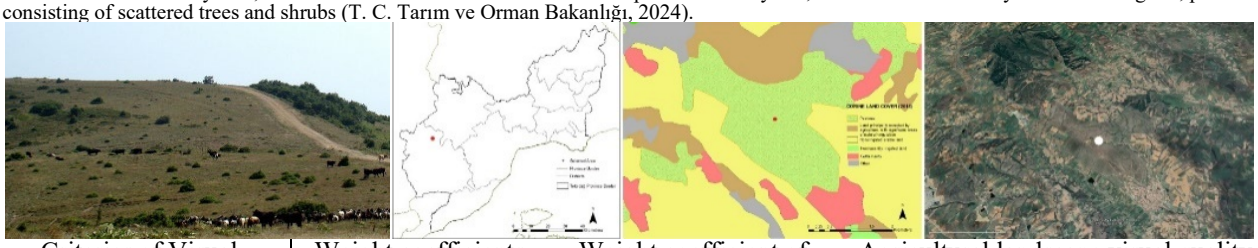
Criteries of Visual Quality	Weight coefficients of agricultural uses	Weight coefficient of criteria	Agricultural landscape visual quality impact value
Harmony	0.227	0.111	0.025
Landscape Beauty	0.248	0.220	0.055
Color Effect	0.179	0.200	0.036
Uniqueness	0.317	0.468	0.148
Agricultural landscape visual quality total impact value			0.264

When olive groves were examined in terms of visual quality impact value, it was included in the strongest impact class. It was found to have the strongest effect in terms of Landscape Beauty and Uniqueness among the nine other agricultural land uses examined.

Table 10. Agricultural landscape visual quality impact assessment of pastures

Image 7: Pasture Photograph (original,2023)	CORINE Land Cover (2018) Class		
	Level 1	Level 2	Level 3
	Agricultural areas	Pastures	Pastures

Pastures: Lands covered with dense grass, with flower composition, dense grasses, without a rotational system, artificial pastures that are temporary and not in a rotational system, abandoned arable lands that can be used as pasture after 3 years, moist meadows mainly covered with grass, pastures consisting of scattered trees and shrubs (T. C. Tarım ve Orman Bakanlığı, 2024).



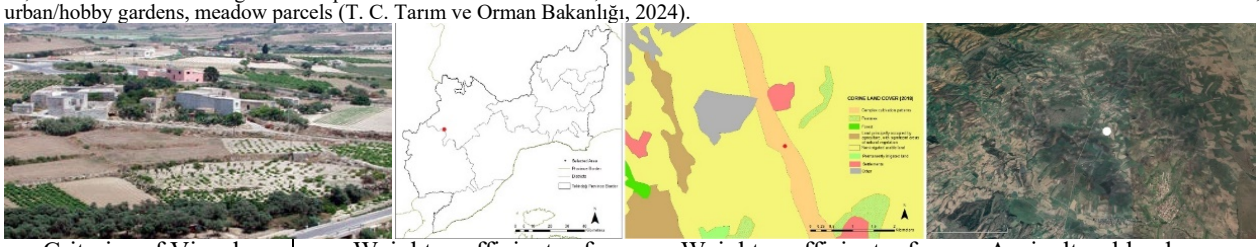
Criteries of Visual Quality	Weight coefficients of agricultural uses	Weight coefficient of criteria	Agricultural landscape visual quality impact value
Harmony	0.071	0.111	0.008
Landscape Beauty	0.056	0.220	0.012
Color Effect	0.036	0.200	0.007
Uniqueness	0.036	0.468	0.017
Agricultural landscape visual quality total impact value			0.044

When pastures were examined in terms of visual quality impact value, it was included in the medium impact class.

Table 11. Agricultural landscape visual quality impact assessment of complex cultivation patterns

Image 8: Complex cultivation patterns Photograph (original,2023)	CORINE Land Cover (2018) Class		
	Level 1	Level 2	Level 3
	Agricultural areas	Heterogeneous agricultural areas	Complex cultivation patterns

Complex cultivation patterns: Mixed parcels with permanent crops, unfertilized free spaces within a discontinuous urban structure smaller than 25 ha, lands with a mixed agricultural pattern with scattered houses, summer settlement areas without urban infrastructure and road network, urban/hobby gardens, meadow parcels (T. C. Tarım ve Orman Bakanlığı, 2024).



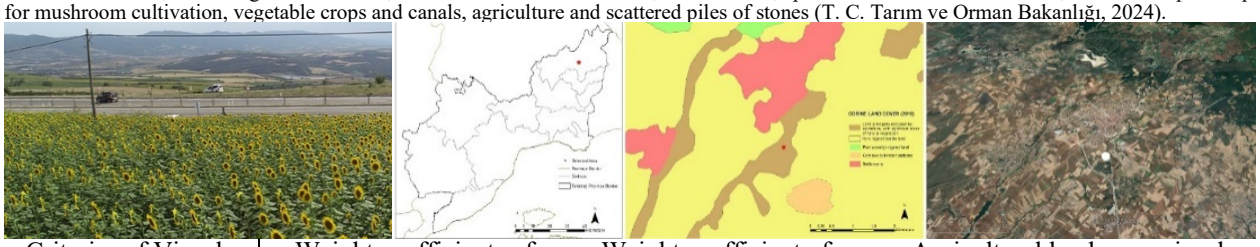
Criteries of Visual Quality	Weight coefficients of agricultural uses	Weight coefficient of criteria	Agricultural landscape visual quality impact value
Harmony	0.031	0.111	0.003
Landscape Beauty	0.034	0.220	0.007
Color Effect	0.035	0.200	0.007
Uniqueness	0.033	0.468	0.015
Agricultural landscape visual quality total impact value			0.032

When pastures were examined in terms of visual quality impact value, it was included in the medium impact class. Among the nine other agricultural land uses examined, it was found to have the weakest impact in terms of the four criteria examined.

Table 12. Agricultural landscape visual quality impact assessment of land principally occupied by agriculture, with significant areas of natural vegetation

Image 9: Sunflower Field Photograph (Anadolu Ajansı, 2024).	CORINE Land Cover (2018) Class		
	Level 1	Level 2	Level 3
	Agricultural areas	Heterogeneous agricultural areas	Land principally occupied by agriculture, with significant areas of natural vegetation

Land principally occupied by agriculture, with significant areas of natural vegetation: Areas where agricultural activities are carried out within natural vegetation, field-like areas scattered within important natural areas, arable land parcels smaller than 25 ha, orchard and vineyard parcels smaller than 25 ha, remaining natural forests, water bodies with small areas, farm houses , sporadic rural settlement houses, trees lined up in strips for mushroom cultivation, vegetable crops and canals, agriculture and scattered piles of stones (T. C. Tarım ve Orman Bakanlığı, 2024).



Criteries of Visual Quality	Weight coefficients of agricultural uses	Weight coefficient of criteria	Agricultural landscape visual quality impact value
Harmony	0.168	0.111	0.019
Landscape Beauty	0.165	0.220	0.036
Color Effect	0.139	0.200	0.028
Uniquness	0.140	0.468	0.066
Agricultural landscape visual quality total impact value			0.149

When pastures were examined in terms of visual quality impact value, it was included the strong impact class.

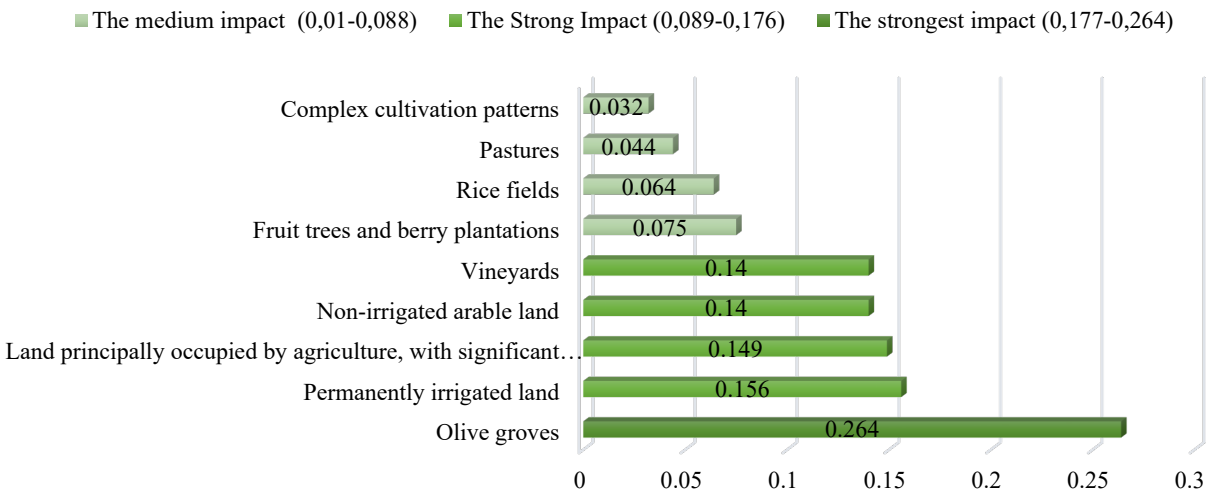


Figure 5. Visual quality values of CORINE level 3 agricultural sub-uses in terms of basic components

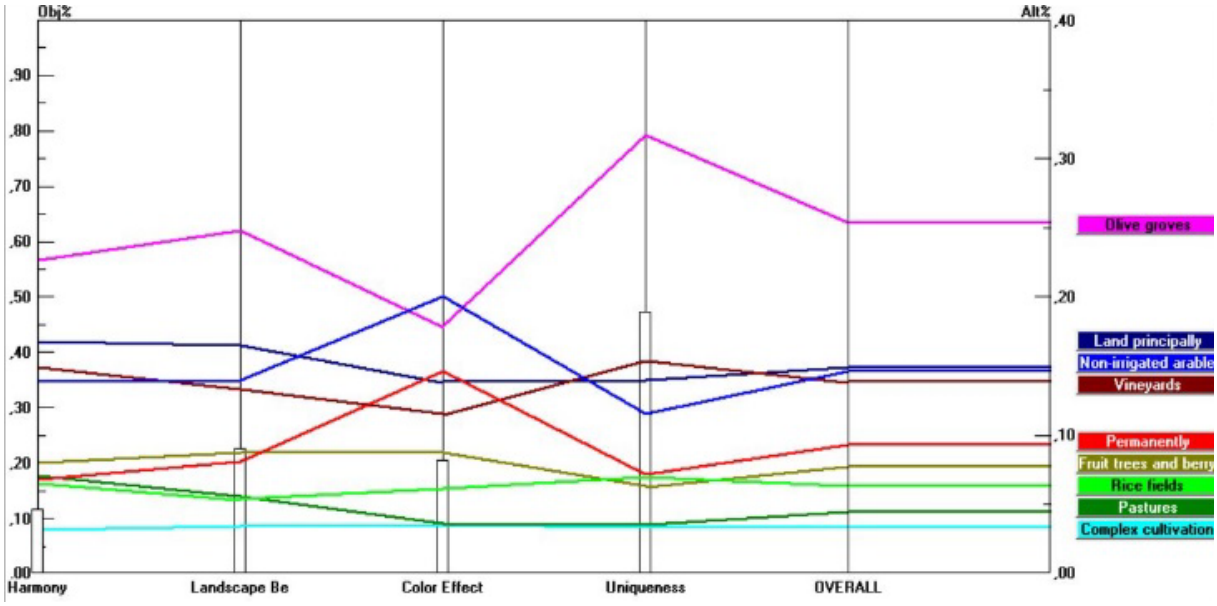


Figure 6. Comparison of agricultural landscapes in terms of parameters

According to the 2018 Corıne Level 3 data, olive groves create the strongest impact in terms of visual landscape value, but it covers about 0.6% of the agricultural area of Tekirdağ. The study by Arriaza et al. (2004) emphasised that olive grove areas enhance the visual impact of the agricultural landscape, and the study by Wang (2024) emphasised that rice terraces have views that change with the seasons (Arriaza et al., 2004; Stobbelaar, et al., 2004). Areas with a high impact accounted for 91.4% of the total agricultural area, while areas with a medium impact accounted for 8%. The fact that 92% of the agricultural landscape areas of Tekirdağ Province have strong and strongest impact is an indication that they create an important aesthetic value as well as strengthening the landscape quality. In fact, many studies have emphasised that agricultural areas have a significantly impact on landscape quality and create a strong aesthetic effect (Gobster et al. 2007; Howley et al., 2012; Kalivoda et al., 2014; Marafa, 2021; Wartmann et al., 2021).

Conclusion

The study aimed to determine the visual quality of agricultural landscapes based on parameters from an expert approach. The hypothesis that identifying visual landscape values based on the changes in agricultural landscapes over time is important and necessary has been confirmed.

As a result, the appearance of agricultural landscapes within the land cover varies and has multiple functions. One of these multiple functions is their aesthetic value. The aesthetic value of agricultural landscapes is an important component of cultural ecosystem services and should be considered in landscape planning and management as a factor in enhancing landscape quality.

Declarations

The authors have equal contributions.

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