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Determinant Factors for Agricultural Fields Appraisal

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Abstract: The possession and appraisal of agricultural fields have significant economic and social impacts. The objective of this study is to examine the perception of the factors that contribute to the value of agricultural fields and those that diminish their value in the appraisal process. The utilized quantitative methodology is based on a questionnaire administered to farmers in Huambo Province, Angola. The sample size consists of 644 respondents. The results allow concluding that the income generated from farming activities and the presence of infrastructure greatly facilitate the appraisal of agricultural fields. Conversely, the absence of legal ownership documentation and conflicts related to land ownership reduce the value of the fields. The exploratory factor analysis has identified seven determinant factors in the appraisal of agricultural fields: inherent location characteristics of the property, market dynamics related to agricultural fields, the availability of water on the property, proximity to tourist destinations, physical conditions of the fields, the positive externalities generated, and the advantages offered by the fields. We believe that this study will assist appraisers, farmers, and public administration in understanding the factors that positively and negatively impact the appraisal of agricultural fields.

Keywords: agricultural; fields; farmland

1. Introduction

In the appraisal of agricultural lands and in the process of determining transaction prices, one of the elements to be considered is the return on investment, i.e., the expected profit from the use of agricultural land (Tione and Holden, 2020). The increase in the appreciation of lands and agricultural territories is related to the demand for land for livestock food production, as well as land for agricultural purposes (Lima and Nóbrega, 2017).

In the assessment of agricultural land, it is important to gather information from individuals engaged in the activity. To achieve this goal, it is necessary to select a group of individuals who directly or indirectly work with the land (Herzbergb et al., 2019). Sardaro et al. (2020) argue that when evaluating the value of agricultural land, not only typical agricultural elements should be taken into account, but also elements related to monuments, historical sites, and recreational features. Somantri et al. (2021) also believe that land assessment involves calculating the price and value of agricultural land. According to Somantri et al. (2021), the value of the land is associated with its use. Therefore, if the land has a high level of utility, its value will tend to increase, and vice versa.

Sardaro et al. (2020) believe that the valuation of agricultural land is an important tool as it allows for a comprehensive understanding of various aspects related to the land, including water reserves, intervention areas, and perspectives from authorities. To determine the value of agricultural land, it is essential to rely on market information (Del Río and Marques, 2018).

The appraisal process of agricultural land involves understanding and identifying its characteristics and value-adding qualities, which serve as the basis for creating a desirable model to compare with other homogeneous assets (Sal and Garcia, 2007). According to authors Sardaro et al. (2020) and Tavares, Tavares, and Santos (2022), agricultural lands can provide essential attributes for well-being, including food and other fundamental elements that relate to entertainment, beauty, and

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culture. There is significant variability in defining whether a farm is small or large, as each reality has its own specificity (Ardakani et al., 2020). Garcia et al. (2003) argue that in the process of evaluating agricultural lands, it is crucial to consider climate and soil, as these factors can be seen as integral components of the potential of agricultural lands.

Xu et al. (2019) assert that the processes of evaluating agricultural lands are comprehensive, encompassing not only the analysis of soil ownership and productivity but also everything existing within it, such as trees, wells, and integrated infrastructure. The value of agricultural lands is closely related to the growth of public and private structures, as well as the development of the transportation system within a particular state (Lima and Nóbrega, 2017). According to Lima and Nóbrega (2017), initially, prices may appear stable, but through a combination of endogenous and exogenous factors, agricultural land prices become speculative. The conversion of agricultural lands into residential areas emerges as a prominent factor that adds value to agricultural lands and simultaneously has a significant impact on their evaluation (Somantri et al., 2021).

This study aims to examine perceptions regarding the characteristics that enhance or diminish the value of agricultural lands in the appraisal process. The paper is divided into five sections. Following this introduction, the literature review is presented, focusing on the significant factors in the evaluation of agricultural lands, positive amenities, negative externalities, the importance of public policies, and proximity to urban centers. The third section presents the methodology, while the fourth section presents the empirical study, including a descriptive analysis of the results and exploratory factor analysis. Finally, the conclusion is presented.

2. Survey of Relevant Literature

2.1. Preponderant Factors in Agricultural Fields Appraisal

In a positive manner, the expectation held by institutions to transform the use of agricultural land into an area comparable to urban zones serves as an indicator for the increase in land value in certain regions (Tione and Holden, 2020). For a specific land use, an evaluation is necessary to anticipate the most suitable utilization (Herzbergb et al., 2019).

According to Lima and Nóbrega (2017) and Tavares, Tavares, and Santos (2022), there is a set of variables and factors that, on one hand, can increase the prices of agricultural lands and, on the other hand, conversely, can reduce the prices of agricultural lands. The authors summarize these elements as follows: spatial location; marketing and support infrastructure; fiscal contributions and legislation regarding environmental protection; socioeconomic and political situation; inflation and hydrographic and climatic properties, relief, lithology, temperature, air humidity, sun exposure, soil type, wind, atmospheric composition, and rainfall; determinants of land rent differential; production infrastructure; availability of labor; measures of fragmentation and property size; and components of differential rent.

When appraising land, it is important to consider a set of information, including data on cultivation history and local knowledge, while also considering global data on the subject (Herzbergb et al., 2019). The measurement or evaluation of land will depend directly and indirectly on how various elements can impact it, including: physical conditions of the land; soil fertility capacity of the land; environmental characteristics of the land; historical or numerical productivity results of the land; economic capacity and productivity of the land; and the intended function or activity to be assigned to the available land (Somantri et al., 2021).

According to Sardaro et al. (2020), in the evaluation of agricultural lands, the value of use and the potential of the lands should be taken into account in the medium and long term. Hedonic models are a good possibility for estimating prices per square meter of different rural lands with different characteristics, infrastructure, proximity to urban centres, and the potential cash flows they can generate (Lima and Soares, 2015). Other factors that, according to Sardaro et al. (2020), impact the determination of agricultural land value are primarily related to the transformation of a particular agricultural land into an urban area, including land ownership status, population growth in the area or surroundings, and future pollution expansions in the area. Lima and Soares (2015) identify water,

infrastructure, and fencing as factors that can increase the value of agricultural lands. Silva et al. (2011) and Santos et al. (2021) conducted a study aimed at improving methodologies for evaluating properties for forest plantations, comparing three evaluation methodologies: market value, cost value, and productive value. Silva et al. (2011) found a significant difference among the three evaluation methods, with market value being the most suitable for lands with older forests as the property's appreciation is also higher.

The type of land and climate (natural environment) have a significant impact on the potential use of the territory (Meneses, 2003; Tavares et al., 2021). Other important aspects, according to the author, include whether the boundaries of the lands are parallel or not, whether they have a regular or irregular shape, whether they have pronounced or sharp angles, or if the area to be cultivated is excessively narrow, as these aspects facilitate or hinder the use of machinery, such as the slope, distance to urban centers, and transportation routes.

According to Caballer (2002), hedonic studies for estimating land value take into account the following explanatory variables: land rent, land productivity - dry or irrigated, forest or herbaceous, average farm size, and soil productivity; non-agricultural factors - average local industry wages, average precipitation, average temperature, population density, erosion, environmental contamination; location - population density, soil quality, risk of waterlogging, wind speed, hours of sunshine, and relative humidity. According to Middelberg (2014), two fundamental elements are necessary for the evaluation of agricultural land: the land's production capacity and its ownership. Kilić et al. (2019) suggest that the land evaluation process should be carried out without any errors to ensure that the results can be compared with values assigned in other contexts regarding agricultural land.

One of the factors that negatively influences the evaluation of agricultural land, and consequently affects its value, is the fragmentation of land into small parcels (Kilić and Jajac, 2019). According to Xu et al. (2019), in land valuation, it is necessary to consider not only the quality of the land but also other elements that contribute to the overall assessment, including physical and legal aspects, location characteristics, as well as economic and social components. The value of land cannot be dissociated from its price, as these two elements are interrelated (Somantri et al., 2021). Thus, the price of land represents the return on its value in terms of market exchange for this asset (Pacheco, Lote, and Tavares, 2017). It can be concluded that the price of land is influenced by physical, social, and political factors depending on the locality.

2.2. The Positive Amenities

In the case of lands located in areas where certain services exist, such as markets, national roads, or infrastructure, these lands will be more attractive, which will be reflected in the cost, in the case of renting these lands.

According to Tavares, Tavares and Santos (2022), it is undeniable that interventions in agricultural lands lead to benefits and amenities. To some extent, in order to achieve such satisfaction, the owner accumulates several years of production to cover and get a return on their investment. Amenities are also considered a source of income for landowners. According to Buday et al. (2018), there is an influence of regional aspects such as climate, proximity to networks, and location factors. They argue that soil quality, slope, drainage, as well as aspects related to supply and demand in the market, are elements that affect the composition of legislation for the regulation of agricultural lands in certain countries.

Farms near urban centers have better and easier access to markets and seaports, resulting in lower transportation costs (Lima and Soares, 2015; Tavares and Santos, 2021). These farms also offer the possibility of being used for leisure and recreational activities for nearby populations, as well as for construction purposes, making this variable significant in determining the prices of rural lands. Gripp et al. (2006) take into account factors such as the land's ability and potential to generate income, its ease of cultivation, available natural water resources (riverbanks, land with various perennial and intermittent springs, ponds, etc.), artificial water resources (cisterns, artesian wells, reservoirs, water

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tanks, troughs, etc.), access to the property (paved or dirt road), and water and electricity supplied by public utilities.

Ruivo (2008) distinguishes rural amenities that enhance attraction to the area, specifically referring to the following amenities: natural landscapes, tranquillity, nature, clean environment, beach/river pool, churches and chapels, and other monuments. The development of infrastructure, provision of public utilities, and public safety can increase land prices in the outskirts of cities, as optimistic expectations drive up prices (Khương, 2019). Khương's (2019) work also demonstrates that "indecisive" planning has a negative effect on land prices in urban peripheries, and it was found that orchard prices in the outskirts of cities depend on factors that facilitate the transportation of agricultural products to markets.

The factors influencing the higher or lower valuation of agricultural lands are not homogeneous across all countries or localities (Kocur-Bera, 2016). The value of agricultural land is directly influenced by security factors to which the lands are subject (Lima and Nóbrega, 2017). This insecurity reaches its peak during the property transaction process, where certain protective procedures are followed.

2.3. The Negative Externalities

The fact that agricultural lands are located in areas distant from urban centres is an indicator of less relevance in terms of their evaluation (Tione and Holden, 2020). Similarly, the costs associated with transportation and the availability of a market capable of supporting the transaction process are also factors that reduce the price of land value. Luo et al. (2020) state that one of the limitations to agricultural development is the phenomenon of drought, which in turn affects the productivity level of households. Despite the influence of climate change on food production, its repercussions are uncontrollable and unpredictable, to the extent that it can negatively impact food production and lead to scarcity in availability (Ardakani et al., 2020).

The authors Luo et al. (2020) emphasize the need to assess the risk of drought in order to manage uncertainties, which often take a different course than anticipated, particularly in the agricultural field. According to Kilić et al. (2019), the subdivision of land into smaller parcels carries a range of negative aspects, including those that interfere with the economic component as well as those related to people's lives, such as social differences.

One aspect that generally negatively influences the value of land is the presence of natural phenomena, which occur worldwide and can be abundant in certain areas, rendering the respective land valueless or with a low price (Zhao et al., 1991). This phenomenon is responsible for the low productivity in high-risk areas, such as cyclones, erosion, floods, and tsunamis. The degree of dependence on agriculture is related to the extent of water consumption, meaning that if the proportion of water consumption is high, the damages will be greater (Luo et al., 2020). According to Kilić and Jajac (2019), one problem that can arise due to the division of agricultural land is the occurrence of social tensions caused by disputes over land, which to some extent undermines social stability within a territorial jurisdiction. Wentland et al. (2020) state that when assessing land, they take into account amenities that remain unchanged over time, starting from the local area where the land is situated.

Other elements that do not add value and incentives to agricultural land include the long distance from irrigation points and roadways, which are pessimistic factors that reduce the value of agricultural land (Rondhi et al., 2018). In an effort to optimize their resources, individuals seek to acquire land at low prices. According to Somantri et al. (2021), these low-priced lands are typically located far from urban centres and lack social infrastructure, which influences the decrease in land value, despite having considerable value from the perspective of the owners.

2.4. Public Policies

The authors Li et al. (2019), Ardakani et al. (2020), and Zhao et al. (2021) state that the role of public and private authorities is important as their decisions influence investment attraction and the partial increase in land and labor productivity. According to Buday et al. (2018), the provision of

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agricultural production subsidies by various governments has been one of the reasons for the increase in agricultural land prices. In the evaluation of rural agricultural land, prices will depend on a range of factors, such as legislative structure, as well as regional aspects such as climate change, proximity to power grids, and water channels (Buday et al., 2018). Kilić et al. (2019) highlight available solutions to address the negative impact of land fragmentation on agricultural land, including prevention through land consolidation.

Agricultural land has been at the core of various conflicts, and therefore it is important for authorities to ensure the elimination of risks that contribute to the insecurity of families (Schwarcz et al., 2013). Szturc et al. (2021) state that the search for available areas for infrastructure construction has an impact on agricultural land, which has been subject to transformation. The authors concluded that the loss of these areas for urbanization purposes often occurs in zones where agricultural production had achieved high levels of productivity.

2.5. The Proximity to the Urban Centres

The price of agricultural land is directly related to the distance between the location of the agricultural land and the nearest city or metropolitan area (Plantinga et al., 2001). According to the authors, the further the agricultural land is located, the lower the prices and the less attractive it will be for commercial transactions and other purposes. The conversion of land for urban purposes has been the main cause for the transformation of agricultural land for non-agricultural uses (Rondhi et al., 2018). Similar transformations occur to a large extent in developing countries with low planning indices. The development of rural areas and agricultural land requires the creation of essential conditions to achieve such objectives (Tezcan et al., 2018).

For the authors Rondhi et al. (2018), it is necessary to consider that the economic value of agricultural land has often been stimulated rapidly through its transformation for residential purposes, which is the main cause of the appreciation of agricultural land. Somantri et al. (2021) state that if two pieces of land are compared, one designated for agricultural practice and the other for a different purpose, particularly residential development, it is easy to see that the lower value will be associated with agricultural land. Somantri et al. (2021) confirm that land plays a crucial role in the lives of rural and peri-urban societies as a source of their subsistence. The conversion of agricultural land into urban land is driven by population growth pressure in major cities (Livanis et al., 2006).

3. Methodology

To study the preferences regarding agricultural land mentioned in the literature review, a survey was conducted. The survey was designed to collect data on owners' preferences for agricultural land and was administered in the Huambo Province, Angola, during the months of May, June, July, and August 2022.

The snowball statistical methodology was employed, serving as a valuable tool in quantitative research. This approach entails the identification of study participants and the collection of questionnaire responses, which are subsequently quantitatively processed. Particularly advantageous for studies involving specific groups, this methodology functions akin to a snowball, steadily expanding as new participants are identified and incorporated into the study. However, it is essential to acknowledge that the utilization of the snowball methodology may present limitations in terms of sample representativeness, as participants might possess shared traits that do not accurately reflect the broader population.

To test the survey model on property preferences for agricultural land in the Huambo Province at the municipal level, a pilot test was conducted with 30 surveys to assess any inaccuracies that might be encountered in the proposed survey model for data collection. After the designated period for testing the model, the final survey model on property preferences in the Huambo Province was obtained. The SPSS 26 software was used for survey data analysis. A total of 644 valid surveys were obtained.

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4. Empirical Study

4.1. Descriptive Analysis of the Results of the Agricultural Land Survey

For the present study, the sample consisted of 644 agricultural individuals located in the province of Huambo. Out of the total respondents, in terms of gender distribution, 61.3% were male and 38.7% were female.

Regarding the age of the individuals, the average age was 36 years ($\bar{x}$= 36.1), with a minimum age of 18 years and a maximum age of 72 years. It was found that 99.8% of the respondents were Angolan nationals. Regarding the marital status of the sample, 49.4% were single, and approximately 2% were widowed. Separated/divorced and married/cohabiting accounted for 5.3% and 43.6%, respectively.

Regarding the educational level of the respondents, 41.5% have completed Cycle I, which includes classes up to 9th grade. Furthermore, 23.6% have a bachelor's degree, 17.1% have never attended school, 13.7% have completed 9th grade, and only 4.2% have a Master's or PhD. In terms of household income, 49.2% consider it difficult to manage their resources, 36.3% find the available resources sufficient for managing their family, 11.5% believe that the resources they have are good enough to cope with family difficulties, and only 3% consider their income very good for covering family expenses.

As for other sources of livelihood besides agriculture, out of the 644 respondents, 66.3% stated that they have another source of income, while 33.7% responded that they have no other income.

As for the variables related to the purchase of agricultural land, as shown in Table 1, there are five high means that are considered of greater importance by the respondents, namely: rents of lands near urban areas have higher values ($\bar{x}$=3.94; s=1.027), areas with higher population density have higher land values ($\bar{x}$=3.92; s=1.107), lands with national roads and other infrastructures have higher value ($\bar{x}$=3.89; s=1.142), drier lands with water scarcity have lower value ($\bar{x}$=3.88; s=1.047), lands with access to electricity grid have higher value ($\bar{x}$=3.87; s=1.134), and the soil type is important in determining the land value ($\bar{x}$=3.87; s=1.098). The variable with the least importance and lowest mean value is related to purchasing a land adjacent to one that is already owned, even if the value is high ($\bar{x}$=3.09; s=1.391).

Table 1. variables which one faces in the purchase of an agricultural fields。

	Mean	Median	Mode	Standard Deviation	Completely disagree	Disagree	I am undecided	I agree	Completely agree
The fields' rent near urban areas have higher values.	3.94	4	4	1.027	4.3	5.4	13.7	45.3	31.2
In zones where more people live, land value is higher.	3.92	4	4	1.107	6.1	4.8	14.4	40.1	34.6
Fields which have national streets and other infrastructures nearby have more value.	3.89	4	4	1.142	6.2	6.5	14.1	37.9	35.2
If the fields are dry and lack water they have less value.	3.88	4	4	1.047	4.7	5.6	16.6	43.2	30.0

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Fields with electricity have more value.	3.87	4	4	1.134	6.1	6.5	15.5	38.0	33.9
The kind of soil has an importance in the land's value.	3.87	4	4	1.098	5.3	7.9	12.3	43.9	30.6
Fields which are next to urban zones have more value.	3.86	4	4	1.07	5.1	7.0	13.2	45.8	28.9
Flat fields are worth more than declivous ones	3.86	4	4	1.053	4.2	7.1	16.8	42.2	29.7
The soil quality and the cultivation made there affect the field's value.	3.85	4	4	1.024	4.7	5.9	15.2	48.1	26.1
Fields next to the agricultural products selling markets have more value.	3.85	4	4	1.098	5.4	7.9	12.7	44.4	29.5
Climate changes have impact in property value.	3.84	4	4	1.073	5	7.8	14.0	45.3	28.0
The lower the drainage of the land, the lower its value.	3.80	4	4	1.061	5	7.0	17.2	44.4	26.4
A field that permits the use of agricultural equipment (tractors) has more value.	3.80	4	4	1.112	5.4	8.2	16.6	40.5	29.2
The more the declivous, the minor its value.	3.78	4	4	1.053	5	7.6	15.8	47.2	24.4
The smaller agricultural fields produce less.	3.78	4	4	1.16	7.8	7	13	43.9	28.3
The fields' value is determined by the rent they offer.	3.75	4	4	1.142	7.8	6.2	15.4	44.4	26.2
Land value is the reflex of agricultural and forest cultures that it offers.	3.74	4	4	1.019	5.1	7.0	16.3	51.7	19.9
The land in less windy areas has higher value.	3.73	4	4	1.115	6.1	8.1	18.6	41.3	25.9
The bigger the property, the less its value per square meter is.	3.63	4	4	1.172	7.3	10.4	18.8	38.8	24.7
The land next to one that is already owned should be purchased, even if the value is high.	3.09	3	4	1.391	20	16.3	15.1	32.3	16.3

Source: Own elaboration.

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Table 2 refers to the variables related to the sale of agricultural lands, considered of greater importance by the respondents. In this context, there are five variables whose means are above four.

Table 2. Variables encountered **in the sale of an agricultural land.**

	Mean	Median	Mode	Standard deviation	Completely disagree	Disagree	I am undecided	I agree	Completely agree
Lands with good water drainage are more valued.	4.15	4	4	0.923	3.3	2.5	9.3	46.3	38.7
The better the quality of the soil, the higher its value.	4.13	4	4	0.97	3.4	4.2	8.2	44.3	39.9
Agricultural lands in safer areas (with fewer thefts and disturbances) have a higher value.	4.07	4	4	0.981	3.4	4.2	12.0	43.3	37.1
Lands with year-round water springs have a higher value.	4.06	4	4	1.013	3.3	5.7	11.8	40.5	38.7
Lands located on riverbanks where water flows all year round have a higher value.	4.04	4	4	1.019	3.9	4.5	13.4	40.7	37.6
Lands near tourist attractions are more sought after and have a higher value.	3.99	4	4	0.99	3.6	4.2	15.4	43.3	33.5
Lands with easy access for machinery have a higher value.	3.98	4	4	1.004	3.4	5.7	13.8	43.8	33.2
Flat or gently sloping lands have a higher value.	3.95	4	4	0.979	3.0	5.4	16.1	44.1	31.4
Lands with ponds or water reservoirs have a higher value.	3.95	4	4	1.004	2.8	7.1	14.4	43	32.6
Lands closer to transportation networks have a higher value.	3.95	4	4	1.003	3.1	6.5	14.9	43.6	31.8
Farmers, in general, face financial difficulties in acquiring large plots of land.	3.94	4	4	1.037	3.9	6.4	14.3	42.5	32.9
Lands near natural beauty spots have a higher value.	3.94	4	4	1.022	3.6	5.6	17.2	40.7	32.9
Lands near recreational areas are more attractive and have a higher value.	3.94	4	4	1.048	4.8	5.3	13	44.4	32.5
In areas with a higher population growth, lands have a higher value.	3.94	4	4	1.022	3.6	6.7	13.8	44.4	31.5
Areas with greater rural development have higher land values per square meter.	3.93	4	4	1.104	7	3.0	13.7	42.7	33.7
Lands with fruit tree plantations have a higher value.	3.92	4	4	1.003	3.9	5.1	15.7	45.3	30

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Lands where irrigation systems can be used have a higher value.	3.91	4	4	1.014	3.7	6.1	16	44.4	29.8
Lands with higher population density have a higher value.	3.90	4	4	0.963	3.1	5.3	17.2	47.0	27.3
Lands near locations with historical heritage have a higher value.	3.89	4	4	1.026	3.7	5.6	19.3	40.4	31.1
Lands with artificial water resources (artesian wells, ponds, dams, watering holes, water tanks) have a higher value.	3.86	4	4	1.063	4.3	7.1	16.6	41.6	30.3
Lands with difficult access for machinery have a lower value.	3.83	4	4	1075	4.3	8.9	15.1	43	28.7
Lands in pollution-free environments have a higher value.	3.83	4	4	1.061	5.4	5.6	16.. 6	45	27.3
Lands at risk of waterlogging have a lower value.	3.83	4	4	1.075	5.7	5.6	16.5	44.4	27.8
Lands with a larger labor force available have a higher value.	3.83	4	4	1.04	4.2	6.5	19.1	42.2	28
Lands with higher rainfall have a higher value.	3.82	4	4	1.077	5.3	6.5	17.4	42.7	28.1
Older farmers possess more land than younger farmers.	3.81	4	4	1.15	5.9	8.5	16.3	37.1	32.1
Lands in animal hunting areas have a higher value.	3.81	4	4	1.067	4.3	8.4	16.6	42.9	27.8
Lands with rainfed crops have a lower value.	3.80	4	4	1.015	3.7	7.5	19.1	45	24.7
Lands closer to urban areas have a higher value.	3.80	4	4	1.046	5.3	5.3	19.4	44.7	25.3
Lands with surrounding walls or fences have a higher value.	3.79	4	4	1.107	5.9	7.1	16.8	42.1	28.1
Lands with forest plantations have higher market values.	3.77	4	4	1.085	5.3	7.9	17.4	43.2	26.2
Lands with regular shapes (square, rectangle) have a higher value.	3.70	4	4	1.127	5.9	9.5	19.4	39.6	25.6
Lands near churches, chapels, and other monuments have a higher value.	3.70	4	4	1.147	5.7	10.1	20.7	35.7	27.8
Smaller plots of land are more sought after than larger ones.	3.40	4	4	1.268	9.6	17.7	17.9	33.1	21.7

Source: Own elaboration

4.2. Exploratory Factor Analysis

Factor Analysis assumes the existence of a smaller number of unobservable variables underlying the data that express what is common among the initial variables.

To determine if Factor Analysis is appropriate, we calculated the KMO statistic and conducted the Bartlett's test. The performed factor analysis yielded a KMO value of 0.944, which, according to Pestana and Gageiro (2014) and Marôco (2018), indicates an excellent Factor Analysis. The Bartlett's test yielded a significance level of 0.000. Based on this, we can conclude that Factor Analysis is

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suitable for the questions regarding the different variables to consider when purchasing agricultural land. If this were not the case, the use of this factor model should be reconsidered.

Table 3 presents the extraction of seven factors. We also observe in Table 3 that the eigenvalues of the seven factors are all above 1 (Kaiser's criterion). Several attempts were made to ensure that the loading of each variable was above 0.5, meaning that variables with loading below 0.5 were successively removed (Table 4).

The Factor Analysis resulted in the extraction of seven factors, which account for 61.334% of the total variance (Table 7). The unexplained variance, 38.666%, may be related to other less relevant factors resulting from different combinations of variables.

Table 3. Total explained variance.

	Initial eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	% Accumulative	Total	% of Variance	% Accumulative	Total	% of Variance	% Accumulative
1	12.504	35.727	3.727	12.504	35.727	35.727	4.551	13.003	13.003
2	2.496	7.13	4.857	2.496	7.13	42.857	3.368	9.621	22.624
3	1.422	4.064	46.921	1.422	4.064	46.921	3.159	9.025	31.649
4	1.418	4.05	50.971	1.418	4.05	50.971	3.115	8.899	40.549
5	1.287	3.677	54.648	1.287	3.677	54648	2.916	8.331	48.879
6	1.235	3.529	58.177	1.235	3.529	58.177	2.18	6.228	55.108
7	1. 105	3.157	61.334	1.105	3.157	61.334	2.179	6.226	61.334

We will now describe how the selected factors from the principal component analysis and results (Table 3 and 4) were named and interpreted. The Cronbach's Alpha indicates the consistency of each factor as presented in Table 4. Regarding factor 1, the observation of the variables that contribute to explaining this factor allows us to conclude that we are dealing with aspects related to intrinsic location characteristics of the property. Thus, this factor consists of the following items: agricultural lands in animal hunting areas, lands with a higher labour force, lands closer to the urban fringe, lands closer to transportation networks, lands with fruit tree plantations, lands with higher rainfall, and lands where irrigation systems can be used have higher value. The variables that decrease the value of the land are: lands at risk of waterlogging have lower value, and lands with dryland crops have lower value. These items show good consistency (Cronbach's Alpha).

In factor 2, the observation of the variables that contribute to explaining this factor allows us to conclude that we are dealing with aspects related to the dynamic characteristics of the agricultural land market. Thus, this factor is characterized by the variables: smaller agricultural lands have lower productivity, areas with higher population have higher land value, areas with less wind have higher land value, rents of lands near urban areas have higher values, climate change has an impact on property value, and larger properties have lower value per square meter. This factor shows good consistency.

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Table 4. Rotated components matrix.

Items	Component							Factors Interpretation
	1	2	3	4	5	6	7	
Wildlife hunting areas have higher value.	.693	.146	.008	.274	.122	.057	.101	Characteristics intrinsic to the property's location
Land with more labor availability has higher value.	.664	.129	.329	.001	.084	.120	.213	
Land closer to urban areas has higher value.	.650	.257	.125	.238	.074	.080	.248	
Land closer to transportation networks has higher value.	.632	.203	.050	.351	-.011	.227	-.006	
Land with a risk of waterlogging has lower value.	.620	.061	.287	.170	.289	.011	-.006	
Land where irrigation systems can be used has higher value.	.606	.132	.427	.111	.163	.091	.107	
Land with dryland crops has lower value.	.604	.210	.240	.055	.014	.092	.381	
Land with fruit tree plantations has higher value.	.604	.096	.402	.146	.124	.090	.108	
Land with higher rainfall has higher value.	.582	.111	.234	.254	.249	.012	.091	
Smaller agricultural land has lower productivity.	.184	.705	.014	.043	.161	.055	.227	Dynamic characteristics of the agricultural land market
Higher population areas have higher land value.	.087	.699	.255	.169	.156	.180	-.003	
Less windy areas have higher land value.	.195	.691	.054	.186	.172	.035	-.089	
Rents in land near urban areas are higher.	.080	.688	.236	.173	.106	.259	.122	
Climate changes impact property value.	.155	.548	.139	.127	.268	.206	.135	
Larger properties have lower value per square meter.	.215	.547	-.034	.080	.263	.042	.210	
Land on riverbanks with year-round water flow has higher value.	.244	.153	.706	.230	.091	.118	.178	Importance of water availability on agricultural land
Land with ponds or pools has higher value.	.278	.092	.649	.252	.100	.059	.122	
Land with year-round water springs has higher value.	.262	.068	.632	.240	.104	.182	.040	
Land with artificial water resources has higher value.	.321	.203	.620	.143	.175	.005	.160	
Land near recreational areas is more attractive and has higher value.	.230	.140	.095	.710	.108	.084	.258	Proximity to tourist destinations
Land near historical heritage sites has higher value.	.251	.179	.161	.707	.191	.091	.103	

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Land near natural attractions has higher value.	.218	.163	.265	.682	.160	.112	.188	
Land near tourist destinations is in higher demand and has higher value.	.243	.128	.325	.603	.121	.056	.144	
Better soil quality correlates with higher land value.	.194	.203	.362	.537	.106	.197	.142	
Land with steeper slopes has lower value.	.171	.162	.129	.080	.762	.088	.101	
Soil quality and suitable crops affect land value.	.161	.133	.002	.111	.682	.292	.129	
Flat land is more valuable than sloped land.	.087	.246	.121	.238	.665	.075	.039	Physical characteristics of the land
Poor drainage reduces land value.	.057	.327	.257	.032	.585	-.003	.170	
Land near urban areas has higher value.	.154	.207	.056	.129	.575	.329	.044	
Land with national roads and other infrastructure has higher value.	.104	.137	.197	.113	.148	.762	.033	
Land with access to electricity has higher value.	.140	.174	.230	.045	.180	.728	.007	Positive externalities created
Land value is influenced by agricultural and forestry crops it can support.	.063	.142	-.110	.136	.158	.675	.202	
Land surrounded by fences or walls has higher value.	.162	.107	.212	.152	.125	.175	.744	
Land with forest plantations has higher market value.	.150	.204	.232	.289	.095	.011	.670	Improvements made on the property
Land with regular shape has higher value.	.299	.090	.019	.254	.209	.084	.647	
Cronbach's alpha	.897	.828	.821	.856	.807	.721	.865	

Source: Own elaboration

Factor 3 refers to the variables that contribute to the value of water availability on agricultural land. Thus, this factor is composed of variables such as land on riverbanks where water flows year-round has higher value, land with ponds or pools has higher value, land with year-round water springs has higher value, and land with artificial water resources has higher value. This factor shows good consistency (Cronbach's Alpha).

In factor 4, we observe the variables that contribute to the value of proximity to tourist destinations. Thus, this factor includes variables that state that land near recreational areas is more attractive and has higher value, land near historical sites has higher value, land near natural beauty has higher value, land near tourist destinations is in higher demand and has higher value, and higher land quality corresponds to higher value. This factor shows good consistency.

Factor 5 comprises variables related to the physical characteristics of the property. Thus, this factor includes the following variables: higher slope (inclination) of the land leads to lower value, the quality of the soil and the crops that can be cultivated affect the value of the land, flat land is more valuable than sloping land, lower land drainage corresponds to lower value, land near urban areas has higher value. This factor shows good consistency.

Factor 6 indicates the variables that contribute to the value of positive externalities created on the land. Thus, this factor suggests that land with national roads and other infrastructure has higher value, land with electricity has higher value, and the value of the land is reflected by the agricultural and forestry crops it can offer. This factor shows acceptable consistency.

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Factor 7 presents the variables that contribute to the value of improvements made on the property. Thus, this factor indicates that land with surrounding walls has higher value, land with forest plantations has higher market values, and land with regular shape (square, rectangle) has higher value. This factor shows good consistency.

4.3. Mean Differences

4.3.1. The Difference in Means in the Variables Encountered when Purchasing Agricultural Land between Males and Females

Table 5 presents statistically significant mean differences in various survey items related to the purchase of agricultural land in terms of gender differences. As observed, there is one item where the difference is statistically significant, with a higher mean reported by females (The land next to one already owned should be purchased even if the value is high), and another item where the difference is statistically significant, with a higher mean reported by males (Land where irrigation systems can be used has greater value).

Table 5. The t-test for difference of means: gender - items related to the purchase of an agricultural land.

Items	Levene test for variance equality (Do we accept HO?)			Test for means equality
	t-test	Male	Female	t-test (p-value)
The land adjacent to one already owned should be purchased, even if the value is high.	-2.557	2.97	3.96	0.011
Land where irrigation systems can be used has greater value.	2.202	3.97	3.80	0.028

Source: Own elaborationiguire

4.3.2. Difference between People who Only Work in Agriculture and those who have another Job in Addition to Agriculture

Table 6 presents the statistically significant differences in means for various survey items related to variables encountered in the purchase of agricultural land, concerning the difference between people who have (or do not have) another type of job in addition to agriculture. As observed, there is a set of items where the differences are statistically significant, and in all of these items, higher means are reported by individuals who have another type of job in addition to agriculture.

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Table 6. Teste-t for difference in means: additional job besides farming - items related to the purchase of agricultural land.

Items	Levene test for variance equality (Do we accept HO?)			Test for means equality
	t-test	Yes, has another job besides agriculture	Does not have another job besides agriculture	t-test (p-value)
The value of land reflects the agricultural and forestry crops it can offer.	2.057	3.80	3.63	0.040
Land close to urban areas has a higher value.	2.294	3.93	3.73	0.022
Land that allows the use of agricultural equipment (tractors) has a higher value.	2.119	3.86	3.67	0.034
In areas with higher population growth, land has a higher value.	2.561	4.01	3.79	0.011
Land with year-round water springs has a higher value.	2.266	4.12	3.93	0.024

Source: Own elaboration

5. Conclusions

This study aimed to investigate perceptions regarding the characteristics that enhance or devalue agricultural land in the evaluation process. Regarding the perceptions of the factors that contribute to the appreciation of agricultural land, the majority of respondents state that demand is the main element, followed by the profitability of agricultural plots and the surrounding infrastructure of agricultural areas. In terms of factors that inversely reduce the value of agricultural land, land conflicts are indicated, followed by the lack of land ownership (deeds) and, finally, the absence of social infrastructure.

As for the concerns of respondents when selling agricultural land, they mention issues related to land information, access to land, location, and the security of the area as their primary concerns. On the other hand, buyers of agricultural land are concerned about bureaucratic elements, investment costs due to the lack of supporting infrastructure, and the lack of credibility among the parties involved in the land buying and selling process (buyer, seller, traditional authorities, and intermediaries).

When it comes to the purchase of agricultural land, there are several variables that influence this process, such as land located near urban areas, land located near national roads, and land located in areas with social infrastructure, among others. Regarding the factors to consider when selling agricultural land, several variables emerge, including good water drainage on the land, the land being located in a secure area, the land having a year-round water spring, and the land being situated in a riverside area.

Seven factors were extracted in the Exploratory Factor Analysis. The first factor refers to the intrinsic location characteristics of agricultural land properties, the second factor is related to the dynamic characteristics of the agricultural land market, the third factor is linked to the variables concerning the importance of water availability in agricultural land, the fourth factor relates to proximity to tourist locations, the fifth factor pertains to the physical characteristics of the land, the sixth factor is associated with positive externalities, and the seventh factor is related to variables regarding improvements made to the property.

The results obtained in this study are important for land appraisers, agricultural engineering universities, the agricultural population in general, and the public administration. The findings of

this study allow us to understand and correlate the determining variables with positive and negative impacts on the evaluation of agricultural land. As future work in this field of knowledge, it will be important to study the agricultural land market through actual transactions and determine whether the market takes into account these perceptions or if it deviates from the conclusions of this study.

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References

1. Ardakani, Z.; Bartolini, F.; Brunori, G. New Evaluation of Small Farms: Implication for an Analysis of Food Security. *Agriculture* **2020**, 10(3), 74. https://doi.org/10.3390/agriculture10030074.
2. Buday, Š.; Roháčiková, O.; Rumanovská, Ľ. Analysis of the agricultural land market transactions in selected regions of Slovakia in the years 2007–2016. *Acta Regionalia et Environmentalica* **2018**, 15(2), 28-37. https://doi.org/10.2478/aree-2018-0006.
3. Caballer, V. Nuevas endências en la valoración territorial. *CT/Catastro* **2002**, 45(11).
4. Del Río, B. S. G.; Marqués-Pérez, I. Spatial analysis of agricultural land prices. *Economía Agraria y Recursos Naturales-Agricultural and Resource Economics* **2018**, 18(1), 135-159. https://doi.org/10.7201/earn.2018.01.06.
5. Gracia, A.; Pérez Y Pérez, L.; San Juan, A., Barreiro, J. Análisis hedónico de los precios del suelo rústico. VI Encuentro de economía aplicada **2003**, Granada.
6. Gripp JR, J.; Marques, M. É. T.; Gonçalves, R. P.; Andrade, R. J. Avaliação de imóveis rurais. *In Congresso Brasileiro de Cadastro Técnico Multifinalitário-UFSC* 2006, Florianópolis-SC (Vol. 15).
7. Herzberg, R.; Pham, T. G.; Kappas, M.; Wyss, D.; Tran, C. T. M. Multi-criteria decision analysis for the land evaluation of potential agricultural land use types in a hilly area of Central Vietnam. *Land* **2019**, 8(6), 90, 1-25. https://doi.org/10.3390/land8060090.
8. Khuong, N. I. Factors Affecting Land Prices In The Urban Fringe Of The Mekong Delta. *Journal of Economic Development* **2019**, 02–08. https://doi.org/10.13106/jafeb.2022.vol9.no3.0123
9. Kilić, J.; Rogulj, K.; Jajac, N. Fuzzy expert system for land valuation in land consolidation processes. *Croatian Operational Research Review* **2019**, 10(1), 89-103. https://doi.org/10.17535/crorr.2019.0009.
10. Kocur-Bera, K. Determinants of agricultural land price in Poland–a case study covering a part of the Euroregion Baltic. *Cahiers Agricultures* **2016**, 25(2), 25004. https://doi.org/10.1051/cagri/2016013.
11. Li, M.; Wang, J.; Chen, Y. Evaluation and influencing factors of sustainable development capability of agriculture in countries along the Belt and Road Route. *Sustainability* **2019**, 11(7), 2004. https://doi.org/10.3390/su11072004.
12. Lima, A.; Soares, V. S. Modelo de avaliação hedónico de terrenos rústicos e seus desafios: o estudo de caso da realidade da Região do Porto, Norte de Portugal. *População e Sociedade* **2015**, 23, 145-159.
13. Lima, D. A.; Nóbrega, M. L. Análise do preço de terras agrícolas no tocantins: decifrando os caminhos do agronegócio. *Raega-O Espaço Geográfico em Análise* **2017**, 40, 163-176. http://dx.doi.org/10.5380/raega.v40i0.46275.
14. Livanis, G.; Moss, C. B.; Breneman, V. E.; Nehring, R. F. Urban sprawl and farmland prices. *American Journal of Agricultural Economics* **2006**, 88(4), 915-929. https://doi.org/10.1111/j.1467-8276.2006.00906.x.
15. Luo, D.; Ye, L.; Sun, D. Risk evaluation of agricultural drought disaster using a grey cloud clustering model in Henan province, China. *International Journal of Disaster Risk Reduction* **2020**, 49, 101759. https://doi.org/10.1016/j.ijdrr.2020.101759.
16. Marôco J. *Análise Estatística com o SPSS Statistics*. 7. Ed 2018. ReportNumber, Lisboa.
17. Meneses, T. G. Desarrollo de la valoración catastral de fincas rústicas. Aplicación a la Comunidad Foral de Navarra. *CT: Catastro* **2003**, 63–74.
18. Middelberg, S. L. Agricultural land valuation methods used by financiers: The case of South Africa. *Agrekon* **2014**, 53(3), 101-115. https://doi.org/10.1080/03031853.2014.922033.
19. Pacheco, L.; Lote, E.; Tavares, F. Empresas Agrícolas e Desenvolvimento Económico: Potencialidades da Província do Huambo, em Angola. *Revista em Agronegócio e Meio Ambiente, Maringá (PR)* **2017**, 10(4), 1051-1076. http://dx.doi.org/10.17765/2176-9168.2017

20. Pestana, M.; Gageiro, J. *Análise de Dados para Ciências Sociais: A Complementaridade do SPSS*. 6ª Edição **2014**. Lisboa. Edições Sílabo.
21. Plantinga, A. J.; Miller, D. J. Agricultural land values and the value of rights to future land development. *Land economics* **2001**, 77(1), 56-67. https://doi.org/10.2307/3146980.
22. Rondhi, M.; Pratiwi, P. A.; Handini, V. T.; Sunartomo, A. F.; Budiman, S. A. Agricultural land conversion, land economic value, and sustainable agriculture: A case study in East Java, Indonesia. *Land* **2018**, 7(4), 148. https://doi.org/10.3390/land7040148.
23. Ruivo, P. Amenidades rurais-que contributo? Estu do de caso em territórios rurais. *III Congresso de Estudos Rurais* **2008,** Faro, Universidade do Algarve.
24. Sal, A. G.; García, A. G. A comprehensive assessment of multifunctional agricultural land-use systems in Spain using a multi-dimensional evaluative model. *Agriculture, Ecosystems e Environment* **2007**, 120(1), 82-91. https://doi.org/10.1016/j.agee.2006.06.020.
25. Santos, E.; Tavares, F.; Tavares, V.; Ratten V. Comparative Analysis of the Importance of Determining Factors in the Choice and Sale of Apartments. *Sustainability* **2021**; 13(16):8731. https://doi.org/10.3390/su13168731
26. Sardaro, R.; La Sala, P.; Roselli, L. How does the land market capitalize environmental, historical and cultural components in rural areas? Evidences from Italy. *Journal of Environmental Management* **2020**, 269, 110776. https://doi.org/10.1016/j.jenvman.2020.110776
27. Schwarcz, P.; Bandlerová, A.; Schwarczová, L. Selected issues of the agricultural land market in Slovak Republic. *Journal of Central European Agriculture* **2013**, 14(3), 0-0. http://dx.doi.org/10.5513/JCEA01/14.3.1314
28. Silva, M. L.; Rocha, R. R.; Cordeiro, S. A.; Silva, M. L.; Bezerra, A. F. Estudo comparativo de três métodos de avaliação de terras florestais. *Cerne* **2011**, 17, 209–213. https://doi.org/10.1590/S0104-77602011000200008.
29. Somantri, L.; Ridwana, R.; Himayah, S. Land value analysis in the suburban of Bandung and agricultural land availability impact. *In IOP Conference Series: Earth and Environmental Science* **2021**, 683(1), 012088. doi:10.1088/1755-1315/683/1/012088
30. Szturc, J.; Karásek, P.; Podhrázská, J. (2017). Historical Changes in the Land Use Connected with Appropriation of Agricultural Land-Case Study of Cadastral Areas Dolní Věstonice and Modřice (Czech Republic). *European Countryside* 2017, 9(4), 658-678. https://doi.org/10.1515/euco-2017-0038.
31. Tavares, F.O.; Almeida L.; Pinto A.; Tavares V.C. The Role of Stakeholders in Thermal Tourism: A Bibliography Review. In: Ratten V., Braga V. (eds) *Stakeholder Entrepreneurship* **2021**. Springer, Singapore. https://doi.org/10.1007/978-981-16-7091-6_4
32. Tavares, F.; Santos, E. M. Validation of an Information Asymmetry Scale in the Portuguese Real Estate Market. *Review of Business Management* **2021**, 23(4), p. 586-599. https://doi.org/10.7819/rbgn.v23i4.4136
33. Tavares, V. C.; Tavares, F.; Santos, E. The Value of Farmland and Its Determinants - The Current State of the Art. *Land* **2022**, 11(11), 1908. https://doi.org/10.3390/land11111908
34. Tezcan, A.; Büyüktaş, K.; Aslan, Ş. A multi-criteria model for land valuation in the land consolidation. *Land Use Policy* **2020**, 95, 104572. https://doi.org/10.1016/j.landusepol.2020.104572.
35. Tione, S. E.; Holden, S. T. Urban proximity, demand for land and land shadow prices in Malawi. *Land Use Policy* **2020**, 94, 104509. https://doi.org/10.1016/j.landusepol.2020.104509.
36. Wentland, S. A.; Ancona, Z. H.; Bagstad, K. J.; Boyd, J.; Hass, J. L.; Gindelsky, M.; Moulton, J. G. Accounting for land in the United States: Integrating physical land cover, land use, and monetary valuation. *Ecosystem Services* **2020**, 46, 101178. https://doi.org/10.1016/j.ecoser.2020.101178.
37. Xu, F.; Ho, H. C.; Chi, G.; Wang, Z. Abandoned rural residential land: Using machine learning techniques to identify rural residential land vulnerable to be abandoned in mountainous areas. *Habitat International* **2019**, 84, 43-56.
38. Zhao, F.; Hitzhusen, F.; Chern, W. S. Impact and implications of price policy and land degradation on agricultural growth in developing countries. *Agricultural economics* 1991, 5(4), 311-324.
39. Zhao, Q.; Bao, H. X.; Zhang, Z. Off-farm employment and agricultural land use efficiency in China. *Land Use Policy* 2021, 101, 105097. https://doi.org/10.1016/j.landusepol.2020.105097.