Bulgarian Journal of Agricultural Science, 28 (No 1) 2022, 26–35

Relationship between rent prices and agricultural land prices

Mihaela Mihailova

Agricultural Academy, Institute of Agricultural Economy, 1113 Sofia, Bulgaria
E-mail: m.mihailova92@gmail.com

Abstract

Mihailova, M. (2022). Relationship between rent prices and agricultural land prices. *Bulg. J. Agric. Sci., 28 (1)*, 26–35

The aim of the author is to first assess the factors influencing and the importance of their impact on agricultural rents and land prices. Much of the land in Bulgaria is leased and that requires an assessment of the relationship between lands rent and land price. The price of land is mainly influenced by the location, size and purpose of the purchased land. The average market price of agricultural land, regardless of location, size and purpose of land use, show significant differences from year to year and from region to region. Since 2010, the percentage of land for rent and the market price of land have been called the capitalization rate. The average growth rate of land rent should not exceed 6%, nor should it lead to a mismatch between the development of land rent and land prices or to a disproportionate increase in land price.

Keywords: land relationship; agriculture; land prices; land markets

Introduction

The study is based on a proven study in the Czech Republic (Střeleček et al., 2011). This study is adapted for Bulgaria, bearing in mind that two countries have a similar environment given that they had a planned farm and apply the CAP and we have taken 10 year period where the CAP policy has been adapted and is more stable. The study aims to provide a detailed overview of price changes in the agricultural land and rent market and to conclude on the environment in which these markets develop. The main task is to determine the relationships between agricultural land prices in Bulgaria, rents and CAP support, as well as to make forecasts based on long lines and dynamic trends.

Methods of Literature

The determination of the market price of land is based on three main approaches that determine the current valuation method. The most cost-based approach is based on the premise that an informed buyer will not pay more than for a property with comparable characteristics. The comparative approach is based on comparing current market prices of land with comparable characteristics Zdeněk, Lososová (Střeleček et al., 2011). The income approach is based on the capitalization of land income (Gwartney, 2004) extends the methodology for determining the market price of land through other specific methods, including the following:

(1) Sales comparison method. This method is based on the analysis of the prices of vacant plots, their mutual comparison in order to obtain an appropriate price for the assessed land. The author considers this method to be the best if there is relevant data.
(2) Proportional relations method. This method relies on comparing the area of a site with the standard size of the site. The difference is expressed by the proportion that improves the price of a standard site.
(3) Earth residual equipment. This method assumes that the land is prepared for its proper use. All operating expenses and income due to other factors affecting production are deducted and net income is capitalized.

(4) Allocation method. The price is divided into the part expressing the value of the land and the part expressing the improvements of the land.
(5) Extraction method. The value of the land is estimated on the basis of the difference between the known price of the land and the improvements made.
(6) Method for capitalization of land rent. This method is used when there is land rent and market price of land.
(7) Subdivision development method. This method is based on the presumption that uncultivated land is valued as cultivated and sold land. Cultivation costs and other costs are deducted from the selling price, and net revenues are discounted during the forecast period required to absorb the costs of the cultivated area.

Huang et al. (2006) discuss the impact of factors not directly related to production. Explanatory variables include land productivity, plot size and distances to large cities, urban and rural index, farm density measures, income and inflation. They proved that the prices of agricultural land increase with the productivity of the soil and the density of the population and decrease with the size of the plots, the typical region and the distance from the big cities. The most favorable influence was the access to the roads and the density, the proximity to settlements, the presence and proximity to a water body and the use of contractual financing. Chavas & Shumway (1981) model the price of land as a function of economic rent. Economic rent includes both land and maximum profit. Ciaian (2007) proves that change in macro scenario (higher GDP) has higher impact than policy scenario changes. The price of land is expressed as an annual discounted flow. For this purpose, the only Gordon model with a constant growth rate is indicated. Gwartney (2004) compares land rents and the market price of land. The above method is based on the following relationships:

$$\textit{Capitalization rate} = \textit{Land rent} / \textit{Market price of land} \quad (1)$$

The following dependencies arise from this:

$$\textit{Market price of land} = (\textit{Land rent} - \textit{Land tax}) / \textit{Capitalization rate} \quad (2)$$

$$\textit{Land rent} = \textit{Market price of land} \times \textit{Capitalization rate} + \textit{Land tax} \quad (3)$$

The assessment in the analysis is based on the above-mentioned relationships. The degree of capitalization is a very sensitive index that requires special skills to assess it. The payback period in years is also used for this purpose, as it is a more indicative indicator.

$$\textit{Payback period} = 1 / \textit{Capitalization rate} \quad (4)$$

Both static and dynamic approaches can be used in the calculation. The statistical approach is calculated by the number of years to pay the land rent as a reciprocal of the capitalization rate. The dynamic approach calculates the value of money over time, which allows you to calculate the number of years within the required interest rate.

Changes in the land market, land price and land rent since EU enlargement are discussed in Buday (2007), Němec & Kučera (2007), Hamza & Miskó (2007), Pavel Ciaian, D'artis Kancs and Johan F.M. Swinnen (Ciaian et al., 2010). The impact of the single area payment scheme on the land market and land rent is analyzed by Boinon et al. (2007), Patton et al. (2008), showing that the impact of the distribution of different types of payments provides space for further research. Their study reveals that direct decoupled payments are directly related to land and they directly affect land rent, the correlation between land price and SAPS is negative, and the rent relationship is also negative. Different types of analysis are used in estimating the price of agricultural land in Bulgaria. The data were extracted from the Ministry of Finance and the NSI (National Statistical Institute).

Land rent is based on the FADN (The Farm Accountancy Data Network) database, consisting of cash and in-kind payments for 1 ha of leased ("external") agricultural land within the relevant zone. This article deals with the lease of land in the first and second type above.

The correlation between the price of land and the price of rent in different regions is considered. In a narrower sense, the term correlation is understood as synonymous with a correlation coefficient ρ, which is a measure of the linear relationship between two random variables x, y, defined as the normalized covariance of the two variables:

$$p = (\text{cov}\ (x, y)) / \sqrt{}\ (\text{Var}\ (x)\ .\text{var}\ (y)) \quad (5)$$

If the random variables are independent, they are uncorrelated, ie. p = 0. On the other hand p = 1 when the studied random variables are related to a linear relationship. The R-square value, denoted by R2, is the square of the correlation. It measures the proportion of variation in the dependent variable that can be attributed to the independent variable.

How high must a correlation be to be considered meaningful: It depends on the discipline? In this study these are the guidelines we use:

Discipline r meaningful if R^2 meaningful if
Physics $r < -0.95$ or $0.95 < r\ 0.9 < R^2$
Chemistry $r < -0.9$ or $0.9 < r\ 0.8 < R^2$

Biology r < -0.7 or 0.7 < r 0.5 <R^2
Social Science r < -0.6 or 0.6 < r 0.35 < R^2

Research

The areas with agricultural purpose are 52 261 thousand ha or 47.1% of the territory of the Republic of Bulgaria. Arable land (areas included in crop rotation, temporary meadows with cereals and legumes) 3463370 ha or a total of 68.9% of the utilized agricultural area. The share of arable land is slowly increasing in the period from 2010 to 2018. Ownership rights over agricultural land are consolidating with the exception of state land. The total area is divided into 8.6 million plots with an average area of 0.51 ha (Ministry of Agriculture, 2018). There is a high correlation between the increase in the amount of arable land and the price of land Correlation: 0.91 (Figure 1).

In a normal economic environment / economic conjuncture, established as a result of working` agricultural production models, there are equilibrium states in the price of different categories of land, land plots, regional massifs. Rental relationships also move within certain limits. The manifestation of extremes may be due to unfavorable agro-environment, investment intentions and investment projects, etc. The price decreases with increasing supply, but due to a faster growth rate of demand than the growth rate of supply land – the price of land increases.

There are a large number of small owners in Bulgaria, and most of them do not manage the land they own. In Bulgaria, 1.86 million citizens and companies own agricultural plots, owning a total of 4.4 million hectares of agricultural land, which represents about 88% of the utilized agricultural area (UAA). In Bulgaria the situation does not differ from the general one in Europe, as 0.1% of all owners own 21% of the land. In the beginning of the period the largest is the group of owners who own up to 10 ha. They own 7.3 million properties with a total area of nearly 3.5 million hectares with an average size of 0.48 ha. This means that in the hands of the smallest landowners are nearly 80% of the area. At the other end of the spectrum are the ten largest owners. Together they own nearly 190 000 ha or 4% of the total area, divided into 270 406 plots. This process negatively affected the model of the land use and resulted in the bipolar agriculture. Many small farms are taking care of a small part of the agricultural land (Yovchevska, 2015). Bulgaria is among the EU countries in which agricultural land is concentrated in the hands of a large number of owners. Compared to the EU, the share of leased land in Bulgaria is more than twice as high. The base / administrative cost at national level is determined on the basis of the potential of different soil types, proximity to shopping centers and good infrastructure, and the following factors are taken into account in the assessment. First of all, the assessment of agricultural land is based on their permitted and most effective use, taking into account the specifics of the area in which they are located. Main factors influencing the value of agricultural land are to be further researched and are of higher importance in understanding the process of change in agricultural land prices and rent.

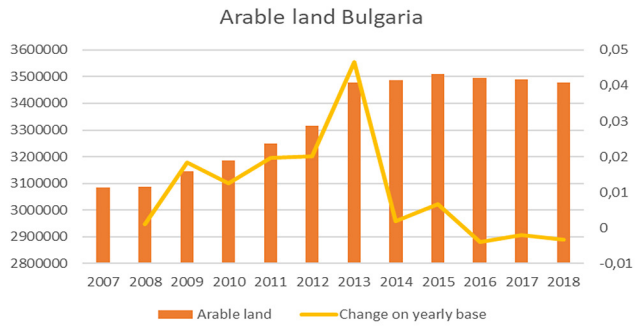

Fig. 1. Arable land and percentage change in Bulgaria
Source: NSI and own calculations

In most cases, the value of land is influenced by such factors as location, transport accessibility, availability of communications, shape, size and more. When assessing agricultural land, the value is additionally affected by the quality and fertility of the soil. Among the main factors that determine the fertility of the soil are the qualitative characteristics of the soil layer (nutrient content, moisture content, aeration, mechanical composition, structural composition, acidity, etc.) relief and microclimate. Thus, for example, agricultural land in the northern part of the country (the Danube plain) is valued as more expensive than agricultural land in the regions of southern Bulgaria. The market price is regulated by supply and demand, but the rise in prices since 2007 depends on direct payments of the CAP. The rent for agricultural land in Bulgaria is lower than in the EU. There is a pronounced tendency for accelerated growth rate of the received rent. The country's agricultural holdings continue to rely on leased land, which in 2016 accounted for 86% of the land used on the farms (NSI price of land). The main source for increasing UAA in Bulgaria is the leased land. There are several factors that affect the market. One of them is the repeated change in the legislation and in particular about 60 plus amendments to the Land laws. In addition, the lack of a long-term agricultural development strategy does not provide predictability (Table 1).

The average increase in the price of land in Bulgaria for the period 2010-2018 is a little over 17%. The linear increase for the years 2010-2018 is more than twice.

Table 1. Change in the price of agricultural land, average and linear growth 2010-2020

Year	Total for the country	Severozapaden	Severen Tsentralen	Severoiztochen	Yugoiztochen	Yugozapaden	Yuzhen Tsentralen
2010	279	249	295	365	230	302	230
2011	398	420	447	555	271	237	292
2012	547	493	623	860	346	463	364
2013	594	598	708	827	480	301	357
2014	684	682	807	957	509	403	474
2015	732	708	820	1040	636	415	442
2016	761	735	895	1157	707	221	412
2017	872	910	779	1401	796	406	538
2018	941	869	1087	1345	802	189	660
2019	948	923	1110	1397	852	518	679
2020	952	951	1134	1443	877	398	635
Linear price increase in%	341.22%	381.93%	384.41%	395.34%	381.30%	131.79%	276.09%
Average growth in%	17.16%	18.54%	19.48%	19.49%	17.47%	7.40%	15.27%

Source: NSI and own calculations

At standard norms of 6% for average growth for developed countries with stable land relationships, Bulgaria shows immaturity in the processes related to the pricing of agricultural land. The highest average price growth in the Northeast region is 19.49% and in the North Central – 19.48%. Northwestern – 8.54% and Southeastern – 17.47% also have a rise higher than the national average of 17.16%. In South Central the average growth is 15.27% (intensive crops and livestock) lack of subsidies lead to lower land prices. Southwest 7.40% – most small farms have a much lower increase than the national average of 17.16% (Figure 2).

In all regions of Bulgaria except in the Yugozapaden there is a trend of increasing the price of agricultural land. For the development of plant growing the region has only 12.4% of the used agricultural land in our country and is in last place among the other regions. Its supply per capita with agricultural land is also very low – 0.3 ha per capita compared to 0.67 ha for the country. Of the used agricultural land in the region, the largest percentage is occupied by meadows, which is due to the predominant mountainous terrain and determines the relatively small amount of arable land. The biggest changes are in the price in the Severoiztochen region, where subsidies per unit area, the cultivation of

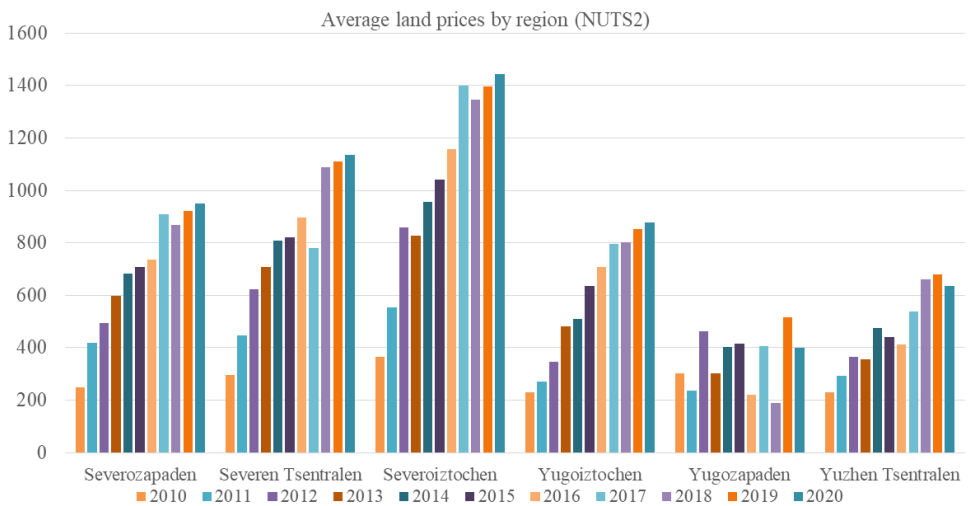

Fig. 2. Average price of land by regions
Source: NSI and own calculations

Table 2. Average prices of transactions with agricultural land by categories of land use in the period 2010 – 2020*

Land category	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Linear increase %	Average increase %
Agricultural land – total	2790	3980	5470	5940	6840	7320	7610	8720	9410	n/a	n/a	194.66%	7.82%
Fields	2790	4130	5560	6210	7080	7610	7700	8700	9800	10530	10420	205.49%	6.50%
Orchard	2420	2840	4120	4330	4400	4800	5340	n/a	n/a	n/a	n/a	220.66%	7.81%
Vines	2060	2480	2620	3190	4510	3390	3700	n/a	n/a	n/a	n/a	179.61%	6.33%
Permanently grassed areas	1890	2070	2170	1980	2460	2270	2710	2620	2180	3000	2680	141.10%	1.21%

Source: NSI and own calculations * (n/a – no data can be found for 2016 and 2020)

cereals (which have the peculiarities of commodities) have increased the price many times more than in other regions, the same reasons apply to the Severen Tsentralen region (Table 2).

In 2018 the average price per ha of agricultural land reached BGN 9,410 / ha, which is 7.9% more than in 2017 there is no date for 2020. Compared to the previous year in 2018 an increase was reported in the price of fields – by 12.6%. The price of permanently grassed areas decreased by 16.8%. The decrease of 16.8% is the largest in the grasslands for the whole period under review, the decrease from 2013 is 8.8%, and this 2015 is 7.8%. The highest increase for the whole period was observed in 2011 at the prices of the fields 48.03%. In 2014 there was a jump in the prices of land used for vineyards by 41.38%, this is due to changes in the CAP in 2013 as a result of support provided under the National Program for Support of the Wine and Wine Sector 2014-2018 from the beginning of its implementation by the end of June 2017, 1598 ha of new vineyards were created and the management techniques of 1912 ha of vineyards were improved.

For the period 2003-2013 the number of farms decreased more than 3 times – from 665.5 thousand in 2003 to 254.4 thousand in 2013. At the same time there is a concentration of land in larger farms – in 2013 these with a size of more than 50 ha manage more than 85% of the utilized agricultural area (UAA). The average rent paid for land increases by 252.55% in specialization in cereals, oilseeds and protein crops, this is partly due to an increase in the area sown with these crops and on the other hand the impact of the CAP. Farmers are starting to consolidate their farms. Subsidies per unit area and the market nature of these crops are at the heart of this process.

For the period 2007-2020, the increase in rent paid for vineyards increased by 19.86%, which is the second highest increase. Article 62 of Regulation (EU) № 1308/2013 sets out the general requirement for Member States to grant authorization for planting vines after the submission of an application by producers who intend to plant or replant vines.

Relationship between Rent and the Price of Agricultural Land

The ratio between the rent for land and the market price for the purchase of agricultural land is called the coefficient of capitalization of agricultural land. The payback period, which is reciprocal to the capitalization rate, is more instructive, determining the number of years required to pay the price of the land in the rent for the land (Table 3).

For the period under review the capitalization is between 8.24% and 17.2% or on average 14.01%. We believe that the Bulgarian arable land has some unique and very useful char-

Table 3. Capitalization coefficient of agricultural land and payback period

Bulgaria	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Linear growth	Average growth
Average price of land	2790	3980	5470	5940	6840	7320	7610	8720	9410	9480	9520	341%	6.43%
Average price of land rent	230	300	340	380	410	420	440	460	480	480	450	195%	4.44%
Capitalization basic 2010	8.24%	10.75%	12.19%	13.62%	14.70%	15.05%	15.77%	16.49%	17.20%	17.20%	16.13%	Average 14.30%	
Payback period basis 2010	12.13	9.30	8.21	7.34	6.80	6.64	6.34	6.07	5.81	5.81	6.20	Average 7.33	

Source: NSI and own calculations

acteristics – high return on reporting risk, low correlation (interdependence) to traditional classes of investment assets, strong connection with the growth of an emerging market with low political risk, approaching land prices in EU countries and obtaining a secure monetary income. Agricultural land in Bulgaria is an undervalued asset, the price and occupies the lowest place among land prices in EU countries. The natural price approximation creates an attractive potential for growth of over 6% per year on land in Bulgaria (average for the period under review 14.30%). Another very important reason for growth is the consolidation of individual land properties. In countries with stable land relationships the payback period is 25 years in Bulgaria the average is 7.33 years, and only in 2020 the payback period is nearing 6.2 years (Figure).

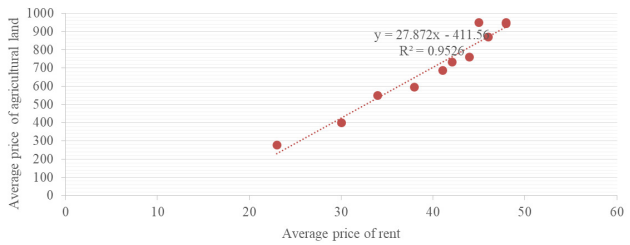

Fig. 3. Capitalization of land
Source: NSI and own calculations

The degree of this linear relationship, expressed as a correlation coefficient R^2 0.95, revealed a significant statistical relationship between land prices and rents.

The data of the National Statistical Institute provide information on prices from 2010 to 2020, and in this period, they are constantly moving in an upward direction. If in 2010 the average rent price was BGN 230 ha, then in 2011 and 2012 it has already increased to BGN 300 and 340. A new increase follows to BGN 380 and 410 ha for 2013 and 2014, as well as BGN 420 in 2015. In the following years the price increased by BGN 20 per year – BGN 440 in 2016, BGN 460 in 2017 and BGN 480 ha. The increase of price of land continues and reaches 9529 in 2020 but the price of land rent decrease from 2019 with 30 lv[1].

Time Value of Money and Percentage of Capitalization

The price of a plot of land should express the interest on the rent for the land, as well as the land rent for several years. It is important to compare the interest rates on long-term loans with the capitalization rate. The same interest rate and capitalization rate mean efficient land purchase. Long-term loans are quite high in different countries that do not meet the price of land, as shown below. The adequacy of the bank interest rate and the capitalization rate can be assessed through the actual discount period. Repayment discount period:

$$n = \frac{\log \frac{P_0}{P_0 - r.CP_0}}{\log(1+r)} \quad , \tag{6}$$

where P_0 = rent of land in the period 0, r = interest, CP_0 = price of land in the period 0 (for 1 ha). The above equation can only be solved if the capitalization rate will be higher than the interest rate. This condition is associated with many limitations. If required when calculating the average repayment period in order to use the average interest rate for each year, the interest rate for each year must be less than the capitalization rate in that particular year. We use real interest rate for calculations. It includes only systemic and regulatory risks and is designed to measure the time value of money and take into account inflation.

$$Real\ intrest\ rate\ (R^r) = \frac{Nominal\ interes\ rates\ (R^n) - Inflation(I)}{1 + Inflation(I)}, \tag{7}$$

$$Payback\ period = \frac{\text{Initial Investment}}{Chash\ flow}, \tag{8}$$

Correlaton SAPS and land price	Correlaton SAPS rent
-0.082488786	-0.01458483

Source: NSI and own calculations

The calculations are made with real interest rates and dynamic periods. We find that there is a negative correlation between the price of land and SAPS payments and a negative correlation between the price of rent and SAPS payments. According to some calculations, it is set that the owner cultivates the land and does not rent it out, and taking into account for how long he will pay for this land through SAPS payments. The average repayment period at 0.5% interest is between 1 and 4 years. The average payout period at 1% interest remains the same between 1 and 4 years. It is accepted that the normal period for payment of the purchased land during the rent is standard up to 25 years, which means that for Bulgaria for the period under consideration the payment period is much shorter than the standard one. This shows accelerated land processes and instability. The model applied for the Czech Republic has been changed and adapted for Bulgaria, payments per unit area have been added as a positive cash flow in order to consider the differences in the two scenarios. The levels of real interest rates in Bulgaria stabilize after 2015 and are in the norms for a developed economy after 2017. Looking at the

[1] 1 euro = 1.95 lv

table we come to the conclusion that in Bulgaria land is one of the most attractive investment goods. Despite the difficult liquidity of land as a commodity (in principle), the consolidation of land in the country continues and the price continues to grow. When betting on SAPS payments, we find that in Bulgaria it is much more profitable to cultivate the purchased land than to lease it. The period of repayment of land on a chain basis at different interest rates is much shorter than when leasing the purchased land (Table 4).

Calculations are also made for the payment of the land during the rent at the maximum interest rate for the period and at certain values of the interest rate (0.5% and 1%) and without SAPS payments. In this scenario, we find that without accepting SER payments as a factor, the time for which we will be able to pay one ha of land through rent is between 8 and 15 years at 0.5% interest, 1% interest and at the maximum interest rate. Even under these conditions, the landowner has a much faster return on investment than other EU Member States. Comparing the two scenarios, we conclude that with self-cultivation of land and EU support per unit area (without considering other measures), the landowner would be able to pay it off most quickly. When renting, the owner adds a period of 4 to 11 years to the repayment period. Despite all the above, land is one of the best investment goods on the Bulgarian market, regardless of the owner's decision to use it (Table 5).

Using the Gorden Model to Estimate the Discounted Payment Period

Other capitalization-based models that can be used are Gordon models. Their use has been suggested, for example, by Chavas & Shumway (1981). In terms of international comparisons, Gordon's single model with a steady increase in rents is appropriate.

$$CP_n = \frac{P_0 (1 + g)^n}{r - g}. \quad (9)$$

Table 4. Return of investment in land in Bulgaria

Year	Capitalization	Real interest rates (calculated)[a]	Payback period for 0.5 % interest	Payback period for 1 % interest	Maximum interest rate that it is possible to calculate	Payback period with maximum interest rate applicable
2018	17.204%	1.297%	13.42	13.43	17.20%	13.41
2017	16.487%	1.970%	13.40	13.41	16.49%	14.48
2016	15.771%	4.056%	13.24	13.55	15.77%	13.66
2015	15.054%	5.130%	14.16	14.12	15.05%	14.30
2014	14.695%	7.764%	13.58	13.53	14.70%	13.67
2013	13.620%	9.815%	12.58	12.85	13.62%	12.77
2012	12.186%	4.388%	12.49	12.75	12.19%	14.12
2011	10.753%	4.388%	11.09	11.32	10.75%	12.59
2010	8.244%[b]	9.927%	8.59	8.60	8.24%	12.13

Source: own calculations NSI, BNB (a – interest rates are calculated from Bulgarian National Bank monthly interest rates, b – interest rates can't be higher than capitalization rate)

Table 5. Return of investment in land in Bulgaria

Year	Capitalization	Real interest rates (calculated)[a]	Payback period for 0.5 % interest	Payback period for 1 % interest	Maximum interest rate that it is possible to calculate	Payback period with maximum interest rate applicable
2018	17.204%	1.297%	4.36	4.37	17.20%	4.38
2017	16.487%	1.970%	4.09	4.10	16.49%	4.10
2016	15.771%	4.056%	3.33	3.37	15.77%	3.49
2015	15.054%	5.130%	4.38	4.43	15.05%	3.07
2014	14.695%	7.764%	4.15	3.73	14.70%	3.78
2013	13.620%	9.815%	2.33	2.35	13.62%	2.75
2012	12.186%	4.388%	2.07	1.93	12.19%	2.15
2011	10.753%	4.388%	1.67	1.79	10.75%	1.71
2010	8.244%[b]	9.927%	2.12	2.87	8.24%	1.53

Source: own calculations NSI, BNB (a – interest rates are calculated from Bulgarian National Bank monthly interest rates, b – interest rates can't be higher than capitalization rate)

Under this model it is possible to estimate a period of payment with a discount, as well as the price of land,

$$n = \frac{\log\left(CP_n(r-g)/P_0\right)}{\log(1+g)}, \tag{10}$$

or acceptable interest rate:

$$r = \frac{P_0(1+g)^n}{CP_n} + g, \tag{11}$$

where CPn = price of land after n years; P_0 = rent of land in the period 0; g = growth rate of land rent; r = interest rate; n = payback period in years. The above analysis has shown that it is impossible to achieve an appropriate interest rate within the stated prices and land rent (Table 6).

The real interest rate, created by comparing the growth rate of land rent and the price of land, showed inappropriately high interest rates. The real interest rate for much of the period is much lower. It is very likely that the rate of price growth will always be less flexible than the rate of price growth, which will always be associated with inappropriate interest rate growth.

Table 6. Gordon model discounted payment period

Land rent	2010	230.00
Rising the price of rent (g)	2010-2020	0.16
Land prices	2011	3980.00
	2012	5470.00
	2013	5940.00
	2014	6840.00
	2015	7320.00
	2016	7610.00
	2017	8720.00
	2018	9410.00
	2019	9480.41
	2020	9520.08
Maximum interest rate calculated	2011	22.70%
	2012	21.66%
	2013	22.04%
	2014	22.09%
	2015	22.60%
	2016	23.36%
	2017	23.45%
	2018	24.01%
	2019	23.95%
	2020	23.92%

Source: NSI and own calculations

To assess the relationship between the dynamics of land rent and the price of land, the capitalization ratio can be used. Its value and dynamics in relation to the chosen interest rate show whether it is profitable to sell the land. With regard to the analysis, it is useful to assess the appropriateness of the growth rate of land rent from the following views: 1. To what extent does the real adjustment of land price affect the capitalization rate of a given increase within a certain interest rate? 2. How does inflation affect this relationship each year?

The Influence of the Rate of Growth of Land Rent on the Adjusted Price of Land

Adjusted real land prices based on the Gordon model can be used as a criterion for evaluating the first task. This criterion suggests that the growth rate affects the return on rents, but rents will offset the dynamics of land price dynamics. The verification of the reality of this condition was a comparison of the actual price with the modified price. The average growth rate is calculated for the period 2010-2018 (Table 7).

Influence of the increase in land rent on the adjusted land price:

$$UCP = \sum_{n=1}^{N} \frac{P_{08}(1+g)^n}{(1+r)^n}. \tag{12}$$

The main and most interesting thing is that if certain conditions are met, then the equation becomes a full-fledged equivalent of the general formula for discounting the flow of currencies. Therefore, in order to determine the current value of an enterprise‘s equity, it is necessary to divide all expected cash flows from the period by the difference between the discount rate and the growth rate. It should be noted here that Gordon first sought a solution to calculate the profit you can count on. Therefore, these calculations were originally

Table 7. Influence of the increase in land rent on the adjusted land price

	Influence of the increase in land rent on the adjusted land price
Land price CP_{2020}	9520.00
Land rent 2020	450
Interest rate on long-term loans 2020 г.	0.89%
Rising price of rent (g)	16%
Adjusted land price UCP	1374.33
Difference between real land prices	-8145.67
Ratio	0.144

Source: NSI and own calculations

called the „dividend model". Nevertheless, the equation given here is quite general.

It should be noted that with all its advantages, the Gordon model has a very limited use. So only companies/sectors that currently have a stable growth rate can make calculations on it. In order to use the information obtained correctly, the data for determining the growth rate must be carefully selected.

With regard to the adjusted discounted land price (UCP), adherence to higher growth rates is absolutely realistic, as the adjusted reduced land price is 0.144 times lower than the real price in 2020 (Table 7). It is clear that the price of land is able to follow the dynamics of the growth rate of rents and even exceed them. The high growth rate of rents is caused by the CAP and its implementation in Bulgaria, the consolidation of agricultural holdings with a large percentage of leased land. As a result of subsidies and changes in prices, profits improve by influencing the growth rate of land rent. The unbalanced dynamics of land prices leads to the fact that cases of high rent growth are an advantage for the buyer, while low rents are an advantage for the seller. This discrepancy can also cause reluctance to sell land.

The Influence of Inflation on the Adjusted Land Price

The minimum requirement for the reduced price of land is that the rate of inflation does not adversely affect pricing. It turns out that when the average inflation (i) is below 5%, the static payback period may not increase the price of land, and in 2020 in Bulgaria the inflation exceeds the 5% by 2.8% (Table 8). The inflation rate is reliably covered by the level of capitalization. The impact of inflation is assessed by comparing the price of land in 2020 with the modified price discounted by fixed-rate loans. Reduced adjusted price with average inflation rate is equal to:

$$UCP = \sum_{n=1}^{N} \frac{P_{08}\,(1+i)^n}{(1+r)^n} \cdot \tag{13}$$

Table 8. Influence of land rents on adjusted land price, 2020

Influence of the land rent increase on the adjusted land price	Value
Inflation	0.08
Rent prices 2020 in lv	450
Interest rate on long-term loans 2020	0.0890
Land price (lv)	9450
UCP in lv	944.04
UCP – CP in lv	-8505.96
Rate	0.0999

Source: NSI and own calculations

Conclusions

Many institutions have been involved in establishing the market price of land in recent years. Unfortunately, their estimates of market prices for land vary considerably. The expected average market price of land in addition to targeted research requires a detailed classification of land prices, not only in terms of land quality and size; but also in view of the type of its future use, see e.g. Snyder et al. (2007), Chavas & Shumway (1981).

The degree of capitalization of agricultural land increased steadily from 2010 (8.24) to 2020 (16.03) that is beyond the normal capitalization rates and shows that any in institutional environment moves the land and rent markets. In 2010, the capitalization rate was 8.24%. The payback period, which is reciprocal to the degree of capitalization in the range between 2 to 14 years and is way faster than the standard of developed European countries that shows that the land relations in Bulgaria are still under development and land, is by far one of the best investment opportunities in the country. The high rate of increase in land rents in Gordon's model can be reconciled with the level of capitalization. The above relations lead to the fact that in terms of the degree of capitalization it is currently profitable to buy agricultural land, but it is unfavorable to sell, and you can actually return your investment faster if you work your land not put it under lease. On the other hand, there may be other reasons for selling land that are not mentioned in the article, change in investment, lack of time to manage it, etc. Stabilizing the growth rate of land rent and land prices in Bulgaria are highly dependable on the institutional norm, CAP payments and many more factors. In further studies we will aim to include green payments and dynamic capitalization of land markets.

Acknowledgements

The author thanks the Scientific Research Fund for the support in carrying out the work on the POZESIN "*Land Relations and European Policy: Synergy and Prospects for Bulgarian Agriculture*„ project, contract № КП-06-H35/2-18.12.2019 National Research Fund at the Ministry of Education and Science of Bulgaria.

References

Boinon, J. P. Kroll, J.-Ch., Lépicier, D., Leseigneur, A. & Viallon, J.-B. (2007). Enforcement of the 2003 CAP reform in 5 countries of the West European Union: Consequences on land rent and land market. In: *Agricultural Economics – Zemedelska Ekonomika, 53,* 173–183.

Buday, S. (2007). Agricultural land market in Slovakia. In: *Agricultural Economics – Zemedelska Ekonomika, 53,* 146–153.

Chavas, J. P. & Shumway, C. R. A (1981). Pooled time-series cross-selection analysis of land prices. In: *American Journal of Agricultural Economics, 63,* 1049-1049.

Ciaian, P. (2007). Land use changes in the EU: Policy and macro impact analysis. In: *Agricultural Economics – Zemedelska Ekonomika, 53,* 565–579.

Ciaian, P., Kancs, D. & Swinnen, J. (2010). US Land Markets and the Common Agricultural Policy, Centre for European Policy Studies. Brussels http://ssrn.com/abstract=1604452

Gwartney, T. (2004). Estimating land values [online], April, 2004. <www.henrygeorge.org/ted.htm>

Hamza, E. & Miskó, K. (2007). Characteristics of land market in Hungary at the time of the EU accession. In: *Agricultural Economics – Zemedelska Ekonomika, 53,* 161–168.

Huang, H., Miller, G. Y., Sherrick, B. & Gómez, M. I. (2006). Factors Influencing Illinois farmland values. In: *American Journal of Agricultural Economics, 88,* 458–470.

Ministry of Agriculture (2009). Situation and Perspective Report Soil. Ministry of Agriculture: Prague.

Němec, J. & Kučera, J. (2007). Land market development after the accession to EU. In: *Agricultural Economics – Zemedelska Ekonomika, 53,* 154–160.

NSI – Prices of agricultural land and rents in agriculture 2020 https://www.nsi.bg/tsb/wp-content/uploads/2021/07/26_AgrLand_2020_trgv.pdf

Patton, M. et al. (2008). Assessing the influence of direct payments on the rental value of agricultural land. In: *Food Policy, 33,* 397–405.

Snyder, S. A., Kilgore, M. A., Hudson, R. & Donnay, J. (2007). Determinants of forest land prices in Northern Minnesota: A hedonic pricing approach. In: *Forest Science, 53*, 25–36.

Střeleček, F., Jelínek, L., Lososová, J. & Zdeněk, R. (2011). Rent and Agricultural Land Prices in the Czech Republic. In: *Statistika 48(2),* 49-59.

Yovchevska, P. (2015). Land use in the system of the land relationships. *Economics and Management, XI (2),* 77-86.

Received: September 24, 2020; *Accepted:* November 11, 2020; *Published:* February, 2022