Efficiency of Investments in Purchase for Agricultural Land Through Financial Instruments

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Abstract

This paper proposes an analytical model for evaluating the efficiency of investment in the purchase of agricultural land financed with financial instruments (bank loan). It is argued that investments in agricultural land are crucial for farm development, but financed by bank loans are not suitable for individual investors seeking returns from rent payments. Investing in agricultural land involves considering a variety of factors, including the level of subsidisation of agricultural production, the profitability of the agricultural products produced, the country's tax system, access to credit resources, inflationary processes in the economy, etc.

Keywords: investment efficiency; investment is agricultural land; long-term bank credit; access to finance; price of agricultural land; rent.

JEL Code: G51; Q14; Q24.

Introduction

Land resources are a major factor in the development of socio-economic relations, especially as regards agricultural production. Land use is linked to national and global challenges arising from demographic processes, food security, maintaining the environment and agroecological ecosystems from degradation, changing consumption patterns, rising food prices, etc. (FAO, 2021). In the last decade, the international community has adopted important global policy frameworks, including the 2030 Agenda for Sustainable Development, The Paris Agreement on Climate Change, Sustainable Development Goals, etc., with a particular focus on soil conservation and efficient land use to improve food security and the resilience of agri-food systems. Achieving sustainable land use underpins the implementation of efficient value chains in the transition towards sustainable agricultural production and food consumption patterns.

The drivers of global land demand are complex. According to FAO (FAO, 2021), by 2050, agriculture will need to produce almost 50% more food for people, feed for livestock and biofuels than it did in 2012 to meet global demand as a result of rising consumption. At the same time, opportunities for expanding arable land are limited, with agricultural land being lost to urbanisation and resulting degradation. This continuously increases pressure on agricultural land. There is therefore a need to implement climate-smart land management to increase land productivity (FAO, 2013) and expand investment in innovative practices.

Nationally, agricultural production occupies a central place in land use. Land is a basic resource for the needs of agricultural production from which agricultural output is obtained as a result of the input of labour and material resources. The interrelation of land with other factors of production in agricultural production has a technological and territorial aspect (Stanimirova & Hristova, 2014). Technologically, land use decisions are linked to the objectives and specific conditions for the development of agricultural production. Territorially, the organisation of land use itself as an object of management, the removal of administrative, legal and socio-economic barriers, the construction of the necessary infrastructure, etc. are essential. By effectively managing land resources, favourable conditions are created not only for the development of agricultural enterprises, but also for the other entities in the system which the agricultural sector represents. The efficient use of land as a basic and indispensable factor of production in agriculture involves complex social relations (Yovchevska, et al., 2019). The dynamics, condition and maturity of societal attitudes related to land use are determinant for the development of agriculture and the national economy (Yovchevska, et al., 2020).

According to Ministry of Agriculture (Ministry of Agriculture, 2022) and National Statistical Institute (National Statistical Institute, 2022), in 2022, 54,6% of Bulgaria's territory is functionally dedicated to agricultural production. Despite the decrease in the area with agricultural use in recent years, in 2022 it is 5,226 million ha, with 5,022 million ha of used agricultural area and only 0,2 million ha of uncultivated land. The in-depth study of the state of agricultural land, as well as of the complex relations related to its use, has an important place in achieving balance and sustainability in the development of Bulgarian agriculture (Kirechev, 2021).

Against this backdrop, there is reportedly global interest in agricultural land investment from both governments and private investors (Antonellia, Siciliano, & Turvania, 2015). Agricultural land has become a global resource, shared not only between local communities but also between multinational companies from different countries. The main drivers for the growth of investment in agricultural land globally can be traced back to: the need to secure a reliable food supply in the long term; the growing demand for biofuels, especially in the US and the European Union; and speculation about the future appreciation of agricultural land. Proximity to export markets is not in itself a driver but determines where these investments are allocated (De Schutter, 2009). Discussions on these investments reflect, on the one hand, the opportunities and risks that accompany these investments and, on the other hand, highlight their negative impacts on local natural resource use.

Nationally, investment in agricultural land is driven mainly by the need to expand agricultural production and by increasing returns in the form of rents. In the last ten years, agricultural land has been one of the best investments. For the last 5 years, a 36,9% appreciation has been recorded for arable land, while in the period 2010 - 2020 the increase is of the national average 273%. Of course, increases vary from district to district, and the same can be said for the price of land. For the period after 2010, the ratio between land price and land rent increases annually and reaches 19,8 for 2019.(Stanimirova M. , 2021). The country's introduction of direct payments in 2015 has put significant pressure on the land market, boosting returns on land investment and increasing demand for it. For the period after 2010 to 2021, the average increase in the price of agricultural land for the country is between 4% and 14% per year. In rent alone, for example, over the period from 2018 to 2021, incomes have risen from 490 BGN per hectare to 570 BGN per hectare, according to data from the Bulgarian Association of Farmland Owners. Several large private investment funds have also started to operate on the agricultural land market, further increasing demand for land.

The pandemic of the last two years has triggered a series of crises that have had a serious impact on economic life and financial flows. Global supply problems, the economic recovery in 2021 and the rise in energy prices have awakened serious inflationary processes. While other markets are experiencing high-risk dynamics, farmland and agribusiness are proving to be an undervalued asset. In recent years, investment in agriculture has grown at an avalanche rate. Farmland is not only bought to produce various crops that are sold at a profit on world markets. But it also brings sustainable and predictable development potential. Investment in farmland and agribusiness not only complements opportunities for security and growth of savings and financial capital, but also has a number of advantages. Since Bulgaria's accession to the EU, capital investment in this market has proven to be one of the most stable. In addition to profits from land price increases, investors expect cash flows from rents or subsidies. Land users - due to political and economic uncertainty and probably for purely savings reasons - are increasingly resorting to land purchases. This creates a constant demand, but with a shortage of supply, turns this real estate into a valuable asset.

Agricultural business is traditional with a continuous demand for the products produced. In addition, agriculture is also supported under the Common Agricultural Policy. Although investments in agriculture are associated with high risks, good organisation of production can create the conditions for good profits, ensuring a favourable return on investment.

It can be summarized that the purchase of agricultural land in Bulgaria has become a good investment. Besides the economic factors related to agricultural production, the reduction of interest rates in the economy has supported the demand for agricultural land. According to Vlaev, (Vlaev,

2020), buying agricultural land with a bank loan started to make more economic sense than renting it and some agribusinesses started to seek bank financing for land purchase. It is reported that, after 2015, rents paid for land exceeded interest payments for bank loans, which appears to be a significant incentive to finance land purchase with long-term financial instruments (Vlaev, 2021).

In the context of the above, the main objective of the paper is, starting from the specificity of agricultural land as a productive resource for agricultural production and from the direction of the demand for capital for its purchase, to investigate the efficiency of the investment financed by bank credit and to determine the limits within which a positive return is provided. The analysis includes: a literature review; a study of the characteristics of land as a productive resource; a study of the direction for investing in the purchase of land and the supply and demand for finance; the identification of the main constraints and the methodological framework for assessing the effectiveness of investment in the purchase of agricultural land; a study of the financial and economic efficiency of an investment in agricultural land financed through a financial instrument (bank credit).

1. Thesis statement and literature review

The literature review and evaluation shows various aspects of farmland investment, but not enough studies are provided on the effectiveness of farmland investment. Globally, investments follow agricultural and energy policies (Antonellia, Siciliano, & Turvania, 2015), particularly in the European Union countries, with attention being paid to competition between food and biofuel production. Although transnational investment in land is increasing (Han, Jiang, Zhang, & Lu, 2021), the main research area is investment to improve land use and agricultural production. The effects of land tenure and interventions on agricultural productivity, income and other outcomes have been studied (Lawrya, et al., 2017). There is a perception that investments in agriculture, including investments in agricultural land, should focus on building responsible and sustainable food systems (FAO, 2014). Globally, investment in agricultural land will continue to grow, as evidenced by the positive trend in land supply and demand. At the same time, the role of land as an asset is strengthening and becoming an increasingly compelling investment opportunity because it offers potentially stable income, good returns and protection from inflation (Nuveen, n.d.).

The Bulgarian literature focuses more on land prices, rents and land use and their impact on investment in agricultural land. Trends in the development of land rental prices in Bulgaria and the factors that determine its value are thoroughly studied by Stanimirova (Stanimirova M. , 2021) and Mihailova (Mihailova, 2022). It is argued that the average rate of increase in rent should not exceed the average rate of increase in the price of agricultural land in order not to create a disparity between rent and price and land. A high degree of capitalisation of agricultural land and a return on investment in land in the range of 2 to 14 years is considered (Mihailova, 2022). Stabilization of land rent and land price growth rates in Bulgaria is highly dependent on the institutional norm (Mihailova, 2022), direct payments under the CAP (Yovchevska, Mihailova, & Koteva, 2022), economic cycles, access to credit (Vlaev, 2021), the tax system (Ivanova, 2021).

The impact of credit on agricultural investment activity in European Union countries has been thoroughly studied by the European Commission and the European Investment Bank (fi-compass, 2020 a). Demand for loans for investment in agricultural land in the EU accounted for 17% of total loans for agriculture and 29% for land improvements. In Bulgaria, loan demand for land investments and land improvements is 15% and 11% respectively (fi-compass, 2020 b). The literature review revealed considerable research on the methodological significance of credit on agricultural sector productivity (Sakhno, Polishchuk, Salkova, & Kucher, 2019), (Kirechev, 2019). Global experience has been explored to assess opportunities for financial support to shape sustainable and competitive land use (Kucher, 2022) and methodological bases for the evaluation of investment alternatives in land use in agricultural enterprises (Kucher, 2018). Research on local conditions for access to financial services for farmers in need of specialized investment products, lower level of deductibles, optimal loan terms, financing cost concessions (Vlaev, 2021), and the supply and demand of finance

for agricultural enterprises (Kirechev, 2021). A business model for evaluating land purchase and rental comparisons is explored (Vlaev, 2020). Its results address the need to identify and build the right strategy in agribusiness enterprises, land pricing trends and processes.

The literature review provides a basis for summarizing that investments in agricultural land are important and determinant for the development of agricultural holdings, as well as for the realization of investment opportunities of individual investors seeking returns and inflation protection. Investments should be made in accordance with the principles of economic viability and reflect all the factors that determine and change them. The assessment of the economic efficiency of investment decisions in the acquisition of agricultural land will be determined to a significant extent by the level of the price of land, the level of rental income, the income from agricultural production, the tax system, the level of support, inflationary processes, etc.

2. Materials and methods

The methodology of the study includes an investigation of the economic efficiency of purchasing agricultural land in Bulgaria. The evaluation focuses on farmers who acquire land in order to carry out agricultural activities, rather than on investors who acquire land in order to earn rental income. The approach taken is that the financing of the land purchase is through a bank loan, on terms average for the country as set by commercial banks.

A methodological sequence in the computational procedures is given in the following order:

1) Determined the annual loan payment, including interest payments and loan payments (on the example of equal annuity payments).

2) The profit with subsidy per acre, not including the annuity, is determined.

3) Changes in profit if the farm pays rent rather than acquires its own land are shown for comparison. In practice, rent does not indicate an influence in the calculation procedures, but it matters in the analysis given that if the land is owned no rent will be paid for its use.

4) In connection with the calculation of the net present value of the land investment, we determine in advance the residual value of the land at the end of the investment period. The residual value of the land (given that it is not depreciated, is assumed to be as much as the purchase price, but increased by 3% per year, according to the years of credit. After the calculation of the residual value, the land's present value is calculated, given the need to include it in the calculation of the net present value.

5) The computational procedures conclude with the measurement of the net present value of the investment financed by the bank loan.

The model for evaluating the efficiency of land purchase with bank credit has the following limiting conditions. First, the applicability is valid in field production when the land is used within one year and provides annual income. This creates a prerequisite for including the residual value of the land in the model to provide a capital income opportunity if the investor decides to sell the land on the open market. Secondly, in the case of vegetable production (with cultivation facilities) and perennial crops, the possibility to include the residual value of the land in the valuation is limited, given the more difficult possibility to change its use. In this case, the residual value should be excluded from the valuation. Third, inflation and changes in crop prices are not assessed. Inflationary developments will be reflected in changes in interest rates to finance the investment and increase the rate of return required by investors. Changes in agricultural commodity prices are likely to be the result of increased costs, and are therefore not accounted for, but are dealt with in terms of the absolute amount of profit realised per unit area of agricultural land.

3. Results and discussion

Land is a specific resource for agricultural production, possessing a number of qualitative characteristics defined as follows:

Earth is a product of nature and is formed by complex natural processes.

– Land can hardly be replaced as a factor of production for agricultural production.
– Agricultural land has important qualitative characteristics related to its fertility.
– Agricultural land is considered specifically in its market valuation: its supply is relatively constant and its demand is the result of a variety of factors.
– The use of agricultural land is seasonal, being actively influenced by natural and climatic factors and conditions.
– Land is spatially immobile. Land management activities can result in changes in the functional use of land.
– Land has unique characteristics due to its heterogeneous nature (quality, topography, remoteness, etc.).
– Land does not depreciate, unlike other tangible fixed assets.
– The acquisition of land can be seen as a costly investment given the significant financial outlay that investors have to make to acquire it.
– Land provides its owners with security and protection.

These characteristics determine its specific relations that arise in its evaluation as a factor of production and should be considered in connection with the evaluation of the investment activity of agricultural holdings.

Currently, the demand for finance in Bulgarian farms is mainly determined by the need for working capital, investments in modernization and land purchase (fi-compass, 2020 b). At the same time, Bulgarian farms' liabilities are growing faster than assets, as farmers use more loans than savings to cover their financial needs (Kirechev, 2021). Small farms (less than 20 ha in size) are particularly sensitive in receiving funding and often feel discouraged to apply in order not to be rejected. As for young farmers (under the age of 40), they face various obstacles in seeking funding, including a reduction in extension activities.

In the report of the European Commission and the European Investment Bank (fi-compass, 2020 b) the gap in agricultural financing is estimated at between €289 million and €863 million, with the greatest need for financing identified for small farms (under 20 ha), which have the most frequent and greatest difficulties in accessing finance. The financing gap is identified as being greatest for long-term loans. The survey showed that over 42% of farms sought finance, with 16,9% from banks, 13,9% from private sources (non-banks, relatives and friends) and 5,2% from mixed sources.

The difficulties experienced by Bulgarian farmers are reflected in their demand for finance, which is determined by the following main aspects: working capital needs (67%); modernization of agricultural enterprises (construction of buildings, purchase of machinery and equipment) (63%); purchase of additional (arable) land (29%); implementation of technological improvements in land use (17%)(fi-compass, 2020 b). Farm business succession has also played an important role in the investment needs and financial decisions of farms over the past decade.

Purchasing land is a key element in the search for finance is aimed at increasing production capacity, but plots of good size and location are currently hard to find. Over the period 2010-2019, the average price of land tripled and land rents more than doubled. The ratio between land price and land rent reached 19,8 in 2019 (Stanimirova M. , 2021). Significant demand for land followed by rising prices (especially in the regions of Northern Bulgaria) have predetermined the need to expand financing in land purchase. Often, in order to develop, farmers cultivate land in different territories, which leads to an increase in the costs of both production and the production process as a whole. This is a major barrier to entry for new entrants into the sector, especially for young farmers and livestock farms. Demand for land has led to an increase in arable land in the country and direct payments have further stimulated investment in land.

According to the Bulgarian National Bank, the financial sector in Bulgaria comprises a large number of finance providers, including 26 commercial banks, 26 credit cooperatives, 208 non-bank financial institutions and 1 guarantee fund. Commercial banks are the main providers of credit for agricultural development, with half of them offering credit products to farms.

Commercial banks offer loans to farmers for both investment and working capital needs. Given the structure of agricultural production, banks are mainly focused on offering credit products to grain and oilseed farmers, grape and wine producers and, to a lesser extent, vegetable and livestock producers. Some of the commercial banks also offer products for young farmers to start and develop their agribusiness, provided that they have negotiated a grant under the RDP, which reduces the risk for the banks in lending to them.

The main features of the loans for the purchase of agricultural land offered by Bulgarian commercial banks are generally as follows:

- Maturity - 5 to 15 years;
- Grace period - up to 12 months;
- Repayment - according to an individual plan (in equal instalments or equal parts of the principal);
- Collateral - pledge of property and/or purchased land;
- Interest rates - between 3.5 and 5% annual interest rate.

For the purpose of estimating the income from agricultural activity, a sample of the main agricultural crops included in the production structure of Bulgarian agricultural holdings is presented, which will serve to determine the profit per dka for the needs of the model (the income values are at current prices as of mid-2022, the cost values are according to organizational-technological maps as of mid-2022, and the yields are based on average yields for the country). The crops selected are mainly grain and oilseed production, as well as vegetables grown outdoors (Table 1). Vegetables and perennial crops, which are not desirable to include in the model given the permanent commitment of the land, are also presented for example only.

Table 1. Yield per dka for different crops

Crop	Yield (kg/dka)	Unit price (BGN/kg)	Revenue (BGN/dka)	Average cost (BGN/dka)	Profit (BGN/dka)	Profitabi-lity based on cost
Soft wheat	600	0,62	372	185	187	101%
Maize grain - non-irrigated	650	0,58	377	165	212	128%
Barley	540	0,48	259,2	145	114,2	79%
Sunflower	270	1,24	334,8	150	184,8	123%
Canola	250	1,10	275	155	120	77%
Potatoes	2000	0,55	1100	900	200	22%
Tomatoes - open field	4500	0,80	3600	2200	1400	64%
Pepper - open field	3000	0,65	1950	1200	750	63%
Apples - full fruiting	1000	0,80	800	550	250	45%
Apricot	1000	1,00	1000	700	300	43%

For the purposes of the model for assessing the financial efficiency of an investment in the purchase of land financed by a bank loan, the following indicative conditions for assessing the efficiency of the investment are defined:

1) Land price - options have been developed from 600 BGN/dka to 2600 BGN/dka in increments of 200 BGN.

2) Term of the loan - from 5 to 15 years.

3) Annual cost rate (interest payment) - 4%.

4) For the purpose of calculations, lump sum annual repayments have been used. In the option where monthly payments are applied, the interest payments per year decrease slightly, which reduces the annual payment by about 1,5%.

5) Variations of profits per acre have been developed, ranging from BGN 80 to BGN 200, based on the income from production per acre and the costs of materials and labour (using the example of arable crops);

6) A subsidy of BGN 35 per dka has been foreseen, and for the purposes of the calculations, this amount is not changed. In a scenario in which the subsidies increase, the effect will be positive.

7) A level of rent payment has been set, based on the market valuation approach, with rent being subject to valuation as a cost that reduces the financial result and the farm would not make if it had its own land (the effect of saved rent costs is considered). For the purposes of the example valuation, the rate of return required by the investor is assumed to be the cost of borrowing, i.e. 4%

8) The fees associated with the provision of the loan are included in the annual percentage rate of charge determined.

On the basis of the defined methodological framework, the following conditions are set to assess the effectiveness of the investment:

1) Land Price - the perceived fundamental basis for valuing agricultural land as a resource providing perpetual income. The rent payment is set in equal instalments and the required return is constant without increasing:

$$Price\ of\ land = \frac{Rent\ payment}{Required\ rate\ of\ return\ to\ the\ investor} \qquad (1)$$

2) Determination of the rental payment:
$$Rent\ payment = Price\ of\ land \times Required\ rate\ of\ return\ to\ the\ investor \qquad (2)$$

3) A growth in land price over the next 15 years of 3% per annum is assumed, calculated on the basis of the front-end change in land price over the last 3 years (according to the National Statistical Institute), which increases the residual value of land.

4) A discount rate of 4% was chosen to update the cash flows, based on the average borrowing cost rate. The required rate of return for projects financed by structural funds is similar. A determining factor is that, in an environment of inflationary expectations, the discount rate may rise.

On the basis of the research framework outlined in the methodology and the additional conditions presented, one can proceed to clarify the computational procedures.

1) Establish the annual loan payment as a flat payment determined under different loan amount and repayment term options (Table 2). The cost of land per acre is also the loan amount. Alternatives ranging from BGN 600/dka to BGN 2,600/dka have been developed and the different price allows for differences in the quality of the land and the area in which agricultural activity takes place. The repayment period considers options with loan maturities ranging from 5 to 15 years, with annual rather than monthly repayments to simplify calculation procedures.

2) Determine net income with subsidies, excluding rent (Table 3). Considering the possibility to benefit from direct payment subsidies, which are in the nature of farm income, different options of farm profits and loan amount are determined. The loan amount is set according to the land price in the range of BGN 600 to BGN 2,600 per dka and the net income per dka is set in the range of BGN 80 to BGN 200. The different amount of net income will depend on the different production structure of the farms. To the profit per acre is added the sum of BGN 35 subsidies in the form of direct payments (defined as the average subsidy per acre for 2022, excluding other subsidies and tax remitted). Rent is not considered as the farmer is the owner and does not have to pay to rent land.

Table 2. Annual loan payment for different loan options by size and term, BGN

		Price per dka (loan amount)										
		600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600
Loan repayment term (years)	**5**	135	180	225	270	314	359	404	449	494	539	584
	6	114	153	191	229	267	305	343	382	420	458	496
	7	100	133	167	200	233	267	300	333	367	400	433
	8	89	119	149	178	208	238	267	297	327	356	386
	9	81	108	134	161	188	215	242	269	296	323	350
	10	74	99	123	148	173	197	222	247	271	296	321
	11	68	91	114	137	160	183	205	228	251	274	297
	12	64	85	107	128	149	170	192	213	234	256	277
	13	60	80	100	120	140	160	180	200	220	240	260
	14	57	76	95	114	133	151	170	189	208	227	246
	15	54	72	90	108	126	144	162	180	198	216	234

Table 3. Net income including subsidies under different land price options and net income per dka with subsidies, BGN

		Price per dka (loan amount)										
		600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600
Net income per dka	**80**	115	115	115	115	115	115	115	115	115	115	115
	90	125	125	125	125	125	125	125	125	125	125	125
	100	135	135	135	135	135	135	135	135	135	135	135
	110	145	145	145	145	145	145	145	145	145	145	145
	120	155	155	155	155	155	155	155	155	155	155	155
	130	165	165	165	165	165	165	165	165	165	165	165
	140	175	175	175	175	175	175	175	175	175	175	175
	150	185	185	185	185	185	185	185	185	185	185	185
	160	195	195	195	195	195	195	195	195	195	195	195
	170	205	205	205	205	205	205	205	205	205	205	205
	180	215	215	215	215	215	215	215	215	215	215	215
	190	225	225	225	225	225	225	225	225	225	225	225
	200	235	235	235	235	235	235	235	235	235	235	235

3) Determine the change in net income with subsidies under the different options, considering the rent payment (Table 4). The rent payment is calculated using formula (1). It is established for comparison only, to track changes in income if rent has to be paid (for rented land without having to purchase).

4) Determine the residual value of the land (incremental value at the end of the relevant credit year) (Table 5). For the purpose of evaluating the performance of the investment, it is necessary to consider the residual value of the land at the end of the loan term that the investor could obtain if he sold the land at the end of the loan term. The residual value is a potential capital gain for the investor. The model assumes an average annual growth in land price for the next 15 years of 3% per annum. The incremental value at the end of the relevant year of the loan is determined by the future value (FV) of capital (cost per acre) formula (C), with r (rate of increase equal to 3%) and n (years):

$$FV = C \times (1 + r)^n \tag{3}$$

Table 4. Net income including subsidies under different rent payment options, BGN

Rent per dka		600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600
		24	32	40	48	56	64	72	80	88	96	104
Net income per dka	80	91	83	75	67	59	51	43	35	27	19	11
	90	101	93	85	77	69	61	53	45	37	29	21
	100	111	103	95	87	79	71	63	55	47	39	31
	110	121	113	105	97	89	81	73	65	57	49	41
	120	131	123	115	107	99	91	83	75	67	59	51
	130	141	133	125	117	109	101	93	85	77	69	61
	140	151	143	135	127	119	111	103	95	87	79	71
	150	161	153	145	137	129	121	113	105	97	89	81
	160	171	163	155	147	139	131	123	115	107	99	91
	170	181	173	165	157	149	141	133	125	117	109	101
	180	191	183	175	167	159	151	143	135	127	119	111
	190	201	193	185	177	169	161	153	145	137	129	121
	200	211	203	195	187	179	171	163	155	147	139	131

Table 5. Residual value of the land at the end of the relevant credit year, BGN

		Price per dka (loan amount)										
		600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600
Loan repayment term (years)	5	696	927	1159	1391	1623	1855	2087	2319	2550	2782	3014
	6	716	955	1194	1433	1672	1910	2149	2388	2627	2866	3105
	7	738	984	1230	1476	1722	1968	2214	2460	2706	2952	3198
	8	760	1013	1267	1520	1773	2027	2280	2534	2787	3040	3294
	9	783	1044	1305	1566	1827	2088	2349	2610	2871	3131	3392
	10	806	1075	1344	1613	1881	2150	2419	2688	2957	3225	3494
	11	831	1107	1384	1661	1938	2215	2492	2768	3045	3322	3599
	12	855	1141	1426	1711	1996	2281	2566	2852	3137	3422	3707
	13	881	1175	1469	1762	2056	2350	2643	2937	3231	3524	3818
	14	908	1210	1513	1815	2118	2420	2723	3025	3328	3630	3933
	15	935	1246	1558	1870	2181	2493	2804	3116	3428	3739	4051

5) Determine the present value of the residual value of the land at the end of the relevant year (the incremental value at the end of the relevant credit year) (Table 6). For the purpose of estimating the net present value of the investment, the incremental residual value needs to be updated to the time of the valuation, i.e. to the present. This will be done through the process of discounting, the incremental residual value (C_n), to present value (PV), using the formula:

$$PV = C_n \times \frac{1}{(1+r)^n} \tag{4}$$

6) Determine the financial impact of the investment. The financial efficiency of the investment will be established using the concept of Net Present Value (NPV), expressing the excess of the expected proceeds of the investment over the costs. A positive NPV value expresses the financial viability of the investment decision. The calculation of the NPV is carried out according to the formula:

$$NPV = -C_0 + \frac{NCF_1}{(1+r)^1} + \frac{NCF_2}{(1+r)^2} + \ldots + \frac{NCF_n}{(1+r)^n} + \frac{AO}{(1+r)^n} = -C_0 + \sum_1^n \frac{NCF_i}{(1+r)^n} + \frac{AO}{(1+r)^n} \tag{5}$$

C_o – investment costs (the cost of a loan to buy one dka of agricultural land);

$NCFi$ – Net cash flows by year of project implementation for years 1 to n (calculated on the basis of net income including subsidies (Table 3) fewer borrowing costs (Table 1). It should be noted that the tax effect of the tax reduction due to the interest payments is not considered;

AO – residual value at the end of use of the asset (calculated on the basis of the incremental residual value using the data in Table 5);

r – discount rate (set for valuation purposes at 4%).

Table 6. Present value of the residual value of the land at the end of the relevant credit year, BGN

		Price per dka (loan amount)										
		600	**800**	**1000**	**1200**	**1400**	**1600**	**1800**	**2000**	**2200**	**2400**	**2600**
Loan repayment term (years)	**5**	572	762	953	1143	1334	1525	1715	1906	2096	2287	2477
	6	566	755	944	1132	1321	1510	1699	1887	2076	2265	2454
	7	561	748	935	1122	1308	1495	1682	1869	2056	2243	2430
	8	555	740	926	1111	1296	1481	1666	1851	2036	2221	2407
	9	550	733	917	1100	1283	1467	1650	1833	2017	2200	2383
	10	545	726	908	1089	1271	1453	1634	1816	1997	2179	2361
	11	540	719	899	1079	1259	1439	1619	1798	1978	2158	2338
	12	534	712	891	1069	1247	1425	1603	1781	1959	2137	2315
	13	529	706	882	1058	1235	1411	1588	1764	1940	2117	2293
	14	524	699	873	1048	1223	1398	1572	1747	1922	2096	2271
	15	519	692	865	1038	1211	1384	1557	1730	1903	2076	2249

Three variants of Net Present Value estimation are developed for an investment in one acre of agricultural land financed with a bank loan for a period of 5 years (Table 7), 10 years (Table 8) and 15 years (Table 9). The areas of positive Net Present Value, under different variations of land price (loan term) and net income per acre are identified.

Table 7. Determining the financial performance of the investment (NPV) for a 5-year loan

		Investment cost determined on the basis of land cost per dka										
		600	**800**	**1000**	**1200**	**1400**	**1600**	**1800**	**2000**	**2200**	**2400**	**2600**
Net income per dka	**80**	-116	-326	-535	-745	-954	-1163	-1373	-1582	-1792	-2001	-2211
	90	-72	-281	-491	-700	-910	-1119	-1328	-1538	-1747	-1957	-2166
	100	-27	-237	-446	-656	-865	-1074	-1284	-1493	-1703	-1912	-2122
	110	17	-192	-402	-611	-821	-1030	-1239	-1449	-1658	-1868	-2077
	120	62	-148	-357	-567	-776	-985	-1195	-1404	-1614	-1823	-2033
	130	106	-103	-313	-522	-731	-941	-1150	-1360	-1569	-1779	-1988
	140	151	-59	-268	-478	-687	-896	-1106	-1315	-1525	-1734	-1944
	150	195	-14	-224	-433	-642	-852	-1061	-1271	-1480	-1690	-1899
	160	240	30	-179	-388	-598	-807	-1017	-1226	-1436	-1645	-1855
	170	284	75	-135	-344	-553	-763	-972	-1182	-1391	-1601	-1810
	180	329	119	-90	-299	-509	-718	-928	-1137	-1347	-1556	-1765
	190	373	164	-46	-255	-464	-674	-883	-1093	-1302	-1512	-1721
	200	418	208	-1	-210	-420	-629	-839	-1048	-1258	-1467	-1676

Table 8. Determining the financial performance of the investment (NPV) for a 10-year loan

		Investment cost determined on the basis of land cost per dka										
		600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600
Net income per dka	80	277	59	-159	-378	-596	-815	-1033	-1251	-1470	-1688	-1907
	90	359	140	-78	-297	-515	-733	-952	-1170	-1389	-1607	-1826
	100	440	221	3	-216	-434	-652	-871	-1089	-1308	-1526	-1744
	110	521	302	84	-134	-353	-571	-790	-1008	-1227	-1445	-1663
	120	602	384	165	-53	-272	-490	-709	-927	-1145	-1364	-1582
	130	683	465	246	28	-191	-409	-627	-846	-1064	-1283	-1501
	140	764	546	327	109	-110	-328	-546	-765	-983	-1202	-1420
	150	845	627	408	190	-28	-247	-465	-684	-902	-1121	-1339
	160	926	708	490	271	53	-166	-384	-603	-821	-1039	-1258
	170	1007	789	571	352	134	-85	-303	-521	-740	-958	-1177
	180	1089	870	652	433	215	-4	-222	-440	-659	-877	-1096
	190	1170	951	733	514	296	78	-141	-359	-578	-796	-1015
	200	1251	1032	814	596	377	159	-60	-278	-497	-715	-933

Table 9. Determining the financial performance of the investment (NPV) for a 15-year loan

		Investment cost determined on the basis of land cost per dka										
		600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600
Net income per dka	80	598	371	144	-83	-310	-537	-764	-991	-1218	-1445	-1672
	90	709	482	255	28	-199	-426	-653	-880	-1107	-1334	-1561
	100	820	593	366	139	-88	-315	-542	-769	-996	-1223	-1450
	110	931	704	477	250	23	-204	-431	-658	-885	-1112	-1339
	120	1042	815	588	361	134	-93	-319	-546	-773	-1000	-1227
	130	1154	927	700	473	246	19	-208	-435	-662	-889	-1116
	140	1265	1038	811	584	357	130	-97	-324	-551	-778	-1005
	150	1376	1149	922	695	468	241	14	-213	-440	-667	-894
	160	1487	1260	1033	806	579	352	125	-102	-329	-556	-783
	170	1598	1371	1144	917	690	463	236	9	-218	-445	-672
	180	1710	1483	1256	1029	802	575	348	121	-106	-333	-560
	190	1821	1594	1367	1140	913	686	459	232	5	-222	-449
	200	1932	1705	1478	1251	1024	797	570	343	116	-111	-338

The model can also be adapted for individual investors in agricultural land, as their net income will be determined only by the level of rent payments. However, the calculations show (Table 9) that the purchase of agricultural land with a bank loan for investors who will not be operating a business is not financially efficient.

Table 9. Determining the financial efficiency of an investment in land financed by a bank loan for individual owners who expect only rental income, BGN

		Investment cost determined on the basis of land cost per dka										
		600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600
Rent per dka		24	32	40	48	56	64	72	80	88	96	104
Year	5	-521	-695	-869	-1043	-1217	-1391	-1564	-1738	-1912	-2086	-2260
	10	-461	-740	-925	-1110	-1295	-1480	-1665	-1850	-2035	-2220	-2405
	15	-414	-707	-884	-1061	-1238	-1414	-1591	-1768	-1945	-2122	-2298

Conclusion

Land purchase is an important aspect of farm investment activity, with almost 1/3 of demand for finance directed in this direction.

There are ample financial opportunities to finance land purchase from bank and private funds.

Land purchase decisions should be based on the economic viability of bringing current income as an asset from agricultural activity.

The economic viability of an investment in land purchase through financial instruments varies inversely with changes in the price of land and in direct proportion to the expected net income per acre: When financing with a 5-year loan, the price limits ensuring the efficiency of the investment (in the example) are 600-800 BGN, at any level per unit of net income per acre above 160 BGN/dka; In the case of financing with a 10-year loan, the price limits ensuring the efficiency of the investment (by way of example) are BGN 600-1600, at any level per unit net income per dka above BGN 80/dka; In the case of 15-year loan financing, the price limits ensuring the efficiency of the investment (by example) are BGN 600-2200 at any level per unit net income per dka above BGN 80/dka.

The proposed investment appraisal framework can be successfully used by farms to justify the appropriateness of investment decisions. The ability to program the model would create a tool for easier decision making by farms.

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