

**Czech University of Life Sciences Prague**  
**Faculty of Economics and Management**  
**Department of Economics and Management**



## **Bachelor Thesis**

**Analysis of development of agricultural-land prices in  
the Czech Republic**

**Antonín Juřík**

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# CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

## BACHELOR THESIS ASSIGNMENT

Antonín Juřík

Economics and Management

Thesis title

Analysis of development of agricultural-land prices in the Czech Republic

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### Objectives of thesis

The objective of this bachelor thesis is to analyse and evaluate the agricultural land market with a focus on the development of agricultural land prices. With a professional literature and journals will be built relevant analysis and comparison with other economic aspects. Goal of this thesis is to create overview historic development of price for land. Bring comparison with neighbouring countries and selected economical attributes to draw complex picture of land price in nowadays economy.

### Methodology

The thesis is divided into the theoretical and analytical parts. The first part, theoretical, will contain a detailed description of the agricultural land itself, its natural and ecological attributes. It will include a general definition of the agricultural fund, together with a description of soil types in the Czech Republic and the division of areas with natural constraints.

Practical part comparing price of land with chosen factors of Czech economy provided by Czech statistical office. By charts will be compared selected European countries with explanation of the trends.

The proposed extent of the thesis

30-40 pgs

Keywords

land, price, farmland, Czech, Europe, bpej, ecological, natural, yield, correlation, inflation, investment

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Recommended information sources

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## **Declaration**

I declare that I have worked on my bachelor thesis titled "Analysis of development of agricultural-land prices in the Czech Republic" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break any copyrights.

In Prague on date of submission

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### **Acknowledgement**

I would like to thank the supervisor of this thesis, Dr. Petr Wawrosz for his feedback and useful tips. Special thanks to Farmy.cz for an excellent overview of the agriculture real estate market.

# **Analysis of development of agricultural-land prices in the Czech Republic**

## **Abstract**

The work deals with the development of agricultural land prices in the Czech Republic. It summarizes the initial parameters for soil assessment based on economic and natural ecological criteria. Methods for calculating fertility and soil, which is also essential for determining the official price of land, are discussed. In the practical part, the average price of agricultural land will be compared with the price in some European countries. A more detailed comparison with the description of local specifics will be performed for selected countries. The average annual price will be compared with key economic factors as gross domestic product and inflation. At the end of the work, the land market is evaluated, and a forecast of further development will be made from the obtained data. This work can be a useful resource for people interested in agriculture, landscape, or real estate investment.

## **Keywords:**

land, price, farmland, Czech, Europe, bpej, ecological, natural, yield, correlation, inflation, investment

# **Analýza vývoje ceny zemědělské půdy v České republice**

## **Abstrakt**

Práce se zabývá vývojem ceny zemědělské půdy v České republice. Jsou zde shrnuty výchozí parametry pro hodnocení půd na základě hospodářských a přírodně ekologických kritérií. Dále jsou rozebrány metody výpočtu úrodnosti a půdy které je zásadní pro stanovení úřední ceny půdy. V praktické části bude průměrná cena zemědělské půdy porovnána se cenou v některých evropských zemích. Pro vybrané země bude provedeno podrobnější srovnání s popisem lokálních specifík. Průměrná roční cena bude porovnána se některými ekonomickými faktory jako jsou HDP, inflace, .... V závěru práce bude hodnocen trh s půdou jako celek a ze získaných dat učiněna prognóza dalšího vývoje. Tato práce může být užitečným zdrojem pro čtenáře se zájmem o zemědělství, krajinu či investice do realit.

## **Klíčová slova:**

Pozemek, cena, orná půda, Česko, Evropa, BPEJ, ekologie, přírodní, výnos, korelace, inflace, investice

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## List of abbreviations

BPEJ	Assessment of agricultural soil price and quality
BSM	Soil classification research
ČSÚ	Czech statistical office
Destatis	Federal Statistical Office of Germany
Eurostat	Statistical office of the European Union
GDP	Gross domestic product
KÚ	Cadastral area
Výmop	Research Institute for Soil and Water Conservation

# 1 Introduction

Agriculture land is a crucial part of the agricultural sector with overlap to the real estate market. It is greatly influenced by agricultural production and the overall economic output of a country. Higher intensity of agricultural production is in the most of world connected with a higher price of land and a higher level of protection of soil itself. Following chapters will be focusing on trends of price development with regards to price-setting factors.

The thesis is divided into two parts. The theoretical part is focused on the description of the land funds in the Czech Republic. Classification of land parcels based on their agronomical and economical attributes and how these parameters influence price of land parcels. The practical part will compare prices with selected European countries and explained trends. Also, there will be examined development of agricultural land price with selected economic factors in the Czech Republic to decide, if there was a correlation.

Ownership and usage of agricultural land in the Czech Republic went through a turbulent and unstable 20<sup>th</sup> century where Czech land parcels experienced four major changes in ownership. It was the confiscation of nobility property after 1918. Confiscation of the property of displaced German citizens of former Czechoslovakia. Soon after, starting from 1948 there was collectivization of farming along with the nationalization of all industries and services. Besides other effects, this led to the creation of large farms which dominates the domestic primary sector till the present day. And in the 1990s there were large restitutions mainly for property nationalized after 1948. These all events led to complicated land ownership and tear traditional connection of land and farmer. (Průchová, 1997)

## **2 Objectives and methodology**

The objective of this bachelor thesis is to analyse and evaluate the agricultural land market with a focus on the development of agricultural land prices. The work outlines the essential concepts associated with agricultural land and identifies the main factors influencing the growth of agricultural land prices. With a professional literature and journals will be built relevant analysis and comparison with other economic aspects. Goal of this thesis is to create overview historic development of price for land. Bring comparison with neighbouring countries and selected economical attributes to draw complex picture of land price in nowadays economy.

The final work is divided into the theoretical and analytical parts. The first part, theoretical, will contain a detailed description of the agricultural land itself, its natural and ecological attributes. It will include a general definition of the agricultural fund, together with a description of soil types in the Czech Republic and the division of areas with natural constraints. An important part of the first part of the final work will be the general valuation of land, then focused on agricultural land in the form of valuation. The second component of the theoretical part will contain a description of the land market and an outline of the current situation of supply and demand of agricultural land during the pandemic. The method of secondary data collection and comparison will be used in the theoretical part.

Practical part of this thesis will provide a comparison of land prices in the Czech Republic with selected economic factors and bring possible explanations of discovered correlations. There will be also compared prices of agricultural land with prices in selected countries with a comparison of the agronomical and economical specifics of those countries.

## **3 Literature Review**

### **3.1 Agricultural-land prices in the Czech Republic**

Agricultural land had always, during modern history, high value due to its capability to grow crops. Main factors for price setting were approximately the same, agronomical attributes and geographical location. Later came to the fore its prospective usage as a building plot. Today, at the beginning of 2022, there is trend of seeking various investments to protect spare money against inflation. One of those investment possibilities is farmland. Land parcels can be owned directly either by natural persons or legal entities. On an investment market operates many property funds offering investment in mixed portfolios including farmland. ("ZPRÁVA O TRHU S PŮDOU za rok 2021", 2022)

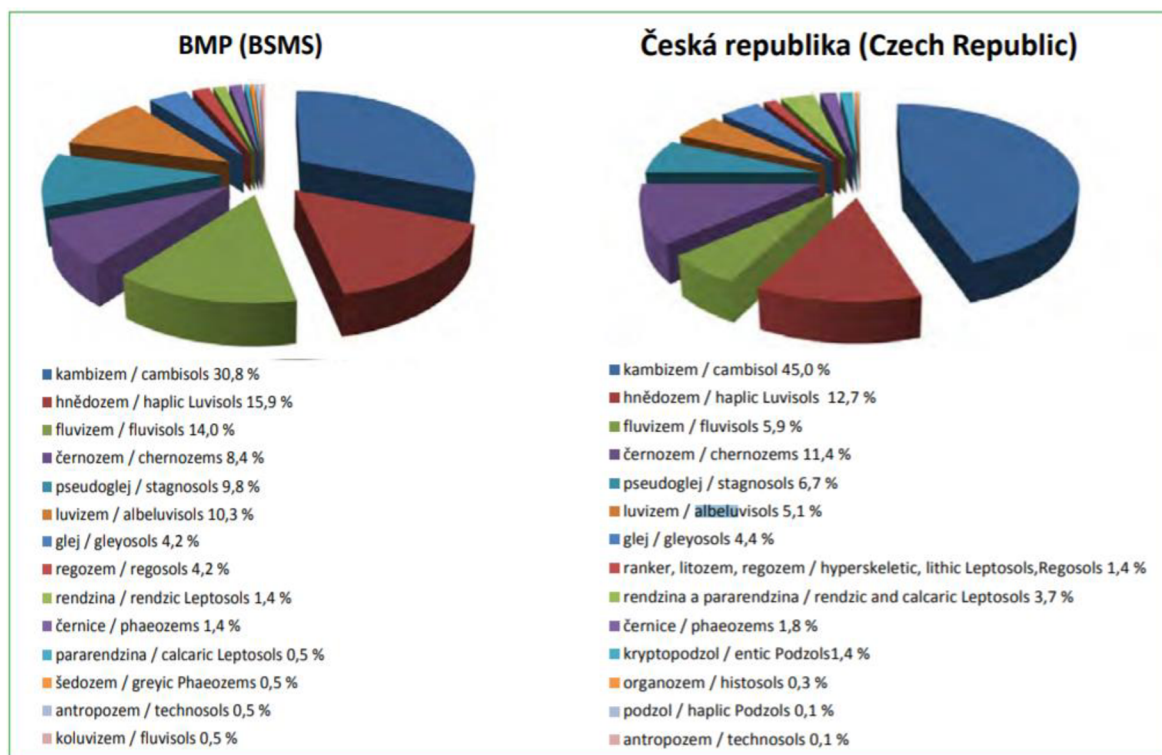
In the following subchapters will be described main factors setting a final price. There will be described agricultural attributes and location which are base for official price set by ministry of agriculture. Also, will be explained economic factors which have great influence on the final market price.

### **3.2 Price setting factors**

#### **3.2.1 Soil classification**

Agricultural-land parcels across the country are covered with different types of soil. Often multiple soil types are present on one cadastral parcel. The most common kinds of soil present are cambisol, brown earth, black earth, pseudogley, fluvisol, and luvisol. (Šimek, 2019) Bellow following two pie charts showing the distribution of particular soil types. On the left side is a chart representing share of soil types among measuring reference plots. This information is rather useful pedological research. For purpose of farmland evaluation is more important pie chart on the right side where is shown total area of the Czech Republic covered by a particular soil type. We can see that cambisol has the highest share and therefore is the most common soil type in the Czech Republic. When taking into account only soil with relevant crop production capacity, soil type with the lowest share is phaeozem.

Figure 1: Distribution of particular soil types



Source: (Poláková, Kubík, Prášková, Malý, Němec and Staňa, 2017)

**Cambisol.** It is the most represented soil type of agricultural land not only within areas. Basal soil monitoring, but also within the soil of the whole Czech Republic. Cambisol is typical for their cambian brown horizon, developed on various soil-forming substrates. Cambisol is represented by soils with a very wide ecological amplitude occurring in different climatic conditions, from lowlands to higher altitudes, and to different soil-forming substrates. These soils are mostly moderately fertile. When contaminated with heavy metals, there is a presumption for higher transport to cultivated crops due to a more acidic reaction of these soils. These soils are most at risk from acidification processes and humus losses. (Poláková, Kubík, Prášková, Malý, Němec and Staňa, 2017) Regarding basal soil monitoring, this soil type occurs in 66 plots, thus reaching 30.8%. In the Czech Republic, it constitutes 45.0%. (Němeček, Smolíková and Kutílek, 1990)

**Haplic Luvisols.** So-called brown earth. It is the second most common soil type in basal soil monitoring and in the Czech Republic. It belongs to the Luvisols group of soils, because in the profile there is a vertical shift of clay into the lower layers - the so-called illimerization and the formation of the eluvial horizon, which is usually completely or partly ploughed into topsoil. Brown earths developed mainly on loess or loess clays and slopes in the middle positions, mainly in the flat or slightly undulating relief, with an average annual temperature of 7.5–8.5 ° C and precipitation 500-650 mm. These are soils with high fertility, typical for beet production areas. In the dry years achieve higher yields than chernozem due to increased retention water capacity of Luvian horizons. Brown earths are vulnerable in terms of preserving the content and quality of humus and, if they are on slopes, they must be protected before erosion. (Poláková, Kubík, Prášková, Malý, Němec and Staňa, 2017) Regarding basal soil monitoring, this soil type occurs in 34 plots, thus reaching 15,9 %. In the Czech Republic, it constitutes 12,7 %. (Němeček, Smolíková and Kutílek, 1990)

**Chernozems.** The third most widespread type of soils in the Czech Republic are chernozem, but in basal soil monitoring they are on fourth place. They developed in the driest and warmest areas of the lowlands and hills in flat to slightly undulating terrain, mostly on loess. The soil-forming process is the accumulation and transformation of organic substances, the so-called humification in conditions non-washable to periodically washable water regime. They are characteristic strong (up to 70 cm), dark humus (black) horizon with favourable biological and physical properties and quality crumb structure. Limiting the factor of fertility is often the lack of accessible water for plants. (Poláková, Kubík, Prášková, Malý, Němec and Staňa, 2017) In basal soil monitoring, this soil type is present in 8,4 % of the area. In the Czech Republic, it reaches 11,4 %. (Němeček, Smolíková and Kutílek, 1990)

**Stagnosols.** It is one of the most common soil types in both basal soil monitoring and the Czech Republic. They arise on various non-carbonate substrates in washable water conditions surface water surplus regime. They most often occur at the lowlands and foothills. They are characterized by a bright eluvial horizon. Bellow eluvial is the typical grey horizon. In agriculture parcels with this kind of soil are used mainly as grassland or pasture, less often as arable land. Physical limitations are a limiting factor for the use of

pseudogley as arable land are low porosity, high density and surface wetness. (Poláková, Kubík, Prášková, Malý, Němec and Staňa, 2017) In basal soil monitoring this soil type represents a 9,8 % share of soil. In the area of the Czech Republic, it has a 6,7 % share. (Němeček, Smolíková and Kutílek, 1990)

**Fluvisols.** Fluvial soils are third the most common soil type. These are young soils, in the initial stage of development, developed only on Holocene fluvial sediments in the floodplains of rivers. They are characterized by grain diversity, different mineral richness, differences in the amount of humus, different levels of groundwater and the so-called azonality. Azonality means those soils can be present at different altitudes and climatic areas. In fluvial lands, it is important to monitor them for contamination by hazardous elements and substances due to possible groundwater or sludge contamination. The limiting factor for contamination may be contamination by risk elements. (Poláková, Kubík, Prášková, Malý, Němec and Staňa, 2017) Within basal soil monitoring, this soil represents 14 %. These soils cover 5,9 % of the area of the Czech Republic. (Němeček, Smolíková and Kutílek, 1990)

**Albeluvisols.** The representation of Albeluvisols in the Czech Republic and in a basal soil monitoring is over 5 % and we can rank them more often occurring soil types. It is formed from non-carbonate substrates (polygenetic clays, slopes) in the conditions of a washable water regime. Albeluvisols occurs in lowland to hilly areas - in flatter terrain, in a mildly cold and wet climate. They are moderately fertile with lower acidity. Liming and sufficient fertilization are needed to obtain a good harvest. Due to their geographical occurrence, they may suffer from erosion, are susceptible to compaction and may preform higher water content on the surface. (Poláková, Kubík, Prášková, Malý, Němec and Staňa, 2017) Within basal soil monitoring this soils type occurs in 22 plots, thus accounting for 10.3 %, its representation in the Czech Republic shows 5.1%. (Němeček, Smolíková and Kutílek, 1990)

### **3.2.2 Assessment of agricultural soil price and quality**

Assessment of agricultural soil price and quality is a key parameter for estimation of agronomical and economical attributes of the land parcel or particular area. This parameter

includes consideration of soil chemical and mechanical structure, biological profile, type of climate, annual perception, and relief type. Assessment of agricultural soil price and quality maps and are publicly available and are also noted in cadastral records. Basic soil types were defined by extended research in the years 1961-1972. Later, in 1973-1980 was developed complex dataset which describes all agriculturally used land in the Czech Republic. For simplifying the Assessment of agricultural soil price and quality taxonomy is used 5-digit code where each digit is a specific attribute.

The first digit is expressing belonging to the climatic region. The climatic region consists of all places with approximately identical climatic conditions from crops. These regions were defined only for purposes of Assessment of agricultural soil price and quality.

Climatic regions were defined based on relevant criteria which include the sum of average days equal to or higher than 10°C, average annual and average temperatures, and temperatures on vegetation period. The average annual sum of perception and average perception in the vegetation period. Probability to occur dry vegetation period. There is more factor like elevation, information about known climatic singularities, and factor me relief.

The second and third digit represents the general classification of soil which is described in chapter 2.2.1. *Soil classification*. With extended classification including hydrological group, acidity, and potential wind erosion.

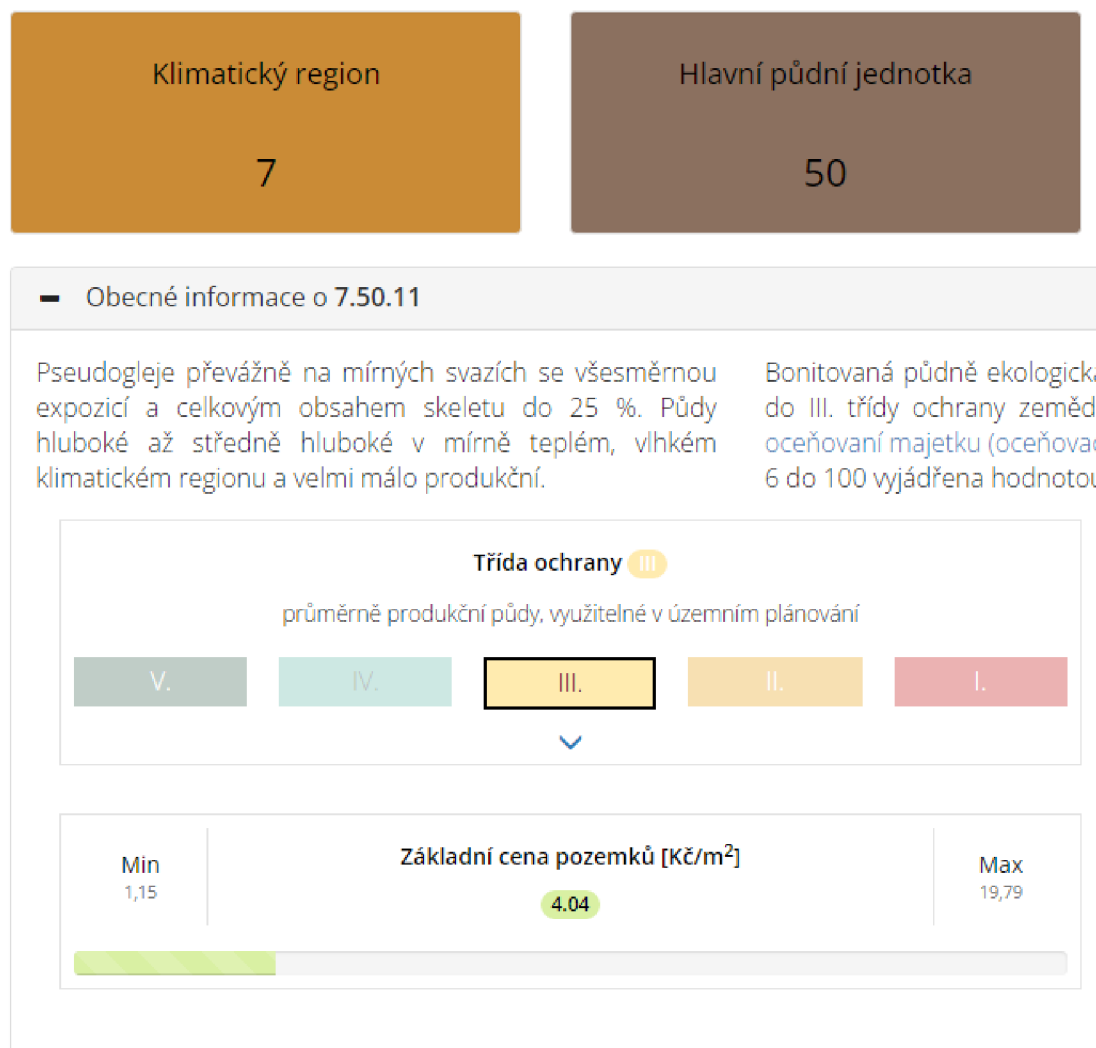
The fourth number is expressing slope and exposition to various cardinal points. The slope has an impact on the management of the parcel. Also, can appear higher water and wind erosion. Exposition affects vegetation circumstances due to different temperatures, sunlight, and perception.

The fifth digit is expressing depth and stoniness. Where lower number means a relatively lower content of rocks and in most cases lower soil profile itself.

Bellow we can see a screenshot from the site “[bpej.vumop.cz](http://bpej.vumop.cz)”. There is the record for BPEJ code 7:50:1:1 – this is the most common soil class in the BPEJ system.



Figure 2: Soil classification table, part 1



Source: Výmop

Selected soil type is described with four variables where the number “7” stands for the climatic region, in this case, it is medium warm and rich in perception. Number “50” represents the main soil unit which is in this case pseudogley. Below code we can see a paragraph with basic information for soil class. In the top left text box is defined type of law protection, here it is out of five levels third one “medium production, usable in spatial planning”. It can be practically described as medium administrative difficulty with transforming farmland into a building parcel. The most important information for our further analysis is shown in the left bottom text box. Here we have a value of 4,04 CZK/m<sup>2</sup>. The price range in the BPEJ classification is 1,15 CZK – 19,79 CZK for a square meter which puts our sample in deep below average.

Figure 3: Soil classification table, part 2



Source: Vúmop

The slope and exposure variable is here “1”. Which describes the land with a mild slope from 3 to 7°. Exposure is thanks to narrow terrain even to all cardinal points. The last digit “1” reveals the content of stones up to 25% and the depth of soil profile more than 30 cm. Right top text box tells us unified agricultural productivity on a scale of 1-100. Value 30 is described as “very low productivity”. In the right bottom text box is the total area of this soil class in the country. Our sample is, as mentioned before, most common and covers 469,89 ("Obecné informace o 7.50.11", 2019)

### 3.2.2.1 Assessment of agricultural soil price calculation (BPEJ)

In the end of previous chapter was shown price for particular BPEJ defined soil type. These BPEJ soil types are known for absolute majority of land parcels in agricultural land fund. Soil classification is available publicly via cadastral register. (Bradáč, 2016)

The process of BPEJ estimation consists of the following steps: – Calculation of the gross annual rental effect (HRRE) for particular crops and the total value for the BPEJ; – Calculation of the official price of agricultural land (UCZPBPEJ) for the proposed production focus according to HRRE; the estimation made according to the production focus on cereals best corresponding to the existing estimation; – Set up of the limit of the land price change with regard to the current evaluating regulation; – Adjustment of the land assessment to the set limit. The official price of BPEJ is deduced from the adjusted equation for the calculation of perpetual annuity. Due to the variable ratio of inputs and outputs in real time, the long-term average of revenues and expenses needed for their achievement was used in order to calculate HRRE. The total achieved HRRE > 0 is defined by the following equation:<sup>1</sup>

$$UCZP_{BPEJ} = BCZP + \frac{HRRE \times D}{U}$$

where:

UCZP<sub>BPEJ</sub> – the official price of agricultural land (CZK/ha)

BCZP – the base agricultural land price (CZK/ha) - set on 20 000CZK/ha

HRRE – the gross annual rent effect for BPEJ (CZK/ha)

D – total share of non-taxed plant production

where D = (100 – DP)/100; DP – income tax

U – interest rate – set on 3%

The gross annual rent effect for BPEJ is calculated by specific agroeconomic factors:

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Data adopted from (Doušek and Matějčík, 2008)

$$HRRE_{BPEJ} = \sum_{i=1}^{i=n} [CPP - (NPP + Z_n)] \times K_{OTS}$$

where:

CPP = price of parameterised produce crop of the plant production in CZK/ha

NPP = normative cost of parameterised produce in (CZK/ha)

K<sub>OTS</sub> = scalar number stemming from the share of individual pricing crops in specific appraisal structure for individual BPEJ

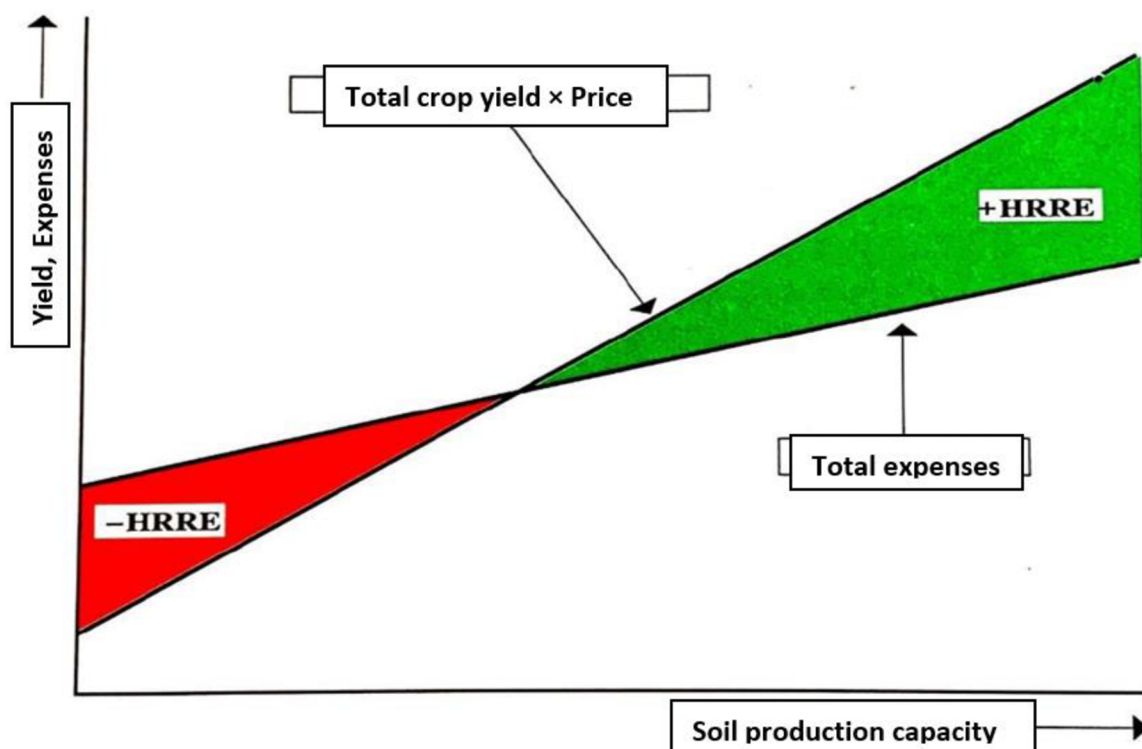
Z<sub>n</sub> = normative profit expressed by scalar number in relation to normative costs, Z<sub>n</sub>= 0.1, i.e. 10% of normative costs. In the best land-climatic conditions, HRRE is as much as +9785 CZK/ha. In the worst land-climatic conditions it can reach the negative value 2576 CZK/ha.

The schematic course of HRRE in dependence on yield and costs is as follows:

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Data adopted from (Doušek and Matějčík, 2008)

Figure 4 Revenue of farmland



Source: (Doušek and Matějčík, 2008), edited

Above is graphically shown economical revenue of farmland. In the left part of chart is shown case of unprofitable farming where selling price of yield do not fully covers total expenses. We can also see intersection of expense and earning line, so called break-even point. On the right side is ideal case where soil is capable to grow sufficient volume of harvested commodity to cover expenses and generate profit.

### 3.2.3 Official agricultural land prices

Official agricultural land prices were elaborated after the analysis of practical and theoretical procedures of land valuation in developed countries with market economies and while using the results of the new evaluation of the Czech agricultural land fund, The new evaluation of the agricultural land fund took place in the The 70s of the 20th Century. (Drobník, 2007)

The use of the new evaluation makes it possible that official agricultural land prices can sufficiently objectively express relations and the value of land in very different natural and land-climatic conditions characterized by the classification code of soils (BPEJ). The drawback of this arrangement is the fact that official agricultural land prices can't express economic and market valuation of a specific plot of agricultural land. The price of a specific plot reflects not only the economic potential of the differentiated fertility of the land (production capability) but also the degree of horizontal and vertical variations of the land, its location, way of use, technical equipment and other features stemming from ownership relations towards the agricultural land. Evaluation of all these features of the plot of agricultural land in a market economy can best be reflected only in the market price of the land. (Doušek and Matějčík, 2008)

For tax purposes were elaborated extensive list where are stated average land prices for every single cadastral area in the Czech Republic. Prices are based on weighted average of BPEJ prices in selected area. Tax rate stays the same since 1<sup>st</sup> of January 0,75% of average parcel price for arable land, hop garden, vineyard, garden, orchard. (*Zákon České národní rady o dani z nemovitostí*, 1992) This value multiplied by surface area and tax rate makes final property tax. Prices can be found in Decree No. 298/2014 Coll. on the determination of the list of cadastral territories with assigned average basic prices of agricultural land, as amended.

Table 1: Extract from Decree No. 298/2014 Coll

Name of cadastral area	Average basic price in CZK/m <sup>2</sup>	National region code	European region code NUTS 3	
Petřvald u Nového Jičína	9,13	720500	CZ080	Moravskoslezský kraj
Petřvaldík	9,70	720526	CZ080	Moravskoslezský kraj
Pchery	7,95	720542	CZ020	Středočeský kraj
Pičín	6,04	720551	CZ020	Středočeský kraj
Pičín u Jankova	4,43	656739	CZ020	Středočeský kraj
Pihel	5,99	720585	CZ051	Liberecký kraj

Source: Ministry of Finance of the Czech Republic

### 3.2.4 Market prices

The market prices of the agricultural plots of land are based on the principle of supply and demand, The market price results from the agreement between the seller and the buyer, so it falls into the category of the contract price. Contract prices that are stated in the contracts of sale are recorded by revenue authorities for income tax assessment on the side of the seller, The buyer registers the contract of sale with the Cadastre for recording title to the purchased plot of land. (Bradáč, 2016)

At present, no central statistical authority follows the progression of the market prices of agricultural land.<sup>3</sup> Therefore, the Ministry of Agriculture of the Czech Republic charged the Research Institute of Agricultural Economics in Prague with following and analysing the land market. Since 1993, this institution has surveyed the land market through a survey of 24 districts of the Czech Republic. By the end of 2003, in 10 years, more than 77.000 data concerning market prices of agricultural land for sale were recorded. Based on the analysis of research data on market prices, we can unequivocally state that the most important factor influencing the market price of a plot of land is its location, its size, and the purported use of the purchased plot of land. (Němec and Vrbová, 2006)

Overview about market price, those prices which are really offered and paid brings two main sources. State office ČSÚ – which collect all possible data about national economy, including primary sector. And private owned company Farmy.cz, which is focusing on real estates in agriculture such a land parcels and whole farms.

#### 3.2.4.1 Czech statistical office

Czech statistical office, referred as ČSÚ is state-run agency gathering various data about population, economy, and nature in the Czech Republic. Table below is showing average market price for land parcel in period of 2012 – 2020. Price is average for both, arable and

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<sup>3</sup> Nowadays ČSÚ is publishing statistics about market prices of agricultural land however those are not as detailed as they could be

grass land. Sadly, ČSÚ somehow does not publish data for years before 2012.

Nevertheless, it is valuable source and gives useful overview how price have a steadily growing tendency.

Table 2: Inflation compared to price growth

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Price for m2 in CZK	7,5	8,6	11,5	12,4	14,0	15,5	18,6	21	24	(?) <sup>4</sup>

Source: ČSÚ

Prices do not include VAT, possibly the value of buildings built on monitored plots. The statistics cover the entire territory of the Czech Republic, except for the region "Prague". The source data for the calculation of the above-mentioned average prices are the data of the tax authorities ascertained from real estate transfer tax returns. ("Ceny výrobců - časové řady", 2021)

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<sup>4</sup> Expected to be published in the fourth quarter of 2022



### 3.2.4.2 Farmy.cz

Farmy.cz is a private company operating real estate agency and professional website focusing on agricultural realities established in 2007. These results are based on their statistical data and knowledge of price from own real-estate deals.

Table 3: Price for hectare 2005-2020

Year	Price CZK/ha
2005	68 336
2006	73 983
2007	76 901
2008	86 673
2009	96 300
2010	102 456
2011	108 100
2012	118 712
2013	124 070
2014	139 590
2015	162 565
2016	204 085
2017	235 111
2018	240 850
2019	243 985
2020	253 510
2021	294 326

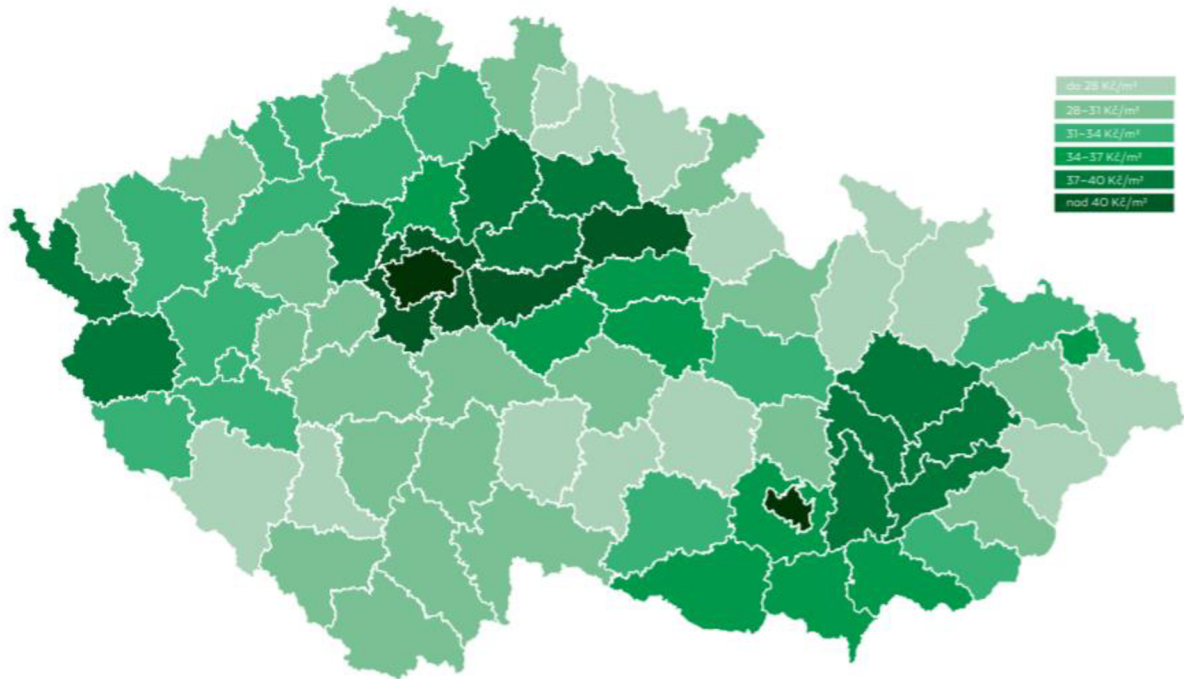
Source: [www.farmy.cz](http://www.farmy.cz)

## 3.3 Agricultural-land market on the beginning of 2022

In chapters above were described key attributes which influencing official and market price of land parcels. Main factors are agricultural production and location of parcel. Also, there is described evolving of during specific historic periods. In practical part will be examined possible correlation between average price and selected economic factors. Let us have a brief view where price of land and it is market now, in the first quarter of 2022. To conclude this, we can use newest possible data, published in January 2022 by Farmy.cz. It is the best available analysis of land market in year 2021 with calculated average price and annual growth. There is revealed that in 2021 average price for one square meter of agricultural land was 29,4 CZK. Which made two-digit growth comparing with previous

year: 16,1%. In detailed look we can see price for arable land was 33% higher to compare with pastures.

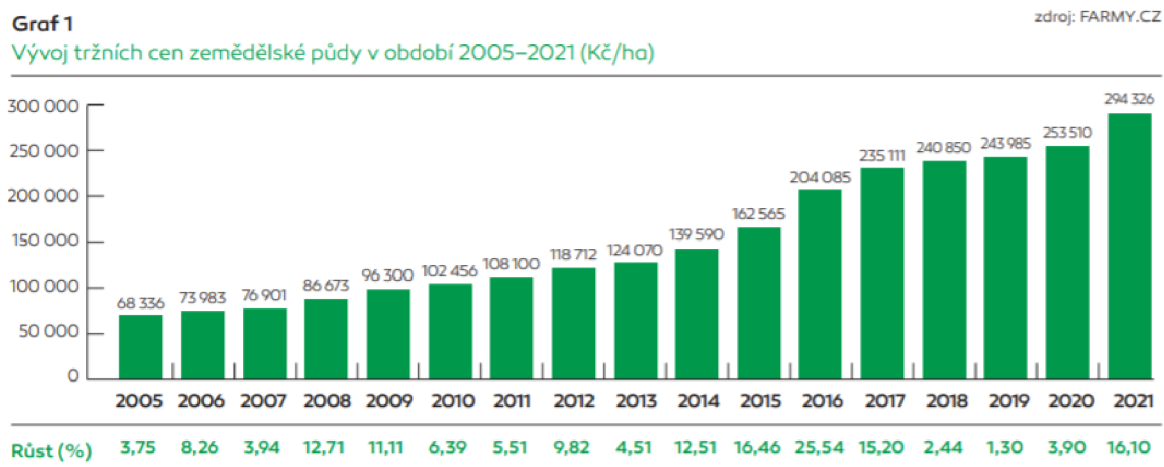
Figure 5: Average price by regions of the Czech Republic



Source: ("ZPRÁVA O TRHU S PŮDOU za rok 2021", 2022)

Above is shown map of Czech Republic with regards to 76 counties and one specific county for capital city of Prague. Prices vary from 28 CZK/m<sup>2</sup> and less which is represented by lightest green color on side of spectrum. These areas are typically high lands or mountain regions such a Vysočina region, Jeseníky mountains or Liberec region. On the opposing side of spectrum is dark green representing prices over 40 CZK/m<sup>2</sup>. This color is most present in central Bohemia and central Moravia. There are two major reasons for higher price in these areas. One is geographical location, parcels in those regions are in high population density areas, close to big cities with its agglomeration, accompanied by high industrial activity. All those factors are increasing demand on building plot, therefor also on agricultural plots. Second reason is agriculturally high-quality soils with large share of chernozems and favor climate for crop production. These good farming conditions enabled growing of populous settlements in the past such a Prague, Brno, Pardubice, or Olomouc. (Čornej, Čornejová and Parkan, 2009)

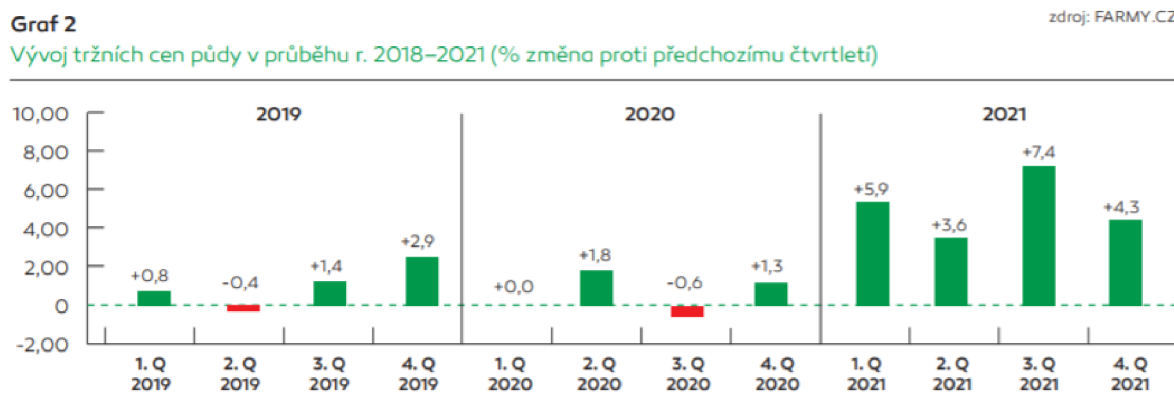
Figure 6: Price and growth in period of 2005-2021



Source: ("ZPRÁVA O TRHU S PŮDOU za rok 2021", 2022)

Above we can see most recent chart of land prices development with mentioned annual growth. created by farmy.cz from their database and sources. So far, a best data of this kind for Czech market.

Figure 7: Relative growth of price in period of 2018-2021



Source: ("ZPRÁVA O TRHU S PŮDOU za rok 2021", 2022)

On the table above is shown chart of relative price growth with regard on quartiles. Land prices rose sharply throughout 2021. Already in the 1st quarter, an increase of 5,9 % was recorded against last quarter of 2020 and price growth continued still: 3,6 % in second quarter. 7,4 % in third quarter and 4,3 % in the fourth quarter, always compared to the previous quarter. Price increase of 7,4 % in third quarter was the highest recorded quarterly

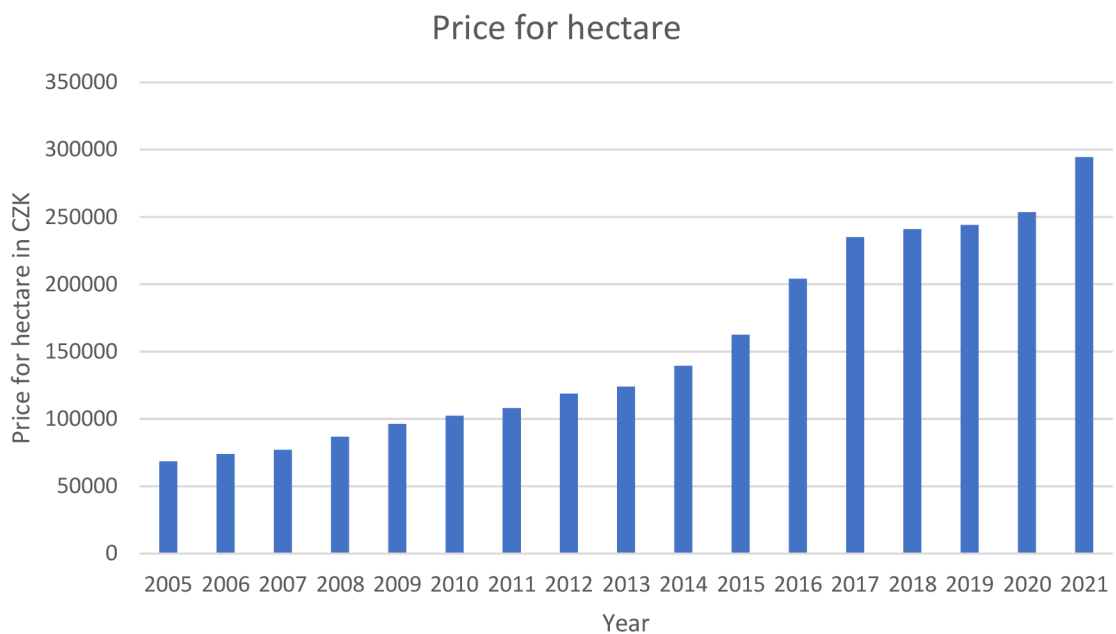
increase since 2017. While in 2019 and 2020 was price growth rather stable, in 2021 is increase significant. ("ZPRÁVA O TRHU S PŮDOU za rok 2021", 2022)

## 4 Practical Part

### 4.1 Comparison of land price with specific economic factors

In practical part will be compared monetary price for hectare with a selected economic factor. As economy is closely connected set of various factors where those have always lower or higher impact on each other. As a source of data for this analysis we decided to choose data from website farmy.cz for their overall high expertise and larger data set.

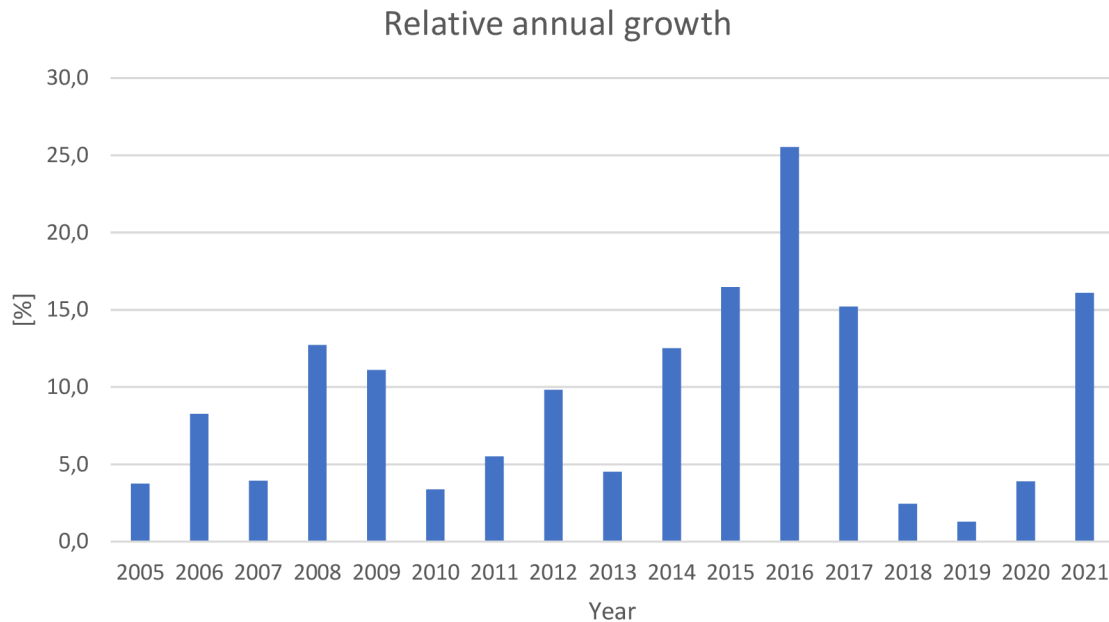
Figure 8: Price for hectare



Source: ("ZPRÁVA O TRHU S PŮDOU za rok 2021", 2022)

Market price for agricultural land is steadily increasing. In 2005 was possible to buy one hectare of land for 68 336 CZK in average. Five years after, in 2010 average price for hectare first went over 100 000 CZK per hectare. Most recent price comes from year 2021. Analysis of farmy.cz is showing price of 294 326 CZK per hectare.

Figure 9: Relative annual growth of price for hectare



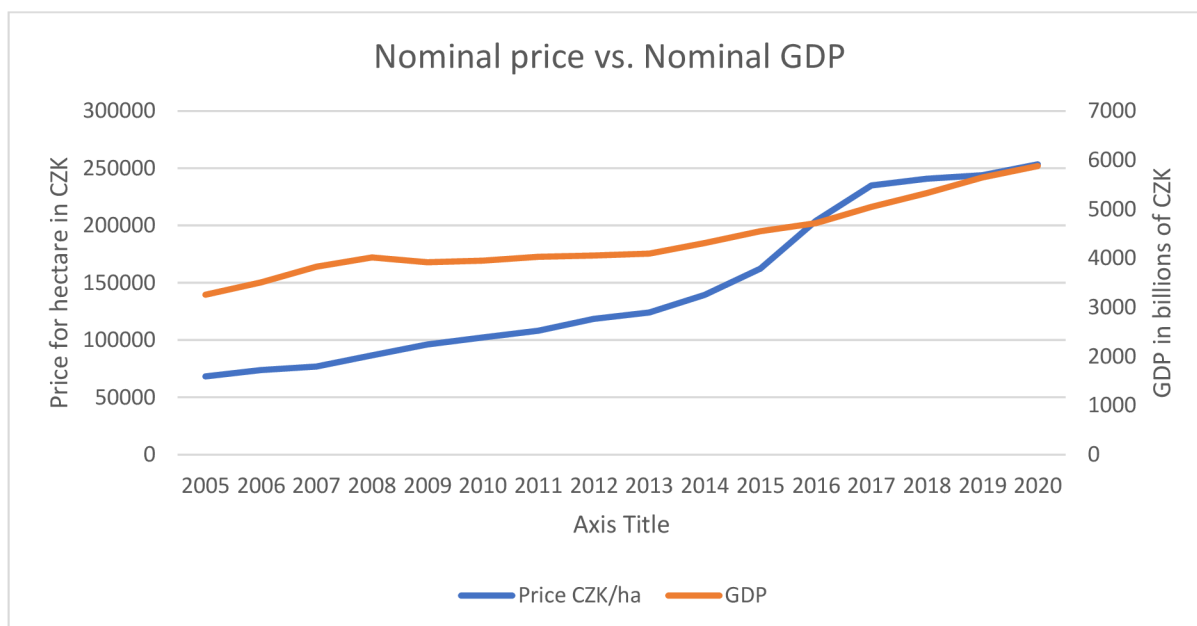
Source: (ZPRÁVA O TRHU S PŮDOU, 2021)

Interesting period are years 2014 – 2017 where annual percentual increase in price per hectare performed growth over 10 %. Years 2008 and 2009 performed two-digit growth, we can speculate it was due to economic crisis where investor find farm-land as a safe asset. Year 2021 made 16 % growth, second highest growth in tracked period. This can be explained by overall price growth of all kinds of real estate. (Štuková, 2022) In average can be concluded annual growth as higher than 5 %.

#### 4.1.1 Comparison with Gross Domestic Product

Gross domestic product (GDP) is a monetary expression of the total value of goods and services newly created in a given period in a given territory; used to determine economic performance. It can be calculated in three ways: the production method, the expenditure method, and the income method.

Figure 10: Nominal price vs. Nominal GDP

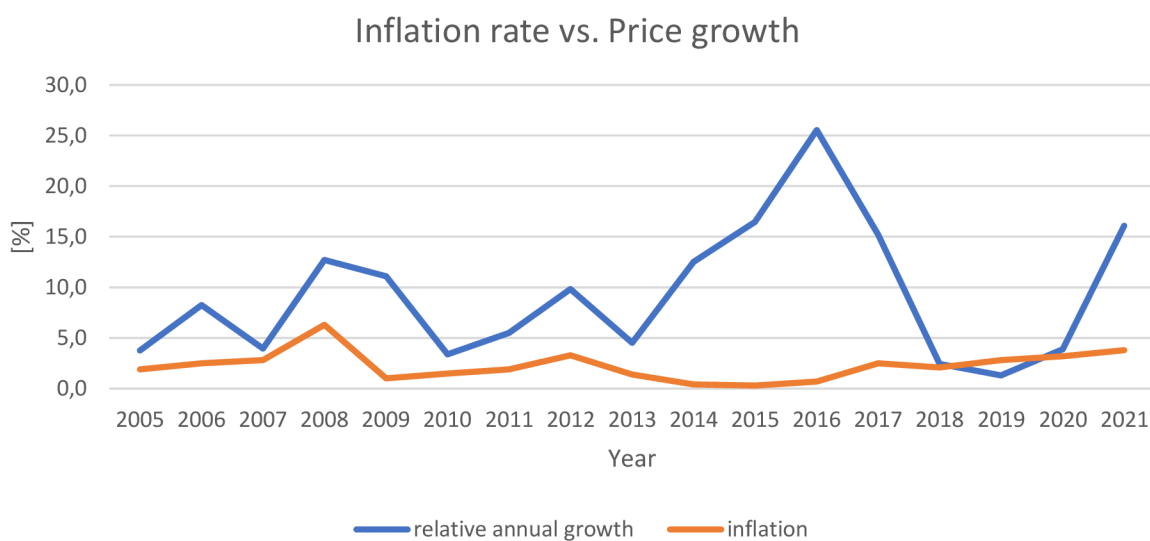


Source: Farmy.cz, ČNB

#### 4.1.2 Comparison with Annual Inflation Rate

When expressing the rate of inflation using the consumer price index, different numbers are often given, which, although different, are correct. The period for which the inflation rate is reported and the basis against which the period is compared must be clearly stated.

Figure 11: Inflation compared to price growth



Source: Farny.cz and ČSÚ

Chart also can answer a question if farmland is a good investment to protect value during a time period. From chart we can see in most of years annual growth of farmland was higher than inflation rate so we can consider farmland as a good tool to preserve value in time.

## **4.2 Comparison of land price with selected Countries**

Table shows price of agricultural land in euros per hectare sorted ascensible by prices in year 2019 due to missing values for several countries in 2020. Anyway, it shows relevant comparison of prices per hectare with typical trends. Price of land in general rather grows. In some countries rapidly grows, as in Romania. And in some countries stay stable, as in France. Higher price in western Europe countries with extreme high values in Luxembourg and Netherlands which are countries with highly developed agriculture production and possess relatively small land fund.

Countries of former eastern bloc has lower prices of land. This can be caused by various variables. It can be lower prices of real estates in general, maybe also undervalued and reaching its fair price. Less developed agricultural sector. Difficulties with trading of land.



Table 4: Price in EUR for one hectare in various countries

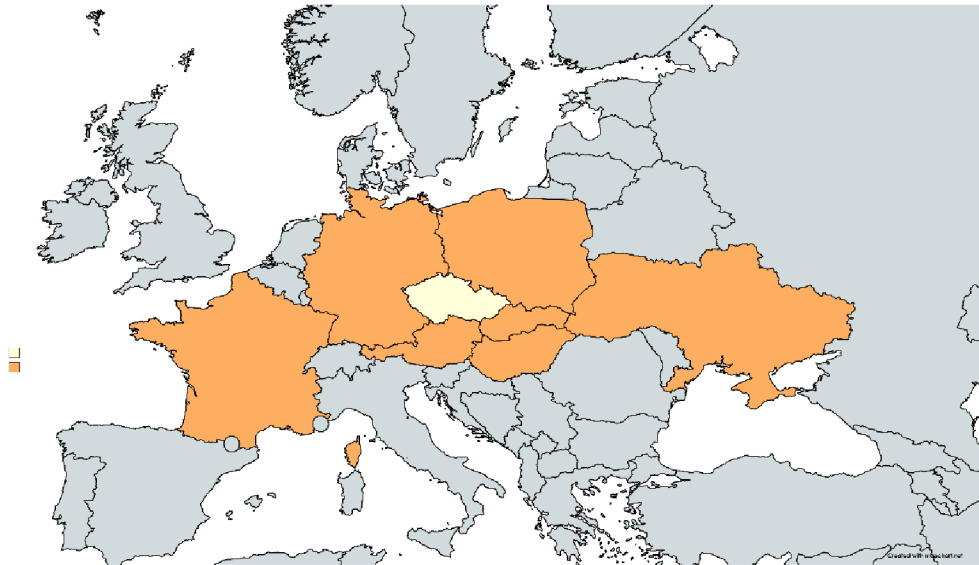
	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
<b>Croatia</b>	2 835	3 005	3 282	3 395	3 440
<b>Estonia</b>	2 735	2 890	3 174	3 461	3 772
<b>Slovakia</b>	28 217	3 009	3 432	3 789	3 984
<b>Latvia</b>	2 917	2 975	3 856	3 922	4 182
<b>Lithuania</b>	3 516	3 571	3 890	3 959	4 127
<b>Hungary</b>	4 182	4 368	4 662	4 862	4 893
<b>Romania</b>	1 958	2 085	4 914	5 339	7 163
<b>Bulgaria</b>	4 131	4 622	5 011	5 382	5 328
<b>France</b>	6 070	6 030	6 020	6 000	6 080
<b>Czechia</b>	5 463	6 448	7 600	8 561	9 477
<b>Finland</b>	8 326	8 718	8 380	8 686	8 524
<b>Sweden</b>	7 921	8 708	8 842	9 056	10 100
<b>Poland</b>	9 083	9 699	10 414	10 991	10 711
<b>Greece</b>	12 272	12 264	12 387	12 604	12 599
<b>Spain</b>	12 522	12 827	13 023	12 926	12 901
<b>Denmark</b>	17 584	17 328	17 724	17 580	:
<b>Slovenia</b>	17 136	16 876	18 460	18 752	21 451
<b>Ireland</b>	18 141	19 903	27 457	28 068	25 724
<b>Italy</b>	33 193	31 731	30 569	34 156	:
<b>Luxembourg</b>	26 030	35 590	35 110	37 300	:
<b>Netherlands</b>	62 972	68 197	70 320	69 632	:

Source: Eurostat

#### 4.2.1 Comparison with selected countries

Czech Republic is located in central Europe surrounded with four neighbouring countries and being a member of European union along with 26 member states. Comparing local average prices development with selected European countries will bring better overview how Czech farmland market and its prices stands in international comparison. In Europe as continent is also significant Ukraine with their large land fund – approximately 13 times larger than Czech arable land area. ("Arable land (hectares)", 2019) Due to recent legislative changes, local farm-land market will be more interesting for domestic and foreign investors.

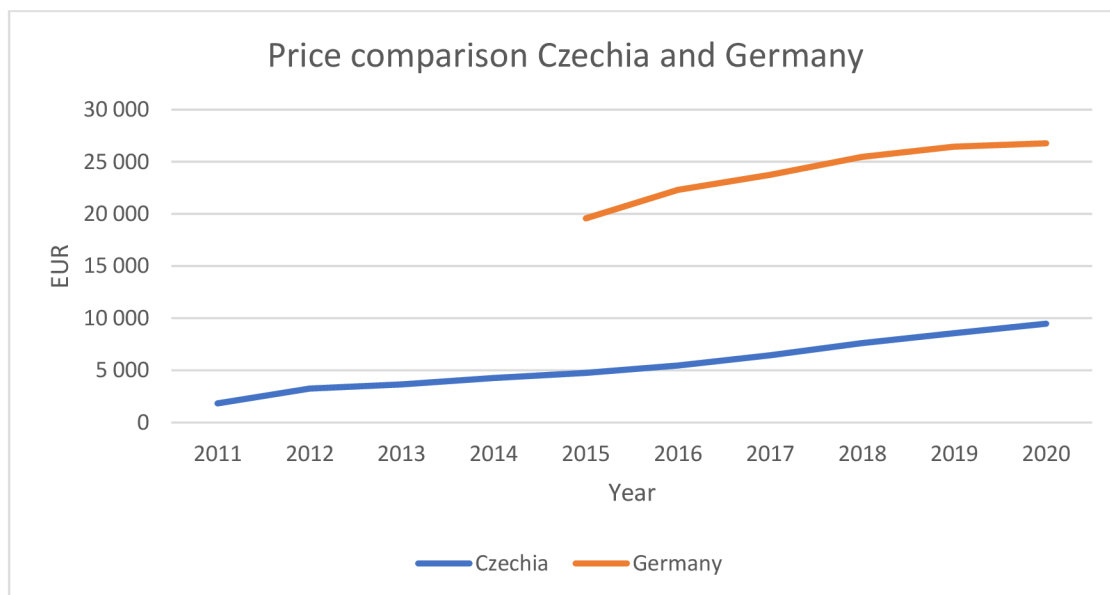
Figure 12: Map of countries selected for comparison



Source: Author's drawing

**Germany** – Highly developed economy with efficient agriculture. Plant production and animal production are both at very high level very well connected to supply chain. In sector operates all kinds of sizes of farming subjects, from small family farms to large agricultural concerns.

Figure 13: Price comparison Czechia and Germany

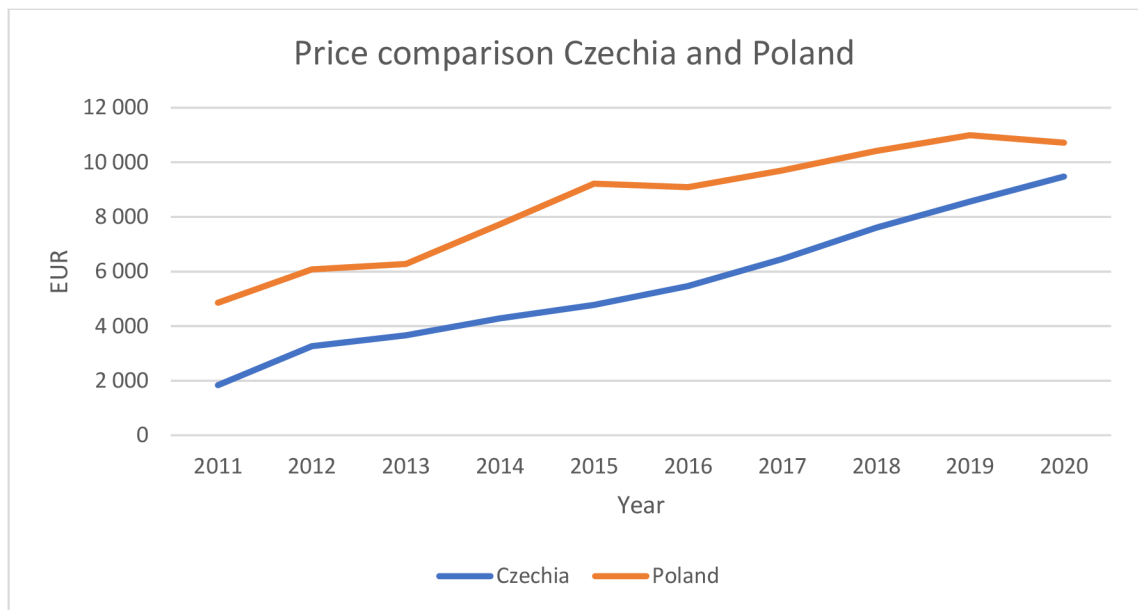


Source: Destatis, Eurostat

Available data for Germany starts from 2015. In the same year was German price about 4 times higher than Czech price. Increasing tendencies are similar. In the year of 2020, we see German price two or three times higher.

**Poland** – Traditionally efficient agricultural sector thanks to favourable natural conditions. Narrow lands, medium and regular perception with fair climate is perfect from plant production of wheat, beet, vegetables etc. The Polish primary sector was influenced by the nationalization of farms which leads to tearing traditional model of farming with its supply chains. The overall impact of communist nationalization of farms and farmland was as high as in former Czechoslovakia.

Figure 14: Price comparison Czechia and Poland



Source: Eurostat

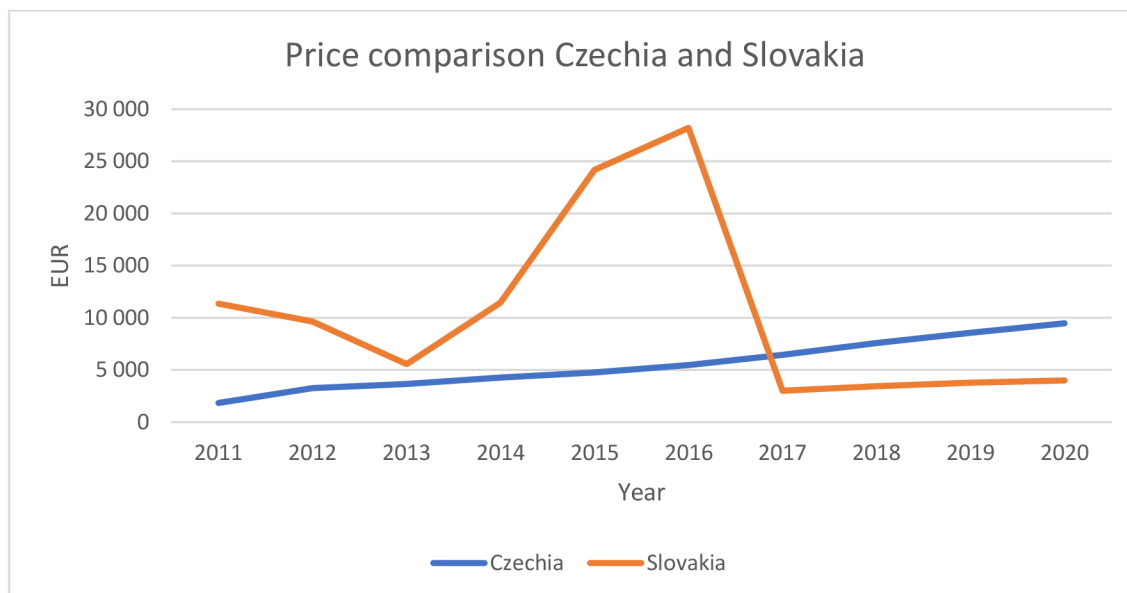
Polish land performs more than twice higher price in 2011. Chart shows steeper price growth in the Czech Republic which leads to very comparable values in the year of 2020.

**Slovakia** – similar history and conditions as in the Czech Republic. Primary sector went through nationalization in 50s and experienced privatisation and restitution in 90s. supply chains, landscape face and consumer behaviour were changed. In last decades was

agriculture development less supported on favour of industry as Slovakia country with dominant relatively high share of secondary sector on GDP.

Table below is specific due to different methodology of price setting till 2016. Therefor we cannot use previous period for comparison. From 2016 is used more accurate statistic way excluding deal with price over 10 000 EUR, where purchase of these parcel was most likely not motivated by farming production. (DRABIK and RAJČÁNIOVÁ, 2014) Therefor we can really analyse only period of 2017 – 2020.

Figure 15: Price comparison Czechia and Slovakia



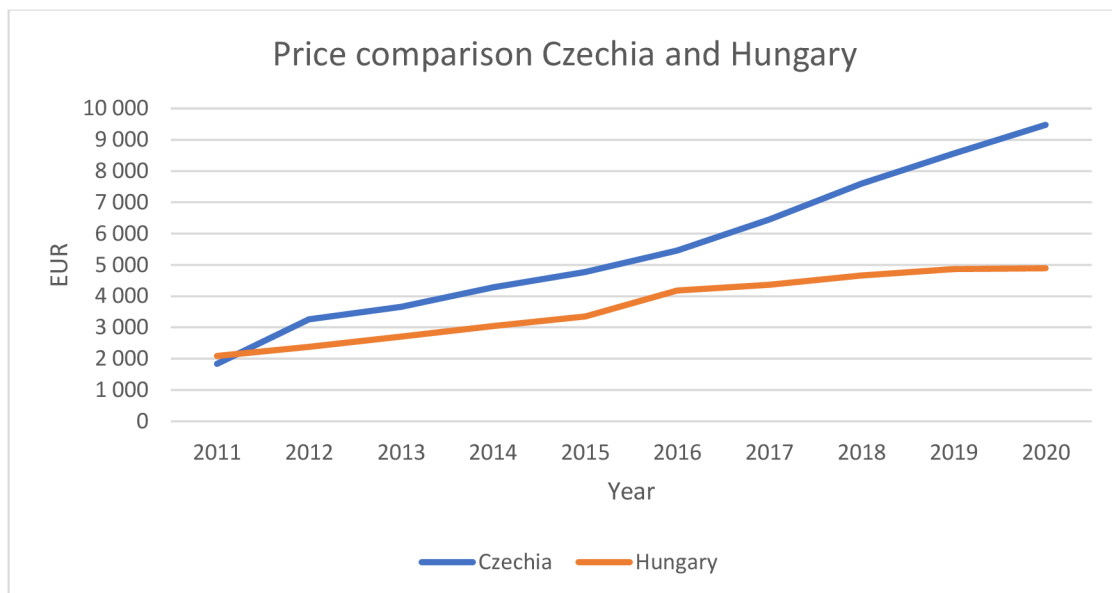
Source: Eurostat

We can explain significantly lower price in, from economical point of view, similar country by two main reasons. Major reason can slightly less developed agricultural sector with high share of meadows and pastures. These kinds of land perform lower market price. Additional reason may be lower demand on using farmland as building plots.

**Austria**<sup>5</sup> – Country with highly developed economy. Primary sector has among selected countries highest share of small farming subjects as a family farms and small companies. Traditionally strong position of farming sector in society and government.

**Hungary** – Hungary can be considered, from a historical point of view, as a very close country, in the past even neighbouring. Hungarian economy together with agriculture went through communist collectivisation in 1950s where traditional farms were confiscated, and collective farms appeared. (Horváth, 2019) After collapse of communist regime farming was privatised again. This scenario is typical for all countries in former eastern bloc.

Figure 16: Price comparison Czechia and Hungary



Source: Eurostat

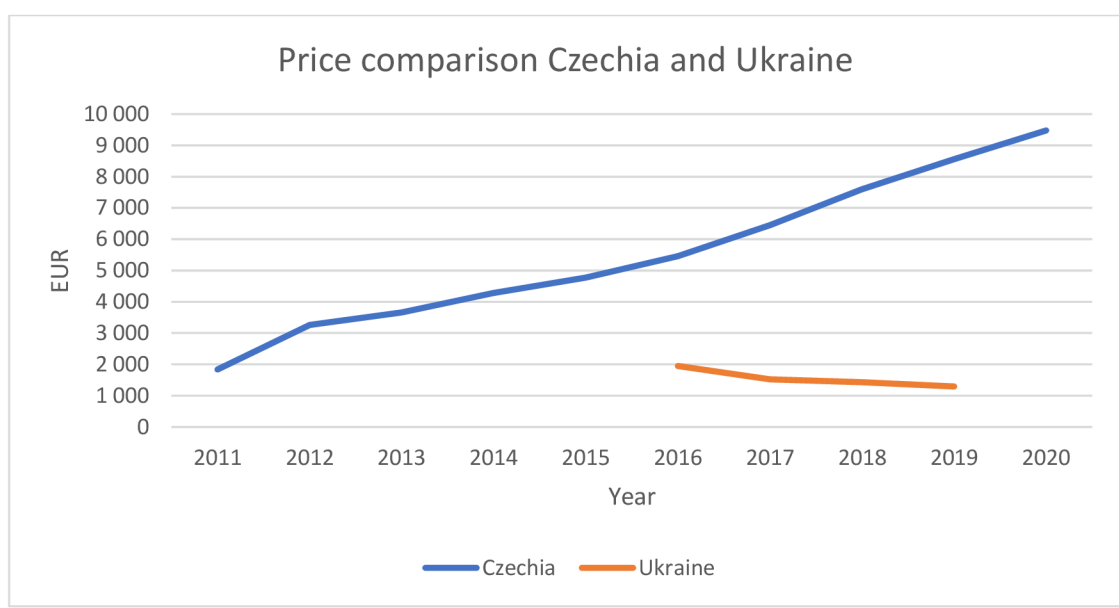
In the beginning of examined period are prices for both, Czech and Hungarian farmland basically the same. During selected period both values are performing steady increase where Hungarian growth is behind. On the end 2020 we can see that Czech farmland is about twice more expensive than Hungarian.

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<sup>5</sup> Austria was excluded from comparison due to the unavailability of statistical data

**Ukraine** - is country with lowest gross domestic product and also lowest human development index. On other hand Ukraine has growing economy with significant where modern agriculture contributes by 9,3 % (“Agriculture, forestry, and fishing, value added”, 2020) to its GDP and 14 % (“Employment in agriculture”, 2020) of its workforce is employed in agriculture. Possibilities in Ukrainian primary sector got is scope of foreign investors thanks increasing economical results and juridical changes in land owning. (Krimenjuk, 2019)

Figure 17: Price comparison Czechia and Ukraine



Source: Voxukraine, Eurostat

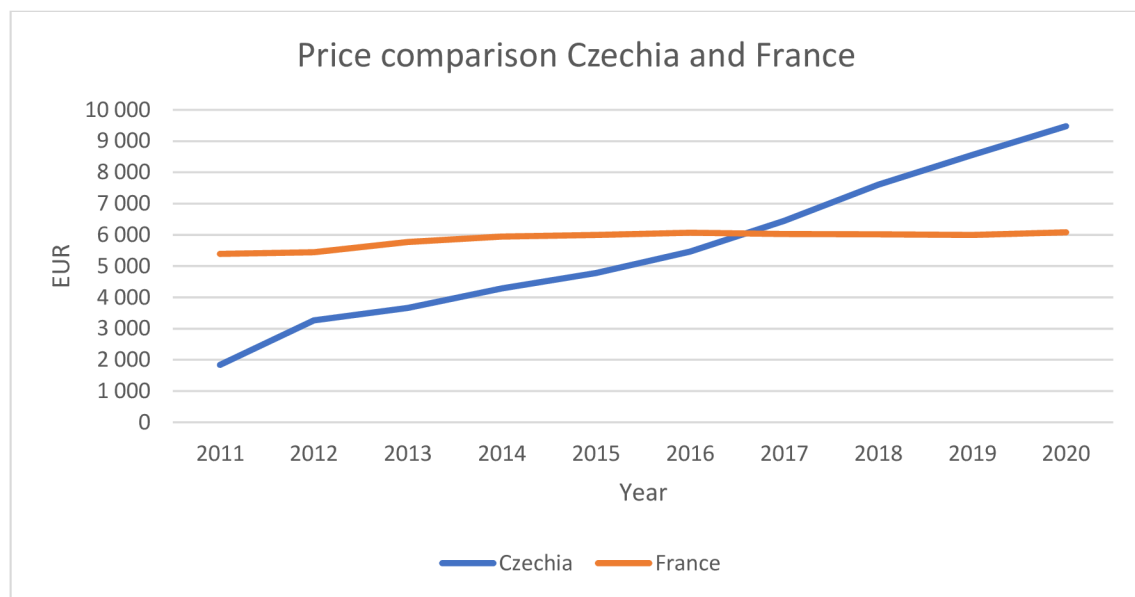
Chart above shows only available data for years 2016 – 2019. We can see decreasing trend however this might be caused by recalculating value to price of year 2016 due to significant inflation. Overall price is lowest among examined countries.

Market with land agricultural land have major specific in Ukraine. There was actually banned to sell (and buy) land. There were only specific cases where it was possible but in general owners of land were not allowed to sell their parcels by law. Option for owners to earn money from their lands were two: Standard agreement of renting their

field to subjects enterprising in farming with a notice period<sup>6</sup> and annually paid rent. Rent can be paid off in money or in kind, usually in agreed amount of grain (still common in rural areas). Combined payoff is also possible. Second option is a hand over their land to farm based on emphyteusis. This is specific form of rent where user can use land for 50 years and rent is paid all at once. Ownership is succeeded to inheritor of owner and after expiration of 50 years emphyteusis contract land becoming property of inheritor with no easement of estate. (Krimenjuk, 2019)

**France** – Is traditionally agricultural superpower due to its large land fund, enormous food production and highly developed manufacturing of farming equipment. In agronomy typically dominating large agricultural concerns.

Figure 18: Price comparison Czechia and France



Source: Eurostat

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<sup>6</sup> Common notice period can be 2 – 10 years.

French price for hectare of farmland performs unusual stability. Price slightly vary from 5 000 EUR per hectare to 6 100 EUR per hectare. Here can surprising also relatively low level of a price as such. Unexpected is also comparison of French land with neighbouring countries. Spain with their 12 901 EUR per hectare in 2020 performs approximately twice higher price. Italy with 34 156 EUR per hectare shows more than 6x higher price. According to *Table 4: Price in EUR for one hectare in various countries* French land parcels are the cheapest among countries of western Europe.



## 5 Conclusion

Further development of the land market in the Czech Republic in 2022 depends on many factors, some of which are purely global in nature and difficult to predict. Forecasts of real estate price developments vary widely and cannot rule out both further growth and a correction of overheated prices real estate markets. It can be assumed that the soil will continue to be perceived as appropriate anti-inflation investment. Regarding the expected development of inflation in 2022, a further rise in agricultural land prices can thus be expected with a higher probability. (ZPRÁVA O TRHU S PŮDOU za rok 2021, 2022)

Reasons for an ownership of farmland are different. The most expectable is owning of land by farming entities. These subjects will have always stable demand on acquiring land for performing their nature of business itself and to less demand on rented land. Land parcels are also fixed asset with simple evaluation which makes is also usable as security for loan financing if needed. Beside of farmer there are also individuals owning rather small areas of parcels and in most cases leasing their land to farmers. Recently, agricultural land and real estate in general tend to be owned by companies and property funds as an investment. Most common kind of ownership is ownership by natural person or mutual ownership of married couple. In the Czech Republic is about 75% of agricultural land is owned by natural persons where average area per person is approximately one hectare. About 21 % of agricultural land is held by legal entities. This including companies doing agricultural business, entities investing in property, and companies speculating with land. State is owner of approximately 3 % of agricultural land in the Czech Republic. (Havlová, 2019)

Land is a very safe investment, if not one of safest in the period with relatively higher inflation and turbulent stock prices. It generates stable annual revenue from farming activities for farmers. For other kind of owners there is rather lower but stable revenue from rent. Overall agricultural land price increase and comparison with selected economic factors in previous chapters are rather confirming that those who own and hold agricultural land are doing right.

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