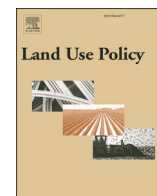




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## Trends for agricultural land-use in the CEECs following the collapse of the Eastern Bloc

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## ABSTRACT

The main cognitive goal of this study is to diagnose and identify trends for agricultural land-use structure in the CEECs. Particular attention has been paid to the spatial differentiation characterising that structure, and to the significance that diverse kinds of conditioning have had in shaping it. Analysis has extended to the main structural elements that are grasslands and arable land, while the countries included are the CEECs acceding to the EU at different times, i.e. Estonia, Latvia, Lithuania, Poland, Czechia, Slovakia, Hungary, Romania, Croatia, Slovenia and Bulgaria. *EUROSTAT* and the FAO have been the main sources of relevant materials. The region under study emerges as very much differentiated in terms of structure relating to both grassland and arable uses. However, once the Eastern Bloc fell, all the CEECs experienced losses in area of grassland, as well as declines in the amounts of land growing perennial-type crops. Where key crops were concerned, the shares of industrial species have increased at the expense of the cultivation of vegetables, fruit and potatoes. Key factors underpinning observed trends for land use have been the privatisation and restitution of land, demographic processes in rural areas, domestic and EU agricultural policies, and agroecological conditions.

### 1. Introduction

Agriculture can be seen as the component of the domestic economy most "sensitive" to change arising out of new social and economic processes and phenomena. Notwithstanding a free-market economy in place and in operation, the sector continues to be much influenced by state policy and EU structuring, and there is no obvious sign of this interventionist tendency in agriculture starting to fade. For there is no country anywhere in Europe in which agriculture is left to market forces. Indeed, it might even be suggested that the farming economy is becoming more, rather than less, dependent on state economic policy.

There are many reasons for this state of affairs, beginning with problems of overproduction in Europe, and continuing down a list that includes limited profitability in the face of rising costs of production, and the increasing significance of subsidies (Lowe et al., 1993; Woods, 2005). The paradigm underpinning the development of European agriculture has also changed, with a departure from quantitative indices of production in the direction of qualitative ones and diversity of agricultural functions (Almsted et al., 2014; Bureau, 2012; Jongeneel et al., 2008).

Back in the communist era, the Central and Eastern European

Countries (CEECs) also received strong state support. Furthermore, the period in question went on long enough for a new model for farming to take shape (Bański and Mazur, 2021). To realise this, it is sufficient to recall the ownership structure involved, in most cases prevalently "socialised", i.e. in state hands. That meant that, when it came to accessing most of the means of production and markets, a strong preference was shown for the State-Farm and Cooperative "favourites" of the communist state, with much done to limit opportunity among farms remaining under individual ownership.

So it was that the collapse of communism in the last decade of the 20th century, followed by long-term transformation in the agriculture sector as the CEECs successively joined the EU, led to radical change in features of the farming the region's states engaged in. This was not least true when it came to the land-ownership structure the present study has considered.

First and foremost, the changes in the food sectors of the post-communist CEECs entailed the restitution and privatisation of assets that had earlier passed into the hands of the state; as well as modernisation and a raising of levels of efficiency, and incorporation of the sector into a system based around global competition to produce and process food (Bański, 2004; Csaki and Lerman, 2000; Doucha and Divila,

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2005; Halamska, 2013; Petrick and Weingarten, 2004, Rusu and Florian, 2003). In that connection, there was a (further) change in the nature of the farm, with those run by the family now returning to a key role.

The transformation of the farming sector can be further linked with social, economic and cultural change in rural areas (Csatari et al., 2019; Vaishar and Stastna, 2019). Country-dwellers were, for example, becoming more active participants in society, while their employment became far more diversified structurally than it had been before, as levels of education in the countryside improved, and urban-rural technological disparities diminished to some extent.

The early 1990s brought radical change in the structure characterising land ownership (Bański, 2017; Burger, 2006; Swinnen, 1996). There was a rapid year-on-year increase in the significance of the CEECs' private sectors (Balteanu and Popovici, 2010; Bicik and Jelecek, 2009; De Arriba, 2007; Tisenkopfs, 1999; Zadura, 2005). For example, in Hungary the share of agricultural land in private-sector use rose from 14% in 1990 to 54% in 2000 (Kovacs, 2005).

The change was associated with farm fragmentation. There was a decline in the numbers of large entities; while the number of small farms increased. In the mid-1990s more than 1.4 M farms were in operation in Hungary (Hartsa et al., 1998). In Bulgaria in the early 2000s there were an estimated 8.7 M farm plots, under the ownership of some 5.1 M citizens of Bulgaria – or 65% of the country's entire population (Bencheva, 2005; Kopeva, 2003).

The furthest-reaching change from this point of view affected Romania, where the transformation increased the numbers of owners of land steadily, to around 4 million (Benedek, 2000). In turn, Slovakia and Czechia experienced quite different changes, even though privatisation there too took in all of the agricultural land. The Cooperatives and State Farms of the communist era were made over into private enterprises, but the land once belonging to them was not fragmented by being parcelled off, even though it did come into the ownership of hundreds of thousands of lawful owners (Spišiak, 1997). As of 2007, only around 4% of the farms in the Czech Republic covered more than 500 ha, but together these were making use of more than 72% of all land in agricultural use (Basek and Divila, 2008).

Changes of ownership and agrarian structure resulted in a transformation in agricultural land use (Ianoş and Secăreanu, 2020; Lennert and Farkas, 2020; Vaishar and Stastna, 2020). They involved the management structure in terms of its basic components (arable land, grasslands and land set aside for the cultivation of perennial crops), as well as trends relating to the species of crop actually being grown on arable land. Clearly, a significant influence on any new trends noted for land use was exerted by CEECs' preparations for accession, and then their actual accessions, to the EU. Taking place in or after 2004, these allowed advantage to be taken of direct payments, the Structural Funds, and special programmes founded under the Common Agricultural Policy (*Rural Development ...*, 2008).

The subject literature – and analysed indicators present within it – point to the huge significance of EU policy for the CEECs, and the condition agriculture finds itself in there (Bański, 2018; Wilkin, 2016; Page and Popa, 2013; Todorová, 2016; Veznik et al., 2013). Moreover, the domestic food-sector policies now pursued by the countries in question differ quite markedly, most likely helping shape land-use structure in specific and varied ways. A number of other, more-specific kinds of socioeconomic conditioning may be referred to, with these able to shape the structure analysed here to a greater or lesser degree. These include: changes in the relationship between the costs of means of production and prices chargeable for produce and products, reorientations when it comes to foreign trade in both those means of production and what is produced, changes in consumer preferences as they shape demand, the growth of environmental awareness, and a number of other factors.

A second category of conditioning of agricultural land-management involves farming's factors of production – i.e. soil, hydrological conditions, relief and climate. The area under analysis has rather a broad north-south spread, stretching as it does from the Gulf of Finland to the

Aegean. Climate across that area is obviously rather well-differentiated, as mediated via length of the growing season among other factors; while soil conditions and relief are also rather varied. Together, these factors encourage a differentiated approach in farming whereby – for example – a variety of different crops are chosen for cultivation (Falkowski and Kostrowicki, 2001).

The principal cognitive aim of the work detailed here has been the diagnosis and identification of trends for agricultural land use among the CEECs. Particular attention has been paid to spatial differences in land-use structure, and to the latter's significance in shaping conditioning. Analysis has extended to key elements of land-use structure in farming, as well as to the crop structure characterising arable land in earlier years, as well as now.

The work has been devoted to the CEECs – i.e. countries located in an area imbued with various historical and political connotations, and assigned different spatial designations (Halecki, 1994; Hoffman, 1989; Kłoczowski, 2003). Today it is typical for the idea of Central and Eastern Europe to relate to states emerging out of the old Eastern Bloc, while this particular study confines itself to formerly-communist countries that have now joined the European Union. That denotes – in north-south order: Estonia, Latvia, Lithuania, Poland, Czechia, Slovakia, Hungary, Romania, Croatia, Slovenia and Bulgaria.

## 2. Data collection and methods

The source materials used in this work have derived first and foremost from either *EUROSTAT* or the FAO. However, it needs stressing that the statistical material available is very disparate in terms of its subject matter, in part because it is collected by statistical offices domestically – in line with a range of different methodologies. There are also country-to-country differences in the ways of defining different statistical categories. This all ensures major disparities in the values different statistical indices assume, with this again complicating – or even precluding – comparative analysis. The assumption therefore adopted saw analysis mainly confined to data from a single source (i.e. *Eurostat* or the FAO).

That analysis as it concerned agricultural land distinguished between the three main categories of arable land on the one hand, as well as – on the other – areas growing crops of a more permanent nature or status (e.g. perennial crops), and grasslands (as typically split into the meadow or pasture sub-categories). In turn, as the main components making up the structure of crops sown on arable land needed identifying, a focus was on the most-widespread crop species, at the expense of certain crops – or even groups of crops – ignored altogether as of lesser economic significance or as only grown very locally. Spices, drugs, fibre-generating plants and so on were some of the categories not taken account of at all.

A separate analysis has considered changes in the areas planted with the crops of different kinds. So that trends in crop structure across the region could be compared, it seemed reasonable that types considered should be present in all of the states analysed. However, that posed major problems in and of itself, given the considerable differentiation present in a region in which around 100 crop and plant species are cultivated more regularly. Thus, while the key oleiferous crop in the north of the region is oilseed rape, the southern alternative or substitute is the sunflower. This kind of circumstance demanded a strategy including a few key species (wheat, barley, potatoes, etc.) alongside defined groups of crop plant (i.e. those generating oil, cereals overall, fruit, and so on). Analysis of changes of area for these selected crops in the different countries was mainly associated with the 1990–2015 period, even if objective considerations occasionally dictated a reference period shorter by 2 or 3 years. Where this happened, the fact is noted in relevant footnotes.

Ultimately, the work took in:

- cereals overall;
- wheat;

- barley;
- potatoes;
- oleiferous crops (oilseed rape and field mustard, as well as sunflower);
- sugar-producing crops (sugar beet and sugar cane);
- vegetables;
- fruits.

The research assigned separate treatment to changes in the area planted with different crop species (or groups thereof), with these being categorised in terms of trends for three different features. The first was the trend observed nationally in the years 1990–2018,<sup>1</sup> which could be characterised as follows:

- 1) an upward trend, whereby the area cultivated increased (by more than 10% in comparison with the situation in the first year),
- 2) stabilisation (a value different from (higher or lower than) the original one by less than 10%,
- 3) a downward trend, with less land than before planted with the given crop (to the extent that the area was more than 10% below the initial value noted).

The second feature was variability assessed for the national trends by comparing the five sub-periods 1990–1995,<sup>2</sup> 1995–2000, 2000–2005, 2005–2010 and 2010–2015. This analysis offered a basis for characterisation as follows:

- 1) a steady or sustained trend – in the case of increased area over the 1990–2015 period, all five intervals would note an increase; while in the case of a downward trend for 1990–2015, all five sub-periods would report a decline; and in the case of stabilisation over the 1990–2015 period, all five sub-periods would see areas differing from the initial value by less than 10% in either a positive or negative direction,
- 2) a non-sustained trend – in all other cases.

The third feature was an assessment of a given country's trend as set against the one characterising the CEECs in general.<sup>3</sup> That led to the identification of:

- 1) an upward trend notable on the regional scale (given a value more than 10% above that characterising the average change in the region as a whole),
- 2) stabilisation (with a value less than 10% above or below that characterising the average change in the region as a whole),
- 3) a downward trend notable on the regional scale (given a value more than 10% below that characterising the average change in the region as a whole).

The results of the analyses are as presented below in Section 3.3.

### 3. Results

#### 3.1. Agricultural land-use structure

Land under agricultural management represents a basic land-use

<sup>1</sup> The analysis for Czechia and Slovakia took in the 1993–2015 period, while those relating to Croatia, Estonia, Lithuania, Latvia and Slovenia involved 1992–2015.

<sup>2</sup> In the cases of Czechia and Slovakia, the first time interval was therefore 1993–1995, as compared with 1992–1995 for Croatia, Estonia, Lithuania, Latvia and Slovenia.

<sup>3</sup> In line with the issues relating to availability of data, the period analysed for all the CEECs was 1993–2015.

structural category in all of the CEECs. At the beginning of the transformation, the country with the highest share of its area accounted for by such farmland was Hungary (at around 70%), followed by Romania (62%), Poland (60%) and the then Czechoslovakia (53%). From the point of view of the area of land under the management of the agricultural sector, it is unsurprisingly the region's two largest countries – Poland and Romania – that stand out. In each case, around 14 million ha of land is involved, and in total there is a great deal more farmland there than in all of the region's remaining states put together.

A downward trend for agriculture's share in overall land use was then noted in all CEECs, even as sizes and rates of these declines varied greatly from one country to another. The largest absolute changes of area characterised Poland and Romania – mainly of course because these are large countries which anyway happen to have large amounts of farmland. Nevertheless, this was change on a very large scale, as a period of just 20 years (between 1993 and 2013) witnessed the loss of no fewer than 6,563,000 ha of agricultural land in these two countries – or more than the *entire* area of farmland in Czechia and Slovakia. Losses mainly occurred in the vicinity of large cities, as single-family housing construction boomed in those areas. Land first taken out of agriculture was then designated for other forms of use, before being divided up into small building plots. A further loss of farmland reflects intensive expansion of the network of expressways and motorways. A third cause is economic, and results mainly from a rationalisation of production in the food sector. In this case, a function in farming is mainly being lost by areas in which the natural conditions disfavour agriculture and/or there are locations for a large group of farms not able to engage in efficient production.

It is today possible to discern 2 groups of CEECs which differ in terms of the role played by farmland within their land-use structure overall. The first group is formed by Romania, Hungary, Czechia, Lithuania, Poland, Slovakia and Bulgaria, in which farmland represents the key land-use component, accounting for between 40 and nearly 60% of the whole country. The remaining 4 states (Estonia, Latvia, Slovenia and Croatia) have relatively large shares of land under forest or regarded as "wasteland". For example in Slovenia, forest cover is at more than 60%, while in Croatia there are both mountain and coastal areas in which over half of the potentially-cultivable land is not in regular use (*The agriculture...2015*). This is furthermore a reflection of out-migration, the unprofitability of production on small farm plots, and warfare in the mid-1990s that did much to degrade farmland. Where the Baltic countries are concerned, the low share of farmland reflects unfavourable edaphic and climatic conditions. In contrast, in the Balkan states it is above all the mountainous relief that ensures less-suitable circumstances. It should be clearly emphasised that physical conditions, including relief and climate, determine the structure of agricultural land and its share in countries' total areas.

Crop production plays a very important role in the agriculture of the CEECs, with this first and foremost involving cereals and industrial crops. This fact also explains why there is a decided prevalence of arable land within farmland overall.

Other components to the agricultural land-use structure are grasslands of different kinds. In contrast, on the scale of whole countries, perennial crops cover only small areas. This does not of course preclude their representing the leading use of land in some areas (like the Tokay wine-making region in Hungary, and the apple orchards in a part of Poland centred around the centres of Grójec and Skierniewice).

In most countries of the region, the share of all agricultural land taken by field crops exceeds 60%. Only in Croatia and Slovenia is the share of all farmland that is arable lower (as a reflection of the often-mountainous terrain already referred to). At the same time, these two countries also feature rather large shares of land given over to perennial crops, mainly as a reflection of the climatic opportunities for both vineyards and olive groves to be established and cultivated. Fig. 1.

Even as agricultural land was being lost in all of the CEECs, the structure characterising the use of the remaining farmland was also

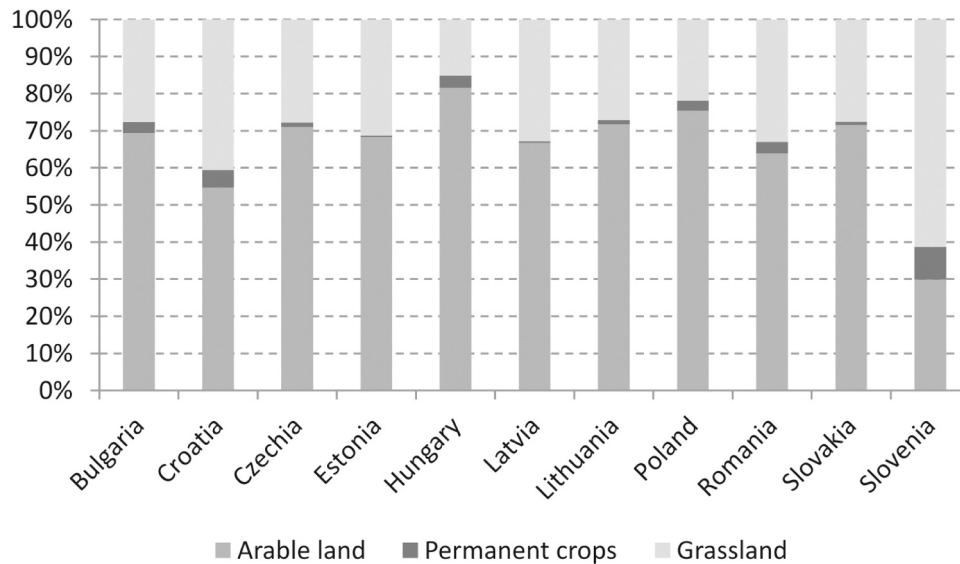


Fig. 1. Structure characterising the agricultural land in the CEECs in 2017. Source: Author's own research on the basis of FAOSTAT data.

changing. In Poland, it was above all the share taken by perennial crops that increased; while Romania saw its shares of meadows and pastures increase at the expense of areas supporting perennial crops, and arable land. In Bulgaria too, the area under perennial crops declined, though that country also lost some share of grasslands, so that cultivated fields ended up accounting for a larger share at the end of the period. In Estonia and Lithuania it was the share of land taken by grasslands that rose – quite considerably – again at the expense of arable land. Yet the situation in neighbouring Latvia was rather the reverse.

On their own, these examples are enough to show how structural change expressed in areal terms did prove varied – in terms of both direction and nature. Indeed, it is even possible to conclude that, while some countries experienced an intensification of agricultural production, others underwent extensification. This all leaves it particularly important for the changes that have taken place to be identified and have certain likely causes assigned to them. The remainder of this paper is therefore devoted to such matters. Fig. 2.

A fact worth stressing is that all the CEECs are experiencing increases

in the share of all farmland suitable for organic farming. To obtain the necessary certification for this, land is specifically converted out of conventional agricultural and into that of an environment-friendly profile, with this fact being attested to by a special institution. Depending on the type of crop to be grown, the time taken for this conversion to take place is in the range 2–3 years. As of 2012, the CEECs accounted for around 17% of all the land suitable for organic farming in the EU (Bruma 2014). And, while the highest shares of land of this kind are noted for Estonia, Czechia and Latvia, the lowest characterise Bulgaria and Romania.

Estonia is among the leading organic-farming countries anywhere in the EU. In terms of the share of farmland that meets the relevant requirements, it takes second place in the EU after Austria. Farming of this profile is of a mixed nature, with crops grown and livestock raised, and the mean area of a typical organic farm is of 80 ha. Organic-farming land in Latvia is assigned to livestock production as well, given that more than 80% of it takes the form of pasture, or else fields used to grow fodder crops. A similar situation applies in Poland, where around 70% of

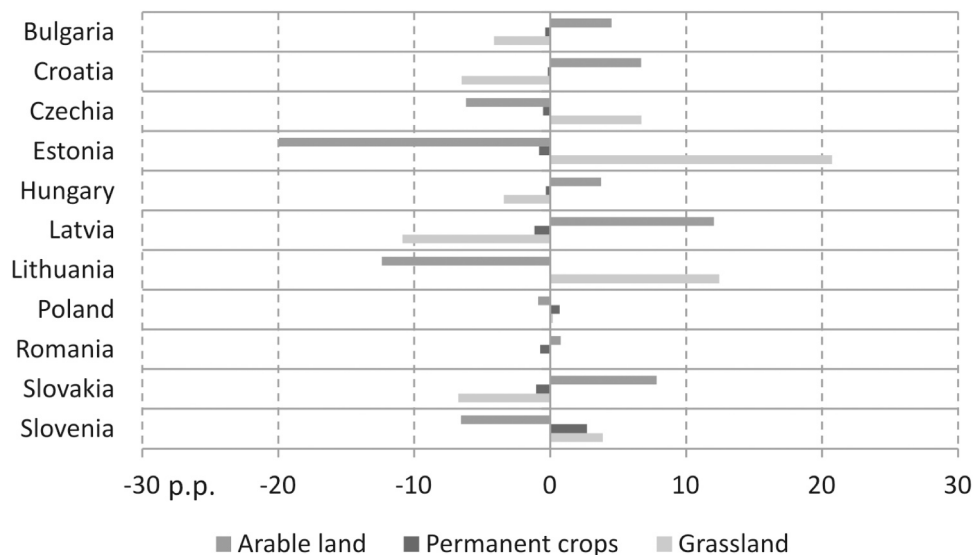


Fig. 2. Changes in agricultural land-use structure in the CEECs between 1995 and 2017. Source: Author's own research on the basis of FAOSTAT data.

the certified land again takes the form of grasslands.

### 3.2. The current structure characterising crops sown on arable land

The structure for crops sown on arable land in the CEECs is dominated by cereals, whose share amounts to some 69% overall. A high level of production per inhabitant is to be noted in two parts of the region, i.e. the Baltic States, as well as Romania, Bulgaria and Hungary. However, given the two sets of natural conditions involved here, the areas are found to have crop structure differing markedly in terms of the species of cereal actually grown.

Given its plethora of varieties adapted to different kinds of natural conditions, wheat is the cereal crop cultivated most widely in the region. The major growers are Romania, Poland, Bulgaria and Hungary, which together account for over 72% of wheat production. Maize comes second to it among the crops sown on arable land. Otherwise, it is typical for structural components involving the key crops to be shaped by geographical location. For example, wheat is the leading crop grown in the region's northern countries, while maize is clearly a "southern" crop. Fig. 3.

In the Baltic states, barley, oats and rape are the crops featuring alongside wheat in accounting for high shares of the sown area. In contrast, Poland has a rather specific crop structure, in that there are a wide variety of components accounting for rather similar shares (i.e. barley, rape and rye, as well as – somewhat less importantly – maize, oats and potatoes). Nevertheless, the key element is again wheat. To the south, the Czech Republic features high shares of wheat and barley, as well as rape, while a further noteworthy feature is the relatively high share accounted for by sugar beet. The latter is also of importance in the crop structure noted for Croatia, Poland and Slovakia. When it comes to specialisation, Slovakia's crop structure is rather similar to that in neighbouring Czechia, even if maize and sunflowers are rather more significant. In turn, Hungarian agriculture is dominated by three crop species, i.e. (in order of area occupied) maize, wheat and sunflower. A key role is also played by rape- and barley-growing. In Slovenia and Croatia, a characteristic feature is the very high share that maize accounts for. Apart from that species, only wheat and barley are otherwise important to Slovenian crop-growing, in line with their high shares. In some contrast, structure in Croatia can be seen as more diverse. While wheat takes its high share, barley, rape and sunflowers are also important, as is the aforementioned sugar beet. In turn, Romania's agricultural structure is apparently characterised by the high percentage shares achieved by maize and wheat; even as sunflowers, rape and barley are

all decidedly less important. Finally, crop structure in Bulgaria stands out for the distinctly high shares that both wheat and sunflowers account for.

### 3.3. Trends for crop structure

The trend for the transformation in crop structure across the region has first and foremost entailed increases in the shares taken by rape and wheat, as well as declines for potatoes and barley. Moreover, sunflowers and maize have tended to become more important, while the role of rye has declined. The role of wheat in the CEECs is in turn the leading one, given the high potential yields, as well as very widespread use in both human and animal nutrition. The production of oilseed rape has increased markedly over the last 3 decades, albeit with a great deal of variability reflecting trading conditions in given years. Price fluctuations are thus behind major year-to-year changes in the area of land planted with this crop.

A marked growth of interest in the cultivation of rapeseed followed on from the accession of the CEECs to EU structures. Thanks to the CAP, the growing of this crop increased in profitability, as demand rose in the context of biofuel production. The region at present accounts for some 40% of the overall production of the crop in the EU, with its major producers being Poland, Romania and Czechia. In turn, most countries have undergone a steady decline, in recent decades, in the area of land planted with potatoes. The potato as a fodder crop is easily substituted by alternative root crops, while in the case of human consumption, people seem to be eating more of other vegetables. A decline in the level of production of the potato (as a labour-intensive crop) is also in large measure a reflection of rising labour costs. Since the 1990 s, the area planted with barley has declined somewhat, with the increased production achieved in some countries first and foremost due to increased yields.

Changes in the overall area of cereals and of several key cereal species proved different in different countries, to the point where clear overall trends are hard to discern. It is in general possible to refer to a decline in area for cereals, or else a stabilisation. Likewise expected is a further gradual decline in the area of agricultural land taken by cereals, with the share in relation to crop structure also declining – as new higher-yielding varieties are introduced to allow levels of production to rise in any case. This may in turn threaten overproduction, with a potential consequence being reduced profitability of cereal-growing. Over the analysed period, the highest mean annual fluctuation in the area of land assigned to the growing of cereals was noted in the region's south-

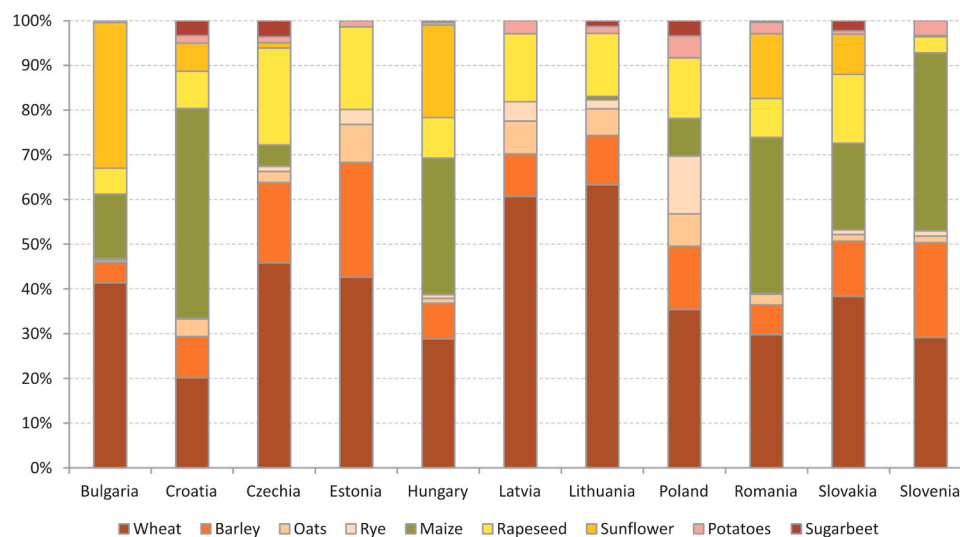


Fig. 3. Crop structure in relation to the main species grown on arable land in the CEECs in 2017.

Source: Author's own research on the base of FAOSTAT data.

east, which is to say Bulgaria (7.1%) and Romania (6.1%). This reflects the way in which dynamic changes of ownership may shape an unstable situation on the market for food. [Table 1](#).

The area planted with cereals in the Baltic states (Estonia, Lithuania and Latvia) is rather stable, if subject to fluctuations from time to time. Within the group, wheat has continued to gain in importance, with the area sown experiencing an above-average rise in all three countries – as set against the CEECs overall. There has been an increase in the area sown with rape and field mustard – as in other countries, but here rather more so. The shares of crop structure accounted for by the other categories analysed have gone down.

Agriculture in Poland – as set against the other CEECs – stands out mainly in the way the area assigned to fruit-growing has increased. This is a (positive) change markedly different from what has happened on average in the rest of the region. Also noteworthy is the stabilisation in the area planted with wheat; as well the increased significance of maize. Similar changes have been characterising Romanian agriculture, even though a further-reaching extensification of cultivation has taken place there. The area allocated to the cultivation of cereals (including wheat and maize) remains stable, while a situation resembling that throughout the CEECs applies to the growing of oil-producing crops. Other categories of crop are now being grown over smaller areas than they were before. Trends very similar to those noted for Romania apply to Slovakia, albeit with a greater rate of increase in area characterising maize. [Table 2](#).

A major growth in the area under crop cultivation in Bulgarian agriculture (above the average for the region as a whole) is found to relate solely to crops grown for their oil, and has applied equally to rapeseed and sunflowers. An increase was also noted for maize, though this was in line with the average situation in the region. Other kinds of crop-growing continued on a smaller area of land. The changes noted in Croatian agriculture are more diversified – and more favourable than those noted for Bulgaria. Alongside the change noted for oleiferous crops, there was an increase above average for the region in the area devoted to growing barley and vegetables, as well as a stabilisation of the area growing sugar beet. In turn, in the case of Czechia, we may speak of extensification (in one sense of that term) – since a greater area of cereal cropland is involved, with large areas of monoculture and a decline in the significance of other plants whose cultivation is intensive in that it requires a greater input of labour. Czech agriculture experienced an increase in the areas under wheat and maize, as well as oil-generating crops (though in the latter case the increase was actually less-marked than on average in the region). The remaining crops analysed (barley, potatoes, sugar beet, vegetables and fruit) all showed declines in area, albeit none capable of being seen as more permanent or persistent.

It was probably in the agriculture of Slovenia that trends for crop structure were most favourable in farm-income terms. For the changes there point to intensification, and a focus on the cultivation of more-

profitable crops. The area planted with cereals has been stable, but – at the expense of an average-size decline in wheat – there was a clear increase in the area planted with barley. Other than in line with an increased area of oleiferous crops, there were no more-major changes in vegetable- or fruit-growing: something of an exceptional situation in the studied region. In turn, in Hungary, it was rather an extensification of crop structure that took place. In the face of a stable situation as regards the area planted with cereals overall, there were visible structural changes as areas with barley and maize increased at the expense of wheat. While the share taken by oil-producing crops increased, those of the remaining species or groups studied (i.e. sugar beet, vegetables, potatoes and fruit) all experienced declines.

#### 4. Discussion

The analysis of changes in agricultural land use reveals that these have been multi-directional, and diversified in spatial terms. Unlike in the Czech Republic, where the share of all land accounted for by agriculture only decreased rather slowly, this region's largest states experienced an average overall loss of 10% of their farmland in the years following the collapse of the old Eastern Bloc. Furthermore, the changes in question actually remained rather limited in the 1990s – in connection with the fact that the old system was collapsing in crisis, while the incoming market economy was only being built up gradually. It was therefore only with the new millennium that a very dynamic process of transformation set in. Generalising, the phenomenon of the loss of agricultural land can be said to have intensified at the time the CEECs began to make their preparations for EU membership – given the way that necessitated far more dynamic social and economic processes.

The largest decline in the share of a country's area devoted to agriculture occurred in Poland – and there were several reasons for that. One was the territorial expansion of cities, resulting mainly in the development of suburban areas and satellite villages and towns. This was a further example of a phenomenon that intensified greatly as the new millennium began. Farmland was also taken over as new developments in transport networks gathered pace – above all the construction of expressways and the modernisation of the network within wider metropolitan areas. On the other hand, the pursuit of various environmental programmes ensured that much low-quality farmland was reafforested, as production there had lost its viability. A further underlying factor has involved unfavourable demographic processes, notably the ageing of the rural population and out-migration from the countryside of young and active people. Areas hit by these kinds of processes do not develop, while more and more of the mainly-uneconomical farms left behind go out of production. Other countries in the region have also been subject to such processes in their more marginal parts ([Bicik and Jelecek, 2009](#); [Gajdos, 2005](#); [Balteanu and Popovici, 2010](#)).









Of all the CEECs, it is Czechia that features the most-stable land-use structure. This reflects the fact that urbanisation at a high level was

































































































**Table 1**  
Changes in amounts of land in the CEECs (11 EU Member States) sown with selected crop species.

Crop species	1995	2000	2005	2010	2015
Apples	370,373	361,175	353,775	305,822	311,215
Barley	4,189,437	3,490,541	3,599,995	3,037,796	2,782,646
Maize	5,222,415	5,210,057	5,059,883	4,444,136	5,498,522
Oats	11,48,451	1,130,886	1,091,427	1,063,538	922,122
Potatoes	2,321,964	1,993,601	1,136,263	810,931	624,387
Rapeseed	1,010,404	1,145,236	1,391,064	2,954,558	2,535,638
Rye	2,884,417	2,503,956	1,658,450	1,264,783	905,120
Sugar beet	838,574	600,080	541,851	355,163	327,426
Sunflower	1,877,644	1,757,151	2,283,869	2,154,107	2,557,198
Wheat	9,116,795	8,760,172	8,910,834	8,733,826	9,465,768
Cereals Primary	24,843,275	23,663,131	23,553,049	21,590,300	22,581,158
Fruit Primary	1,618,393	1,525,101	1,366,029	1,201,490	1,138,547
Vegetables Primary	939,040	839,290	668,782	590,744	589,922

Source: author's own research on the basis of FAOSTAT data.

**Table 2**  
Trends for change in the areas under selected crops in the CEECs, 1990–2015.

National trends 1990–2018		Variability of national trends		Trend as set against the one characterising the CEECs	
	an upward trend		a steady or sustained trend		an upward trend
	stabilisation				stabilisation
	a downward trend		a non-sustained trend		a downward trend

Country	Crop species								
	Cereals	Wheat	Barley	Maize	Potatoes	Oleiferous crops	Sugar-producing crops	Vegetables	Fruit
Bulgaria									
Croatia									
Czechia									
Estonia				X			X		
Hungary									
Latvia				X					
Lithuania									
Poland									
Romania									
Slovakia									
Slovenia									

Source: author's own research.

established here longer ago, as was a reasonable level of transport infrastructure. Nevertheless, this country also manifests clear differences from one region to another. The greatest loss of farmland is again affecting areas in the vicinity of cities, as fields there are redesignated for building (Janku et al., 2016). A particularly distinct process of this kind characterises the zone of impact of Prague. In contrast, the fertile Moravian Plain has tended to maintain its stabilised structure where land use is concerned.

While multidirectional change has also affected the structure when it comes to farming land, Poland and Romania as the two countries with most of the latter had quite opposite experiences. Romania can be seen to have experienced an extensification of production, given that an increase in the share taken by grasslands occurred at the expense of both

perennial crop-growing and arable land. Privatisation and the abrupt associated agrarian fragmentation had this effect – in the 1990s, in line with unfavourable demographic change, the devastation of the infrastructure left behind by the “socialised” sector, and so on (Balteanu and Popovici, 2010; Takacs, 2008). Similar factors are also seen to be at work in other CEECs.

The indirect effect of the processes of privatisation was for the area of land assigned to agriculture to decline. New owners of land on small farms abandoned cultivation in the light of its limited economic viability, a lack of funding for investment, and the availability of other options better able to generate an income.

The subject literature sees fragmentation as a key problem with agricultural land-use (Bentley, 1987; King and Burton, 1982; Dijk van,

2003). Where this goes too far, it generates additional costs related to the accessing of plots (and requires more time), while obstructing or precluding the use of larger items of machinery, and work in the fields in general. Proportionally speaking, the boundaries between plots come to account for ever-greater areas of all the land held, and it is typical for these areas to be left uncultivated. Meanwhile, the need to access fields denotes a denser and denser network of tracks, while land registration becomes complicated – up to and including the point where landowners come into conflict.

It further needs to be noted how, as the phenomenon of out-migration from rural areas by young people is maintained, a large group of farm-owners comprise elderly people, who sooner or later withdraw from activity in farming, or at least shift over to self-supplying status. This is especially visible in Romania (Otiman, 2013). Moreover, the closure of Cooperatives there led technical infrastructure to deteriorate (in the face of a lack of repair and maintenance work, let alone modernisation and better management), with the result that productive potential was also impaired. In the view of Balteanu and Popovici (2010), over 20% of Romanian agricultural land existing in 1989 was fed by the irrigation system. That figure had declined to 3% by 2006. The 2000 drought then ensured that cereal production was lower by 40% than it had been in the previous year. Phenomena of these kinds only encouraged many farms to take their land out of production, or else at least forced change in a “safer” direction. In the face of a lack of “prospects” as one might see them in general terms, the owners of Romania’s fragmented farms eschew crop-growing, with all its requirements when it comes to financial outlays and the need for modernisation. An exception testing this rule is the very fertile region of Romania along the Danube, which retains its large farms in private hands, engaging in both crop and livestock production on an industrial scale.

In Poland the decline in the area of agricultural land was first and foremost associated with an increase in the share accounted for by areas under more-permanent forms of cultivation – a sign of an intensification in the country’s effort to produce fruit and fruit products. These came to represent a key product for export from Poland. Moreover, after EU accession, Polish farmers obtained rather high levels of payment for certain categories of orchard – even sufficient to encourage new planting, as well as the introduction of trees offering higher yields of fruit. That said, not all the new investment associated with the development of orchard cultivation looked justified. This was particularly true where new orchards were founded in areas lacking any tradition in this field, or even suitable climatic and edaphic conditions. The prime example was provided by the walnut plantations set up in Pomerania. The reason for this activity may be looked for in a change of ownership, with the media alleging that those involved were investors (or better “speculators”) lacking any prior experience whatever in agriculture, but seeking to “get rich quick” from the EU payments extended to this type of growing. The first step in that direction was the purchase of land, usually low in price, but also in quality.

Quite distinct from the phenomena observed in Poland were those characterising most of the countries located in the region’s south – where there was a decline in the significance of perennial crops in agricultural areas as set against the overall structure of agricultural land – as was made clear through an extensification of production structure, and resignation from more highly-specialised forms of cultivation (Takacs, 2008). This has above all characterised Romania, Slovakia and Bulgaria – as well as Hungary to a lesser extent. Factors probably underpinning these processes are changes of ownership and the associated withdrawal of small farmers from labour-intensive crops and those requiring own investment and/or modern technologies and necessary technical infrastructure.

Such phenomena also gain confirmation in detailed research into land use carried out on the basis of *CORINE Land Cover* data for Romania (Popovici et al., 2013). These show that, in the 1990–2000 period, farmers resigned from intensive forms of crop-growing, with some

regions even seeing new owners of land abandoning farming altogether – on account of their unsuitability for the work (lack of funds for investment or appropriate professional training). Only in Slovenia – with its better economic situation of agriculture – did the significance of the perennial crops increase.

Bulgaria’s increase in the share of land accounted for by field crops would seem justified, given the way in which more than half of the country’s farmland boasts highly-productive soils. A leading role in crop structure there is now played by wheat and maize – regarded as species of strategic importance when it comes to nutrition (Moteva et al., 2014). An increase in the importance of industrial crops is observable, above all for the crops generating oil to produce biofuels. A similar trend can be noted for Croatia, in which both maize- and wheat-growing have increased in significance. Maize mainly supplies the country’s internal needs, with any surplus sold to neighbouring countries like Bosnia, Macedonia and Montenegro. Farms growing maize obtained area payments from 1998 on – in place of the old production subsidies. A condition if support is to be received is that at least 3 ha of land should be planted with the crop in question. The area allocated to the growing of sugar beet has also increase in recent years – this reflecting a conferment of preferences on Croatia and other Balkan countries when it comes to the export of sugar to EU Member States.

It was mainly the share of grasslands that rose in Czechia, inter alia thanks to the collapse of the State Farms once present in (the worse agroecological conditions of) the country’s mountains and foothills. A lack of state support for the farming sector then ensured the abandonment of commercially-unviable crop-growing on arable land, which was converted into meadows and pastures, or else planted with trees. Moreover, a decline in domestic consumption of beef, milk and cheese all operated to change livestock-raising techniques. A closed system had prevailed in the 1990s (as supplied by fodder brought in after having been grown on arable land). But that gave way to a system of grazing out on grasslands that is pursuable for 7–8 months of the year (Bicik and Jelecek, 2009).

A particularly marked increase in the share of land accounted for by grassland was to be noted in Estonia, perhaps in connection with the widespread tendency for land there to be purchased for non-agricultural purposes (with no tax levied on a change in the designation of farmland to building land). According to Zadura (2005), transactions of this kind were mainly pursued in the vicinity of the large urban centres (Tallin and Tartu) – in which a majority of the land was probably arable. This would have allowed the overall structure to register a decline in the share accounted for by this kind of land – to the apparent benefit of meadows and pastureland.

The differentiation in field-crop-structure to be noted in the CEECs is first and foremost a reflection of geography, as mediated via climatic and hydrological factors, among other things. This for example explains why the shares wheat takes are highest in this region’s northern and central parts. A lower share for this kind of cereal is a feature of more-southerly countries (other than Bulgaria), where the role of leading cereal crop is played by maize.

Climatic conditions also do much to determine trends for the cultivation of industrial crops, and most especially those grown for their oil. CEECs from the Czech Republic northward assign a key role to rape and field mustard as the crops in this category, even as the Central and Southern European states see that role played by rape and sunflowers. In contrast, crops like potatoes and sugar beet show no more marked spatial specifics, with their distribution more a reflection of tradition and particular features of the food industry.

By analysing changes in the areas of the CEECs sown with key crops, it becomes possible to discern some general trends applying to either the region as a whole, or its individual states. The first such trend (typical for all the CEECs and with none of these deviating too much from the regional mean) reflects a steady loss of land devoted to potato-growing. It is pretty much only in Romania that the loss of area assigned to potatoes has proceeded at a below-average rate by the standards of the



region. The opposite trend applies to the increase in the area of oleiferous plant species (rape and field mustard or sunflower). There are countries in which the overall 1990–2015 increase in area noted for these species was a ten-fold one, or even greater. That said, in no case was that a sustained trend, given that there were always periods characterised by a loss of area sown with oil-producing industrial crops.

In the cases of the other crops analysed, changes were more ambiguous, even if subject to certain general principles. For example, in the case of sugar beet there is a clear downward trend for the growing of this crop in all of the CEECs except Croatia, where the area planted with sugar beet has remained steady. Otherwise, changes have differed from one period to another, indicating that there were times at which interest in cultivation actually grew greater. Similar trends characterise vegetables – also in decline when it comes to the area under cultivation. Only in Croatia has there been an increase, while the level remained stable in Slovenia. In all of the remaining CEECs there was a reduction in the area under these crops. A fall in the area occupied also concerned fruit, albeit with the aforementioned increase noted in Poland, as well as stability of the situation in Slovenia. While changes in the area planted with vegetables have not followed a fully consistent course (as there were certain periods in which the trend was upward), fruit-growing in Bulgaria, Estonia, Slovakia and Hungary all recorded steady and uninterrupted declines.

To a great extent, changes in crop structure can be seen to reflect the specific conditioning put in place via specific areas of state policy and/or agreements reached with the EU. Thus, Bulgaria's EU accession served to increase the incomes of farmers, but very largely those specialising in cereal-growing. This meant that farms whose key orientation was in the direction of vegetable- or fruit-growing, or else viticulture, saw their sales and incomes fall considerably – to the point where the ultimate effect was actually for some farmers to abandon certain kinds of cultivation altogether (Todorová, 2016).

In recent decades, particular challenges for agriculture have been associated with changes of climate impacting upon different elements of the natural environment, including hydrological conditions in particular (Bański and Białejczyk, 2006; Kozyra and Górski, 2004). Like no other branch of the economy, agriculture is dependent on the climate and on atmospheric phenomena. Even the most minor climatic anomaly – or abrupt weather phenomenon – may have serious consequences for the sector. Nevertheless, the effect is transient, and typically takes in rather small areas. Of a quite different order are persistent changes of climate acting over the long term. It is probably already as a result of change of this nature that areas of occurrence of various crops now differ from their former situation, as does the timing of different tasks out in the fields, yield sizes, and so on. These truths are all forcing farmers to look for new solutions (at times also opportunities), when it comes to the methods used and aspects emphasised.

The trend as of now is in the direction of higher air temperatures, but also a greater frequency of occurrence of extreme weather phenomena (be those heatwaves, major storms, floods, droughts, cyclones, or whatever). Such occurrences necessarily influence land management, and in particular the kinds of crop considered “optimal”, or at least “safe”. Certain climatologists maintain that a lengthening of the growing season and shift of agroclimatic zones will actually have the net effect of limiting the most-productive areas – first and foremost because of moisture shortages. This will be a process affecting lowlands above all, given the reductions in amounts of precipitation to be expected there. In contrast, foothill areas will probably find their agroclimatic conditions improved (Trnka et al., 2011).

## 5. Conclusions

Agriculture in the CEECs is characterised by considerable spatial differentiation in the use made of grasslands, as well as the crop structure typical for arable land. Generally, all of the region's countries except Slovenia have a prevalence of field cultivation within the area of

land under agricultural management. However, the south of the studied region has a relatively large share of land under perennial crops – in reflection of favourable climatic conditions. Crop structure differentiates the region's north and south in quite a clear way, as the former has prevalent cereal (above all wheat) cultivation, while the latter features a more-diverse crop structure, with more industrial crops grown alongside a wide range of cereals.

A decline in the area of grasslands post-1990 has been a feature typical across the region, reflecting the territorial expansion of cities, and development of road and rail infrastructure, as well as greater rationality of crop production inter alia involving exclusion from further agriculture of land of the lowest agroecological value – which tends to be earmarked for reforestation. These phenomena intensified once the phase of privatisation and the restitution of land had taken place. Changes in the structure of agricultural land-use did differ from country to country in the region, though it was possible to observe overall losses (other than in Poland) where the more-permanent uses were concerned – with arable land benefiting, or more rarely grasslands. Overall, the trends for the main components of agricultural land-use were associated with agroecological conditions, as increased rationality of cultivation made clear. Where countries have productive space of lower quality, there tended to be an overall increase in the share taken by grasslands. In contrast, where farming (especially soil-related) conditions are more favourable, it was the share of arable land that increased.

Where the observed structure for field crops is concerned, the direction of change would seem to be underpinned mainly by economic and social causes. Changes of ownership encouraging an unfavourable agrarian structure (with fragmentation of the cultivated area) combined with a process of ageing among rural inhabitants to encourage resignation from the growing of crops requiring large inputs of means of production and labour. The effect of this was for the significance of fruit- and vegetable-growing to decline, along with that of potatoes. The fact of the CEECs acceding to the EU had a major influence on crop structure, first and foremost given the growth in importance of oleiferous crops (rape and sunflowers) – in connection with the production of biofuels. Where cereal-growing was concerned, the main trend involved increased shares for wheat, and locally also triticale (in Poland) – primarily at the expense of barley and rye.

There would seem to be ever-great influence of national farm policy and that of the EU on the crop structure characterising arable land. Subsidies, payments and other forms of financial support for the sector are shaped by defined preferences for certain crops among farm-owners. Equally, given the leading role played by large farms using industrial methods, the nature of production in the CEECs looks in some conflict with the new trend for the CAP to espouse biodiversity and a more-organic production of food. In this respect, anticipated changes will probably raise the level of diversity of crop production. Moreover, warming of the climate is causing a spatial polarisation of food production, both regionally and globally. Productive potential will above all increase at the higher latitudes in which the CEECs are primarily located. Equally, the region's southernmost part is likely to witness a “relative” decline in the productive potential of agriculture – mainly as a reflection of progressing water shortages.

## CRedit authorship contribution statement

**Jerzy Bański:** Conceptualization. **Jerzy Bański, Wioletta Kamińska:** Data curation. **Jerzy Bański:** Formal analysis. **Jerzy Bański:** Funding acquisition. **Jerzy Bański:** Investigation. **Jerzy Bański:** Methodology. **Jerzy Bański:** Project administration. **Jerzy Bański, Wioletta Kamińska:** Resources. **Jerzy Bański, Wioletta Kamińska:** Visualization. **Jerzy Bański:** Writing – original draft. **Jerzy Bański, Wioletta Kamińska:** Formal analysis, Writing – review & editing. Authors have read and agreed to the published version of the manuscript.

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