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Şcoala Doctorală de Studii Inginereşti

A COMPARATIVE ANALYSIS OF REGIONAL AGRICULTURAL ENTERPRISES IN ROMANIA AND GERMANY AS A BASIS FOR DEVELOPING POSSIBILITIES OF AN EFFECTIVE EU SIBSIDY POLICY ON A REGIONAL LEVEL

Teză de doctorat – Rezumat

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The aim of this thesis was to provide a thorough insight into the European funding policy and the Common Agricultural Policy (CAP) in particular. In addition, it should be examined to what extent the CAP ensures effective funding at the regional level based on the needs of the local farmers there and to what extent adjustments would be necessary to ensure the implementation of a common and sustainable European agricultural policy, as well as to enable small and medium-sized companies in particular to facilitate potential for development in the current process of concentration.

The thesis offers a comprehensible insight into the current European funding policy with its goals, challenges and processes. The structure and development of agricultural subsidies, the current financial instruments and the characteristics of the application, award and control processes are explained and summarized.

Furthermore, major undesirable developments in CAP and their associated effects on the agricultural market and European society are emphasized in detail. Especially, the effects on the labour market, the animal welfare, the development of land prices, the biodiversity, the health, climate, soil and water protection, the world trade and the market exit of small and medium-sized enterprises are highlighted.

Case studies and the evaluation of statistical data describe the comparative situation of the German and Romanian agriculture in just as much detail as the system comparison of the CAP with the comparable conditions of the US agriculture. The effects of subsidies or changes of subsidies and their characteristics on farms and the associated procurement and sales markets are examined in detail and the respective developments are reviewed.

The evaluation of two surveys with the same content in the regions of Westmünsterland and in the Banat near the city of Timisoara provide a detailed basic assessment of the current CAP and enable conclusions to be drawn about necessary adjustments. It was examined whether and to what extent the predatory competition takes place at the expense of small and medium-sized companies. It was crucial to answer the question of whether and to what extent the displacement of small and medium-sized companies is caused by subsidies for large companies. Furthermore, an in-depth, comparative analysis of the two survey regions was carried out and the influence of subsidy payments on key success and competitive factors in agriculture was examined, as well as a discussion of possible alternatives to subsidy payments for strengthening these factors.

The current degree of digitisation in agriculture in comparison to industrial digitisation as a whole was presented and the importance of an advancing digitisation for the future survival

on the market was examined.

The results of both surveys and of the analysis concerning the current state of digitisation in agriculture finally offer predefined starting points for future research. Five thought models were briefly outlined and qualitatively assessed concerning to their feasibility.

In addition to the abstract, the thesis is divided into a total of 9 chapters. Introduction, six chapters related to the area studied, summary and references.

Chapter 1 of the present work serves as an introduction. This introduction provides an initial overview of the current funding situation in Europe and its impact on particularly small and medium-sized agricultural businesses and thus introduces the reader to the problem. Nevertheless, the set research goal, the problem and the research methods used, as well as the overall approach are explained in a comprehensible and detailed manner.

In the second chapter, the existing European funding system is described and analysed in detail. First of all, the growth strategy, the objectives of European subsidy policy and the integration of agricultural subsidies into the European subsidy system are presented. In addition, the composition of the EU budget, the application of the multiannual financial framework and the financial instruments used are explained as essential components of the European financial structure before the structure of the common agricultural policy is finally explained on this sub-aspect. This is followed by an analysis and description of the valid approval and decision-making processes. In particular, this part of the chapter describes the administration and allocation of subsidies, the criteria to be observed by the applicants and the decision-makers in the processes. Finally, the chapter provides an insight into the control and monitoring of granted subsidy payments in order to ensure their effectiveness, before it concludes with the presentation and analysis of the announced system adjustments from 2021.

Like no other sector in the European Union, the agricultural sector is strongly influenced by EU rules. The funding is provided exclusively by the EU budget and not by national funds. The share of agricultural expenditure in the European budget is the largest one in the overall budget with an increasing tendency [8]. The funding is provided by two funding areas - called pillars. From the lavishly designed first pillar, 73% of the CAP money is paid as area premiums to farms on a general basis. The second pillar includes rural development and environmental and nature conservation programmes. Compared to pillar 1, it is clearly underfunded and therefore given less priority [5]. The development of the agricultural sector with the different tasks and responsibilities is integrated in the assignments of the EU institutions [27].

The main objectives of CAP are in detail [23]:

- general support for farmers,
- continuous improvement of agricultural productivity, to ensure food supplies for consumers,
- ensure an adequate income for farmers,
- encouragement of the efforts against climate change, as well as the sustainable management of natural resources,
- preservation and tending of rural areas in the EU,
- securing and promoting jobs in the agricultural field and related sectors,
- stabilizing of the agricultural market.

For several decades, the Common Agricultural Policy has been the most important common policy area in the European Union. As a result, a large proportion of the EU budget is used for this sector [8]. Every year, about EUR 59 billion, almost 38% of the EU budget, are spent on this political sector [5].

The current reform cycle is in line with a growth strategy to make the European economy more inclusive, sustainable and integrated. Current crisis situations are to be

overcome and more employment opportunities are to be created. The implementation of the need for action identified at EU level is a national responsibility. Progress in implementation is discussed and, if necessary, adjusted in consultation with the EU Commission [45].

The integrated design of the European agricultural policy ensures an integrated development through the implementation of an overall strategy and the creation and preservation of an internal market for agricultural products, among others [17].

EU budget funds are collected by the member states and made available to the EU. The most important source of revenue in this context is the levy of a certain percentage of the gross national income (GNI) of the respective country, which accounts for almost 75% of the total budget [19]. The Eu budget funds are allocated to defined budget items for the respective valid budget period [18]. Subsequently, the actual financing takes place via structural and investment funds.

The cohesion policy comprises the following main funds [45]:

- the European Fund for Regional Development (ERDF),
- the European Social Fund (ESF),
- the Cohesion Fund (CF),
- the European Agricultural Fund for Rural Development (EAFRD) and
- the European Maritime and Fisheries Fund (EMFF).

So, the field of cohesion policy the ESF, the ERDF and the CF cover and treat mainly the social and regional problems. The EAFRD and the EMFF promote, however, especially agricultural development, as well as the fishing industry [45].

The financing instruments mentioned give CAP the necessary financial leeway to achieve the defined goals by paying subsidies. As mentioned above, agricultural expenditure has two main components that are part of the general budget of the EU. One of them is called the European Agricultural Guidance and Guarantee Fund (EAGF), also referred to as pillar 1. It finances the direct payments to farmers and provides measures to regulate agricultural markets as well. In addition to supporting farmers by direct payments according to the first pillar, the second major objective of the common agricultural policy is to make the future attractive to people in rural areas. The main instrument of support for the implementation of common EU priorities for the development of rural areas is the European Agricultural Fund for Rural Development (EAFRD), which is also known as pillar 2 of the CAP. Its co-finances the programmes of the Member States to the development of the rural areas and is run under the structural funds, because it pushes the regional development of certain Member States. It is intended to flank the first pillar "and at the same time to contribute to the implementation of growth, employment and sustainability in rural areas" [5].

To obtain financial support from the European Union, the respective applicant for a project must go through designated application procedures. The European Commission is responsible for ensuring that all funds from the EU budget are used properly. Since about 80% of EU funds are administered at the national level, a corresponding responsibility also remains for the governments of EU member countries. Organizations and companies seeking a European funding, have to check carefully at what institutions they have to submit their requests or proposals for a project. The European Commission manages the budget with the help of its departments and the Executive agencies of the EU. Member States transfer the central administration mostly to authorities like their ministries and other public institutions [45]. There are a variety of requirements to be fulfilled for a successful submission to a call for proposals or a public-service mission. In addition to the formal and substantive criteria, (including) financial aspects play a crucial role. To meet the formal criteria for EU applications, it is vital for applicants to comply with the respective guides (guidelines, manuals) of EU programmes. Applications that do not meet the formal criteria, that are incomplete, or miss the deadline, are

excluded from the award. Beyond, the formal requirements, when applying there are special items concerning the contents that are to be considered. A presentation of what social benefits can be achieved by the project is required by the European Union. In particular, the resulting added value on European level has to be pointed out. Furthermore, the applicant should deal with the question to what extent the project covers current topics or political priorities of the EU on the national, regional or local level. In the further process sequence, the allocation of funds is carried out with a high degree of transparency. The announcements and tenders for various EU projects are published on the respective websites, as well as information about the recipients of EU funds and the amounts paid out [45]. In addition, an extensive control system checks the legality and amount of the approved funds. With investment measures in the field of rural development the most widespread failures were violations against eligibility conditions, which is an indicator for the fact that private beneficiaries may deliberately have caused irregularities and non-compliance with rules for public and private procurement. Regarding the area-related aid the most commonly identified error is located in the non-compliance of agri-environmental commitments, in non-eligible agricultural plots and too large-scale square footage (space differences) [26].

Chapter 3 uses the example of German agriculture to show the effects of subsidy payments on farms and their economic environment. To illustrate this, statistical data from German farmers for the years 2000-2014 were evaluated and analysed. In detail, the development of the subsidy payments in total and according to the acreage, the development of subsidy payments and the profits generated according to the company size, the development of the number and size of farms, the influence of subsidies on organic agriculture, the price development of the procurement and sales markets, as well as that Farmers' investment behaviour are shown. In the second part of this chapter, the systematics and effects of CAP presented so far are compared with the subsidy methods of US agriculture as a comparable agricultural market. For this purpose, there is an introduction to standardized parameters and a historical development of the development of US agriculture and its subsidization. This is followed by an analysis of the impact of subsidy payments, particularly with regard to the competitiveness of small and medium-sized farms and on organic farming. The chapter ends with a list of comparative key data between European and US agriculture and an analysis of the extent to which negative developments in US agriculture that have already been experienced can be expected for European agriculture if the development of the CAP remains unchanged.

The German agriculture ranks third in global agricultural imports and exports. The majority of the agricultural trade takes place within the EU with a share of 78%, trade with EU third countries amounts to 22%. Around a third of the total agricultural products produced in Germany are exported. About half of the area of the Federal Republic of Germany is farmed and German farms are predominantly medium-sized. With a share of 86%, the single farmer cultivates an area of up to 100 has and use approx. 37% of the available area. German agriculture, forestry and fishing is an important economic sector. This importance is underlined when you consider the complete agribusiness, which means the entire food chain from the original production to the consumer, including the food industry, the food trade and the catering industry. 10% of all employees in Germany are employed in 700 000 agribusiness companies and the production value generated in 2018 amounted to EUR 499 billion. This corresponds to 8% of the total production value or 7% of the total gross value added. Furthermore, with around EUR 581 thousand (thou.) per employed person, agriculture is one of the most capital-intensive areas and the European trend towards concentration on a few large production companies can also be seen in Germany [13].

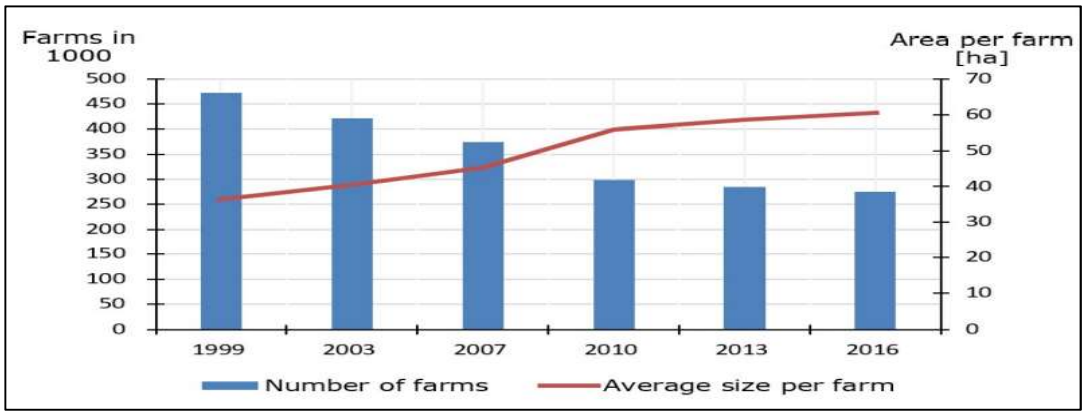

Figure 1. Development of the farm structure of farms from 5 ha in Germany [6]

From over 450,000 farms in 1999, there were still just over 250,000 in 2016. The average farm size rose to over 60 hectares. Furthermore, it can be ascertained that although small and medium-sized companies specifically receive larger amounts of subsidy payments, the specifically largest profits are made by large companies.

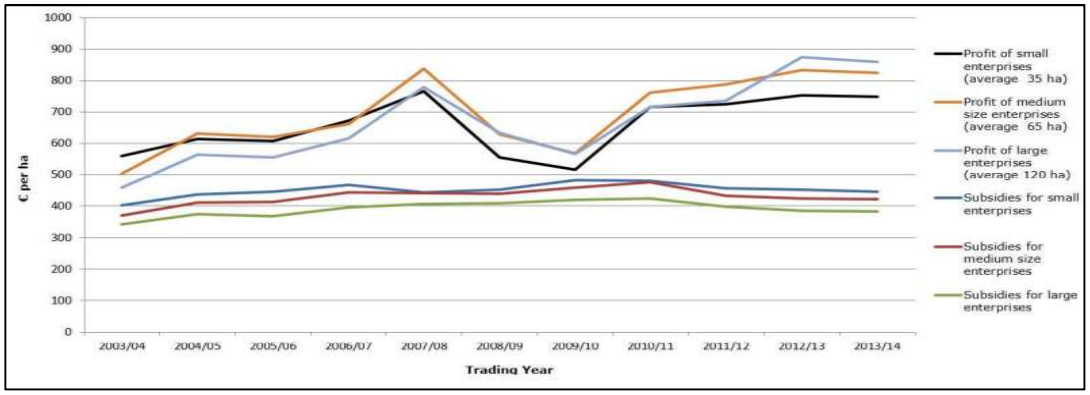

Figure 2. Profit for small, medium and large German farms and subsidizing those per ha land area [6]

The consumer-side trend towards greater health awareness and the associated demand for healthy, fresh and sustainably produced food offers businesses the opportunity to be successful in organic farming. The share of organic farming in the total agricultural area increased from 5.9% in 2010 to 9.1% in 2018. Agricultural enterprises that operate according to the EU eco regulation, received higher subsidies for organic farming than conventional farms. Higher subsidization for organic farming is to promote virtues like those of being particularly environmentally friendly, ground gently and animal-friendly companies and conventional farms to move to a changeover [13]. With regard to the influence of subsidy payments on other essential entrepreneurial activities, both an influence on the pricing on the raw material and sales markets and an influence on the investment expenditures of farms can be determined [41]. Subsidies therefore have a strong impact on the entrepreneurial actions of German farmers and, despite the progress of the current concentration process, are of immense economic importance, especially for small and medium-sized farms. In order to be able to better assess and classify the functioning and effect of the CAP and possibly to derive an outlook on the upcoming development, the support mechanisms of US agriculture, as a comparable market, are analysed in a separate section of this chapter.

Traditionally, agriculture has had a domineering place in the American economy and culture. During the last six decades, an ever-increasing struggle for higher productivity and

efficiency developed between the farmers. Nowadays, the American agriculture is dominated by huge companies, and small farms are almost irrelevant. Production has more than doubled in the past 50 years, with the number of companies having fallen by more than two thirds. Nevertheless, the agricultural sector is an important part of the American economy. In 2018 around 12% of agricultural companies in the United States are big farms, which also generate the majority of profits. In terms of numbers, in 2017 around 241 thousand of the 2.04 million agricultural enterprises own more than half of the total agricultural acreage in the United States [43]. The trend towards development in the direction of large-scale farming can also be seen clearly in the following figure 3.

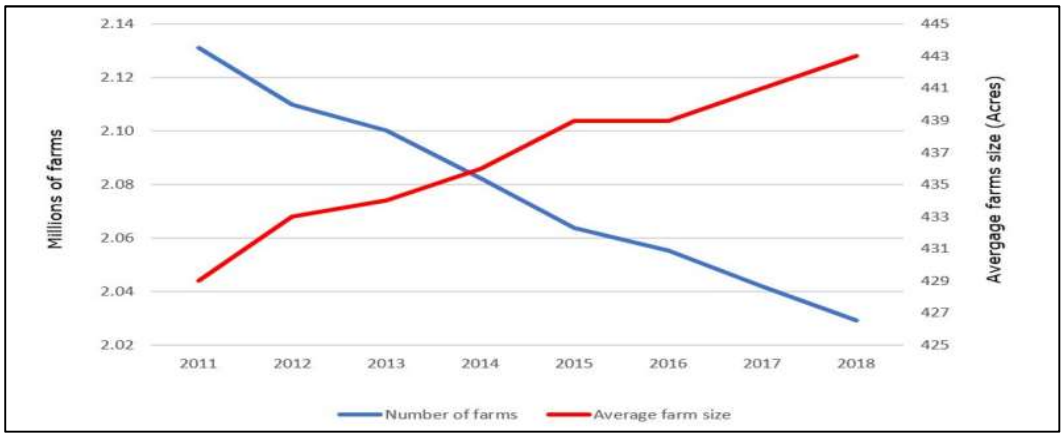

Figure 3. Number of Farms and Average Farm Size United States from 2011 to 2018 [43]

Automation and the use of genetic engineering account for the great increase in efficiency of agricultural enterprises. However, this farming, which is heavily geared to increasing efficiency, has caused huge environmental problems, in particular sustained soil erosion. Many areas in the Midwest as a result of that mismanagement lie barren and are no longer protected by an adapted vegetation. Heavy dust storms are created and take away fertile ground, so that entire landscapes become desolate. Similar to the administrative structures of the European countries, in the United States of America there is also a united Ministry of Agriculture – the United States Department of Agriculture (USDA). This ministry was established in 1862 and its primary task is to ensure the supply of food to the American population. In addition, the Ministry is responsible for the regulation of the agrarian market, forest and landscape conservation, agrarian science and research as well as the economic development of rural America. The subsidization system in the US did not play a big role in the past. With the abandonment of subsidy policy in favour of an industrialisation of agriculture in 1970, a process was initiated that continues to this day. The traditional farming life has been transformed into an entrepreneurial activity that still characterizes the US agriculture, despite some reforms since the 1980s [43].

The highly industrialised Us agriculture is an important trading partner and the economic relationship between the EU and the USA accounts for a large share of global trade. They are each other's main trading partners in goods and services, and they have the largest bilateral trade relationship in the world together [28]. Five corporations dominate the import and export of agricultural commodities: Archer Daniels Midland, Bunge, Cargill, Louis Dreyfus Company and Cofco. Three of these companies are headquartered in the United States. The huge market power enables these corporations to influence world agricultural markets and use their enormous bargaining power over producers in negotiating prices. Based on this market and bargaining power and considering their financial activities, they are capable of achieving high rates of return. However, they conduct their business activities disregarding the

requirements of a sustainable agriculture [30].

Due to the use of genetic engineering, organic farming only plays a minor role in American agriculture, despite a steadily rising demand for organic products. Therefore, the increased demand needs to be covered by imports [38]. As consequence of the associated increase in prices, predominantly young well-educated people with an increased awareness of healthy nutrition are its main consumers. These people are also willing and able to pay the much higher product prices [14]. For the coming years, a strong increase in demand for organic products is expected in the United States. Due to the fact that the organic cultivated area with just under 2.2 million ha corresponds to only 1% of the total agricultural area, American organic production cannot compete with strong demand growth [38].

Chapter 4 gives an insight into the importance and historical development of Romanian agriculture. In addition to data on the development of GDP, land use, the products produced and exports, the infrastructural conditions and operational structures are also described and analysed in detail. Furthermore, the procurement and sales markets accessible to the farmers, the investment behaviour of the farmers and the importance of organic farming are considered. The acquisition of agricultural land by foreign investors and the resulting concentration processes in farm structures are dealt with in detail in this chapter. The chapter closes with an analysis of the development of agricultural subsidies from 1991 to the present and their impact on agricultural holdings.

The agricultural sector has always been of major importance in Romania. Reforms after World War I reorganized agricultural ownership in many ways [39]. The biggest change came after World War II when the communist regime launched the collectivization of agricultural lands [31]. Following the collapse of the communist regime in Romania in 1990 the new government started to remove collective farms and state farms and they gave back the land to their former owners [12]. This changed the entire farm structure. In 1997 family farms and household plots cultivated 67% of the utilized agricultural area (UAA). The average size of the small farms was only 3 ha. In contrast, the average size of the privatized state farms was 2,491 ha [35]. Between 1996 and 2004 the share of Romanian agriculture in GDP valued 14% and had a growth rate of only 0.7% per year. Shortly before the EU accession the situation of Romanian agriculture deteriorated again. The competitiveness of Romania's agricultural products was miserable, and the technology used for farming was strongly outdated. Farmers ploughed their land with plow and horses. Because of that and caused by the land fragmentation the domestic prices were significantly higher than the world prices. To secure the support of farms by Brussels the authorities determined that the land should be consolidated. The objective of the EU was to ensure their competitiveness by supporting medium-sized farms [15].

In Romania agriculture 26% of all employees were still working in agriculture, much more than in other European countries, and generating a share of GDP of about 4.4%, which is also is much more than it is the case in any other European country [42]. These figures underline, that agriculture is even today an important part of Romanian's economy. From 2009 to 2014, the agricultural area remained more or less unchanged. In 2009 the agricultural area comprised 14.7 million ha and 14.6 million ha in 2014. In 2018, the total agricultural area was 13.4 million hectares. The agricultural production is divided into three main parts: crop production, animal production and agricultural services. Crop production was predominant with a share of 64.9% (65.9%) in 2020 (2014), followed by animal production with 32.9% (32.8%) and agricultural services with 2,3% (1.3%) [34]. The share of agricultural products in Romanian exports was about EUR 7.4 billion in 2019, corresponding to 11.5%. Compared to this share, other EU member states such as Germany with 6.3% (about EUR 77 billion) or the Czech Republic with 5.5% (about EUR 8 billion), as well as the EU with 9.4% (about EUR 182 billion excluding intra EU trade) showed significantly lower overall agricultural export shares. On the other hand, countries such as Poland with 14.2% (approx. EUR 32 billion) and Bulgaria with

17.1% (approx. EUR 5 billion) were above Romania's share. These ratios of agricultural export shares are at a comparable level for 2020. In 2020 the top five exported agricultural products included maize with a value of EUR 1,226 million, cigars, cheroots, cigarillos with a value of EUR 799 million, wheat and meslin with a value of EUR 949 million and other manufactured tobacco with EUR 762 million. Sunflowers with the lowest value amounting to approximately EUR 699 million. The largest trading partner is the EU with their member states with a share of approx. 74% of the recorded imports. Compared to the listed exports, the share of imported agricultural goods in 2019 was 10.9%. The share for imported manufactures was 78.6%, for fuels and mining products 10% and other imports 0.5%. In absolute terms, agricultural products were imported for about EUR 8.4 billion [44].

Table 1 shows the very contrasting structure of Romania's landscape according to the latest EU census in 2016. On the one hand, there were many small farms below 10 ha with a share of 98% of the total agricultural holdings with a possession of 39% of the UAA in 2016. With just a share of 2%, medium-sized farms between 10 and 100 ha were hardly available. They comprised 13% of the UAA. On the other hand, only 0.4% of the farms consisted of 100 or more ha but they held 48% of the UAA. Between 2005 and 2016 the number of small farms under 10 ha decreased by 826,000, almost 20%. Concurrently, the number of big farms over 100 ha has increased by 33%. Therefore, the UAA per holding increased from 3.27 ha in 2005 to 3.65 ha in 2016. The structure of farms as just described is the consequence of the land restitution which took place during the 1990s. During this period the state and cooperative farms were almost completely dissolved, and the land was given back to former landowners.

Table 1. Structure of Romanian agricultural enterprises [28]

	2005		2007		2010		2013		2016	
Farm size class	No. of farms	UAA	No. of farms	UAA	No. of farms	UAA	No. of farms	UAA	No. of farms	UAA
[ha]	[thou]	[thou ha]	[thou]	[thou ha]	[thou]	[thou ha]	[thou]	[thou ha]	[thou]	[thou ha]
Total	4,256	13,907	3,931	13,753	3,859	13,306	3,630	13,056	3,422	12,503
0	135	0	80	0	135	0	66	0	80	0
< 2	2,722	1,942	2,486	1,808	2,732	1,718	2,890	1,585	2,401	1,540
2 - 5	1,014	3,161	966	3,022	727	2,230	691	2,141	660	2,049
5 - 10	290	1,926	300	2,018	182	1,211	194	1,295	194	1,304
10 - 20	66	850	70	924	44	571	50	654	50	666
20 - 30	10	243	10	230	10	234	10	248	11	263
30 - 50	6	227	7	251	8	315	8	326	8	289
50 - 100	5	333	5	328	7	518	7	506	6	418
> 100	9	5,226	10	5,172	14	6,508	13	6,300	12	5,973

The quality of Romania's infrastructure is still low. Romania got one of the lowest scores in an EU infrastructure ranking. Romania achieved 2.4 scores for quality of railroad infrastructure, 3.36 scores for quality of port infrastructure, 3.75 scores for quality of air transport infrastructure and 2.6 scores for the quality of roads. Also, the scores for the quality of timeliness of shipments (3.22), modernization and development of TEN-T conventional rail core network (5%) and TEN-T high speed rail core network (0%) were very low. The rating has a scale from 1 to 7 [20]. Since joining the EU, agricultural input and output prices have generally fallen. In 2018, started a turnaround in terms of output prices. This trend reversal started for input prices in 2020 [28]. On the other hand, despite strong annual fluctuations, investment behaviour in the agricultural sector has increased in total since Romania's EU accession [24].

The importance of organic farming has increased in recent years. In organic farming technologies are used to conserve biodiversity and environmental protection [7]. Romania offers a wide range of possibilities to develop organic agriculture. These include good natural conditions, soil and climate. However, compared to the EU, Romania still has a great potential for improvement in this area [2] because of the lack of modern technology equipment, land

fragmentation, low productivity, inefficient output and the aging society [16].
Nevertheless, Romanian agriculture still holds one of the last rank in the development of organic farming in the EU [28], despite enormous upward trend from 2010 to 2020 concerning the number of operators in organic farming [16].

A major problem in Romanian agriculture is the behaviour of foreign investors [37]. The term 'land grabbing' describes the (partly illegitimate or illegal) purchasing or long-term leasing of land from public or private owners [3]. Romania is sought-after destination for land grabbing. About 900,000 ha of agricultural land are already in the hands of foreign investors. This corresponds to approximately 8% of the total arable area in 2016 [25]. Among the top 100 recipients of agricultural subsidies in Romania are companies with connections to Lebanon, Italy, Luxembourg, the USA, Austria, Great Britain, the Netherlands, Spain, Germany, France and Portugal [37].

Factors such as the progressive process of land concentration [32], the extremely good fertility of the soil [4], cheap land prices [32], the current legislation [32], political support [9] and the EU subsidies themselves [10] favour land grabbing. Since the end of the communist system, several reforms of farm structures and subsidy payments have taken place. Since joining the EU, Romania has received subsidy payments from the CAP. These have risen sharply in total [22].

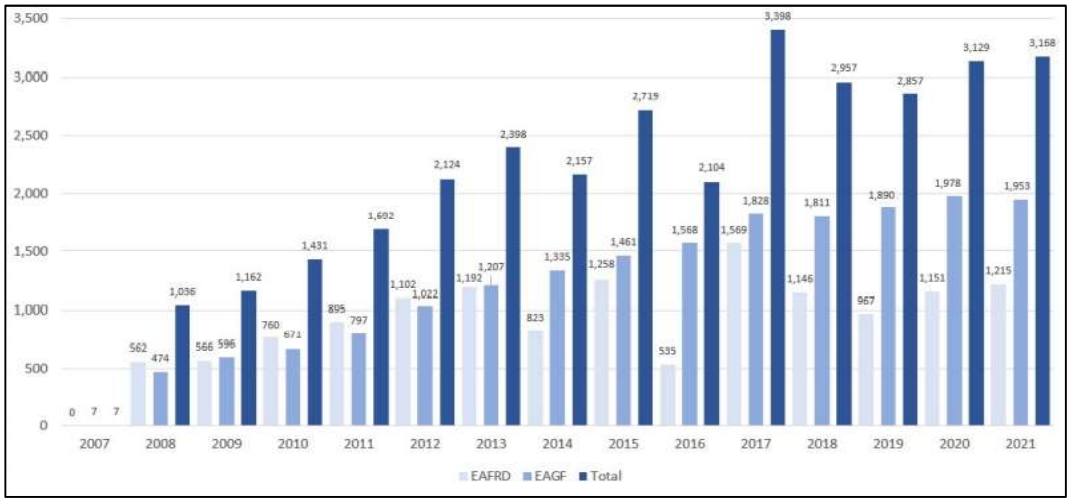

Figure 4. Development of CAP payments in Million Euro to Romania [22]

Due to the special farm structures, the distribution of the funds differs greatly from the EU average and, for example, from the distribution in German agriculture. However, as in all EU member states, the unfair distribution of subsidies between small and medium-sized farms compared to large farms also exists in Romanian agriculture [21].

Table 2. Distribution of direct aids to the producers in the financial year 2019 [21]

		Romania	EU	Germany
Total number of beneficiaries (x 1,000)		827	6,158	311
Amount paid to the beneficiaries (x 1,000) [EUR]		1,847,944	38,162,145	4,794,444
Beneficiaries receiving [%]	< EUR 1,250	81.30	48.10	16.50
	EUR 1,250 - 100,000	18.45	51.40	81.78
	> EUR 100,000	0.25	0.50	1.72
Direct aid distributed among beneficiaries Receiving [%]	< EUR 1,250	16.30	4.60	0.80
	EUR 1,250 - 100,000	57.90	66.20	73.00
	> EUR 100,000	25.80	28.70	26.20

Chapter 5 provides an in-depth analysis of the impact of the current CAP on farms, market participants, consumers, and European society as a whole. After presenting key figures to orient the reader with regard to farm structures per member state, scope, amount and allocation of subsidies granted per source of funding, the effects on the current concentration process in farm structures, the remuneration of agricultural work, the development of land prices, the impact on the Biodiversity, the use of pesticides and fertilizers, organic farming, animal husbandry and animal welfare, the climate, world trade and, last but not least, human health and social justice are shown and assessed.

Around 60 billion euros are spent each year to achieve the CAP's objectives. This is equivalent to about 33% of the total EU budget, or 114 euros per EU citizen. Since 1992, direct payments of pillar 1 have been used to support agriculture. In the 2014-2020 period, direct payments account with EUR 43 billion for approximately 73% of total agricultural subsidy payments. However, 80% of the funds are paid to only 20% of the beneficiaries because of the different sizes of their farms. More than 30% are accounted for only 131,000 of the approx. 6.7 million businesses, i.e., about 2%, received more than 30% of total direct payments. Thus, the second pillar disposes of far less money than the first pillar. These funds are intended to promote and finance measures in favour of climate-, environmental-, animal-, water-, soil, and nature protection as well as the competitiveness of enterprises, the general sustainability aspect, and a regionally balanced development in accordance with the principle of public funds for public goods [5]. Despite this extensive support, the nutrition of humans is achieved today mainly by fewer and larger farms in comparison with the time, when the CAP was started. Between 2003 and 2013, the number of EU farms decreased by 25%. The number of smaller farms in this is declining sharply. Instead, large and very large companies with more than 100 ha account for only a share of 3% of all EU farms and become increasingly important. However, their number increased by 16% in the same period between 2003 and 2013, and they now use around 52% of the total agricultural area. The increase of the large farms goes along with the loss of jobs, with less diverse cultivation of products, with intensive agriculture and accompanying pollution of the environment. Farms with a size of less than 10 ha and a mostly diverse production represent about 80% of all farms in the EU. But these businesses only use about 10% of the available land. The number of these companies has fallen. Between 2003 and 2013, 96% of the disappeared farms disposed of an area of less than 10 ha [5].

Including part-time and seasonal work, agriculture offered employment for approximately 9.5 million full-time workers in 2016, which is equivalent to 4.4% of all jobs in the EU. The importance of the agricultural sector differs significantly from country to country and goes down below 2% in the UK and Germany and up to more than 10% in Romania,

Bulgaria, Greece and Poland. However, the trend is declining everywhere in the EU. Between 2005 and 2016, the share fell by more than 25% and corresponds to a long-term trend [25]. Much of the agricultural work has since then been replaced using capital for investments in mechanization. The increased investment in measures to increase productivity, will lead to a continuation of this development and make more and more agricultural workers redundant. Especially for the countries in South-Eastern Europe, this development is a major problem against the background of high unemployment and the shortage of alternative jobs [5].

The increasing concentration of land ownership has a significant impact on agriculture in Europe, as it is the most important resource of agriculture in terms of fertile soil. The land is farmed by fewer and fewer people and industrial agriculture is increasingly taking over the acreage of medium-sized and smaller farms. This development leads to a permanent increase in purchase and lease prices. As a result, the competitive pressure on smaller farms increases constantly and leads to further market exits of these companies, as well as new entrants are discouraged from entering the market. Furthermore, intensive agriculture is considered the biggest threat to the flora and fauna in Europe. The status of 60% of species and 77% of habitats are considered unfavourable. The number of field birds has decreased by 56% since 1980, and since 1990 there has been a 35% fall in grassland butterflies. In some cases, individual species such as the turtle dove today are threatened with extinction. The biomass of insects in Germany has shrunk over 75% since 1990. Intensive agriculture is therefore the biggest threat to biodiversity [5]. Modern agriculture also has a direct impact on the environment and especially on cultivated soil and water management. The use of too much fertilizer and pesticides leads to economic, ecological and health damage. Due to the lack of suitable instruments, CAP can only partially prevent these damaging effects. Including carbon dioxide, around 391,000 tons of active ingredients are used in European agriculture like large quantities of chemicals. 80% of the chemicals are used as fungicides and herbicides, these are pesticides for controlling fungi and weeds. The existing Nitrates Directive of 1991 aims at protecting groundwater and surface water in the EU from nitrogen contamination by agriculture. Although stable groundwater quality has been observed for years in more than two-thirds of the monitoring stations, in many regions of Europe groundwater is heavily contaminated with nitrate due to the intensive animal husbandry and land cultivation. The high number of livestock stock per unit area is also responsible for existing animal welfare deficits. The CAP does not provide the framework for implementing measures to improve animal welfare and animal protection. It is not aligned with the flat-rate direct payments on the achievements and challenges of agriculture. The second pillar of the CAP offers opportunities to grant funds for particular animal welfare, such as grazing, more space for movements or to give one's animals employment incentives, but this option is hardly made use of [5].

Sustained growth in organic farming is driven by customer demand. In contrast to conventional agriculture, organic farming does not use chemical-synthetic pesticides, easily soluble mineral fertilizers, or genetically modified organisms. In animal husbandry, strict conditions apply to the runs for animals and the use of animal feed. The farm is considered in its entirety as an ecosystem of coordinated, self-regulating forces. For goods production there is EU-wide legislation supplemented by additional national standards. Organic farming is becoming increasingly important due to its low impact on the environment and the conservation of limited resources [5].

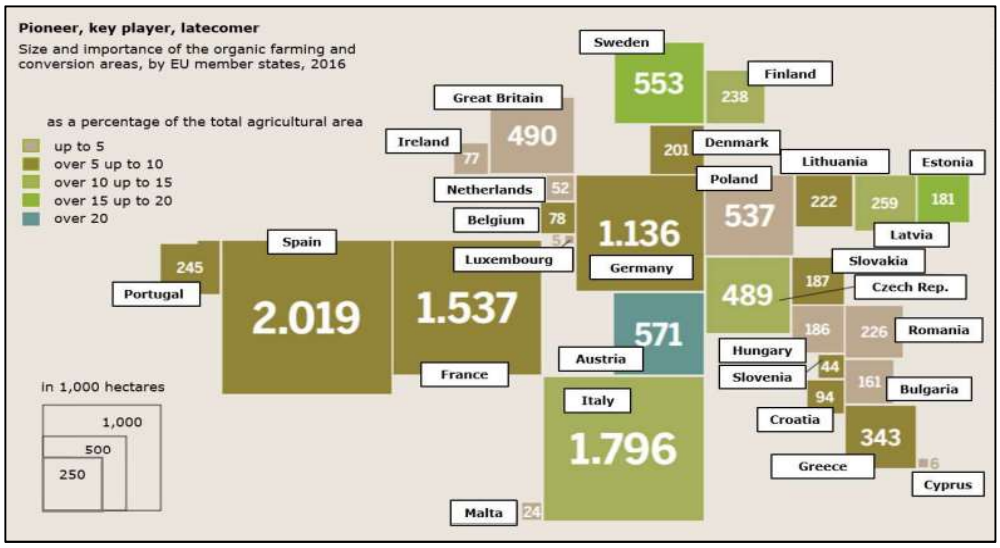

Figure 5. Size and importance of organic farming areas in the EU [5]

Organic farms receive targeted support through the CAP second pillar and automatically meet the environmental requirements for the first pillar direct payments. Nevertheless, the EU pays only around 6.4% of its budget for agricultural environmental and climate measures to organic farming. [5].

Health is a very important concern for most Europeans. This includes ensuring that safe, healthy, and high-quality food are given a high priority in the objectives of the CAP. Agriculture and health are thus closely related. The food produced satisfies a basic human need, but also has many negative effects. Every year, more than 7,700 tons of antibiotics are used to treat animals. This use is the main cause for antibiotic resistance, which in turn increases the mortality rate. In addition, agriculture is a major contributor to air pollution due to the high level of 90% of ammonia emissions and emissions from manure and fertilizers. More than half of all Europeans are overweight and almost a quarter are obese. The treatment of these diseases last not least results in considerable financial burdens for the states. Economic, political, and socio-cultural factors influence what people consume. Most of the commodity flows of agricultural products are dominated by multinational corporations. In households with an increased consumption of highly processed food, the incidence of overweight and obesity also increases because such products provide too much energy, sugar, and fat, but are low in fibre, there is a close connection between the topics of health, animal welfare, the protection of environment and social justice. Thus, e.g., better animal welfare with healthier animals reduces the need for antibiotics. Higher incomes, especially for smallholders, reduce the risk of social exclusion and improve the structures in rural areas. An increase in fruit and vegetable production and less animal husbandry reduces greenhouse gas emissions, air and water pollution and promotes a healthy and sustainable diet. Higher-quality foods enable producers to increase their incomes and lower pesticide use reduces the associated health risks. The CAP can support such a development by stimulating a healthy and sustainable diet, but the improving of the health status is not a CAP objective [5].

Climate change affects agriculture in many ways. In northern Europe, the warmer weather may well be beneficial for agriculture, while in central and southern Europe the negative consequences like the effects of droughts, floods, pest infestation and plant diseases prevail. At the Paris Climate Change Conference in 2015, the EU committed itself to reducing its emissions by 40% until 2030 and adapting agriculture to climate change without restricting production. Climate protection measures have continuously gained in importance in the CAP and have been incorporated as a core objective in the second pillar since 2013. Nevertheless,

the funding of climate protection measures varies greatly in the different Member States [5].

The EU agriculture is part of the international value chains and influences global agricultural markets and thus also prices, wages, incomes, and nutrition in the countries of the southern hemisphere. Africa, especially North Africa, is an important market for many agricultural products. The EU goods compete with the production of food crops and influence the local population's dietary habits. Should these exports decrease in the event of a loss of direct payments, supply pressure in this sector would decrease and prices in many African markets could rise. In turn, this price increase would be an incentive for local investment, as productivity there is still low [5].

Chapter 6 provides a comprehensive and in-depth analysis of agricultural subsidies and their impact on market participants. Based on a developed questionnaire with 39 questions in the categories general data of your company, your opinion on about the situation of agriculture, the kind of subsidies in your company and personal opinion about subsidies, the current importance of subsidies, especially for small and medium-sized agricultural companies Establishments highlighted and assessed. For comparison purposes, the survey was carried out in the Westmünsterland region in Germany and in the Banat region around the city of Timişoara in Romania. The importance of agriculture in both regions is also briefly described in this context. The survey results are analysed, assessed and presented individually in Chapter 6, i.e. for each survey as well as in a comparative way. The relevant key findings and the best or worst ratings of the farmers surveyed are also dealt with separately. The chapter closes with a critical appraisal of the research results against the background of the current European subsidy policy.

Westmünsterland is a region in the northwest of North Rhine-Westphalia, between the Dutch border in the west, the regional centre of Münster in the east and the Ruhr area in the south. With its processing of animal products, the Westmünsterland region is now in the midst of global competition for food. The region is one of the most efficient agricultural areas in the world. In many cases the farms have become high-tech, specialized, and intensive agricultural companies. They are composite systems originated in the food industry, which cover key food areas from the dairy industry to the meat industry. At the same time, a close spatial association between agricultural production and an extremely efficient upstream and downstream industry has developed in North Westphalia. This supplies the farms with means of production. The companies provide state-of-the-art technical equipment for growing crops, keeping livestock and transporting goods [33]. The agricultural companies in the Westmünsterland region are medium-sized distinct and predominantly active in classic areas of German agriculture.

Banat is a historical administrative region in southwestern Romania. Both, its natural conditions and its historical developments characterize it as a special border area in East Central Europe. Almost 73% of the 135 thousand farmers in this region are engaged in arable farming. This corresponds to a share of around 4% of all farms active in arable farming across the country. With approx. 627,562 ha, around 60% of the agricultural area in these districts and almost 8% of the state-wide agricultural areas are cultivated. In addition to arable farming, the agricultural areas in these districts are also used as family gardens (1%), for cultivating permanent crops (2%), but also predominantly as meadows and pastures (37%) [34].

For both surveys the same questionnaire divided in four categories was used. The questions of the first category aim at providing general data of the surveyed companies, e.g., to enable their classification in term of size (in ha), number of staff, or type market category. The surveyed market can be considered a European standard market. The questions of the second category aim at providing information about the general opinion of the surveyed companies about the current situation of agriculture and whether the surveyed companies are satisfied. The questions of the third category are targeted towards whether subsidies are being received, the kind of subsidies being received and their impact on expanding innovation capacity and strengthening competitiveness of the company. Furthermore, in this category the question is

answered, if without subsidies the companies could still exist. The questions of the fourth category are about the personal opinion of the companies surveyed as far as subsidies in agriculture are concerned and whether these are considered important, and their distribution is perceived as fair. The majority of the 39 questions could be answered by means of a five-stage Likert scale rating from 'disagree' to 'agree', only few questions allowed free answers [40].

A total of 120 representative companies were identified in Westmünsterland with the support of the North Rhine-Westphalia Chamber of Agriculture and were asked to participate. Of these companies, 50 took part in the online survey that was carried out between autumn 2017 and spring 2018. Most of the companies surveyed are medium-sized companies with an agricultural area up to 100 ha, maximum was up to 200 ha. In the Banat region around the city of Timisoara, 39 companies were persuaded to take part in the survey. The survey was carried out in autumn 2018. Approximately 41% of the companies surveyed were medium-sized companies with a size of up to 100 ha. The remaining companies were in some cases significantly larger than 200 ha. The results obtained differ very markedly from each other and clearly show the difficulties of the current subsidy policy. Regional differences are also reflected in the predominantly different responses of the surveyed farmers in Romania and Germany. On the one hand, it can be seen that companies are generally dependent on subsidies and, on the other hand, that they clearly notice the resulting growing and system-based competitive disadvantage they face compared to the industrialized large agricultural enterprises. From the answers of the Romanian farmers, it is obvious that the subsidies are used, almost exclusively to secure their livelihood. In comparison to German farmers, farms are still poorly equipped, lacking in technology and are run exclusively by families. Qualified specialist training is virtually unknown. A stronger investment activity or the switch to organic farming is for most farmers only feasible if the present subsidies are increased. Hardly anyone of the Romanian farmers would create additional jobs, not even if subsidies were increased. In order to reduce the competitive disadvantage to large industrial enterprises, the subsidies should be reviewed according to their intended use. However, system changes to the existing system must not lead to a worsening of the current income situation. By comparison, German farmers are convinced that they are less dependent on subsidies, thanks to the structure of their farms, their training and market knowledge in contrast to Romanian farmers. The competitive disadvantage in comparison with large enterprises associated with the subsidy payments is seen and the nature of the distribution is assessed as unfair. A reform of the system is considered possible only by very few of the farmers surveyed. Accordingly, the abolition of subsidy payments as a whole is demanded by the majority and they rely on an unrestricted regulation by the market participants, regardless of the objectives of the CAP. The survey results illustrate that the existing impact of the current subsidy policy on market participants and on public goods requires an adaptation of the CAP’s objectives and a systemic alignment with regard to the granting of subsidies.

Chapter 7 describes the basic possibilities and the current importance of digital applications to enable small and medium-sized farmers to survive in an increasingly concentrated market and to reduce European agricultural subsidy payments in the medium to long term. For this purpose, the essential constraints of the current competition theory to which a company is generally subject to the market are described and explained in compact form for a better understanding. In the further course of the chapter, the historical development of the industrial revolution up to today's Industry 4.0 and the necessary success factors are examined. This is followed by an analogous consideration for the agricultural sector. This chapter 7 ends with a comparative analysis of both developments and an assessment of the extent to which digital applications are already suitable for enabling agricultural businesses to survive on the market.

In general, companies must ensure that they remain competitive in order to survive in

the market. To do this, they define a corresponding competitive strategy and competitive factors in order to measure the success of the chosen strategy and, if necessary, to be able to derive corrective options for action. The competitive factors to be defined are in the area of tension between costs, velocity, reliability, quality and flexibility [29].

As a result of previous strategic decisions, modern society has, among other things, continuously industrialized. From the introduction of mechanical production systems in the late 18th century, through specialized mass production in the early 20th century, to the introduction of programmable manufacturing robots to increase automation in the early 1970s, until to the use of cyber-physical systems today this development progressed in four main phases [36].

A comparable development has also taken place in agriculture.

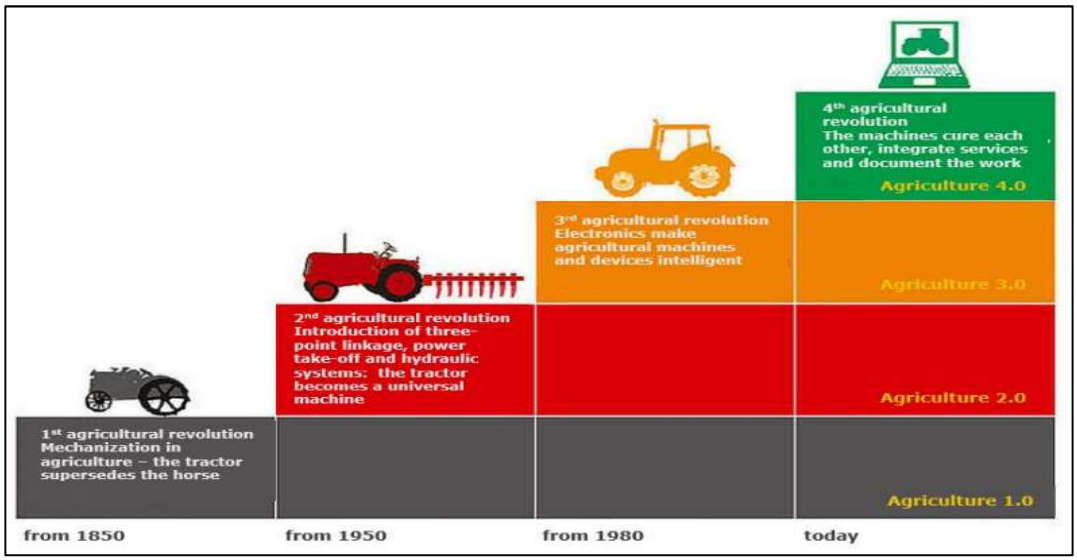

Figure 6. Stages of agricultural development [11]

The possibilities of Industry 4.0 in particular offer all farmers a wide range of technological possibilities to establish their company permanently and competitively on the market [1]. However, there are obstacles that currently prevent the rapid development of Industry 4.0 in agriculture.

The main obstacles can be described as follows [1]:

– Analogical agricultural technology

The importance of tractors in the agricultural sector is great. The average age of tractors is 27.5 years. Due to the long lifespan and the high investment costs of tractors, it is usually not possible to connect older machines due to their lack of technological standards.

– Lack of media literacy

In order to master technological innovations, continuous training of farmers is required. Many farmers cannot or do not want to provide the necessary energy or efforts and time.

– Deficits in the infrastructure of telecommunication

Especially in rural areas, there is no comprehensive and modern structure of telecommunication, which is indispensable for the digitisation of agriculture. For this reason, the digital application is still being developed in its application in terms of possible cost savings and resource efficiency and can therefore only be used to a limited extent at the moment.

– Uncertainties in operational data protection

In agriculture, large amounts of data are processed, linked, and coupled with automated

processes to support and make decisions in production processes. An adequate security of these data is not always guaranteed at the time being. But it is precisely this security that is essential for a successful implementation of these data.

– Dealing with big data in agriculture
In order for raw data to be processed from the amount of data collected in Agriculture 4.0. These data must be collected, bundled, and organised in a standardised manner and made accessible – authorized by the owner. From this knowledge clear recommendations for action can be derived through the meaningful link, analysis, and interpretation. Digital insular solutions must be avoided.

– Isolated solutions
Many digital applications offered in agriculture are usually not cross-user or network adaptable. These methods are isolated solutions. By using standards and interfaces, they would be circumvented so that farm management can make better use of, and the potential of digitisation remains.

Digitization in agriculture is to be seriously viewed by the CAP as a means of maintaining or increasing competitiveness, especially for small and medium-sized farms, measures to remove the existing obstacles must be given priority or promoted more strongly than before.

Chapter 8 summarizes the contents of this dissertation chapter by chapter. In addition, five possible solution models for the future financing of the CAP are described in order to be able to use the funds more purposefully and adapted to regional needs. In detail, the following change options were defined:

1. Limitation of the funding level
   - Discontinuation of funding once a defined farm size has been exceeded
2. Increased funding for organic farming products
   - Expansion of funding from pillar 2
3. Needs-oriented support
   - Support of required food needs, considering health aspects, for example
4. Exclusive promotion of sustainable agriculture
   - Exclusive promotion of organic farming
5. Promoting technical solutions to strengthen competitiveness
   - Expansion of funding for faster implementation of digitization

These models are to be examined by further research for their suitability and feasibility. Furthermore, the research results are checked for their validity by updating essential characteristics. In this regard, it has been shown that the described developments concerning the economic performance and farm structure have not changed significantly in German, Romanian and US agriculture, as well as in European agriculture as a whole. The pressure to act for making CAP more demand-oriented in the future still exists.

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