Romania

Systematic Country Diagnostic

BACKGROUND NOTE

Agriculture

June 2018

Abbreviations and acronyms

AKIS	Agricultural Knowledge and Innovation System
Aquacrop	Agricultural Yield Model
AWU	Annual work unit
CAP	Common Agricultural Policy
CEC	Commission of the European Communities
DA	Digital agriculture
EEA	European Environment Agency
EPCARD	European Parliament's Committee on Agriculture and Rural Development
EU	European Union
EU-15	The 15 Member States of the European Union prior to enlargement in 2004 and 2007
EU-28	The 28 Member States of the European Union
EU-SILC	EU Statistics on Income and Living Conditions
FADN	Farm Accountancy Data Network
FAO	Food and Agriculture Organization of the United Nations
HBS	Household Budget Survey
IFC	International Finance Corporation
ICT	Information and communication technologies
MARD	Ministry of Agriculture and Rural Development
MFI	Micro financial institution
MSME	Micro, small, and medium enterprises
NBFI	Nonbank financial institution
NMS	New member states
R&D	Research and development

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Executive Summary

1. Agriculture plays a significant socio-economic role in Romania and its transformation to a modern, vibrant, and market-oriented sector is central to fighting poverty, promoting social inclusion, and reducing the urban/rural development divide.

2. Most of Romania's poor live in rural areas and earn their living from agriculture or agriculture-related activities. In 2016, eight out of ten people who were at risk of poverty or social exclusion lived either in rural areas or in towns and suburbs that were predominately rural. Using microdata from the 2013 Household Budget Survey (HBS), this report finds that individuals living in rural areas are 16.5 percent more likely to be poor than those who live in urban areas. Also, those living in rural areas and working in agriculture are 27 percent more likely to be poor. There are large variations in poverty rates and in the risk of poverty or social exclusion across regions in Romania. The risk of poverty or social exclusion is significantly higher in the northeast, southeast, west Oltenia, south Mutenia, and the west regions compared to that in Bucharest-Ilfov, the northwest, and center regions.

3. The rural population of Romania has very low levels of education. As of 2013, three quarters of the rural population and four-fifths of those working in agriculture had no education or had only primary levels of education. Only one percent of those working in agriculture and 4.5 percent of those living in rural areas had tertiary education. Accounting for other factors, our estimates imply that those with secondary and tertiary education are approximately 21 percent and 32 percent, respectively, less likely to be at risk of poverty or social exclusion. Improving educational attainment would reduce the risk of poverty or social exclusion significantly in rural areas in Romania.

4. This note finds that while education matters to reducing poverty, it cannot alone address socioeconomic disparities between urban and rural areas, and between agriculture and nonagriculture occupations. Long-term productivity-enhancing structural transformations are needed to spur income growth in agriculture and to reduce poverty in rural areas. To this end, the note finds that a 10 percent increase in labor productivity reduces the risk of poverty or social exclusion by 3 percent in new member states (NMS) and 1.1 percent in the EU-15. Similar impacts are obtained for improvements in land productivity in NMS, but land productivity seems not to be correlated with poverty in EU-15 countries. The agricultural labor productivity would have to increase four and a half times, and land productivity would have to double to close the agricultural productivity gap between Romania and the EU-28 average. This large and undesirable productivity gap showcases opportunities for income growth, poverty reduction, and social inclusion in Romania if targeted rural development policies stimulate the growth of agricultural productivity.

5. In Romania, rural areas and agricultural production are particularly vulnerable to natural disasters and climate change. Recent drought-induced declines of agricultural production and incomes among farmers and farm laborers affected the livelihoods and food security of vulnerable individuals. Thus, strengthening the resilience of the agricultural sector to climate-related disasters is critical to rural development and social inclusion in Romania.

6. Agricultural productivity in Romania is very low compared with its EU counterparts, thus multipronged and comprehensive strategies and policies are needed to boost agricultural productivity. This would require addressing the significant constraints to productivity growth, which include: farmland fragmentation and lack of economies of scale; limited access to rural credit; low expenditure on research and development; deficient infrastructure and extension services; lack a network.

7. Strengthening and expanding the capabilities of the Agricultural Knowledge and Innovation System (AKIS) is critical to enabling the transformation of agriculture into a vibrant and fast-growing sector in Romania. The role of the AKIS goes from supporting smallholders' market integration, to sharing knowledge about best farming practices, to preparing the Romanian economy for the digital agriculture era. of market orientation as many farmers are operating on a subsistence and semi-subsistence basis; outdated labor-intensive farming technologies; weak or absent producer organizations and partnerships; and low quality of human capital. The role of sustainable agribusiness is essential for organizing farming activity with renewed focus on improved standards and productivity, developing and strengthening competitive value chains, and enhancing access to markets and regional integration.

8. The findings of this note can be summarized along the following three key strategic policy messages:

a. Reducing poverty in rural areas entails structural changes that would transform agriculture into a high-productivity sector. A strategy for promoting growth and social inclusion must recognize that unproductive farm operations, regardless of size, will not generate enough output and revenue to provide high levels of income to farm operators and laborers. Displaced agricultural workers will need training and support during their transition to jobs in agribusinesses and other sectors of the economy.

b. There is no trade-off between resilience and agricultural productivity growth in Romania. The modernization of agriculture will increase productivity and make the sector more resilient to climate change. Under projected climate change scenarios, improving crop varieties and moving from rain-fed to irrigated farming are not only economically viable but also yield-increasing choices. In addition to averting declines in production, mitigating the impacts of climate risk-related disasters would prevent declines in farmer incomes, securing rural livelihoods and food security. The private sector needs to be leveraged: Romania needs an innovative plan that leverages public and private resources to redevelop and manage its irrigation

9. A multipronged approach, focused on increasing productivity and strengthening the resilience of the agriculture sector to climate risks, requires significant policy efforts and investments along the following areas:

- Developing a comprehensive strategy to increase scale and integrate viable small- and medium-sized farms into sustainable value chains and markets, and transform their agricultural operations into high-productivity and commercially viable enterprises;
- Developing a toolbox for enabling farmers to take full advantage of the benefits from advances in irrigation techniques, the availability of crop varieties suited to the region and climate, and the use of fertilizer to boost agricultural productivity and increase reliance to climate change;

- Developing a policy framework for advancing forward-looking digital agricultural practices.

10. Addressing the areas above would reshape agriculture in Romania. The necessary actions, however, would be costly and would require rethinking the use and role of Common Agricultural Policy (CAP) funds to support this transformation. For instance, from 2018 to 2020, EUR 5.8 billion of CAP funds have been allocated to direct payments in Romania, which has low or no impact on modernization and improving productivity of the sector. CAP resources could be smartly reallocated from direct payments, to finance a transformative rural development vision that can modernize the sector, increase agricultural productivity, increase resilience to climate change, and reduce poverty and social exclusion in rural Romania.

- As an example, CAP funds could be utilized to support a system based on an e-voucher program that would incentivize climate-smart agriculture (CSA) in Romania. More specifically, e-vouchers would be issued based on farm size, to provide incentives for farmers to adopt CSA technologies. The e-vouchers would provide a flow of revenues to private developers of CSA services and supplies, including third-part verification monitors to measure that CSA has been adopted.

Background

11. **Fighting poverty and promoting social inclusion in Romania require understanding the economics and role of agriculture and agri-food systems in rural areas in the country.** Most of Romania's poor people live in rural areas and earn their living from agriculture or agriculture-related activities. In 2016, eight out of ten people who were at risk of poverty or social exclusion in Romania lived either in rural areas or in ruralized towns and suburbs (Eurostat, 2017).

12. **Poverty incidence in rural areas is often associated with low agricultural productivity and weak agri-business chains**, resulting from low asset endowments and underinvestment in mechanization because of poor access to finance, barriers to technology adoption, lack of modernization of farming practices, low economies of scale, and economic, infrastructural, and geographic barriers in accessing markets. These constraints inhibit the growth of agricultural productivity and the ensuing rural incomes, leading to poverty and social exclusion in rural areas.

13. **In Romania, poverty is persistent and much higher in rural areas than in urban areas**. The proportion of the rural population at risk of poverty or social exclusion has stayed stubbornly high during the last 10 years, reducing from 56.6 percent in 2007 to 51.7 percent in 2016. This contrasts to a much faster reduction in the risk of poverty or social exclusion in both towns and suburbs—from 55.9 percent in 2007 to 33.3 percent in 2016—and in cities—from 31.3 percent in 2007 to 24.3 percent in 2016.[1]

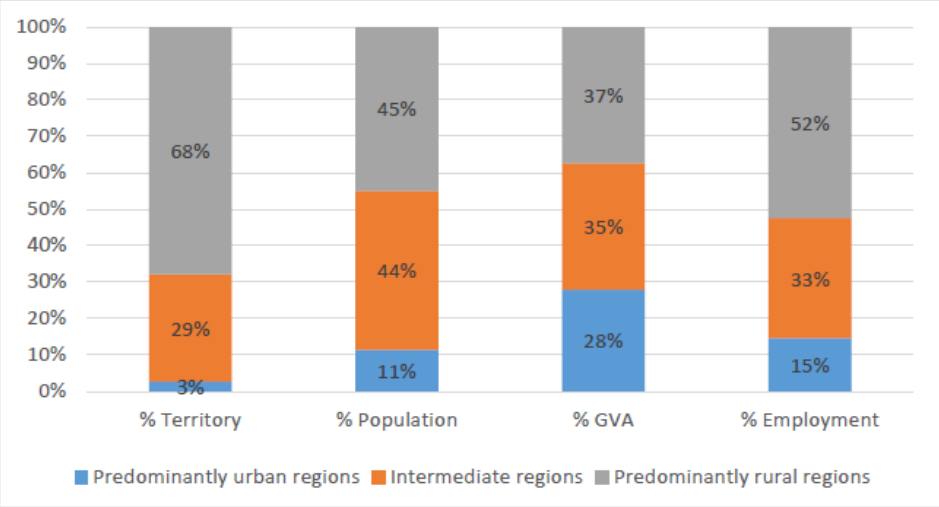
14. **Agriculture and agribusiness are the main sources of jobs in rural Romania, where 8.9 million people or 45 percent of the country's population live**. Agriculture employs 28 percent of the workforce, and indirectly supports a large number of agribusiness jobs in rural areas. As of 2013, five out of ten workers were employed in rural areas in Romania (**Figure 1**). Therefore, for the sector to be successful and inclusive, it is vital that a development strategy leverages the direct and indirect effects of productivity growth in agriculture and in agri-food systems to generate income growth and reduce poverty incidence in rural areas.

15. **Poor people and those living or working in rural areas are also particularly vulnerable to the negative effects of increased variability in climatic conditions.** Increased climate variability has caused floods and droughts, and the occurrence of these events is expected to increase in the future (Maftei, 2015). Natural disasters and climate change negatively impact agricultural production and development, and have cascading effects throughout the economy. FAO (2015) estimates that approximately 80 percent of the damage and losses caused by droughts affect livestock and crop production. It also estimates that 25 percent of the damages and losses caused by all climate-related disasters affect the agricultural sector. Thus, strengthening the resilience of the agricultural sector to climate risks and disasters is critical to rural development and social inclusion in Romania.

16. **This Policy Note builds on the fact that poverty is concentrated in rural areas and that climate-related disasters are particularly harmful to agriculture.** The note examines the role of agriculture in promoting economic growth and social inclusion and in building resilience against climate related risks in

Romania. The discussion below aims at answering two questions: 1) How to leverage the potential of agriculture to promote inclusive growth in Romania? and 2) How to improve the resilience of agriculture and agri-food systems in Romania? This is accomplished by: (a) identifying binding constraints to productivity growth in agriculture; (b) mapping poverty and social inclusion in rural areas; (c) considering the impact of climate variability on agriculture, and (d) assessing institutional constraints to agriculture growth and social inclusion.

Figure 1: Gross value added, population and employment in Romania, by types of regions, 2013

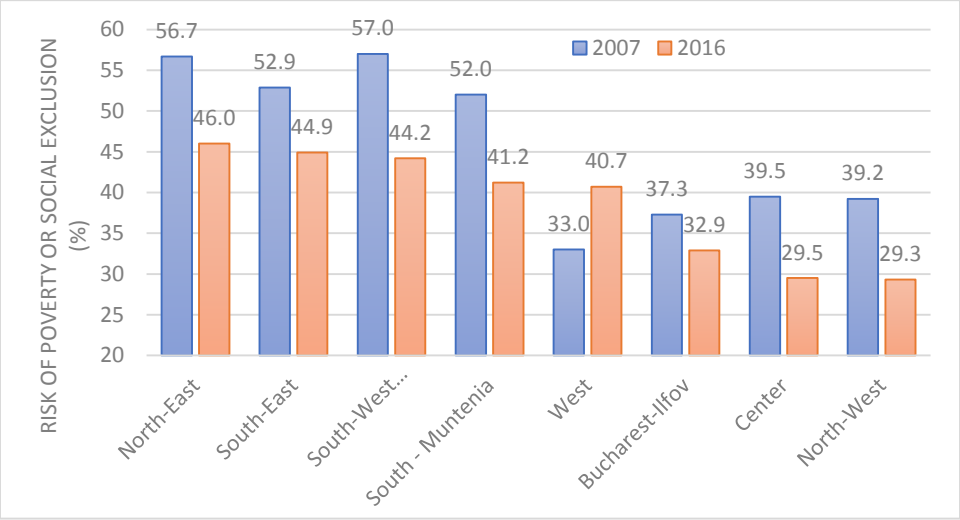


Source: Eurostat.

Poverty and Social Exclusion in Rural Romania

17. **There are large variations in the risk of falling into poverty across regions in Romania**. In five out of eight regions, more than 40 percent of the population are at risk of poverty or social exclusion. The regions with very high poverty risks include the northeast (46 percent), southeast (44.9 percent), west-Oltenia (44.2 percent), south-Mutenia (41.2 percent), and the west region (40.7 percent). The risk of falling into poverty or social exclusion is 32.9 percent in Bucharest-Ilfov and approximately 30 percent in the northwest and center regions (**Figure 2**). The risk of falling into poverty or social exclusion decreased significantly from 2007 to 2016 in seven regions of Romania, but increased in the west region. The west has experienced significant economic growth, but this has been followed by a concentration of economic activity in some sectors, which led to unbalanced growth and major regional disparities in economic activity and growth (World Bank, 2013).

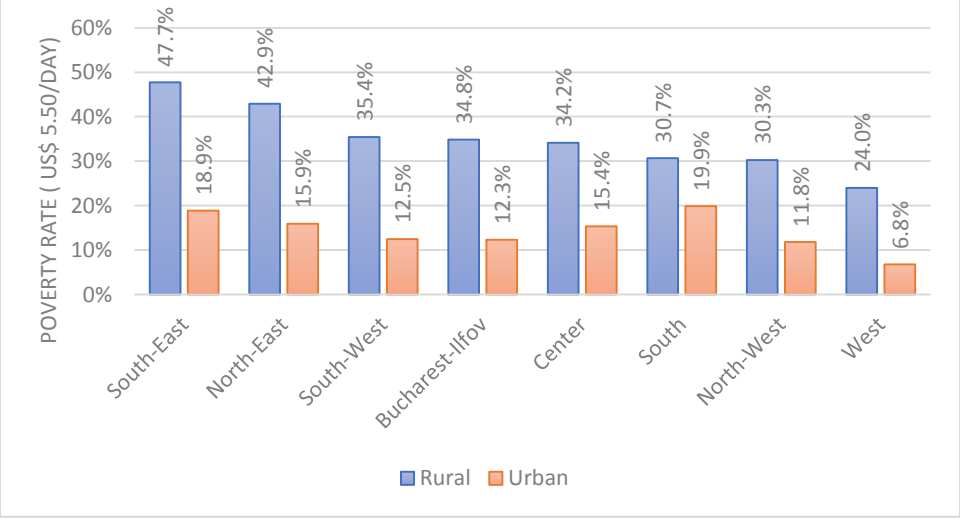
Figure 2: People at risk of poverty or social exclusion by region, Romania, 2007–2016, percent



Source: Based on data from Eurostat.

18. **There are also large rural-urban variations in poverty rates across regions**. In 2013, the poverty rate in rural areas of the west region was three and a half times higher than that in urban areas—at 24 percent in rural areas compared with 6.8 percent in urban areas. Rural poverty is more than 40 percent in the southeast (47.7 percent) and northeast (42.9 percent) regions, and between 30 percent and 35 percent in the southwest, Bucharest-Ilfov, center, south, and northwest regions (**Figure 3**). Urban poverty rates, however, are significantly lower, ranging from 6.8 percent in the West to 19.9 percent in the South region.

Figure 3: Poverty rate by region (US$ 5/day), Romania 2013, percent



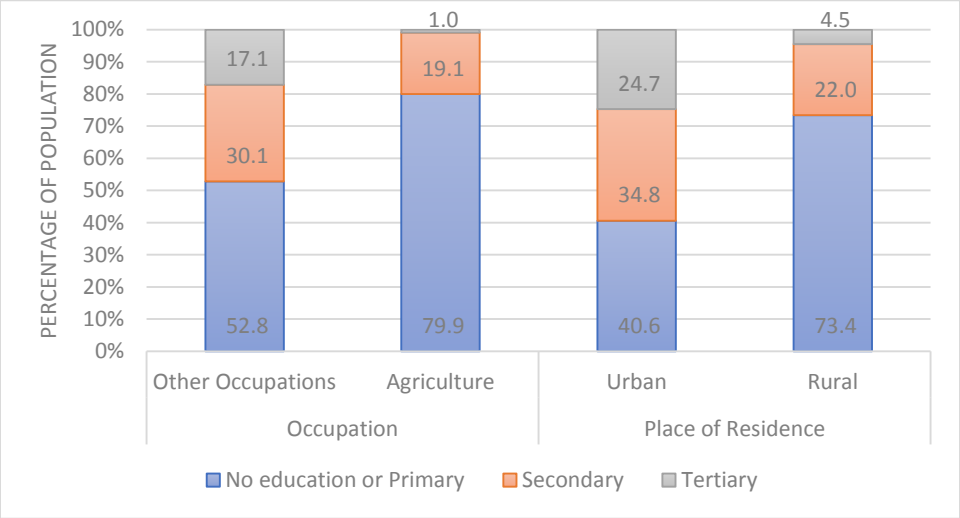
Source: Produced by the Poverty Global Practice using HBS data.

19. **Regardless of educational attainment or other individual characteristics—age, gender, or occupation—people who live in rural areas and who work in agriculture are significantly more likely to be poor than those in urban areas and who work in nonagricultural sectors.** Using microdata from the 2013 Household Budget Survey (HBS), this note finds that individuals living in rural areas are 16.5 percent

more likely to be poor than those who live in urban areas. Also, those living in rural areas and working in agriculture are 27 percent more likely to be poor (column 1 of Table in the Annex). The double jeopardy to falling into poverty for those living in rural areas and working in agriculture is unchanged, even when controlling for regional differences (Column 2 of Table).

20. **Improving educational attainment would reduce the risk of poverty or social exclusion significantly in rural areas of Romania**. The estimates in Table 2 imply that those with secondary and tertiary education are approximately 21 percent and 32 percent, respectively, less likely to be at risk of poverty or social exclusion. As of 2013, 73.4 percent of the rural population and 79.9 percent of those working in agriculture had no education or primary levels of education (**Figure 4**). In addition, just 1 percent of those working in agriculture and 4.5 percent of those living in rural areas had tertiary education.

Figure 4: Educational attainment by occupation and place of residence, Romania 2013, percent



Source: Own calculation using Household Budget Survey 2013 microdata.
Note: population 15 years and older.

21. **Educational attainment reduces the risk of poverty or social exclusion, but education alone cannot eliminate differences in poverty incidence between urban and rural areas, and between agricultural and nonagricultural occupations.** Controlling for education (column 3 of Table A1), the estimates suggest that individuals living in rural areas are 12 percent more likely to be poor, and those living in rural areas and working in agriculture are 20 percent more likely to be poor. This implies that, in Romania structural factors in rural areas and in agricultural activity are inherently linked to low income and, thus are the main culprit for higher poverty incidence in rural areas. Structural transformations aimed at increasing productivity and incomes in agriculture are necessary to reduce poverty in rural areas.

Fighting Poverty through Increases in Agricultural Productivity

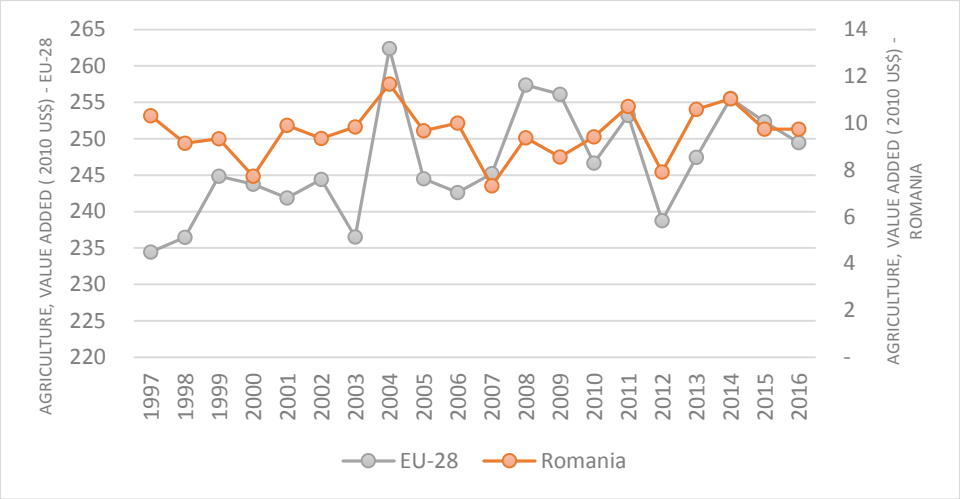
22. **Sustained increases in agricultural productivity reduce the risk of poverty and social exclusion** (World Bank, 2017a; Christiaensen et al, 2011)**.** An analysis using NUTS 2 data from the Farm Accountancy Data Network (FADN) and EU Statistics on Income and Living Conditions (EU-SILC) shows that increases in land or labor agricultural productivity are associated with a significant reduction of the risk of poverty or social exclusion across EU countries. Also, the impact of agricultural productivity on poverty reduction is much stronger for new member states (NMS) including Romania. Estimates imply than a 10 percent increase in labor productivity (column 5 of Table in the Annex) reduces the risk of poverty or social exclusion by 3 percent in NMS and 1.1 percent in the EU-15. Also, a 10 percent increase in land productivity (column 2 of Table) reduces the risk of poverty or social exclusion by 2.6 percent in NMS, but has no statistically significant effect in the EU-15.

23. **The transformation of agriculture leading to the breakdown of the positive association between poverty and agriculture has already taken place in many European countries** (World Bank, 2017a)**.**[2] Romania, however, is still among a group of EU countries where low agricultural productivity contributes to a positive association between agriculture and poverty incidence. This link can be broken through strategies and policies aimed at increasing agricultural productivity. As of 2013, the average agricultural output per hectare in Romania represented just 43 percent of the EU-28 average, and agricultural output per annual work unit (AWU) was just 22 percent of the EUR average. Thus, labor productivity would have to increase approximately four and a half times and land productivity would have to double to close the agricultural productivity gap between Romania and the EU-28 average. To this end, rural development policies aimed at increasing agricultural productivity are a critical component of efforts to reduce poverty and promote social inclusion in Romania.

An Overview of Economic Activity in Agriculture in Romania

24. **The agricultural sector is of strategic importance for Romania because it ensures food security and is a major source of employment, income, and economic activity in rural areas.** The sector represented 4.7 percent of gross domestic product (GDP) in 2015. However, the value added by the agricultural sector has stayed roughly constant over the last two decades (**Figure 5**). A stagnant output indicates structural problems and that policies designed to support the sector have not generated significant productivity gains. Total current output (in tons) is estimated by the private sector at about 24–25 million tons, of which only 8 million tons are processed locally and the remainder are left for raw commodity exports. Romania's agricultural output potential is estimated at three times that of its current performance.[3]

Figure 5: Total agriculture value added, 1997–2016, constant 2010 US$

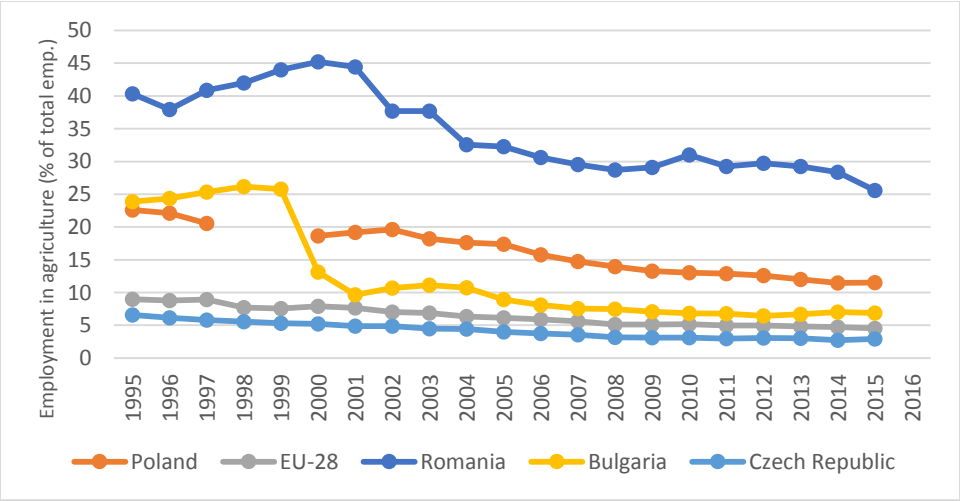


Source: Based on data from World Development Indicators, The World Bank.
Note: The Index was created using inflation-adjusted data.

25. **Agriculture has strong intersectoral linkages. In 2016, the agricultural sector output reached EUR 15.2 billion**, which generated EUR 8.8 billion in demand for inputs, including EUR 2.6 billion worth of feeding stuffs, EUR 1.6 billion from the energy sector, EUR 1.7 billion from seeds, planting, and fertilizer suppliers, EUR 0.7 billion from materials and building suppliers, EUR 290.0 million in veterinary expenses, EUR 200.0 million in extension services, and EUR 2.0 billion in demand for others goods and services throughout the economy (Eurostat, 2017).

26. **The sector employs 28 percent of the workforce, which is almost six times larger than the proportion of workers employed in agriculture in the EU-28**. **Figure 6** shows that the proportion of workers employed in agriculture is steadily declining across the EU, including in Romania. However, the continued uncharacteristically high share of employment in agriculture in Romania is associated with low agricultural productivity and income, which increases poverty incidence in rural areas.

Figure 6: Employment in agriculture (percent of total employment), 1995–2015

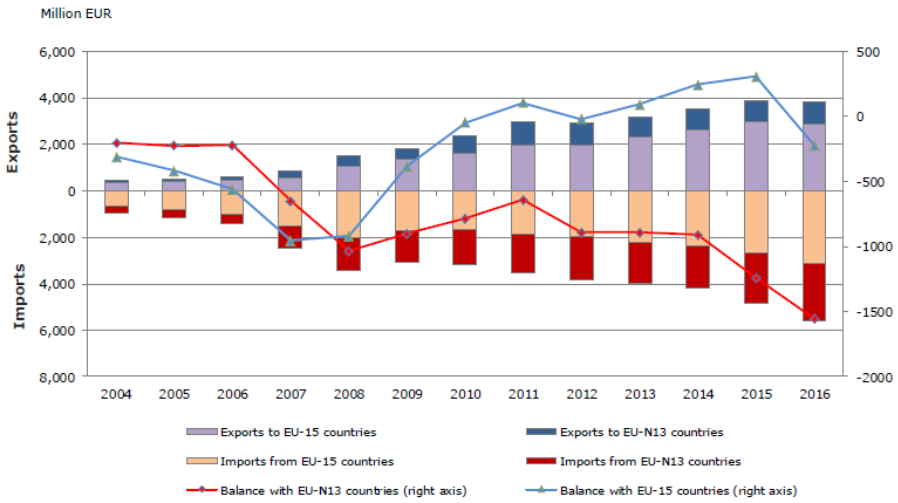


Source: Based on data from the World Development Indicators.

27. **The Romanian average agricultural wage is the second-lowest among EU countries**. The average hourly wage of Romania's agricultural worker is less than EUR 3.0/hour compared with a compensation of EUR 10.0 – EUR 15/hour in ten out of 27 EU countries. The agricultural wage disparities have caused farm workers to migrate from low-paying countries, often only for the season, to high-wage regions (World Bank, 2017a). While the agricultural average wage has been rising faster in NMS including Romania, regional disparities are too large to be quickly eliminated. Low agricultural wages are associated with increased vulnerability and a higher risk of poverty or social exclusion for agricultural workers.

28. **Romania's growing domestic demand for food, the slow increase in agricultural production, and the difficulties of aligning food standards to those of the EU caused a reversal of the trade balance in food and agricultural products**. The country went from trade surpluses in food and agricultural products in the mid-2000s to a net importer since 2013. Romania had a trade deficit of EUR 412.0 million in agricultural products in 2016, with a trade surplus of EUR 1.3 million with non-EU countries, but a deficit of EUR 1.64 billion with EU countries (**Figure 7**). In 2016, Romania had a trade surplus in commodities and non-edible products, but large trade deficits in other primary products and in all industrialized food products including processed products, food preparations, and beverages. Romania's trade imbalances in processed food and agricultural products reflects the country's gap in food supply chains, weaknesses in its agri-food industry, and low competitiveness in international food markets.

Figure 7: Agricultural trade with EU countries, Romania, 2004–2016, millions of EUR



Source: European Commission, statistical factsheets, https://ec.europa.eu/agriculture/cap-in-your-country_en.

29. **The food, beverage, and tobacco industry has faced significant difficulties to adapt to EU food safety standards and regulations**. Milk products, eggs, red meat, and poultry meat were particularly affected because of the stringent food safety regulations. However, Romania's food, beverage, and tobacco industry experienced improvements in labor productivity and has expanded faster than the EU-28 since 2007. More specifically, while employment in the Romanian food, beverage, and tobacco industry decreased by 10.2 percent from 2007 to 2010, value added expanded 12.6 percent during the same period. From 2007 to 2014, valued added by the food, beverage, and tobacco industry increased at an annual average of 1.4 percent in Romania, compared with a decline of 0.9 percent in the EU-28 (Eurostat). This implies that improvements in safety standards and regulations, along with higher labor productivity, enabled the Romanian food, beverage, and tobacco industry to expand and gain markets since the accession to the EU.

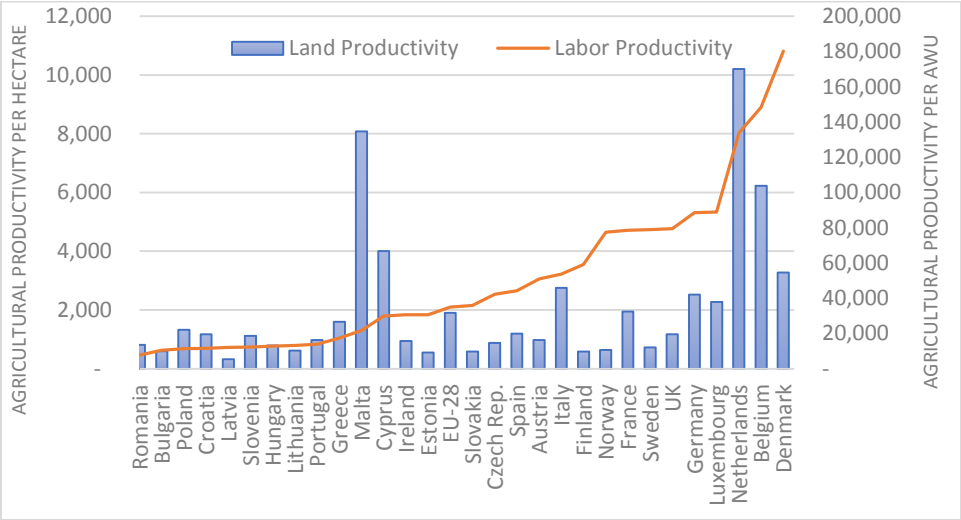
30. **Specific opportunity segments could improve Romania's trade imbalances in agriculture**. There is evidence of increasing opportunities for future growth in wine, oilseeds, and pork, and for commodities like wheat and corn, based on an array of relevant market factors. [45]

The Agricultural Productivity Gap in Romania

31. **Despite the availability of fertile soils and water resources, Romania's agricultural productivity is very low compared with its EU counterparts**. While agricultural productivity has increased during the last decade, there continue to be significant labor and land agricultural productivity gaps in Romania. In 2013, average output per hectare was EUR 818 in Romania, compared to EUR 1,905 in the EU-28 (**Figure 8**). Also, the average farmer produced EUR 7,722 per AWU per year in Romania compared with EUR 35,026 in the EU-28. These figures put Romania last in the EU-28 rank of labor agricultural productivity and 2nd to last in land productivity (output per hectare).

32. **The vast majority of small farms in Romania have no technology endowments, no market orientation, and are operating on a subsistence basis**, **while access to credit remains limited.** Informality and tax evasion of agricultural landholdings are significant. Land cadaster is also problematic. The transformation of agriculture requires strategies that address these constraints and unleash significant increases in both labor and land productivity.

Figure 8: Labor and land agricultural productivity, 2013, EUR



Source: Based on data from Eurostat.

33. **Structural transformations and efforts to modernize agriculture have contributed to an increase in agricultural productivity in Romania, but the pace has been slow**. Agricultural total factor productivity (TFP) increased 0.7 percent from 1991 to 2000 and 1 percent from 2001 to 2014, compared with an increase of 1.4 percent from 1991 to 2000 and 1.5 percent from 2001 to 2014 across other European economies. It is worth noting, however, that from 2014 to 2015 Romania's TFP growth increased to 1.7 percent, the same rate of other European countries (Fuglie, 2015).[6] Yet Romania's TFP growth must outpace that of other European economies if the country is to close the productivity gap.

34. **Differences in land and labor productivity are significant across regions in Romania.** From 2005 to 2013, the average farm size and agricultural land and labor productivity increased in all regions. The

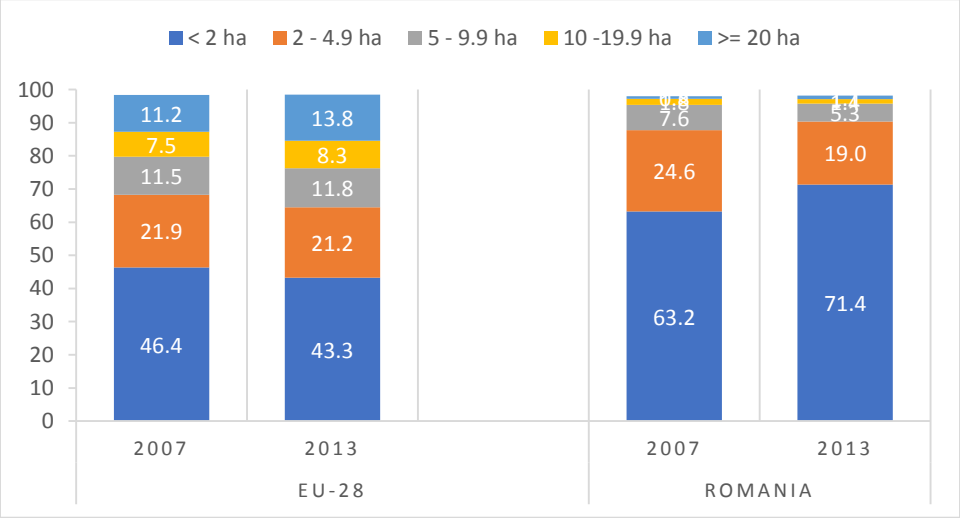
west, southeast, and center regions experienced a much faster growth in labor productivity during this period, while Bucharest-Ilfov and the Northeast regions experienced faster increases in land productivity. The average size of farms increased significantly in the south-Mutenia region. However, regional differences in productivity also increased during this time, indicating the presence of persistent region-specific structural problems in the sector. A rural development strategy should identify and target these regional constraints to reduce regional disparities in agricultural productivity.

35. **Agricultural productivity in Romania is very low compared with its EU counterparts, thus multipronged and comprehensive strategies and policies are needed to boost agricultural productivity**. This would require addressing significant constraints to productivity growth, including farmland fragmentation and lack of economies of scale, limited access to rural credit, low expenditures on research and development, deficient infrastructure and extension services, lack of market orientation as many farmers are operating on a subsistence and semi-subsistence basis, outdated labor-intensive farming technologies, weak or absent producer organizations and partnerships, and low quality of human capital. The role of sustainable agribusiness is key to organizing farming activity with a renewed focus on improved standards and productivity, developing and strengthening competitive value chains, and enhancing access to markets and regional integration.

Size matters in agriculture

36. **Farmland is highly fragmented in Romania.** As of 2013, the country had 3.63 million farms, of which 71.4 percent were operated by individuals who owned less than two hectares of land, 19 percent were operated by individuals who owned between two and 4.9 hectares, 6.7 percent were operated by individuals who owned between five and 19.9 hectares, and only 1.1 percent were operated by individuals who owned more than 20 hectares (**Figure 9**). It is worth noting that from 2007 to 2013, land fragmentation increased in Romania, which contrasts with an increase in land concentration among several new members of the EU as well as with the EU average. Also, the average size of a farm is just 3.6 hectares in Romania compared with 16.1 hectares in the EU-28, 58.6 hectares in Germany, and 133 hectares in the Czech Republic (A1 in the Annex), despite Romania having 13–14 million hectares of arable land, close to Germany's quantity.[7]

Figure 9: Proportion of farms by size, 2007 and 2013

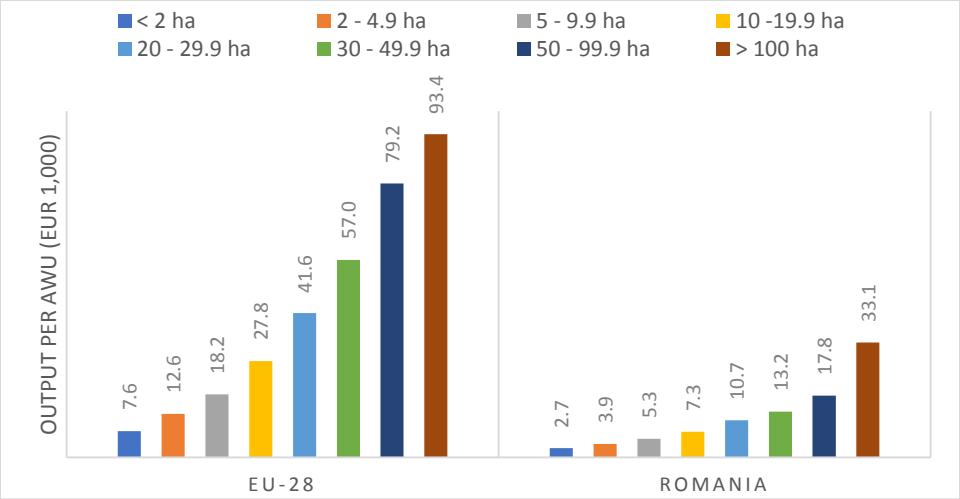


Source: Based on data from Eurostat.

37. **Romania's agriculture is characterized by a high number of very small non-commercial farms and most of its farm holdings have a very small economic size**. In 2013, very small (<EUR 2,000 output) and small farms (EUR 2,000 – EUR 8,000 in output) accounted for 94.9 percent of all the farms in Romania, compared with 69.1 percent in the EU-28. Romania ranks first in the share of very small and small farms across European countries.

38. **Fragmentation and size of farm operations are associated with low productivity**. Figure *10* shows that farm size has a major effect on agricultural labor productivity across EU-28 countries. In 2013, large farms (more than 50 hectares) produced more than 10 times per AWU than farms of less than 2 hectares. In Romania, agricultural output per AWU was EUR 2,700 in farms of less than 2 hectares compared with EUR 17,800 in farms of between 50 to 99 hectares and EUR 33,100 in farms of over 100 hectares.

Figure 10: Agricultural output per annual working unit (AWU) and farm size, 2013, EUR 1,000



Source: Based on data from Eurostat.

Increasing the competitiveness and productivity of agriculture: Farming practices, improved access to finance, and research and development (R&D) investment

39. **Romania is not taking full advantage of the potential benefits arising from advances in irrigation techniques and the use of fertilizer to boost agricultural productivity**. The country is lagging in leveraging irrigation capabilities to increase agricultural productivity and to adapt agriculture to increased climate variability. Agriculture is mostly rain-fed, causing yields and agricultural incomes to vary significantly with weather conditions. As of 2013, only 1.2 percent of the utilized agricultural area was irrigated in Romania, compared with 2.1 percent in Bulgaria, 3 percent in Hungary, more than 5 percent in France and the Netherlands, and more than 20 percent in Cyprus, Italy, Macedonia, Greece, and Malta. The existing irrigation systems are inefficient and require significant improvements and updates. There is an urgent need to increase investment in irrigation schemes that meet the productive needs of farmers.

40. **Romania is also lagging in leveraging the land and labor productivity boosting potential of fertilizer use**. In 2013, Romanian farmers used approximately 37 kilos of fertilizer per hectare of cultivated land, which is significantly less than the EU-28 average (63.3 kilos) and other European countries including Bulgaria (62.9 kilos/ha), Poland (76.2 kilos/ha), Czech Republic (96 kilos/ha), and the Netherlands (119.4 kilos/ha) (Eurostat). There is strong evidence that the increased use of fertilizer is not only associated with

increased yields, but that it also has a causal effect on economy-wide income growth, because its increased use spurs labor shifts out of agriculture and subsequent increases in labor income of those who shifted outside the agriculture sector (McArthur and Gordon, 2014). The private sector finds low access to credit as a critical challenge hindering the development of competitive agribusiness. Expanded financial intermediation is needed to support farmers and agribusiness MSMEs to employ better equipment, technology, and inputs that generate better quality and higher yields. This in turn would help Romania gain comparative advantages in agriculture and food processing, and to facilitate higher levels of long-term economic growth.

41. **Agricultural research and development is extremely important to prepare and equip farmers to respond to a wide range of challenges and boost innovation and productivity**. Romania, however, continues to underinvest in R&D, with EUR 1.2 invested in 2016 per inhabitant in R&D dedicated exclusively for agriculture, compared with EUR 2.2 in Bulgaria, EUR 4.2 in the Czech Republic, EUR 6.4 in the EU-28 area, and more than EUR 10 in each of Germany, Finland, Denmark, Ireland, and Norway (Eurostat). The low agricultural R&D in Romania affects the country's capability to promote more effective agricultural development strategies aimed at increasing productivity and competitiveness in farming systems.

42. **The agri-finance market has enlarged by almost 10 percent over the last three years, outpacing the growth of the general market.** It is currently estimated at about 37 bn Lei, and soon to reach 45bn Lei. This growth signals the need for continuous agricultural investments, and for working with nontraditional investors specializing in agri-financing to reach a broader segment of farmers and agribusiness micro, small, and medium enterprises (MSMEs). Nevertheless, agri-loans represented only 3.9 percent of total banking loans as of December 31, 2016, which is well below the sector's near-5 percent contribution to GDP. Smaller agribusinesses indicate that access to credit proves to be particularly difficult because of unnecessary layers of bureaucracy and complexity in the process, as well as high demands for collateral (150 percent to 300 percent of the borrowed amount). Also, there is no program of warehouse receipts that could support the financing of smallholders. Farming companies seem to indicate the banks are not "culturally" prepared to fund entrepreneurship in the sector.

43. **More financial institutions have begun looking at agribusiness because of access to EU funds and farmers needing equipment and other inputs**. Nonbank financial institution (NBFI) financing is almost double that of bank financing. Yet the sector is underserved because of the very fragmented nature of land, with unsophisticated ways of doing business that are nonbankable. Some banks are establishing micro-financial institution (MFI) subsidiaries also focused to a large extent on agriculture. There are still several opportunities to downscale, with small loans accessible for farmers, and banks trying to create new products to reach underserved segments. The competitiveness of grains production and export potential is an important theme, including how small farmers interact with larger farms, either in terms of competition, suppliers, or employees.[8]

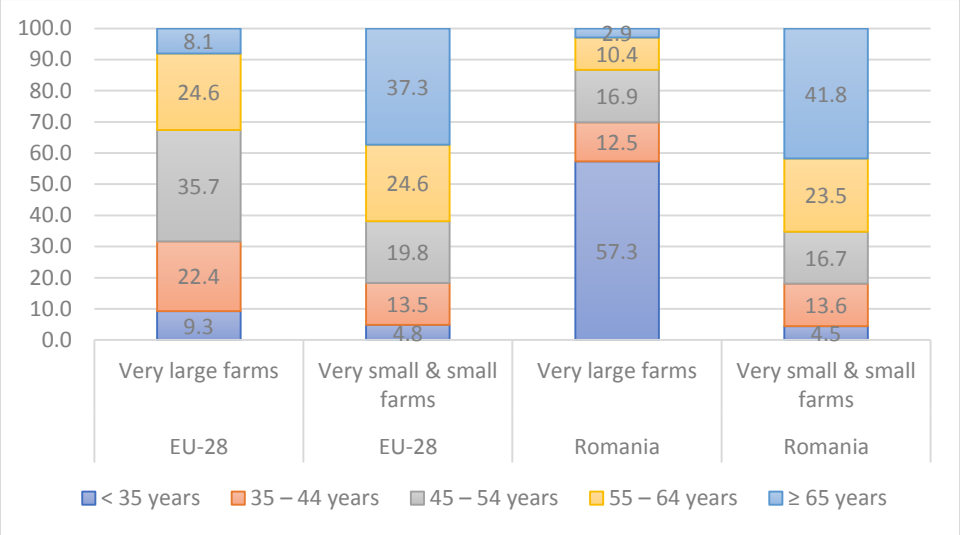
Human capital and aging

44. **Human capital is another factor that constrains labor and land agricultural productivity in Romania.** As discussed above, approximately three-quarters of the rural population and four-fifths of those working in agriculture have either no education or only primary levels of education (**Figure 4**). Also, only one percent of those working in agriculture and 4.5 percent of those living in rural areas have tertiary education.

45. **There is also a structural age divide in farm management.** Two-thirds of farm managers who are 55 years and older operate very small and small farms (measured in economic terms). In contrast, larger farms are more likely to be managed by young farmers (**Figure 11**). In 2013, 57.3 percent of the farm managers operating very large farmers were 35 years or younger. The farm size age divide is associated with education. Small and very small farms are often operated by individuals with low educational attainment, while large and very large farms are more likely to be managed by individuals who have professional training and higher levels of educational attainment. Educational attainment and professional training are associated with the introduction of new and modern farming practices and higher agricultural productivity (Eurostat, 2017).

46. **The aging of farm populations will inevitably lead to a major shift in farm ownership and management in the near future, and it will redefine the farm structure in Romania**. It is estimated that three-quarters of the utilized agricultural area will be transferred to new generations during the next 15–20 years (World Bank, 2015b). This structural change may lead to land consolidation and an increase in the size of farm operations, which could create conditions for a significant expansion in the number of medium and large commercially viable farm operations. This transformation, however, would have to be significantly influenced by government policies (e.g. support to rural development, CAP support, and financing) and the regulatory environment (e.g. farm registry and land markets) enabling agri-food systems (World Bank, 2015b).

Figure 11: Age of farm managers by farm size (economic terms), 2013, percent



Source: Based on data from Eurostat.

Note: Very small and small farms are those with < EUR 8,000 of standard output, and very large farms are those with output ≥ EUR 100,000.

Challenges and opportunities in the era of digital agriculture

47. **Digital Agriculture (DA) technologies will transform traditional farming and agribusiness models, and redefine the rural socioeconomic matrix.** DA is an umbrella term that encompasses the collection of information and computational digital technology tools supported by complex data systems, which together ensure the development and delivery of targeted and timely information to agricultural users. It is a broad concept that encompasses a variety of cross-cutting technologies ranging from radios to the latest technological advances in robotics and artificial intelligence.[9]

48. **To explore fully the opportunities presented by DA would require building a strong digital foundation**. A study conducted by Cornell University suggests that enabling the DA economy requires: (i) expanding high-speed broadband access to rural areas; (ii) disseminating knowledge on the use and economics of DA technologies, data management, and emerging technology applications among those engaged in agriculture; (iii) preparing and training professional service providers and educators on the use of DA to support farming activities; and (iv) educating the next generation of agricultural professionals at institutions of higher education.

49. **Information and communication technologies (ICT) are the backbone of DA, and enable the business of agriculture in modern market economies**. ICT allows farmers to connect to upstream and downstream markets, and to obtain up-to-date information to cope with and respond to climate variability and market trends such as prices and demand (World Bank, 2017c). To harness the power of ICT to boost agricultural productivity and competitiveness, Romania must design a set of policies and make significant investments to build capacity and facilitate the use of ICT across rural areas.

50. **While Romania is unequivocally a connected nation, additional investment is needed to increase next generation access (NGA) broadband coverage in rural areas**. As of 2015, 99.9 percent of urban households and 99.7 percent of rural households had access to broadband coverage (EU, 2016). However, Romania is still catching up in NGA coverage in rural areas, which includes broadband access technologies capable of achieving download speeds meeting the Digital Agenda objective of at least 30 Mbps coverage. Urban NGA coverage increased from 63.7 percent of urban households in 2012 to 71.6 percent in 2015. This figure contrasts with an increase in NGA coverage in rural areas from 25 percent of households in 2012 to 33.2 percent in 2015 (European Commission, 2016). DA innovation and productivity in agribusiness may be hindered if farmers and businesses in rural areas do not have access to fast and reliable internet and mobile connectivity provided by NGA coverage.

51. **Romania has also made significant progress in the field of ICT, but still lacks behind the EU average in important indicators.** The share of employed ICT specialists in Romania increased from 1.1 percent in 2005 to 2 percent in 2016. However, as of 2016 the share of ICT specialists in Romania was only ahead of Greece (1.4 percent) and Turkey (0.9 percent), but significantly behind the EU-28 average (3.7 percent) and other European economies (Eurostat). To harness the power of ICT to boost agricultural productivity and competitiveness, Romania's public and private sectors must make significant investments to build capacity and facilitate the use of ICT across urban and rural areas in the country.

52. **Mapping DA constraints and opportunities would ensure that scarce resources are allocated to areas that would deliver the best long-term outcomes to people and agribusinesses in rural areas**. This could be accomplished by engaging with farmers, local farm organizations/cooperatives, local governments, and the private sector. Also, CAP resources and mechanisms can be leveraged to enable and support DA, including the reshaping of training and extension services (e-extension) and research and education programs focusing on ICT applications for agriculture.

Vulnerabilities of Agriculture to Climate Variability

53. **Agricultural production and rural areas are particularly affected by natural disasters and climate change**. Livestock and crop production bears approximately 80 percent of the damage and loss caused by droughts, and 25 percent of the damages and losses caused by all climate-related disasters falls on the agricultural sector (FAO, 2015).

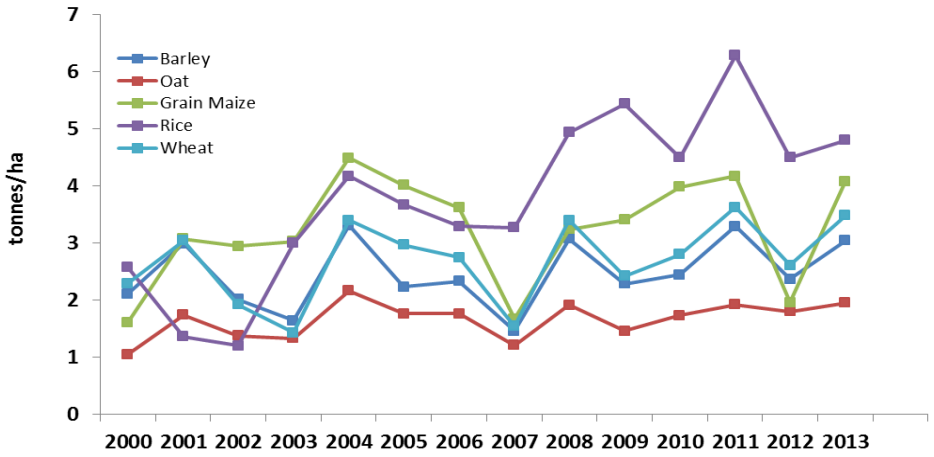
54. **Romania has already been experiencing the impact of climate change, including major floods and droughts, during the last two decades**. The drought of 2007 was the most severe drought during the

last 60 years and it significantly affected agricultural activity because of insufficient water reserves and poorly functioning irrigation systems (World Bank, 2015b). The 2005 historic floods caused 76 deaths and at least EUR1.7 billion in damage, which represents 2.1 percent of Romanian GDP (EU Climate- ADAPT, 2017). The occurrence of floods and droughts are expected to increase in the future (Maftei, 2015).

55. **The 2005 flooding impacted over 650,000 ha of agricultural land,** "10,420 km of roads, 23.8 km of railway, 9,113 bridges and foot bridges and contaminated 90,394 wells." During the last decade, Romania experienced droughts and water scarcity in 2002, 2003, 2007, 2010, 2011 and 2012. Estimates suggest that these frequent droughts affected 7.1 million ha, which represents approximately fifty percent of the total agricultural land in Romania (EU Climate- ADAPT, 2017)).

56. **Flooding in the 2000s negatively impacted agricultural production in Romania**, causing significant reduction in production of wheat, oat, barley, maize, and rice in 2002, 2003, 2007, and 2012 (**Figure 12**). During the 2010 drought, only the production of rice was affected. Lower agricultural production may reduce the availability of food products in local markets and cause food inflation (FAO, 2015). Strategies to promote sustainable long-term prosperity require equipping the agricultural sector with technical means, warning systems, and knowledge to cope with and be resilient to natural disasters and climate change risks.

Figure 12: Agricultural production in Romania, 2000–2013, tonnes per ha

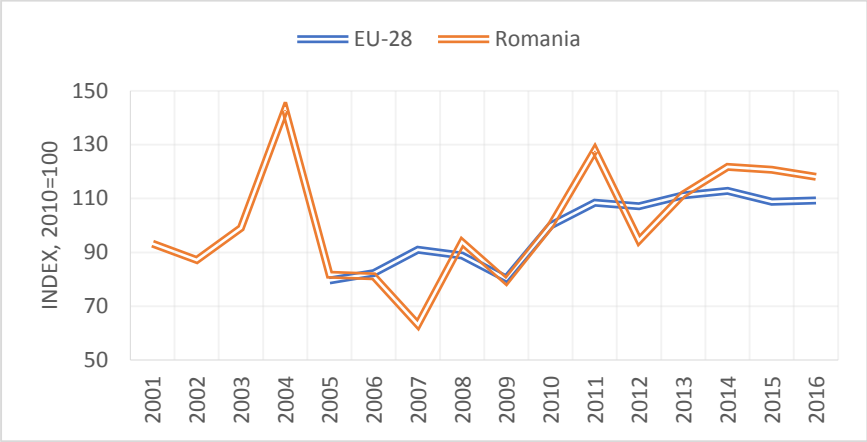


Source: Eurostat.

Climate variability and agricultural income

57. **The occurrence of droughts is associated with lower agricultural production and income in Romania**. Figure 13 shows that agricultural income was relatively low in 2002 and 2003 and that it declined significantly in 2007 and 2012, years of severe droughts in Romania. The drought-induced decline of agricultural production and income among farmers and farm laborers affect the livelihoods and food security of vulnerable individuals, particularly of those living in rural areas.

Figure 13: Agricultural factor income per annual work unit (AWU), 2001–2016, index (2010=100)



Source: EC services, Eurostat.

Note: Agriculture income corresponds to the deflated (real) net value added at factor cost of agriculture.

58. **In Romania, food consumption expenditure represents a larger share of total household expenditure in the west, southwest, and central regions of the country**, areas that were most affected during the 2000s droughts.[10] Table A3 in the Annex shows that the share of food consumption on total household expenditure is approximately 3 percentage points higher in west, southwest, and central regions. In addition, households in rural areas or those working in agriculture spend a much larger share of their income on food consumption. Thus, climate-related disasters that reduce agricultural production and income also decrease rural households' purchasing capacity, deplete savings, and "can force the sale of vital productive assets and erode livelihoods. Ultimately, the quantity and quality of food consumption are reduced, and food insecurity and malnutrition increase, particularly among the most vulnerable households" (FAO, 2015, p. xx).

Looking ahead: Projected impacts of climate change on the Romanian agricultural sector

59. **Climate modeling and analysis suggest that annual average temperatures will rise by up to 1.5°C in the next 15 years** and by up to 5.0°C by the end of the century; and that mean annual precipitation will decrease by 10 to 20 percent. Climate change is expected to cause an increase in the incidence of floods and droughts, and to cause soil erosion[11] and degradation, which will affect the yields and increase the demand for support services in rural and urban areas. Also, small land holders are particularly vulnerable to the effects of climate change because of their limited technical and financial resources and constrained access to modern farming techniques for adaptation (World Bank, 2015b).

Box 1 provides a summary of projected impacts of climate change on the Romanian agricultural sector. Using the Agricultural Yield Model (Aquacrop), the World Bank (2015b) estimates that climate change will cause rain-fed yields to decline significantly, and that the effects will increase over time. The study provides evidence that sugar beets, potatoes, and tomatoes will be the crops most negatively affected by climate change; however maize, barley, and winter wheat yields may increase in some regions (

60. Table *1*). Also, the southeast, south-Muntenia, and Bucharest-Ilfov regions will be the areas most affected by climate change (World Bank, 2015b).

Box 1. Projected impacts of climate change on the Romanian agricultural sector

- **"Damage to land and infrastructure from the increased incidence of flooding:** an estimated 1.3 million hectares of land are at risk. In 2005–10, there was a total of €6 billion in losses from damages to real estate, land, and roads with 27,000 houses affected, thousands of km of national roads destroyed, and hundreds of thousands of hectares of land inundated.
- **Soil erosion and degradation** will come because of more frequent and intense drought, and of intense rainfall. Drought, together with hot winds, will increase soil evaporation and create a risk of soil degradation, marginalization, and abandonment of agricultural land in the areas where soils are most light and vulnerable to erosion, particularly in the south, southeast and eastern parts of Romania. Increased incidence of heavy rain storms, with high intensity and short duration, will generate increased short-term surface runoff and the risk of increased soil erosion by water on sloping land —particularly in areas with the most vulnerable soil types.
- **Yields of grain and other crops are projected to decrease** across the southern and southeastern part of Romania because of the increased frequency of drought. Perennial crops (orchards and vineyards) are also very vulnerable, with partial or total loss of crops and premature ageing of plantations.
- **The productivity, conception rates, and health of farm animals will decrease** as a result of the increased heat stress, water shortage, and the reduction in grassland and forage productivity because of drought.
- **The productivity of the small-scale hydro plants**, which generate 36 percent of electricity in rural areas, will be negatively affected by drought and declining river flows.
- **Water supply will be further decreased by the lowering of the groundwater table in the summer**, because of reductions in the surface flow regime.
- **The demand for irrigation water will further increase** from the higher summer temperatures and the subsequent evapotranspiration.
- **More frequent forest fires** will become a new risk because of drought and higher temperatures; this will negatively impact the availability of wood for fuel and construction.
- **The quality of rural roads will further deteriorate** with the heavier rainfall and flooding; this will affect the dirt and gravel roads more than the paved ones.
- **Ecosystems' capacity to deliver essential services**, such as climate regulation, food, clean air, and water, and to control the floods or erosion will deteriorate.

Source: World Bank (2015).

Table 1: Estimated impact of unmitigated climate change on rain-fed crop production by 2040 (percent change)

Crop	North-west	Center	North-east	South-east	South-Mutenia	Bucharest-lifov	South-west Oltenia	West
Maize	8.4	8.9	4.4	-4.1	-10.9	-11.7	1.6	6.2
Barley	10.8	11.5	10.9	6.8	5.2	5	8.6	8.9
Potato	-6.3	-13.5	-12.4	-15.8	-19.1	-19.3	-16.6	-7.9
Soybean	1.4	-1.9	-3	-6.6	-9.6	-9.8	-5.7	-0.1
Sugarbeet	-3.6	-13.2	-15.6	-25.8	-35.9	-36.9	-19.6	-2.4
Sunflower	0.3	-2	-4.5	-9.9	-15.1	-15.7	-7.2	-1
Wheat	20.3	14.7	7.6	-13.2	-17.4	-18.3	8.3	20.6
Tomato	-2.3	-8.9	-9.7	-14.9	-18.8	-19.1	-12.4	-3.5
Alfafa	9.6	1	2.3	-0.7	-5.4	-5.6	-2.4	6.1

Source: The World Bank (2015b, p. 373)

Development of sustainable agribusiness: Adaptation and resilience

61. **Romania's agricultural sector is particularly vulnerable to the effects of climate change** because of its fragmented land holdings, inadequate agricultural extension services, lack of a modern and efficient irrigation system that could reduce dependency on rain-fed production, and poorly developed ICT systems to share knowledge and information and provide advisory and support services to farmers—particularly to smallholders who lack the financial and technical capacity to access these services through traditional market channels.

62. **Romania must develop adaption measures that prepare the agricultural sector and rural areas to respond to climate variability** by investing in modern irrigation systems, leveraging ICT resources and capabilities, and promoting the use of modern farming technologies. A World Bank (2015b) report presents the results of modelling projections using the AquaCrop model to assess the potential benefits to agriculture of adaptive responses to climate change, including: i) adopting drought-tolerant crop varieties; ii) converting rain-fed to irrigated crops; iii) improving soil drainage; iv) improving soil aeration; v) optimizing fertilizer application; and vi) optimizing the timing of irrigation water application. The study finds that the options with the best outcomes are: i) improving crop varieties; ii) converting rain-fed to irrigated farming; and iii) optimizing fertilizer application. A key message from this study, however, is that irrigated areas may experience increased yields under projected climate change.

63. **Forward-looking rural development strategies that focus on modernizing agriculture are critical to increasing Romania's resilience to climate change.** Such strategies should focus on putting in place high-quality extension services to proliferate climate adaptation knowledge, investing in the rehabilitation and expansion of irrigation and drainage services and other infrastructure, and facilitating access to credit and investments for farm modernization. Also, risk mitigation efforts such as improved warning systems, facilitation of access to insurance for small farmers, and public education and awareness about the impacts of climate change and the benefits of modern farming techniques should be supported.

Shaping Institutions and Leveraging the Private Sector for Rural Development

64. **The rural policy and regulatory environment created since the EU accession has not be able to correct economic inefficiencies**, increase productivity to international competitive levels, and promote the market integration of small farm holders in Romania (World Bank, 2017c).

65. **The key challenge is to increase agricultural productivity and incomes in a landscape marked by a highly-fragmented sector,** with a relatively small number of commercial farms and millions of noncommercial farms. In addition, the lack of infrastructure—irrigation, transport, extension services—and the use of outdated farming methods must also be tackled. Thus, rural development strategies must create the "right" conditions for a fair structural transformation that improves infrastructure, increases agricultural scale and productivity, corrects market distortions, enables agri-business chains, connects farmers to markets and, thereby reduces poverty in rural areas in Romania. Private sector potential needs to be leveraged to improve infrastructure and export competitiveness, explore new investment and business opportunities, and build resilience.

66. **Export competitiveness needs to be improved. Steps should be taken toward increasing the value added of agricultural products**—for example, by moving from exports of raw materials to exports of processed agricultural goods from Romania. Other measures to be considered are increased investments in supporting infrastructure—for example, irrigation systems and transport (AmCham Romania, 2016). Ailing transport infrastructure is adding to the cost of doing business in the sector, and functioning infrastructure is important to sustainable agribusiness and improving regional integration. The port of Constanta's role in materializing the export potential of the agri-sector is crucial: 80 percent of the country's grain production is exported through the port. Unfortunately, the small capacity of the port is causing a significant backlog. Private trading companies are investing on their own in storage and handling facilities at the port.

The Common Agricultural Policy in Romania

67. **The Common Agricultural Policy (CAP), the EU's program to support agriculture, can be leveraged to achieve these goals.** During the 2014–2020 period, Romania is expected to invest EUR 18.5 billion in the farming sector and rural areas through both pillars of the CAP. Approximately 57 percent of CAP funds will be allocated to direct payments to farmers (Pillar I) and 43 percent will be used to finance investments to promote the development of rural areas (Pillar II). From 2018 to 2020, EUR 5.8 billion of CAP funds have been allocated to direct payments, and EUR 3.4 billion have been allocated for rural development. The priorities identified in Romania's RDP include: (i) improving competitiveness in the agri-food sector; (ii) preserving ecosystems and ensuring an efficient use of natural resources; and (iii) boosting the economic and social revitalization of rural areas.

68. **Direct payments under Pillar I are subject to "greening rules" and small- and medium- sized farms are eligible for redistributive payments** (top-up payment for the first 5 hectares, and top-up payments for the next 5.01 to 30 hectares). Romania also implemented a scheme that targets small farms and eliminates conditionality (for example, the "greening rule"[12]) and aims at reducing administrative burdens by offering a maximum annual lump sum payment of up to EUR 1,250 per farm. In 2015, approximately 80 percent of Romania's farmers claimed direct support through this scheme. Romania allocated 12.3 percent of Pillar I's budget to direct payments for coupled support for production of beef

and veal, fruits, and vegetables, grain legumes, hemp, hops, milk and milk products, protein crops, rice, seeds, sheep meat and goat meat, silkworms, and sugar beets.

69. **Decoupled CAP payments contribute to increased agricultural productivity in the EU,** particularly in the new member states (World Bank, 2017a). However, the way in which support is delivered is shaped by the conditions and stage of transformation in the sector.

Producer organizations and cooperatives

70. **Fostering competitiveness of agri-food systems and increasing farmers' incomes require creating institutional, organizational, and managerial capabilities that take advantage of the country's agricultural potential.** Producer organizations are vital to achieving these goals because they play an important role in garnering investments, promoting collective marketing, enhancing bargaining power, increasing economies of scale, reducing transaction costs, providing access to resources and markets, securing advisory services that enhance food quality and safety, and facilitating access to knowledge about modern farming practices. Also, producer organizations engage in activities in downstream stages of the food chain, strengthening their capacity to reach customers, brand and customize their products, and develop differentiated products (European Commission, 2012).

71. **Older generations of Romanian farmers are, however, resistant to join cooperatives because of the historical experiences of collectivization under the communist regime** (World Bank, 2017b). The number of cooperatives decreased from 3,880 in 2005 to 2,566 in 2013, and to 1,688 in 2015 (Cooperatives Europe, 2015). Romanian cooperatives in all sectors had 674,500 members in 2015, which represents approximately 3.4 percent of the country's population. Across Europe, 17 percent of the population are members of a cooperative (Cooperatives Europe, 2015). The number of agricultural cooperatives also declined from 108 (European Commission, 2012) in 2005 to 68 in 2015 (Cooperatives Europe, 2015). However, the number of producer organizations recognized by the Ministry of Agriculrue and Rural Development (MARD) increased from 107 in 2011 to 239 as of January 2017: Including 62 farm organizations for cereals, more than 70 for vegetables or fruits, 34 for milk and dairy products, and 20 for meat and poultry, among other commodities or crops (MARD, 2017). Overall, these numbers demonstrate a need to continue supporting the creation of producer organizations and agricultural cooperatives and strengthening current producer organizations in Romania.

72. **A report by the World Bank (2017b) finds that while the cultural and socioeconomic legacy of collectivization hampers efforts to organize producers in Romania, other obstacles preclude greater cooperation, including:**

a. General lack of awareness among farmers of the benefits of cooperative structures, and lack of knowledge about how to set up and run such structures effectively;

b. The current fiscal status of cooperatives, which limits their access to financing from banks and the double taxation of farmers (both as individuals and as members of a producers' group).[14]

Rural extension and advisory services

73. **The availability of high-quality agricultural extension services is central to improving the competitiveness of agri-food systems and to supporting rural populations**. Extension services provide knowledge, information, and technical advice that farmers—particularly smallholders—would not have

readily available otherwise. This includes knowledge or technical skills to operate new equipment, organizational and farm management skills, recordkeeping, access to weather and quality-of-soil data, and information about new equipments, technologies, and farming methods. Extension services are also becoming more important because established farming practices are becoming obsolete and new food safety regulations and standards are frequently and regularly updated.

74. **The Agricultural Knowledge and Innovation System (AKIS), which is the system responsible for providing agricultural extension services in Romania, has three branches**: advisory services, agricultural research, and education services. Advisory services are provided through a network of 41 County Centers for Agricultural Consulting (CCAC). These CCACs are administratively and financially under the County Councils, but MARD provides technical and coordination support. There are also 500 Local Centers for Agricultural Consulting (LCAC), but their extension-consultant to beneficiary-farmers ratio is 1:4,700 including subsistence-level farmers and 1:1,764 when only farmers registered in the National Farm Registry are considered (GFRAS, 2017).

75. **Agricultural research is an important component of the system that enables and provides technical assistance to farmers**. The majority of agricultural research is supported and conducted by public organizations, including 17 agricultural R&D institutes and centers, and 51 agricultural R&D stations. There are efforts to improve agricultural research capabilities Romania, including the project on Modernizing Agricultural Knowledge & Information Systems (MAKIS) financed by the World Bank, that allowed the construction and staffing of four Training and Information Centers (TIC) in Romania. However, low agricultural R&D in Romania affects the country's capability to create knowledge and disseminate information that would lead to increased productivity and competitiveness in agri-food systems in Romania.

76. **Extension services are not effective, and the country has so far not developed a strategy that would create an efficient system to deliver agricultural extension services** (RUSU, 2014). Overall, the current system does not deliver the services that farmers need because of low staffing and financing, and lack of integration of the different advisory branches (consultancy, agricultural research, and agricultural education). There is also a lack of collaboration among farmers, private farm organizations, and the public advisory services. Another angle is how small farmers interact with larger farms, either in terms of competition, supplier, or employees. Thus, there is a clear and salient need to develop a strategy to strengthen agricultural advisory services, given the increasing pressures to modernize the agriculture sector.

Conclusions and Policy Messages

77. **Productivity-enhancing structural transformations supported by targeted rural development policies are needed to spur income growth in agriculture and to reduce poverty in rural areas**. The key productivity limiting factors to be addressed are: farmland fragmentation and lack of economies of scale; limited access to rural credit; low expenditures on research and development; deficient infrastructure and extension services; lack of market orientation, as many farmers are operating on a subsistence and semi-subsistence basis; outdated labor-intensive farming technologies; weak or absent producer organizations and partnerships; and low quality of human capital. The role of sustainable agribusiness is key to organizing farming activity with a renewed focus on improved standards and productivity, developing and strengthening competitive value chains, and enhancing access to markets and regional integration. Also, strengthening the resilience of the agricultural sector to climate-related disasters is critical to rural development and social inclusion in Romania.

78. **The findings of this note can be summarized along the following three key strategic policy messages**:

a. Reducing poverty in rural areas entails structural transformations that would transform agriculture into a high-productivity sector. A strategy for promoting growth and social inclusion must recognize that unproductive farm operations, regardless of size, will not generate enough output and revenue to provide high levels of income to farm operators and laborers. Displaced agricultural workers will need training and support during their transition to jobs in agribusinesses and other sectors of the economy.

b. There is no trade-off between resilience and agricultural productivity growth in Romania. The modernization of agriculture will increase productivity and make the sector more resilient to climate change. Under projected climate change scenarios, improving crop varieties and moving from rain-fed to irrigated farming are not only economically viable, but also yield-increasing choices. In addition to averting declines in production, mitigating the impacts of climate risks-related disasters would prevent declines in farmer incomes, securing rural livelihoods and food security. The private sector needs to be leveraged: Romania needs an innovative plan that leverages public and private resources to redevelop and manage its irrigation network.

c. Strengthening and expanding the capabilities of the Agricultural Knowledge and Innovation System (AKIS) is critical to enable the transformation of agriculture in a vibrant and fast-growing sector in Romania. The role of the AKIS goes from supporting smallholders' market integration, to sharing knowledge about best farming practices, to preparing the Romanian economy for the digital agriculture era.

79. **A multipronged approach focused on increasing productivity and strengthening the resilience of the agriculture sector to climate risks requires significant policy efforts** and investments along the following areas:

- Developing a comprehensive strategy to increase scale and integrate viable small and medium sized farms to sustainable value chains and markets and transform their agricultural operations into high-productivity and commercially viable enterprises;

- Developing a toolbox for enabling farmers to take full advantage of the benefits from advances in irrigation techniques, availability of crop varieties suited to the region and climate, and the use of fertilizer to boost agricultural productivity and increase reliance to climate change; and

- Developing a policy framework for advancing forward-looking digital agricultural practices.

80. **Addressing the areas above would reshape agriculture in Romania.** The necessary actions, however, would be costly, and would require rethinking the use and role of CAP funds to support this transformation. For instance, from 2018 to 2020, EUR 5.8 billion of CAP funds have been allocated to direct payments in Romania, which has low or no impact on the modernization and improving productivity of the sector. CAP resources could be smartly reallocated from direct payments to finance a transformative rural development vision that can modernize the sector, increase agricultural productivity, increase resilience to climate change, and reduce poverty and social exclusion in rural Romania.

- For example, CAP funds could be utilized to support a system based on an e-voucher program that would incentivize climate-smart agriculture (CSA) in Romania. More specifically, e-vouchers would be issued based on farm size, to provide incentives for farmers to adopt CSA technologies. The e-vouchers would provide a flow of revenues to private developers of CSA services and supplies, including third-part verification monitors to measure that CSA has been adopted.

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Annex

Table A1: Determinants of Poverty, Marginal effects (probability of being poor=1), Romania

	(1)	(2)	(3)	(4)	(5)
Live in a rural area	0.165***	0.160***	0.116***	0.0776***	0.0778***
	[0.0046]	[0.0048]	[0.0050]	[0.0046]	[0.0046]
Work in agriculture (occupation)	0.112***	0.102***	0.0876***	0.0543***	0.0547***
	[0.0073]	[0.0073]	[0.0070]	[0.0066]	[0.0066]
Region					
North-East		0.0480***	0.0265***	0.0119	0.0126
		[0.0103]	[0.0101]	[0.0093]	[0.0093]
South-East		0.0900***	0.0643***	0.0652***	0.0659***
		[0.0100]	[0.0098]	[0.0089]	[0.0088]
South		0.0176*	-0.00301	-0.00457	-0.00424
		[0.0099]	[0.0097]	[0.0088]	[0.0088]
South-West		0.0132	0.00437	-0.00122	-0.000904
		[0.0107]	[0.0105]	[0.0095]	[0.0095]
West		-0.0849***	-0.0992***	-0.107***	-0.107***
		[0.0142]	[0.0137]	[0.0128]	[0.0127]
North-West		-0.0238**	-0.0416***	-0.0412***	-0.0407***
		[0.0106]	[0.0104]	[0.0094]	[0.0094]
Centre		0.0101	-0.00726	0.00346	0.00432
		[0.0103]	[0.0101]	[0.0091]	[0.0091]
Education					
Primary Educ.			-0.185***	-0.149***	-0.149***
			[0.0206]	[0.0187]	[0.0186]
Secondary Educ.			-0.256***	-0.212***	-0.211***
			[0.0210]	[0.0190]	[0.0190]
Tertiary Educ.			-0.428***	-0.318***	-0.316***
			[0.0224]	[0.0205]	[0.0204]
Self Employed				0.0760***	0.0750***
				[0.0092]	[0.0092]
Employee or Employer				-0.0901***	-0.0899***
				[0.0055]	[0.0055]
Female				0.00382	-0.00312
				[0.0042]	[0.0045]
Household size				0.0652***	0.0663***
				[0.0015]	[0.0015]
Age				-0.00182***	-0.00198***
				[0.0001]	[0.0001]
Female is Head of Household					0.0439***
					[0.0074]
Observations	58192	58192	58192	58192	58192

Source: Own estimation using HBS 2013 microdata.

Notes: This analysis uses 5.5. USD-PPP per day as the poverty line. Base categories are: Household location: urban; Occupation: unemployed or out of labor force; Region: Bucharest-Ilfov; Education: no education; robust standard errors in brackets, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The coefficient estimates reported are *marginal effects* or the effect of each variable on the probability of being poor [prob(poor=1)] obtained from probit regressions.

Table A2: Labor and land agricultural productivity reduces the risk of poverty or social exclusion

	(1)	(2)	(3)	(4)	(5)	(6)
ln Agric. Land Productivity	-0.0653**	-0.0341	-0.0396*			
	[0.0278]	[0.0251]	[0.0246]			
ln Agric. Labor Productivity				-0.150***	-0.115***	-0.124***
				[0.0277]	[0.0281]	[0.0316]
% Secondary Education	-0.0307***	-0.0326***	-0.0301***	-0.0306***	-0.0318***	-0.0302***
	[0.0051]	[0.0053]	[0.0036]	[0.0050]	[0.0054]	[0.0036]
% Tertiary Education	-0.0398***	-0.0377***	-0.0302***	-0.0378***	-0.0380***	-0.0293***
	[0.0032]	[0.0029]	[0.0040]	[0.0028]	[0.0027]	[0.0033]
ln Pop. Density	0.0597**	0.0486**	0.00376	0.0467**	0.0439**	-0.00432
	[0.0230]	[0.0217]	[0.0206]	[0.0185]	[0.0173]	[0.0132]
Long-term unemployment			0.0159***			0.0148***
			[0.0028]			[0.0028]
Land prod * EU13		-0.263***				
		[0.0672]				
labor prod * EU13					-0.170*	
					[0.0849]	
Constant	5.607***	5.512***	5.305***	6.696***	6.396***	6.345***
	[0.3835]	[0.3864]	[0.2774]	[0.3795]	[0.3913]	[0.3929]
Observations	331	331	320	331	331	320

Source: Own estimation using NUTS 2 data from EuroStat (EU-SILC, Farm Accountancy Data Network -FADN) for years 2005, 2007, 2010 and 2013. Notes: Standard errors are clustered by country and time. Standard errors in brackets, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

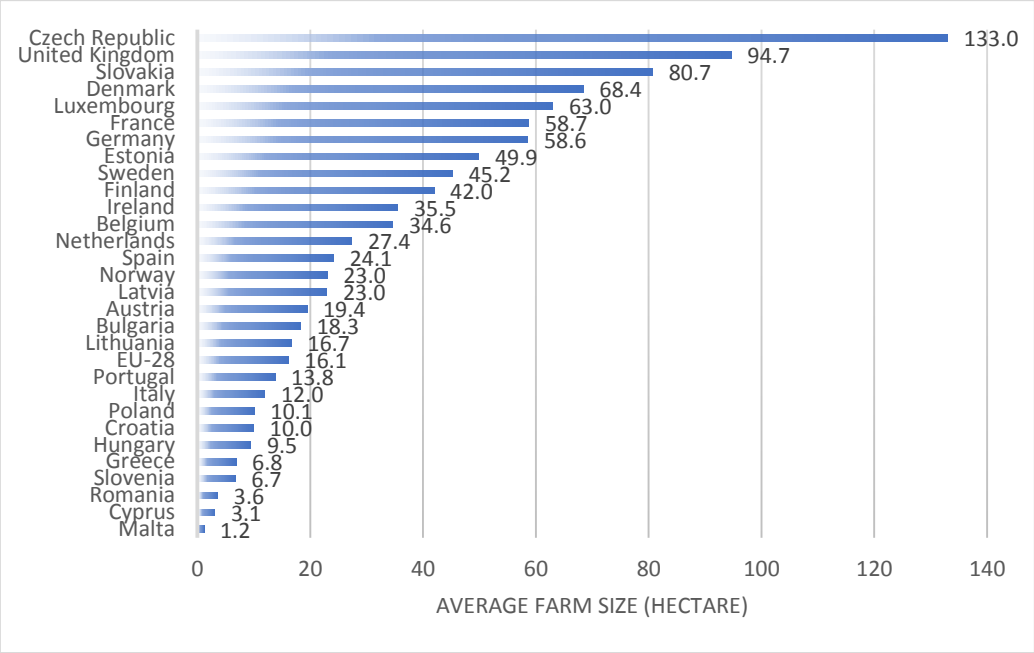
Table A3: Dependent variable: ln of the share of food consumption on total household expenditure

	(1)	(2)	(3)
Regions most affected by droughts: west, southwest, and central	0.0317***	0.0316***	0.0313***
	[0.0026]	[0.0026]	[0.0028]
Live in a rural area	0.182***	0.180***	0.0582***
	[0.0010]	[0.0010]	[0.0022]
Work in agriculture (occupation)		0.0877***	0.105***
		[0.0054]	[0.0055]
Education			
Primary educ.			-0.00809**
			[0.0036]
Secondary educ.			-0.151***
			[0.0039]
Tertiary educ.			-0.282***
Constant	3.829***	3.830***	3.888***
	[0.0016]	[0.0016]	[0.0039]
Controls for: year, region, and interaction term between regions prone to droughts and year	yes	yes	yes
HBS Sample	2006-2013	2006-2013	2008 and 2013
Observations	580,497	580,497	140,609

Source: Own estimation using HBS microdata.

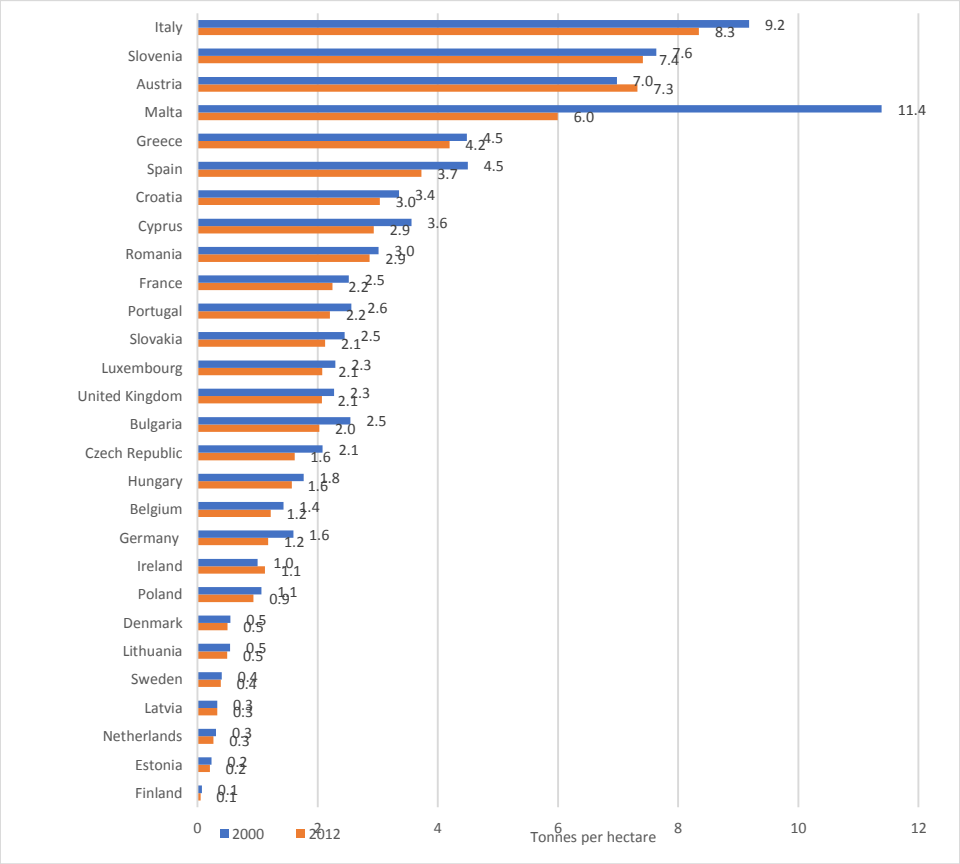
Notes: Base categories are: Household location: urban; Occupation: all other occupations; Region: Bucharest-Ilfov; Education: no education; robust standard errors in brackets, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The coefficient estimates were obtained from Ordinary Least Square (OLS) regressions.

Figure A1: Average farm size, 2013, hectare



Source: Based on data from Eurostat.

Figure A2. Estimated soil erosion by water, tons per hectare, 2000–2012



Source: Based on data from Eurostat.

[1] Source: Eurostat data.
[2] Fully delinked EU countries include: Estonia, Hungary, Slovakia, Denmark, France, Poland, and Austria (World Bank, 2017).
[3] Source: Interview with IFC clients.
[4] Country Opportunity Spotlight, Comtrade; Business Monitor International (2017), Romania Agribusiness Reports.
[5] Per BMI projections, pork will see growth of about 2 percent on average to 2020/21 in production (to 370,000 tons) owing to a stable and growing domestic market. Regarding exports, after a memorandum of understanding on animal food and health safety was signed between the governments of Romania and China in 2014, Romania has been given the green light to begin exporting frozen pork products to China. There continues to be an opportunity for Romania to export grain and oilseeds in a context of grain deficits in North Africa, Africa and the Middle East. In both corn and wheat, Romania exported in 2015 USD 800 million and posited growth of at least 15 percent CAGR above the 3 prior years' global averages in each (Country Opportunity Spotlight, Comtrade). Both can post strong growth owing to export opportunities in the Middle East and North Africa; wheat benefits from Romania's abundant supply and the expected reduction of neighboring Ukraine's export capacity and corn in part from food use.
[6] Europe refers to aggregate TFP growth for 26 countries for which data are available.
[7] Eurostat, industry intelligence.
[8] An important industry learning is from Agricover Group, an integrated agricultural group which is the second largest input distributor in Romania and one of the most important grain traders, with a wide logistical network across the country. The Group's main operations under its various entities provide vertically integrated services for agricultural products to include (i) grain sourcing, trading, and logistical services; (ii) distribution of agricultural inputs to farmers; (iii) provision of financing to farmers; (iv) fuel distribution to agriculture; and (v) the trading of meat and livestock.
[9] See Van Es et al. (2016) for additional discussion about the definition of DA.
[10] See Croitoru and Minea (2015), European Commission (2007) and EEA (2009).
[11] Romania has been subject to significant soil erosion by water (see Figure A2 in the Annex).
[12] Greening rules require that 30 percent of the direct payment allocation, paid per hectare, is linked to three environmentally-friendly farming practices: crop diversification, maintaining permanent grassland and dedicating 5 percent of arable land to environmentally friendly measures.
[13] Romania PNDR 2014-2020.
[14] Provisions for encouraging cooperation in the NRDP 2014-2020 are "restricted to producer organizations and groups in the fruit and vegetable sector and partnerships for innovation and the development of short supply chains." See World Bank (2017b, p. 51).