

# Jointly preparing the conditions in the agricultural and connected sectors in the BSB area for the digital transformation (BSB Smart Farming)



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## REGIONAL ANALYSIS (ROMANIA)

### Deliverable D.T1.3.1

**WPT1 – Investigation on the level of preparedness  
for Smart farming in BSB area**

**Activity A.T.1.3. Common research on the level of  
preparedness for Smart farming of BSB area countries**

*Version 01, 09/02/2021*



## SUMMARY

The Deliverable *D.T1.3.1. Regional analysis* constitutes a document that aims to provide conclusions and recommendations for the relevant BSB Smart Farming project partners countries agriculture and connected sectors.

It was produced during the implementation of *WPT1.1. Investigation on the level of preparedness for Smart farming in BSB area, Activity A.T1.1. Common research on the level of preparedness for Smart farming of BSB area countries.*

It is the outcome of work of PP4 partner in collaboration with BSB Smart Farming partners.

Joint Operational Programme Black Sea Basin 2014-2020

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## Objectives of the investigation

The aim of this document is to present the results of the investigation in the Black Sea Basin (BSB) farming communities, that is in an urge need of becoming more competitive, sustainable and productive, by improving their businesses, production processes, products and services through a smart farming ecosystem, supported by the digitisation of services. The main objective of the research is to identify of the preparedness for smart farming in BSB Smart Farming project partners' country. This regional analysis will become part of the final synthesis report that aims to present specific recommendations on smart farming and IoT solutions to agricultural problems and identified constrains/basic needs of the main actors in the partner's countries.

There were more research activities conducted: primary research and secondary research. In the following sections it will be explained the main approaches that stands to the elaboration of this report, prepared with the collaboration of the BSB Smart Farming project partners, during the implementation of work package **T.1. Investigation on the level of preparedness for Smart farming in BSB area**, activity **A.T.1.3. Common research on the level of preparedness for Smart farming of BSB area countries**.

The present report started with the preparation of a common research methodology, applicable to every partner countries participating in the project. The methodology is presented in Deliverable D.T1.1.1. Moreover, this research comes with results collected from a stakeholder's database of 600, 100 per country, and in-depth primary research and secondary research analysis. A desk research has been conducted using materials published in research reports and/or similar documents, available from public libraries, websites, data obtained from already filled in surveys etc. The resources used were the data available from the internet, governmental and non-governmental agencies collected and processed data, public libraries data, research and/or educational institutions data reports, commercial information sources like newspapers, journals, magazines, radio and TV interviews.



The focus was pointed on the overall situation, policies, quadruple helix stakeholders, projects implemented on both the agricultural needs/challenges of the rural communities and smart and IoT technologies that can be adopted to meet the needs/challenges.

Another research method was the elaboration of an online survey on the stakeholders needs, concerns, level of preparedness, regional digital entrepreneurship ecosystem and related opportunities. The online survey was conducted through a specific questionnaire elaborated during the implementation of the project. It included specific questions related to the stakeholders needs, concerns, level of preparedness, regional digital entrepreneurship ecosystem and related opportunities. There were created focus groups that offered support to the respondents in order to fill the proposed and agreed questionnaire, aiming the identifications of the smart and the IoT technologies that can address stakeholders needs.

In addition, a training needs assessment and draft estimation was conducted, in order to identify the current level of competency, skill or knowledge in the project specific field. In case of BSB Smart Farming project the training needs assessment can be conducted the following phases as: the identification of the business needs, performing a gap analysis, assess training options, and finding training needs and training plans.

During the investigation on the level of preparedness for smart farming, in Black Sea Basing (BSB) partner countries, from the project consortium, all the stakeholders from the quadruple helixes were envisaged to be involved in the investigation. In order to obtain a detailed analysis of the regional BSB partners country areas level, the following quadruple helix figures were envisaged: farms, farmers, regional public and national public authorities, sectoral agency, infrastructure and (public) service providers, interest groups including NGOs, higher education and research institutes, education/training centres and schools, business support organisations, international organisation under national law and enterprises.

The main research questions raised in the investigation were:

- ❖ What are the agricultural needs of the rural and peri-urban communities that, when addressed through the application of smart technologies and IoTs, can

lead to the poverty alleviation, improve the effectiveness and efficiency of use of the rural area resources;

- ❖ How is possible to address the agricultural local needs and identified constrains through IoT and smart technologies solutions to strengthen the development of smart farming in rural and peri-urban areas within BSB partner countries to decrease the poverty level and increase the efficiency of agriculture production and natural resources use? What smart and IoT technologies are implemented already in the country, which of the existing might be transferred from one country to another and what smart technologies and IoTs can in the future be designed and developed by the involved stakeholders and entrepreneurs in the BSB area to meet these needs effectively and efficiently, mobilising the local/regional resources to further fostering the competitiveness of the economies in the BSB area in answer to other main socio-economic challenges in the area, such as the brain drain, youth unemployment and brain waste.
- ❖ What are the successful use cases of smart farming in BSB partner countries and how we can adopt and widen it?
- ❖ How to strengthen the interactions between the relevant helixes, particularly how to boost research, innovation and business cooperation development?

In the investigation recommendations and conclusions on the level of preparedness for smart farming in BSB partner countries were drawn and will be presented in this deliverable. The recommendations are based on findings from the investigation achieved in Romania.

## Chapter 1. Romania's background / situation

Romania is a country located at the crossroads of Central, Eastern, and South-eastern Europe. It shares land borders with Bulgaria to the south, Ukraine to the north, Hungary to the west, Serbia to the southwest, and Moldova to the east and has its opening to the Black Sea. The area is of 238,391 km<sup>2</sup> and comprises: 61.3% agricultural land (cca. 14,6 mil. ha, of which 64.2% arable land, 32.9 % meadows and natural grasslands and 2.7% plantations of trees and vineyard); 28.3% forests and other forestry vegetation lands; 10.4% the built area of the localities, waters, roads, railways and unproductive lands. From the point of view of its area, Romania is an average country in EU 27 (5.41% of the area EU27). The territory of Romania includes 5 bio-geographical regions (steppe, Black Sea, Pannonia, continental and alpine) of the 11 European bio-geographical regions. Out of the total area of the country, around 87.1% is the rural area (according to the definition from the national legislation) that comprises communes, as administrative-territorial units, together with its component villages, and on this territory 45.0% of the Romanian population lived in 2012. The allocation per geographical area is balanced: 33% plain area (up to 300 m altitude), 37% hill area (300- 1000 m) and 30% mountain area (over 1000 m altitude).

The economy of Romania is a fast developing, high-income<sup>1</sup> mixed economy with a very high Human Development Index and a skilled labour force, ranked 12th in the European Union by total nominal GDP and 7th largest when adjusted by purchasing power parity<sup>2</sup>. Romania's economy ranks 35th in the world, with a \$585 billion annual output (PPP). In recent years, Romania enjoyed some of the highest growth rates in the EU: 4.8% in 2016, 7.1% in 2017, 4.4% in 2018, and 4.1% in 2019<sup>3</sup>. In 2019 its GDP per capita in purchasing power standards reached 69% of the European Union average, up from 44% in 2007, the highest growth rate in the EU27<sup>4</sup>. According to the European Commission, Eurostat, and Directorate General for Economic and Financial Affairs, Romania has the following main figures.

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<sup>1</sup> "World Bank Country and Lending Groups". datahelpdesk.worldbank.org. World Bank. Retrieved 1 July 2020.

<sup>2</sup> "World Economic Outlook Database October 2018 -- WEO Groups and Aggregates Information". Retrieved 28 April 2019.

<sup>3</sup> "World Economic Outlook Database, April 2020". IMF.org. International Monetary Fund. Retrieved 16 April 2020.

<sup>4</sup> "GDP per capita in PPS". ec.europa.eu/eurostat. Eurostat. Retrieved 30 April 2020.

### Romania Main figures - 2019

<b>Population (1st January)</b>	19 414 458	persons
<b>Area*</b>	238 398	km <sup>2</sup>
<b>Currency</b>	RON	leu
<b>Nominal GDP at current prices</b>	223 335	million EUR
<b>GDP per capita at current prices</b>	11 504	EUR
<b>GDP per capita at purchasing power</b>	21 579	PPS
<b>Harmonised index of consumer prices</b>	3.90%	change over previous year
<b>Unemployment rate</b>	3.9	% of labour force
<b>Exports (goods &amp; services)</b>	90 119	million EUR (current prices)
<b>Imports (goods &amp; services)</b>	98733	million EUR (current prices)
<b>Balance (goods &amp; services)</b>	-8615	million EUR (current prices)
<b>Exports of agricultural products</b>	7196	million EUR
<b>Imports of agricultural products</b>	8379	million EUR
<b>Current account balance</b>	-4.6	% of GDP
<b>General government balance</b>	4.3	% of GDP
<b>General government gross debt</b>	35.2	% of GDP

Romania is a traditional agricultural country and plays a unique and important part in European agriculture. The soil is fertile and the climate is favourable for agriculture, animal husbandry and horticulture. With a total area of 238,000 sqm, Romania is one of the countries of the most pronounced agrarian profile in the European Union. Having about 15 million ha of farmland, of which more than 9 million ha devoted to arable crops, Romania owns almost 1/3rd of the total agricultural land in the EU (33,5% of all EU farms - EU Commission updates, April 2017). Within a geographical, administrative and socio-economic predominantly rural space, the agriculture has been and continues to be a sector of prime importance in Romania, 66% of Romanian territory being taken up by agriculture with 46% of the population living in predominantly rural regions. At the same time the sector's contribution to the economy and the share of employment play a significant role in the overall Romanian economy<sup>5</sup>.

According to the same European Commission, Eurostat, and Directorate General for Economic and Financial Affairs, Romania's macroeconomics rely on the data presented in the following table.

*Table 1. Macroeconomics*

<sup>5</sup> Agriculture in Romania, Flanders Investment & Trade Market Survey, 2017



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### Population (new European Commission methodology)

Total population (number of persons), of which:	2019	19 414 458	4.4%
in predominantly rural regions (PR)	2019	53.2%	20.5%
in intermediate regions	2019	34.9%	39.1%
in predominantly urban regions	2019	11.9%	40.4%
Population in PR regions (number of persons)	2019	10 328 508	11.4%

### GDP

In EUR (current prices): total (million EUR)	2019	223 335	1.6% 31
GDP per capita (EUR/person)	2019	11 504	094
GDP per capita (PPS/person)	2019	21 579	31 744
Real GDP growth rate (% change over previous year)	2019	4.1%	1.5%

### Gross value added

Agriculture, forestry and fishing (% of total GVA)	2019	4.5%	1.8%
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### Financial aspects

#### Agricultural expenditure

Total expenditure (million EUR), of which:	2019	3 031.7	5.6%
Direct payments (%)	2019	60.9%	70.0%
Market measures (%)	2019	1.4%	4.5%
Rural development (%)	2019	37.7%	25.5%

### Economic accounts of agriculture

#### Agricultural output

Agricultural goods output (million EUR), of which:	2019	17 641.2	4.4%
Crop output, of which:		75.5%	6.2%
Cereals (including seeds)		26.6%	10.0%
Industrial crops		8.7%	8.5%
Forage plants		8.8%	6.6%
Vegetables and horticultural products		16.9%	5.2%
Potatoes		6.7%	8.5%
Fruits		6.1%	4.1%
Wine		1.6%	1.3%
Olive oil		0.0%	0.0%
Animal output, of which:		22.6%	2.5%
Cattle		1.2%	0.7%
Pigs		5.4%	2.4%
Sheep and goats		1.0%	4.3%
Poultry		2.8%	2.5%
Milk		5.9%	1.9%
Eggs		4.3%	8.5%
Gross value added at basic prices (million EUR)	2019	8 980.2	5.1%

#### Agricultural input

Total intermediate consumption (million EUR)	2019	10 147.8	4.3%
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#### Agricultural income

Indicator A (% change over previous year)	2019	10.2%	2.4%
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### Farm structure

#### Holdings



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Total (No), of which:	2016	3 422 030	33.3%
UAA < 5 ha (%)	2016	91.8%	66.6%
Economic size < 4 000 €	2016	84.6%	54.9%
Holder < 35 years (%)	number	3.1%	5.1%
Holder > 64 years (%)	number	44.3%	32.8%
UAA per holding (ha)	Total	3.7	15.2
<b>Labour force</b>			
AWU (No)	2016	1 640 120	18.6%
Female farm holders (%)	2016	33.8%	30.7%
Male farm holders (%)	2016	66.2%	68.8%
Agriculture in % of total employment	2019	19.1%	4.1%

In 2019, the Romania's situation, in the predominantly rural regions, intermediate and predominantly urban regions, in terms of population, territory, Gross Asset Value - GAV (Million EUR) and employment (persons), is presented in figure 1.

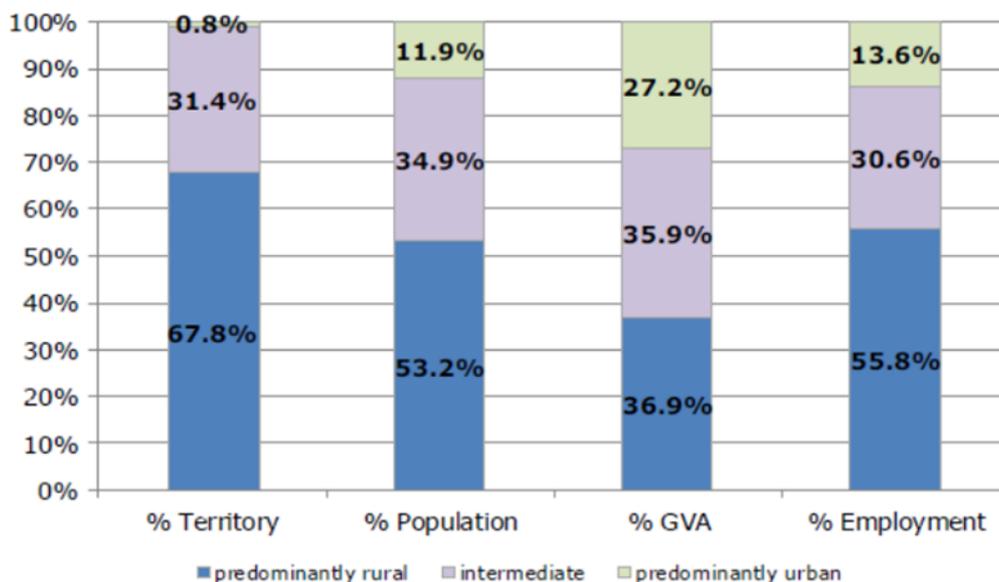


Fig. 1. Importance of rural areas

From the point of view of financial aspects, in terms of Common Agricultural Policy (CAP) expenditures from 2019, the *direct payments* (olive oil, textile plants, fruit and vegetables, wine sector, promotion, other plant products/measures, milk and milk products, beef and veal, sheep meat and goatmeat, pig meat, eggs, poultry and other school schemes), *market measures* and *rural development*, the distribution of Romania in comparison with the EU27 is presented in figure 2.

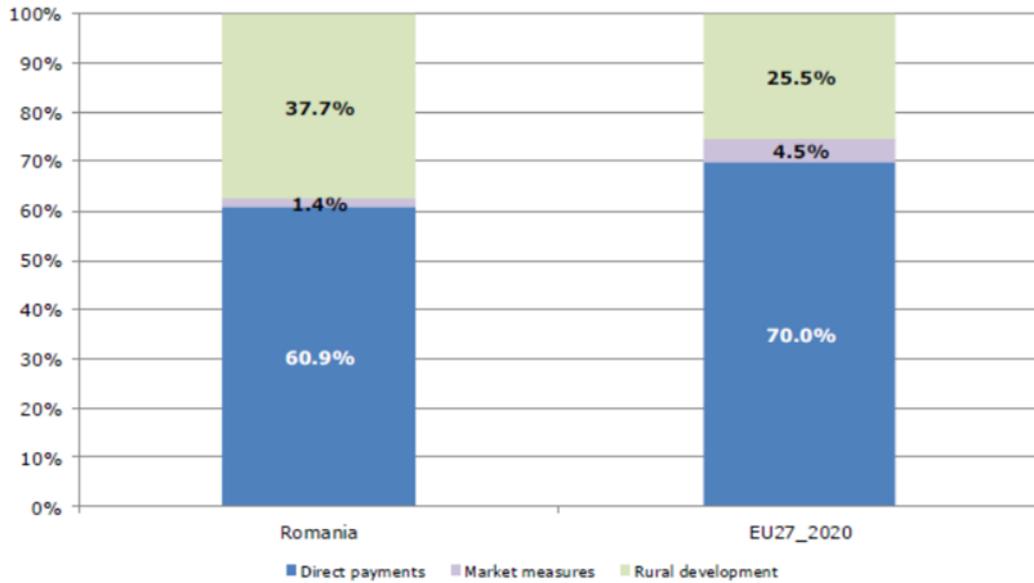


Fig. 2. Distribution of CAP expenditure

In 2018, the distribution of direct aids to the producers is presented in figure 2.

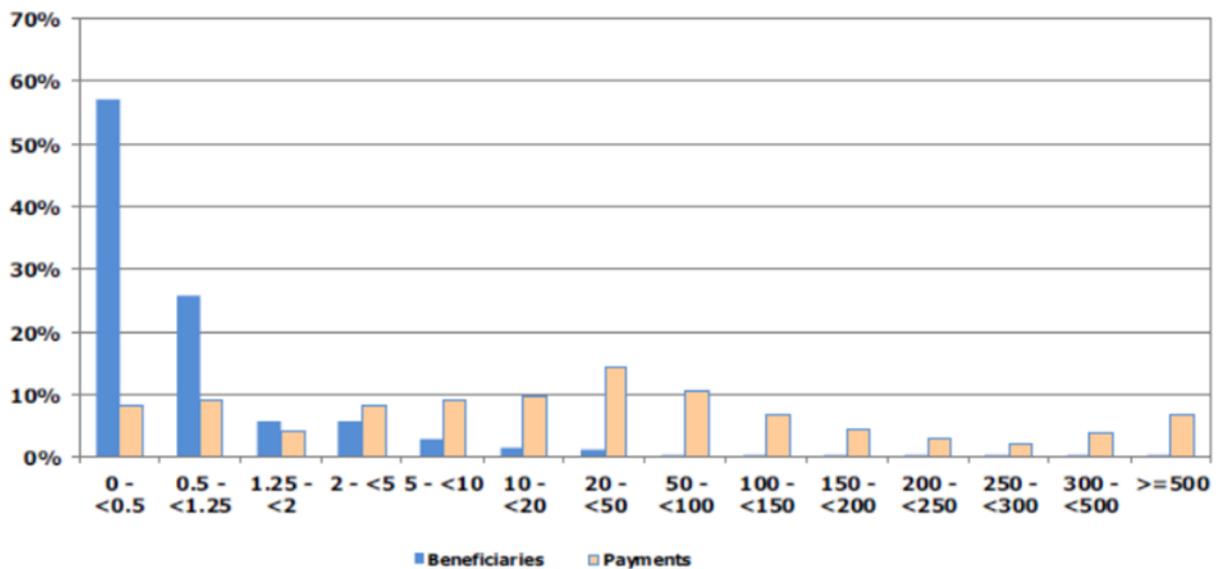


Fig. 3. Indicative figures on the distribution of direct aid by size-class of aid (1 000 EUR)

From the agricultural inputs, outputs and income, point of view the Romania's agriculture economical accounts can be resumed in the following tables.

Table 2. Agricultural output

Output components (constant prices)	2017	2018	2019		
	Million EUR		Million EUR	% of total	% of EU27_2020
Cereals:	3519	1073	3728	27.10%	8.90%
Wheat and spelt	1248	1245	1212	9%	6.10%

Output components (constant prices)	2017	2018	2019		
	Million EUR		Million EUR	% of total	% of EU27_2020
Rye and meslin	3	3	4	0%	0.40%
Barley	281	277	287	2%	3.70%
Oats and summer cereal mixtures	68	60	45	0%	3.80%
Grain maize	1874	2442	2137	16%	22.80%
Rice	8	8	8	0%	1.00%
Other cereals	36	37	35	0%	1.90%
<b>Industrial crops:</b>	<b>1563</b>	<b>1408</b>	<b>1220</b>	<b>8.90%</b>	<b>7.60%</b>
Oil seeds and oleaginous fruits	1353	1261	1037	8%	12.30%
Protein crops	147	91	128	1%	11.90%
Raw tobacco	1	1	1	0%	0.20%
Sugar beet	29	23	31	0%	0.90%
Other industrial crops	32	33	31	0%	0.80%
<b>Forage plants</b>	<b>1140</b>	<b>1208</b>	<b>1227</b>	<b>8.90%</b>	<b>5.80%</b>
<b>Vegetables and horticultural products</b>	<b>1894</b>	<b>2035</b>	<b>2369</b>	<b>17.20%</b>	<b>4.50%</b>
Potatoes	766	737	851	6.80%	7.50%
Fruits	919	1200	227	2.00%	3.50%
Wine	277	301	227	2.00%	1.10%
Other crop products	32	22	15	0.00%	0.70%
<b>Crop output</b>	<b>10110</b>	<b>10985</b>	<b>10573</b>	<b>77.00%</b>	<b>5.40%</b>
<b>Animals:</b>	<b>1666</b>	<b>1481</b>	<b>1449</b>	<b>10.50%</b>	<b>1.70%</b>
Cattle Pigs	252	229	166	1.20%	0.70%
Equines	810	692	756	5.50%	2.10%
Sheep and goats	27	8	6	0.00%	0.70%
Poultry	410	39	86	2.80%	2.20%
<b>Animal products:</b>	<b>1843</b>	<b>1676</b>	<b>1713</b>	<b>12.50%</b>	<b>2.90%</b>
Milk	933	775	825	6.00%	1.70%
Eggs	601	588	605	4.40%	7.50%
Other animal products	309	313	283	2.10%	11.70%
<b>Animal output</b>	<b>3 509</b>	<b>3157</b>	<b>3161</b>	<b>23.00%</b>	<b>2.20%</b>
<b>Agricultural goods output</b>	<b>13169</b>	<b>14141</b>	<b>13734</b>	<b>100.00%</b>	<b>4.00%</b>

Table 3. Agricultural input

Input components	2017	2018	2019	2018/2017	2019/2018
	Million EUR			% Change	
Seeds and planting stock	690.7	685.2	686.7	-0.8%	0.2%
Energy	1 625.9	1 955.2	1 697.0	20.3%	-13.2%
Fertilisers and soil improvers	586.6	517.9	535.1	-11.7%	3.3%
Plant protection products	284.7	283.4	232.2	-0.5%	-18.1%
Veterinary expenses	212.6	210.2	192.3	-1.1%	-8.5%
Feeding stuffs	2 314.7	2 206.6	2 205.2	-4.7%	-0.1%
Maintenance of materials	605.5	657.9	502.4	8.6%	-23.6%
Maintenance of buildings	89.5	94.6	90.8	5.7%	-4.1%
Agricultural services	179.6	220.7	266.3	22.8%	20.7%
Other goods and services	1 598.8	1 687.7	1 621.1	5.6%	-3.9%
<b>Total intermediate consumption</b>	<b>8 216.8</b>	<b>8 545.9</b>	<b>8 053.6</b>	<b>4.0%</b>	<b>-5.8%</b>
<b>Fixed capital consumption</b>	<b>2 266.1</b>	<b>2 347.6</b>	<b>2 308.7</b>	<b>3.6%</b>	<b>-1.7%</b>

D.T1.3.1. Regional analysis

Table 4. Agricultural income

Values at basic prices	2017	2018	2019	2018/2017	2019/2018
	Million EUR			% Change	
<b>Output of the agricultural "industry":</b>	<b>14 912.6</b>	<b>15 494.5</b>	<b>15 180.6</b>	<b>3.9%</b>	<b>-2.0%</b>
Crop output	10 110.3	10 984.6	10 573.0	8.6%	-3.7%
Animal output:	3 508.6	3 156.7	3 161.4	-10.0%	0.1%
Animals	1 665.6	1 481.1	1 448.9	-11.1%	-2.2%
Animal products	1 843.0	1 675.6	1 712.5	-9.1%	2.2%
Agricultural services	179.6	220.7	266.3	22.8%	20.7%
Secondary activities	1 114.0	1 132.5	1 180.0	1.7%	4.2%
<b>- Intermediate consumption</b>	<b>8 216.8</b>	<b>8 545.9</b>	<b>8 053.6</b>	<b>4.0%</b>	<b>-5.8%</b>
<b>= Gross value added at basic prices</b>	<b>6 695.8</b>	<b>6 948.6</b>	<b>7 127.0</b>	<b>3.8%</b>	<b>2.6%</b>
- Consumption of fixed capital	2 266.1	2 347.6	2 308.7	3.6%	-1.7%
- Taxes	18.8	17.8	16.6	-5.6%	-6.8%
+ Subsidies	2 167.9	1 997.8	2 035.1	-7.8%	1.9%
<b>= Factor income</b>	<b>6 578.8</b>	<b>6 580.9</b>	<b>6 836.8</b>	<b>0.0%</b>	<b>3.9%</b>
<b>Agricultural income* (2010=100)</b>	<b>136.6</b>	<b>139.3</b>	<b>153.4</b>	<b>1.9%</b>	<b>10.2%</b>

From the incomes generated by the Romania's agricultural sectors, the distribution on each category is presented in figure 4.

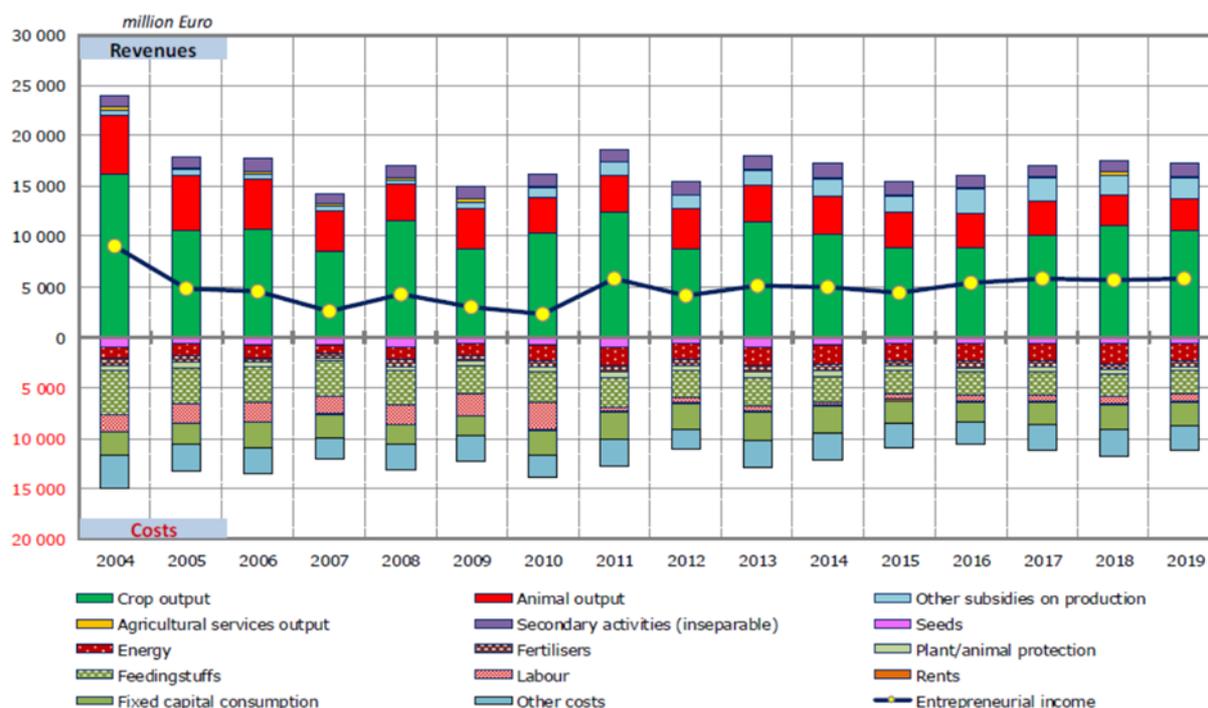


Fig. 4. Agricultural income (real prices)<sup>6</sup>

<sup>6</sup> Directorate General for Agriculture and Rural Development, based on COMEXT data



The generally upward development of agricultural factor income per annual work unit since a low in 2007 continued in 2019, increasing slightly (+1.0 %) to a new peak. The output value of the agricultural industry rose (+2.2 %) in 2019 to EUR 19.0 billion; more than two thirds (70.0 %) of this total value came from crop products.

The total cereals harvest in 2019 was lower (−3.6 %) than in 2018, as a fall in grain maize and corn-cob-mix (−6.6 %) outweighed smaller increases for other large crops; this was the first contraction in the cereals harvest since 2015. Most other crops also experienced a fall in harvested production: oilseeds (−6.9 %, again the first contraction since 2015), fresh vegetables (−8.9 %), root crops (−11.4 %), plants harvested green (−12.2 %) and fruits (other than citrus fruits and grapes), berries and nuts (−18.4 %).

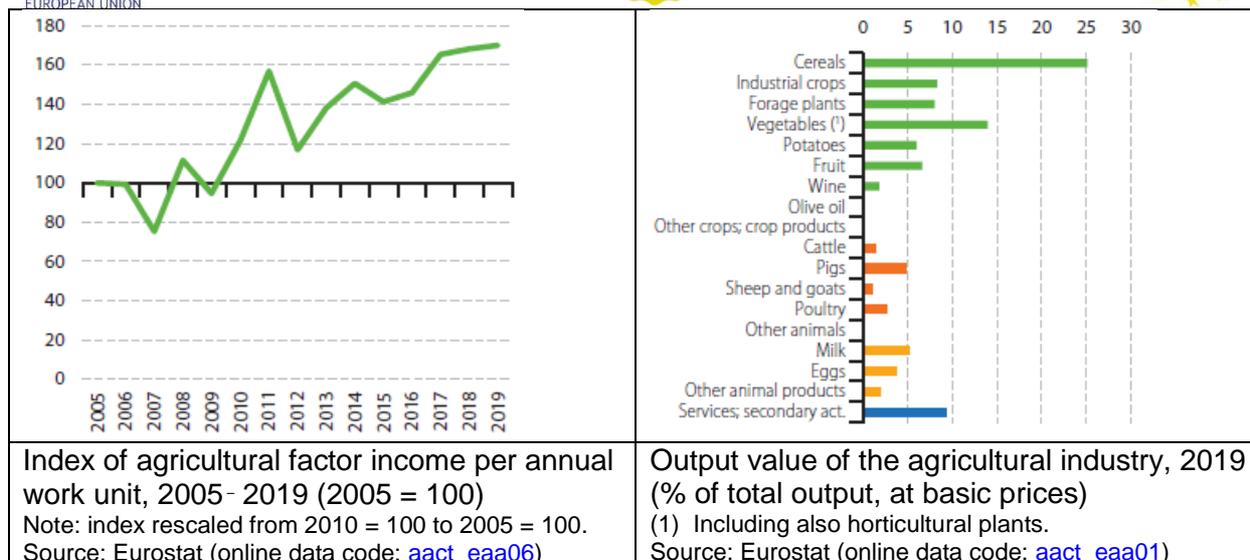
There was a sharp fall in the production of pig meat (−6.2 %) in 2019, in contrast to increased poultry meat production (+6.6 %). Whereas the price for pigs increased (+9.6 % in real terms), prices for cattle (−1.7 %) and poultry (−1.3 %) fell. Production of raw milk declined further (−2.3 %), the level in 2019 being 464 000 tonnes less than in 2014 in part reflecting the fact that the dairy herd declined by 50 000 head during the same period. The average real-terms price of milk in 2019 was higher than a year earlier (+3.3 %).

The slight fall (−0.3 %) in output prices in real (deflated) terms for cereals as a whole in 2019 was principally due to a fall for grain maize (−3.2 %). The decrease (−3.4 %) for oilseeds reflected relatively large falls for soya (−8.1 %) and sunflower seeds (−5.0 %). Most of the other major crops that had lower levels of production in 2019 experienced higher prices, for example, potatoes (+47.7 %), grapes (+16.3 %), fresh fruit (excluding citrus fruit and grapes; +11.3 %), and fresh vegetables (+8.1 %).

Key Information	Year	Value	Unit	Share of EU- 27 total (%)
Population on 1 January	2019	19.4	million	4.3
Land area	2016	234 270	km <sup>2</sup>	5.7
Farmland	2016	125 025	km <sup>2</sup>	8.0
Share of farmland in land area	2016	53.4	%	—



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The key indicators for Romania is presented in the table 5, in terms of farms and farmland, farmers, economic performance of agriculture, economic performance of agriculture, agri-environmental, forestry, fisheries indicators.

Table 5. Key indicators for Romania's agriculture

Farms and farmland	Year	Value	Unit	Share of EU-27 total (%)
Farmland: utilised agricultural area (UAA)	2016	12 503	thousand hectares	8.0
Farms (agricultural holdings)	2016	3 422 030	number	33.3
Share of very small farms (with <EUR 8 000 of standard output)	2016	94.6	%	-

Farmers	Year	Value	Unit	EU-27 average/total
Employment in agriculture as a share of total employment	2017	22.8	%	4.5
Total labour force in agriculture	2019	1 402.0	thousand annual work units	8 739.7
Young farmers (under 40 years old) as a share of all farm managers	2016	7.4	%	10.7

Economic performance of agriculture	Year	Value	Unit	Share of EU- 27 total (%)
Contribution of agriculture to gross domestic product	2019	3.9	%	-
Gross value added (at basic prices)	2019	8 786	EUR million	4.8
Value of agricultural industry output (production value at basic	2019	18 964	EUR million	4.5



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prices)				
Value of crop output	2019	13 269	EUR million	6.0
Value of animal output	2019	3 925	EUR million	2.4
Annual change in agricultural factor income per annual work unit (indicator A)	2019	1.0	%	-

Economic performance of agriculture	Year	Value	Unit	Share of EU- 27 total (%)
Area under organic farming as a share of the UAA	2018	2.4	%	8.0
Area under conversion to organic farming as a share of the UAA	2018	1.2	%	4.8
Change in the harmonised risk indicator 1 for pesticides compared with the average for 2011- 2013	2018	-52	%	-17

Agri-environmental indicators	Year	Value	Unit	Share of EU- 27 total (%)
Cereals (including rice)	2019	30 412	thousand tonnes	10.2
Root crops	2019	3 798	thousand tonnes	2.3
Fresh vegetables	2019	2 384	thousand tonnes	3.9
Permanent crops	2019	2 406	thousand tonnes	3.4
Milk	2019	4 340	thousand tonnes	2.7
Bovine meat	2019	44	thousand tonnes	0.6
Pig meat	2019	343	thousand tonnes	1.5
Poultry meat	2019	482	thousand tonnes	3.6

Forestry	Year	Value	Unit	Share of EU- 27 total (%)
Forest and other wooded land	2020	6 945	thousand hectares	3.9
Persons employed in forestry and logging	2017	47.8	thousand annual work units	9.9
Gross value added (at basic prices)	2017	1308	EUR million	5.0
Roundwood (under bark)	2018	10 436	thousand cubic meters	2.8

Fisheries	Year	Value	Unit	Share of EU- 27 total (%)
Fishing fleet	2019	1 529	gross tonnage	0.1
Persons employed in fishing and aquaculture	2017	2.0	thousand	1.2
Total catches (major fishing areas)	2019	7 149	tonnes live weight	0.2
Total aquaculture production	2018	12 298	tonnes live weight	1.1

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(quantity)				
Total aquaculture production (value)	2018	34	EUR million	0.9

Source: Eurostat (online data codes: [ef\\_m\\_farmleg](#), [nama\\_10\\_a64\\_e](#), [aact\\_ali01](#), [ef\\_m\\_farmang](#), [nama\\_10\\_gdp](#), [aact\\_eaa01](#), [aact\\_eaa06](#), [org\\_cropar](#), farm structure survey — 2016, [aei\\_fm\\_salpest09](#), [aei\\_pr\\_gnb](#), [apro\\_cphh1](#), [apro\\_mk\\_farm](#), [apro\\_mt\\_pann](#), [for\\_area](#), [for\\_auw](#), [for\\_eco\\_cp](#), [for\\_remov](#), [fish\\_fleet\\_alt](#), [fish\\_ca\\_main](#) and [fish\\_aq2a](#)) and Food and Agriculture Organization of the United Nations — Global Forest Resources Assessment, 2020

Romania, as member state of the European Union, has experienced a steady growth in the number and size of large farms over the past years. Commercial farms of over 100 hectares represent 0.4% of Romania’s farms and altogether control almost 6 million hectares or 47.8% of the country’s total farmland. Meanwhile, micro- and subsistence farms of up to 10 hectares account for 97% of farms and operate only 26% of farmland. Top 10 Romanian agrohholdings ranging from 15,000 hectares to 57,000 hectares in size control about 2.6% of the country’s farmland while 8 companies of this list have foreign owners. The sources of agrohholdings’ capital include private investors funds from Great Britain, Lebanon, the Netherlands, Italy, etc. Recently, the Romanian government openly supports farmland consolidation by incentivizing smallholders to sell or lease their farmland. The official EU statistics reports that, in 2008-2016, the share of large farms with annual output of over EUR 50,000 rose from 2% to 12% while the volumes of public support allocated to these large farms more than doubled – from 18% to 38% in the structure of total agricultural subsidies in Romania<sup>7,8</sup>.

According to Eurostat, Farm Structure Survey, updated in June 2020, the structure of agricultural holdings in terms of utilised agricultural area UAA(\*), economic size (\*\*) and Livestock units - LSU(\*\*\*) is presented in table 6. The standard output of an agricultural product (crop or livestock), abbreviated as SO, is the average monetary value of the agricultural output at farm-gate price, in euro per hectare or per head of livestock. There is a regional SO coefficient for each product, as an average value over a reference period (5 years, except for the SO 2004 coefficient calculated using the average of 3 years). The sum of all the SO per hectare of crop and per head of livestock in a farm is a measure of its overall economic\_size<sup>9</sup>, expressed in euro. The LSU is equivalent to a

<sup>7</sup> Feshchenko A., Development of Large-Scale Farming in Romania: The Role of Policies and Reforms, 2020, <https://www.largescaleagriculture.com/home/news-details/development-of-large-scale-farming-in-romania-the-role-of-policies-and-reforms/>

<sup>8</sup> Hajdu A., Certan I., Gagalyuk T., Post-transition development of farm structure and implications for Romania. IAMO Forum 2018: Large-Scale Agriculture – For Profit and Society?, 2018

<sup>9</sup> [http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Economic\\_size](http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Economic_size)



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dairy cow. The number of animals (heads) is converted into LSU using a set of coefficients reflecting the feed requirements of the different animal categories.

Table 6. Structure of agricultural holdings

Holdings		2010		2016	
		Total	%	Total	%
By UAA (*)	< 5 ha	3 593 830	93.1%	3 140 770	91.8%
	5-10 ha	182 440	4.7%	194 200	5.7%
	10-20 ha	43 610	1.1%	50 210	1.5%
	20-30 ha	9 730	0.3%	10 990	0.3%
	30-50 ha	8 210	0.2%	7 530	0.2%
	50-100 ha	7 480	0.2%	6 010	0.2%
	> 100 ha	13 730	0.4%	12 310	0.4%
By economic size (**)	< 4 000 €	3 424 380	88.7%	2 895 780	84.6%
	< 8 000 €	312 180	8.1%	340 280	9.9%
	< 15 000 €	76 090	2.0%	114 160	3.3%
	< 25 000 €	21 240	0.6%	35 630	1.0%
	< 50 000 €	12 620	0.3%	19 490	0.6%
	< 100 000 €	6 150	0.2%	7 730	0.2%
	< 250 000 €	3 990	0.1%	5 180	0.2%
	< 500 000 €	1 430	0.0%	2 180	0.1%
	≥ 500 000 €	950	0.0%	1 610	0.0%
By LSU (***)	0	1 032 420	26.8%	861 790	25.2%
	0-5	2 688 710	69.7%	2 430 100	71.0%
	5-10	88 150	2.3%	75 380	2.2%
	10-15	19 430	0.5%	19 490	0.6%
	15-20	9 460	0.2%	11 020	0.3%
	20-50	15 680	0.4%	18 790	0.5%
	50-100	3 530	0.1%	3 940	0.1%
	100-500	1 350	0.0%	1 240	0.0%
	> 500	310	0.0%	270	0.0%
By age of holder	< 35 years	280 440	7.3%	105 590	3.1%
	35-44 years	609 610	15.8%	399 850	11.7%
	45-54 years	636 370	16.5%	632 780	18.5%
	55-64 years	868 910	22.5%	765 450	22.4%
	> 64 years	1 463 720	37.9%	1 515 570	44.3%
	not applicable	-	-	2 800	0.1%
<b>Total</b>		<b>3 859 050</b>	<b>100%</b>	<b>3 422 040</b>	<b>100%</b>
UAA in 1 000 ha		:		12 503	
UAA (ha) per holding		#N/A		3.7	

## Regional level

At macroeconomic level<sup>10</sup>, in the reference period 2014-2017, the Gross Domestic Product related to the South-East Region of Romania, registered a sustained growth trend, representing in 2017 10.26% of the national GDP (ranking the region on the 6th position) and 0.12% of the European Union's GDP (EU28). A similar evolution was

<sup>10</sup> The Smart Specialization Strategy for the South-East Development Region, 2014-2020



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observed in terms of the degree of competitiveness of the Region's economy, the Gross Value Added for the analysed period reflecting a similar growth rate. However, a comparative analysis of these indicators revealed that the South-East Region was, over the time, outperformed by the North-East, North- West and Central Regions. The sectors with the highest contribution to regional GVA in the case of the South-East Region are agriculture, forestry and fishing (6,701.3 million lei GVA - placing the region on the 2nd place at national level) and construction (with 5,229.8 million lei GVA).

At the level of 2019, the labour resources at national level amounted to 12.1 million people, of which 1.4 million people in the South-East Region (representing 12% of the national value). Most of the labour resources from the South-East Region, respectively 431 thousand people, were concentrated in Constanta County, and the smallest part in Tulcea County, respectively 118 thousand people.

At regional level, the active population (employed population and registered unemployed persons) reached the value of 956 thousand people, resulting in an activity rate of 67.7%, which ranks the South-East Region on the 5th place, after the South-West Oltenia Region (69.2%). The agricultural sector has the highest share of the employed population in the region (25% in 2019), followed by the manufacturing industry (17%) and the wholesale and retail sector (15%). The Information and Communication sector accounts for 9.8% of the employed population in the region, registering a decreasing trend in the period 2015 - 2017. At the level of 2019, the South-East Region ranked on the 6th position in terms of the human resources employment rate (64%), registering higher values only compared to the Central Region (63.9%).

The number of employees in the region places the South-East region on the fifth place at national level, with an average number of 554,174 employees. With the exception of Braila County, all other counties have seen an increase in the number of employees. The analysis of the economic sectors reveals that the highest average number of employees is found in the sector of water distribution, sanitation, waste management and decontamination activities, with a total number of 15,443 people. In 2019, the field of agriculture, forestry and fishing registered 19,138 employees, and the branch of HORECA services was also an important one for the region. Regarding the gender of employees, it is noted that the only county in which there are more women than men

employed is Vrancea. The average salary in the South-East Region is increasing, but below the values of the leading regions (Bucharest-Ilfov Region, with 3,947 lei, West Region, with 2,879 lei, North-East Region, with 2,781 lei, South-East Region, with 2,551 lei). Analysing the evolution over time of the labour productivity in each economic activity, it is observed that, at the level of the South-East Region, between 2013 and 2017, this indicator was on a positive trend for all economic activities, except construction, where the productivity between 2013 and 2017 decreased with 15%.

The investments in the South-East Region are among the lowest compared to other development regions, totalling 4.2% in 2018 (compared to Bucharest-Ilfov - 60.7%, Centre Region - 9%, etc.).

The comparative advantages of the South - East Region present Constanta as the county with the highest value of exports, and Tulcea with the lowest value; the same situation is also valid for the imports. At the regional level, the groups of base metals products, mineral products, vegetables, textiles and food have the highest value of exports.

The analysis of the comparative advantage index reveals that the South-East Region registers comparative advantages with  $RCA > 1$  for the sections: live animals and animal products, animal or vegetable fats and oils, mineral products, base metals and correspondent articles (for the 2017 - 2019 period).

### **Agri-food and biotechnology field**

In 2018, in the South-East Region there were 3,729 local units active in agriculture, forestry and fishing, most of them operating in Constanta County (980). The region also ranks second at national level in terms of the share of crop production and first in terms of the area under fruitful vineyards. In 2019, the region had the highest total grape production in the country, representing 42% of the total production.

The South-East region has an increased potential for rice cultivation, given the fact that in 1990 there were 15,477 ha of rice in the region, so that in 2019 they numbered only 7,427 ha. Through the South-East Region, at the level of which the Danube is also



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present, Romania is considered the country with the greatest development potential in the field of rice.

Among the arguments for supporting the need for the development of biotechnologies in the region can be listed: agri-food biotechnologies contribute to the conservation of natural resources, to reduce CO<sub>2</sub> emissions, to improve soil quality and high productivity; agri-food biotechnologies can provide products of increased quality and safety under more efficient use of resources and environmental protection; the economic contribution of biotechnology to agriculture at EU level is 36%; the use of biotechnology is estimated at 2030 to contribute to about 50% of agricultural production; environmental biotechnologies are effective in sustainable development based on reducing pollution; biodiversity must be conserved through biotechnologies; there is great potential for clustering in the field of environmental protection; the superior recovery of biodegradable waste and by-products by biotechnological processes can lead to increasing the level of well-being in the region, by creating new jobs and improved living conditions.

Most agricultural companies are registered in the South-East Region. The demand for organic products is growing internationally, and at the regional level it is well developed. The research-innovation activities at the level of the region are carried out through the existing local companies, research stations and universities. Availability of qualified human resources in the field. At the level of the region, in 2019, 13.7% of the employed people worked in the fields of agriculture, forestry and fishing. However, the average monthly salary was only 2,133.00 lei (445E). Nevertheless, studies show a chronic need for qualified staff and highly trained specialists in the field.

### **Aquaculture and fishing field**

At the level of the South-East Region the largest areas for aquaculture (65% of the national area) are concentrated. The fishing sector includes marine fishing activities on the Black Sea, and in inland waters (on the Danube and in the Delta area), aquaculture is included. In terms of infrastructure, although it has been funded through the various dedicated operational programs, the infrastructure of fishing ports with specialized



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berths and storage facilities as well as the locations for organizing the first sale of fish are completely missing. The fishing fleet is also in an advanced stage of wear and tear.

The amount of fish consumed at national level has increased in the recent years, but studies show that only 12% of national consumption is covered by domestic production. It is, therefore, an extraordinary development potential for this field. The total quantity of fish sold in Romania is 120,000 tons, annually. Out of these, 100,000 come from imports and only 20,000 are local production. From domestic production, 12,800 tons are obtained from aquaculture, 2,000 tons from the Black Sea and about 4,000 tons from inland waters.

Innovation in the field is low, but there are options to finance it through the Fisheries and Maritime Affairs Operational Program 2014-2020. In March 2019, the National Fisheries Network was operationalized, this being the structure that could boost the research-development and innovation activity in the field.

Availability of qualified human resources in the field. At national level, 4,574 professional fishermen and 2,968 fish farmers are active in the fishing field. Out of the total number of fishermen, 1,720 work in the Danube Delta, 2,215 on the Danube River, 168 on the accumulation lakes and 471 on the Black Sea. The lack of vocational, high school and post-high school institutions is causing a shortage of specialists in the region.

## **Research and development in agriculture**

The most important fields of activity for research<sup>11</sup>, development and innovation sector are agriculture, services, industry, constructions and tourism. These mentions are the result of the opinions expressed by the economic agents that are currently active, but who, in 68,1% of cases, have not invested in RDI activities. Thereby, the indicated areas may result from the analogy with the current turnover and the capacity to face the economic crisis. In regional agricultural field, at the level of the South-East Region, there are the following research and development institutes and research stations subordinated to the "Gheorghe Ionescu Siesta" Academy of Agricultural and Forestry Sciences:

- Constanta Research and Development Plant for Fruit Growing;

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<sup>11</sup> The Smart Specialization Strategy of the South-East Development Region, Romania, 2014-2020



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- Agricultural Research and Development Resort Valu Traian;
- Braila Agricultural Research and Development Centre;
- The Potato Culture Development Centre, Tulcea county;
- The Bujoru Viticulture and Wine Development Research Station, Galati county;
- The Murfatlar Viticulture and Wine Growing Development Station, Constanta county;
- Odobesti Viticulture and Wine Production Development Station, Vrancea county;
- Buzau Vegetable Research and Development Station, Buzau county (Public institution with full financing from own incomes (extra budgetary));
- Dulbanu Cattle Growth Research Station, Buzau county;
- Research and Development Institute for Palatinate and Goat Growing, Constanta county;
- Research and Development Institute for Aquatic Ecology, Fisheries and Aquaculture Galati.

## Chapter 2. Agriculture policies in Romania

A functional and effective agricultural advisory system is an important element for the development of agriculture and rural areas in Romania. In the 2014-2020 programming period, the actions of advisory services and information provided by the national public agricultural advisory system play an essential role in the successful implementation of the Common Agricultural Policy (CAP) in general, but also in complementing the actions that NRDP 2014-2020 supports<sup>12</sup>.

The Romanian public agricultural advisory system aims at helping farmers to better understand and meet the EU's mandatory basic requirements on environment, public health and animal welfare and GAEC and SMR, as set out in art. 93 and Annex II of the R (EU) 1306/2013.

The current advisory system supports farmers and helps them to comply with the obligations at the level of agricultural holding from the regulatory requirements in terms of management, but also provides specific advisory related to production techniques and technologies.

In addition to the public services provided by the national system, the advisory services implemented under NRDP will be carried-out after selecting the providers of advisory services and will aim at farm modernisation, strengthening competitiveness, sectoral integration, association and short supply chain, innovation, market orientation and promotion of entrepreneurship in rural areas, aspects (in business plans) related to the implementation of certain environmental criteria which need to be respected by farmers (such as those imposed by the Water Framework Directive), as well as the implementation of the commitments concluded for the environment and climate measures (agri-environment, organic farming).

The public agricultural advisory service provides provision of technological transfer, information and vocational training in agriculture. The technical and methodological coordination of this national service is done within the Ministry of Agriculture and Rural

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<sup>12</sup> National Rural Development Programme, NRDP 2014-2020



Development by the Department for Advisory, Extension and Vocational Training. At territorial level, the public agricultural advisory service operates in all 41 counties within the county councils and at local level (NUTS5) in approximately 450 local centres that ensure direct links with farmers. The service has 850 advisers specialized in agriculture and related rural development sectors, including technological improvements and innovation actions. This service provides free advisory to farmers taking into account their specific needs. The public advisory system operates in accordance with Law 329/2009 and Government Decision 1609/2009. It is targeted especially to small and medium farms, family farms, that are registered with the paying agency (PIAA) (over 1 million farmers) as well as micro-enterprises in rural areas.

Periodically, they benefit from formation and training related to GAEC, SMRs, minimum requirements for use of fertilizers and plant protection products, code of good agricultural practices, etc. In addition to these training and advisory programmes, the public advisory service, via qualified advisers provide individual advisory services to farmers on production and livestock techniques and technologies, organic farming and traditional products. Besides the public advisory service there are over 360 private advisory service providers, registered at the Trade Register in Romania, most of them being involved in elaborating projects on a fee-paying basis for large farms, enterprises, companies and associations. In addition, there are numerous private companies promoting and providing technical advisory related to farm inputs, for example, seeds and planting material, breeding material, etc. The responsibilities of the public and the private sectors are set up and clearly stipulated in the current legislation, namely the public sector is mainly targeted towards the categories of small and medium farmers who represent the largest share in Romanian agriculture (80%) and have no financial power to ensure the counter value of their services, while the private advisory sector addresses a restricted category of farmers who may bear the costs of services, especially for the preparation of projects for companies, associations and large agricultural companies.

## Chapter 3. Funding initiatives in Smart Farming from SE of Romania

In Romania, the main programme that finance the agricultural sector is the National Rural Development Program 2014 - 2020 (NRDP). The program grants non-reimbursable funds from the European Union and the Government of Romania for the economic and social development of the rural area in Romania. The programme for Romania was formally adopted by the European Commission on 26 May 2015 and last modified on 28 April 2020, outlining Romania's priorities for using the nearly € 9.5 billion of public money that is available for the 7-year period 2014-2020 (€ 8.1 billion from the EU budget, including € 112.3 million transferred from the CAP direct payments, and € 1.34 billion of national co-funding). NRDP responds to three of the development challenges set out in the Partnership Agreement:

- Competitiveness and local development
- People and society
- Resources

The NRDP finance 14 rural development measures with a financial allocation of 9.336 billion Euros, of which 8.015 billion EAFRD and 1.347 billion national contribution. The NRDP (funded by the European Agricultural Fund for Rural Development) supports the strategic development of rural areas by strategically addressing the following objectives:

- OS1. Restructuring and increasing the viability of agricultural holdings
- OS2. Sustainable management of natural resources and climate change
- OS3. Diversification of economic activities, job opportunities, infrastructure and services to improve the quality of life in rural areas

The main rural development priorities for the 2014-2020 programming period were the following:

- Modernization and increase of viability of agricultural holdings by consolidating and opening to the market and processing of agricultural products;
- Encouraging the rejuvenation of generations of farmers by supporting the establishment of young farmers;
- Development of basic rural infrastructure as a precondition for attracting investments in rural areas and creating new jobs and implicitly for the development of rural areas;
- Encourage the diversification of the rural economy by promoting the creation and development of SMEs in non-agricultural sectors in rural areas;
- Promoting the fruit sector, as a sector with specific needs, through a dedicated subprogram;
- Encourage local development placed in the responsibility of the community through the LEADER approach. LEADER's cross-cutting competence improves



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competitiveness, quality of life and diversification of the rural economy, as well as combating poverty and social exclusion.

In order to achieve strategic objective 1, the following categories of intervention were financed through NRDP measures:

- Establishment, extension and modernization of farm facilities (buildings, access roads, irrigation, technologies to reduce pollution and production of energy from renewable sources, storage, marketing and processing facilities, including in the context of short chains, etc.);
- Investments in processing and marketing, including energy efficiency, marketing, storage, conditioning, adaptation to standards, etc.;
- Support for the farm's restructuring, especially small ones, and the rejuvenation of farmers generations;
- Risk management in the agri-food sector;
- Advisory and training activities, including through producer groups.

In order to achieve strategic objective 2, the following categories of intervention were financed through NRDP measures:

- Actions for afforestation of agricultural and non-agricultural lands, as well as the realization of forest curtains on these lands;
- Compensatory payments to farmers who voluntarily make agri-environmental commitments;
- Compensatory payments to farmers who voluntarily undertake to adopt or maintain practices and methods specific to organic farming;
- Compensatory payments to farmers who voluntarily undertake to continue working in areas designated as areas facing natural or other specific constraints.

In order to achieve strategic objective 3, the following categories of intervention were financed through NRDP measures:

- Support for investment in micro and small non-agricultural enterprises in rural areas;
- Improving local infrastructure (water supply systems, sewerage, local roads), educational, medical and social infrastructure;
- Restoration and conservation of cultural heritage;
- Support for locally generated strategies that provide integrated approaches to local development;

In Romania, the Agency for Financing Rural Investments (AFIR) is the institution that ensures the technical and financial implementation of the NRDP 2014 – 2020.

Based to the information available on the site of the Ministry of Agriculture and Rural Development and NRDP site, the situation of the projects submitted/selected for financing on March 11, 2021 is presented in the table below.

Table 7. Projects submitted/selected for financing from NRDP

Sub measures	Public allocation PNDR 2014-2020 (RON)	Funding applications submitted		Selected funding applications	
		No.	Value (RON)	No.	Value (RON)
Sub-measure 1.1 "Support for vocational training and the acquisition of skills"	5,910,092	478	37,704,742	257	20,896,436
Sub-measure 1.2 "Support for demonstration and information activities"	360,000	53	1,719,207	52	1,599,207
Sub-measure 2.1 "Support for assistance to benefit from the use of counselling services"	3,670,000				
Sub-measure 3.1 "Support for participation for the first time in quality schemes"	500,000	0	0	0	0
Sub-measure 3.2 "Support for information and promotion activities carried out by producer groups in the internal market"	5,581,232	0	0	0	0
Sub-measure 4.1 "Investments in agricultural holdings"	841,878,522	4,061	2,237,642,206	1,886	1,051,912,167
Sub - measure 4.1 "Investments in agricultural holdings" - ITI Danube Delta	33,000,000	133	56,160,669	52	25,153,553
Sub-measure 4.1a "Investments in fruit holdings"	296,680,886	1,182	677,769,187	564	310,817,806
Sub-measure 4.1a "Investments in fruit holdings" - ITI Danube Delta	5,000,000	9	4,923,015	8	4,358,466
Sub-measure 4.2 "Support for investments in the processing / marketing of agricultural products"	382,748,167	748	620,946,964	466	430,935,334
Sub - measure 4.2 "Support for investments in the processing / marketing of agricultural products" - ITI Danube Delta	10,600,000	7	11,489,693	6	10,959,866
Sub-measure 4.2 "GBER State aid scheme"	95,500,000	239	157,034,082	163	117,790,038
Sub-measure 4.2 "De minimis scheme"	5,500,000	98	1,619,848	92	1,566,341
Sub-measure 4.2a "Investments in processing / marketing of fruit products"	35,429,439	84	41,790,963	65	31,552,028
Sub-measure 4.3 "Investments for the development, modernization or adaptation of agricultural and forestry infrastructure - irrigation"	433,978,719	625	618,074,659	425	419,336,878
Sub-measure 4.3 "Investments for the development, modernization or adaptation of agricultural and forestry infrastructure - irrigation" - ITI Danube Delta	7,000,000	7	6,798,482	7	6,794,520
Sub-measure 4.3 "Investments for the development, modernization or adaptation of agricultural and forestry infrastructure - agricultural access infrastructure"	130,298,233	441	418,451,214	81	78,989,370

Sub measures	Public allocation PNDR 2014- 2020 (RON)	Funding applications submitted		Selected funding applications	
		No.	Value (RON)	No.	Value (RON)
Sub-measure 4.3 "Investments for the development, modernization or adaptation of agricultural and forestry infrastructure - agricultural access infrastructure" - ITI Danube Delta	3,000,000	4	3,452,793	4	3,347,047
Sub-measure 4.3 "Investments for the development, modernization and adaptation of agricultural and forestry infrastructure - forestry infrastructure"	99,271,119	104	146,722,415	65	91,277,869
Sub-measure 4.3 "Investments for the development, modernization and adaptation of agricultural and forestry infrastructure - forestry infrastructure" - ITI Danube Delta	1,700,000	2	1,462,698	2	1,421,820
Sub-measure 5.1 "Support for investments in preventive measures to reduce the effects of natural disasters, adverse climatic events and probable catastrophic events"	24,775,003	374	29,639,450	285	21,784,238
Sub-measure 5.2 "Investment support for the restoration of agricultural land and production potential affected by natural disasters, adverse environmental conditions and catastrophic events"	3,677,431	1	198,284	0	0
Sub-measure 6.1 "Support for the installation of young farmers"	466,754,112	14,893	612,350,000	10,620	435,950,000
Sub - measure 6.1 "Support for the installation of young farmers" - ITI Danube Delta	10,000,000	233	9,510,000	204	8,300,000
Sub-measure 6.2 "Support for the establishment of non-agricultural activities in rural areas"	106,583,304	6,098	345,300,000	1,895	111,510,000
Sub-measure 6.2 "Support for the establishment of non-agricultural activities in rural areas" - ITI Danube Delta	5,000,000	235	15,250,000	74	5,000,000
Sub-measure 6.3 "Support for the development of small farms"	246,471,271	20,618	309,240,000	13,892	208,380,000
Sub-measure 6.3 "Support for the development of small farms" - ITI Danube Delta	5,000,000	227	3,405,000	188	2,820,000
Sub-measure 6.4 "Investments in the creation and development of non-agricultural activities"	156,503,969	2,518	424,560,139	986	162,689,274
Sub-measure 6.4 "Investments in the creation and development of non-agricultural activities" - ITI Danube Delta	10,000,000	92	17,380,057	54	10,297,223
Sub-measure 6.5 "Scheme for small farmers"	6,000	22	63,296	3	4,882
Sub-measure 7.2 "Investments in the creation and modernization of small-scale basic infrastructure - water / wastewater infrastructure"	1,108,947,145	501	726,335,354	335	476,597,571
Sub-measure 7.2 "Investments in the creation and modernization of small-scale basic infrastructure - water / wastewater infrastructure" - ITI Danube		12	16,111,717	11	14,471,443

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Sub measures	Public allocation PNDR 2014-2020 (RON)	Funding applications submitted		Selected funding applications	
		No.	Value (RON)	No.	Value (RON)
Delta					
Sub-measure 7.2 "Investments in the creation and modernization of small-scale basic infrastructure - road infrastructure of local interest"		973	1,003,987,456	489	510,942,432
Sub-measure 7.2 "Investments in the creation and modernization of small-scale basic infrastructure - road infrastructure of local interest" - ITI Danube Delta		31	29,715,764	29	27,694,510
Sub-measure 7.2 "Investments in the creation and modernization of small-scale basic infrastructure - educational and social infrastructure"		444	168,742,693	325	121,037,443
Sub-measure 7.2 "Investments in the creation and modernization of small-scale basic infrastructure - educational and social infrastructure" - ITI Danube Delta		11	3,781,866	9	2,818,286
Sub-measure 7.6 "Investments associated with the protection of cultural heritage"	188,010,999	913	304,818,329	661	211,735,295
Sub-measure 7.6 "Investments associated with the protection of cultural heritage" - ITI Danube Delta	9,000,000	27	8,405,738	27	7,871,245
Sub-measure 8.1 "Afforestation and creation of forested areas" *****	46,786,653	117	21,704,316	96	16,766,382
Sub-measure 9.1 "Establishment of producer groups"	16,836,313	44	16,181,007	38	14,015,305
Sub-measure 9.1a "Establishment of producer groups in the fruit sector"	3,200,811	6	2,683,870	5	2,183,144
Measure 10 "Agri-environment and climate"	835,317,262				
Measure 11 "Organic farming"	247,038,159				
Measure 13 "Payments for areas facing natural or other specific constraints"	1,522,717,575				
Measure 14 "Animal welfare"	792,480,077				
Sub-measure 15.1 "Payments for forestry and climate commitments" *****	90,147,754	648	97,623,204	628	96,496,674
Sub-measure 16.1 "Support for the establishment and operation of operational groups (GOs), for the development of pilot projects, new products" - Stage I - expression of requests for interest ****	6,723,721	117	49,067,192	24	8,376,817
Sub-measure 16.1 "Support for the establishment and operation of operational groups (GOs), for the development of pilot projects, new products" - Stage II - submission, evaluation and selection of the detailed project of the GO *****		19	6,351,760	16	5,156,169



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Sub measures	Public allocation PNDR 2014- 2020 (RON)	Funding applications submitted		Selected funding applications	
		No.	Value (RON)	No.	Value (RON)
Sub-measure 16.1a "Support for the establishment and operation of operational groups, development of pilot projects, products and processes - fruit trees" - Stage I - expression of requests for interest ****	5,819,040	73	31,125,190	17	7,206,293
Sub-measure 16.1a "Support for the establishment and operation of operational groups, development of pilot projects, products and processes - fruit trees" - Stage II - submission, evaluation and selection of the detailed GO project *****		11	4,766,823	11	4,680,030
Sub-measure 16.4 "Support for horizontal and vertical cooperation between actors in the supply chain"	12,385,582	266	25,300,939	126	11,801,919
Sub-measure 16.4a "Support for horizontal and vertical cooperation between actors in the supply chain"	6,428,560	79	7,586,850	41	3,993,442
Sub-measure 17.1 "Crop, animal and plant insurance premiums" *****	23,699,076	7,807	15,821,770	6,671	12,606,927
Sub-measure 19.1 "Preparatory support for the development of local development strategies"	1,990,183	180	2,435,307	175	2,379,233
Sub-measure 19.2 "Support for the implementation of actions under the local development strategy"	495,641,759	8,200	443,288,644	7,270	408,395,788
Sub-measure 19.3 "Preparation and implementation of the cooperation activities of the Local Action Group" - Component A "Preparatory technical assistance for LAG cooperation projects"	16,986,768	69	260,439	69	260,439
Sub-measure 19.3 "Preparation and implementation of the cooperation activities of the Local Action Group" - Component B "Implementation of the cooperation activities of the selected LAGs" *****		47	11,016,102	30	6,488,413
Sub-measure 19.4 "Support for running costs and animation"	123,013,164				
Measure 20 "Technical assistance" **	176,692,820				
Measure 21 "Specific measure granting exceptional temporary support under the EAFRD in response to the COVID epidemic" *****	182,500,000				
Financial instruments ***	93,973,930				
<b>TOTAL</b>	<b>9,438,714,849</b>	<b>74,151</b>	<b>9,796,652,809</b>	<b>49,458</b>	<b>5,533,836,454</b>

\* NOTE: Unfinished contracts from the 2007-2013 programming period that are paid from funds related to the 2014-2020 programming period.

\*\* NOTE: The M20 Technical Assistance payment also includes direct expenses incurred.

\*\*\* NOTE: The amount paid represents 75% of the value of the contract concluded with the European Investment Fund on November 28, 2017, regarding the granting of financial instruments under sub-measures 4.1, 4.1a, 4.2, 4.2a and 6.4.

\*\*\*\* NOTE: Regarding sM16.1 / 16.1a stage I, the applications for expressing interest were submitted and selected, and in stage II the selection of projects will be made. The total number of selected projects does not contain the



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number of IECs selected



\*\*\*\* NOTE: Regarding sM16.1 / 16.1a stage II, the submission, evaluation and selection of the detailed project of the GO selected in stage I will be carried out. The total number of selected projects also contains the number of GO projects selected for financing from stage II .

\*\*\*\*\* NOTE: With respect to sub-measure 17.1, the selected projects represent submitted applications declared eligible for the conclusion of the Financing Decision.

\*\*\*\*\* NOTE: Session of applications for support opened between September 25 and October 23, 2020. 122,986 sole farmers applied for support, requesting the amount of 182.5 million euros.

\*\*\*\*\* NOTE: If a selected partnership consists of several LAGs authorized by MADR, AFIR concludes financing contracts with each of the partners

\*\*\*\*\* NOTE: The value of support requests is the total value; the measure involves multi-annual commitments that go beyond the 2014-2020 framework.

Value of 1.00 Euro = 4.89 RON (March 2021).

## Chapter 4. Quadruple helix approach in agriculture field

The Quadruple Helix (QH) is an innovation and collaboration model with a citizen/end-user perspective. It is useful in an innovation process where the citizens' needs are central, as in agriculture. Using the Quadruple Helix and involving the citizens in the development of an innovation can lead to more successful, user-oriented innovations. The end-users will be more likely to accept and use the innovation.

The Quadruple Helix involves representatives from all members of society: public authorities, industry, academia and citizens (Fig. 1).



- Public authorities can be government and regional development agencies and policy makers, as well as formal health care providers in some countries



- Industry can consist of businesses, for example private health care providers, and business clusters.



- Academia can be for example the universities or research & development institutes.



- The fourth actor of the quadruple helix is the citizen.

To increase the success of the collaboration it is important to define which are the specific Quadruple Helix stakeholders that should be involved (stakeholder mapping) and to make sure all Quadruple Helix actors are involved, motivated, and have an open mind.

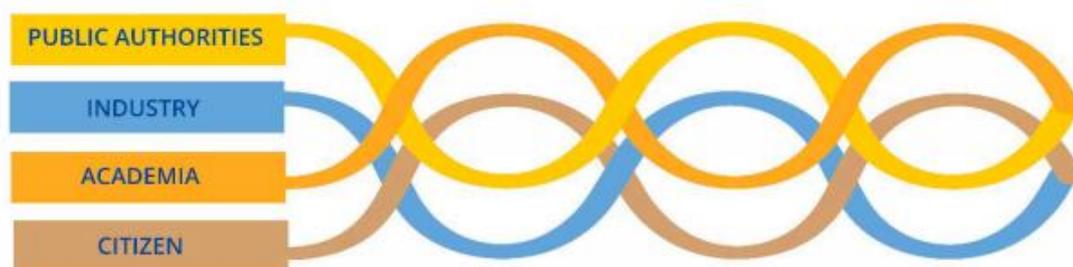


Fig. 5. Quadruple Helix

A detailed database of stakeholders from the quadruple helices of the agricultural sector and connected sectors in the regions has been elaborated trying to encompass the

most representative entities for the four helixes in rural development (public authorities, industry, academia, citizen/civil society). The Romania's list of stakeholders contain more than 125 organisations, and was achieved by a thorough investigation of the main actor in agriculture of the South-East region, eligible in the BSB programme. In Fig. 6, the distribution of the stakeholders from the four helixes for private and public sector is presented.

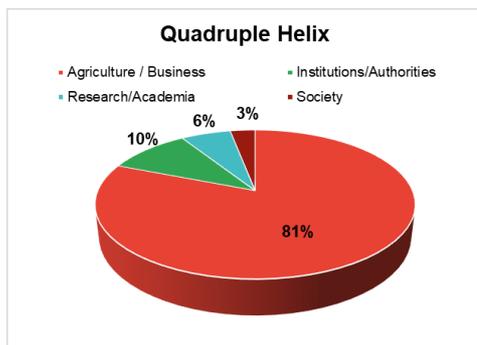


Fig. 6. Stakeholders from the four helixes

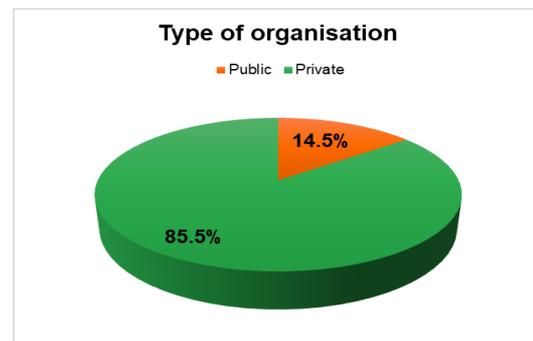


Fig. 7. Key stakeholders' type of organisation

From the whole stakeholders' list, 55 key stakeholders responded to the questionnaire. In Fig. 7, is presented the type of organisation and in the Fig. 11 organizations type of activities as according to the sector they belong to, profit or non-profit and governmental or non-governmental.

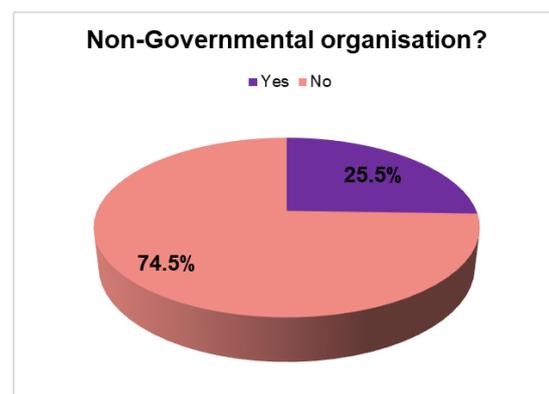


Fig. 8. Key stakeholders' type of activity of the organisation

There is a variety of fields of activities that the interviewed stakeholders' entities belong to (Fig. 11). The majority of them (78.2%) come from agricultural sector, the 3.6% of the interviewed were related to education, 5.5% from technology and 7.3% to business, 1.8% was connected to socio-economical field while the rest of 5.5% are related to

other fields. As for the quadruple helix innovation system of the key stakeholders, the 73.1% of the interviewed are from business/industry helix, 7.7% from research/academia helix and 7.7% from society, while the rest 11.5% is related to the government (Fig. 10).

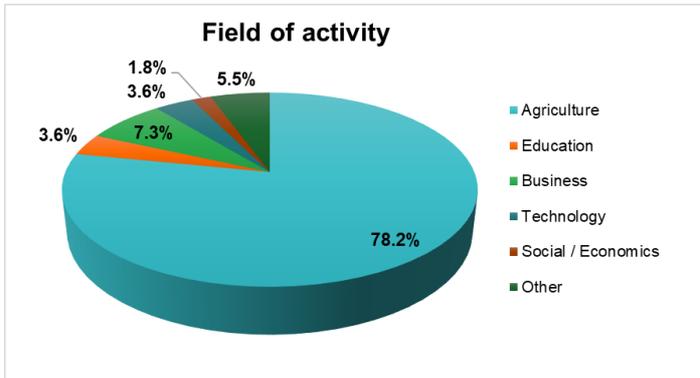


Fig. 9. Key stakeholders' field of activity

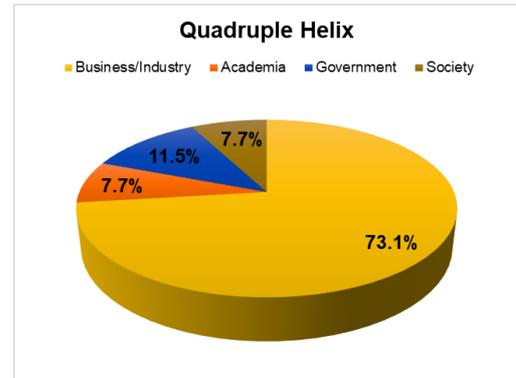


Fig. 10. Key stakeholders' quadruple helix

The interviewed stakeholders' profiles were structure also base to the type of organisation specific to their activity. The following picture (Fig. 11) shown the organisation's distribution: 67.4% farms/farmers (registered or non-registered), 9.10% Technology providers, 3.60% Local public authority, 3.60% Higher Education or Research Institutes, 1.80% Education/Training Centre or School, 1.80% Sectoral Agencies, 1.80% Infrastructure and service provider, 5.50% Interest groups including NGO's and 5.40% Business Support Organisation (Clusters, Chamber of Commerce etc.).

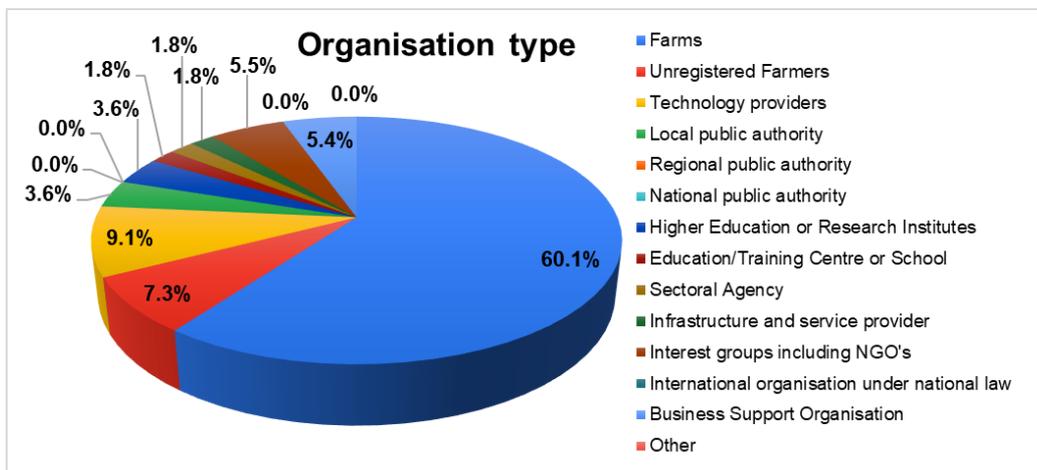


Fig. 11. Stakeholder's type of organisation

## Chapter 5. Smart and IoT technologies existent in SE of Romania

Smart Farming represents the application of modern Information and Communication Technologies (ICT) into agriculture, aiming to increase the quality and quantity of agricultural products. Smart farming includes aspects such as Internet of Things (IoT), data management, soil scanning, the access to GPS and other smart technologies.

In order for Romania to increase the value of its agricultural production, it should mechanize a large part of the agricultural field. This is difficult to do, because of the nature of the properties (extremely fragmented in Romania), when an average area of a farm is about 3.7 hectares. Over 50% of Romanian farmers work on farms with an area of less than one hectare.

In Romania, at least half of the agricultural workers practice a subsistence agriculture. It's about a million people who are torn from modernity, along with their families. By contrast, the approximately 30 agricultural holdings with legal personality in Romania have, on average, about 200 hectares. Thus, they are much easier to work mechanically, and the owners can invest in state-of-the-art equipment, for an agriculture worthy of the 21<sup>st</sup> century.

Fortunately, factories that assemble tractors reappear in Romania, and this year TAGRO was launched, the first 100% Romanian tractor, produced at IRUM Reghin. This tractor is intended primarily for small and medium-sized farms and will be sold on the domestic market as well as on foreign markets. TAGRO will have all the necessary equipment for a modern tractor, including radio commands and air conditioning. Prior to the launch, the tractor was tested in Romania and Italy, and by the end of this year the homologation process will be completed by the Romanian Auto Car Registry<sup>13</sup>. If the government devises a strategy to support farmers to buy such tractors, we will see spectacular increases in production, doubling them in less than a decade.

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<sup>13</sup> Lazar V., 100% Romanian Tractor Launched By IRUM Reghin, [https://www.romaniajournal.ro/top\\_news/100-romanian-tractor-launched-by-irum-reghin/](https://www.romaniajournal.ro/top_news/100-romanian-tractor-launched-by-irum-reghin/)

However, this cannot be enough for a proper strategy for the agricultural mechanisation and automation. At the moment, autonomous combines and seedling robots in Romania are still not implemented, and we probably won't be for a period. But the technological revolution is coming upon us, and the process of mechanization and modernization of Romanian agriculture should be a continuous process.

That's why in depth analysis should be achieved in order to understand better the real condition, particulars in the South-East part of Romania.

For the investigation related to the level of preparedness for Smart farming in BSB South-East part of Romania, a questionnaire was elaborated and sent to the key stakeholders identified from the quadruple helix. The results of the investigation, related to the level of awareness about the smart and IoT technologies are presented in the following.

The first question was related to the smart farming applications that the stakeholder's are aware, and they replied by "Yes" or "No" to the following examples give in the questionnaire: the water deficit detection and control, cattle monitoring and management, crop management, weed detection and control, climate conditions monitoring, pest and diseases detection and rural property management. In the picture below is depicted the number of replies to the above mentioned question (Fig. 12).

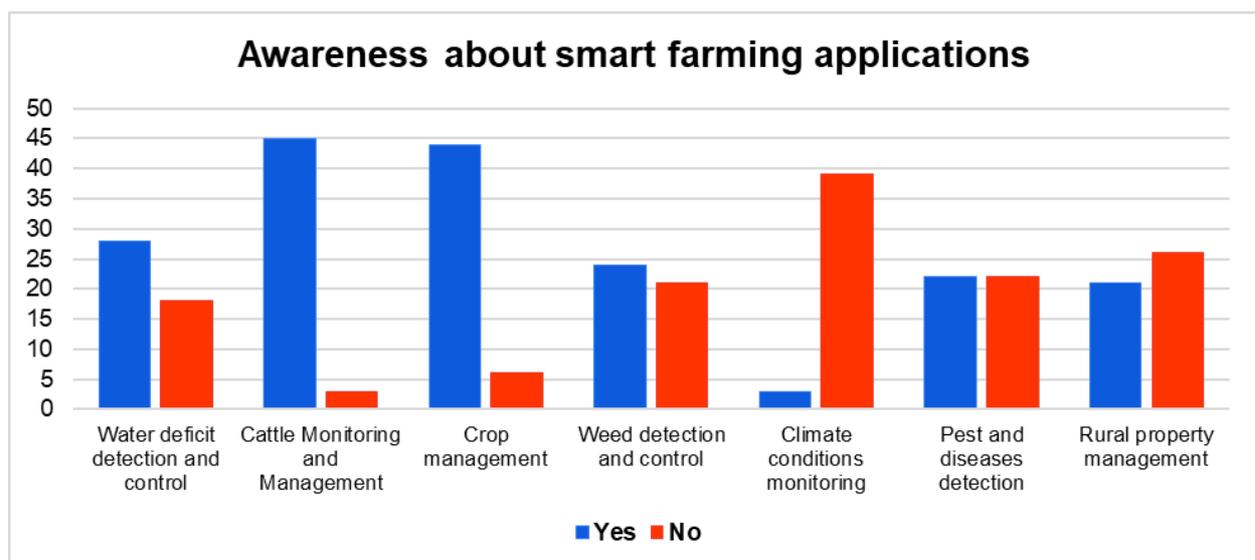


Fig. 12. Stakeholder's awareness about smart farming application in the SE Region of Romania

The second question was related to the smart farming technologies in South-East region from Romania that the stakeholder's are aware, and they replied by "Yes" or "No" to the following examples give in the questionnaire: data or images from sensors, digital maps, Global Positioning Systems, automated systems, robotic systems, drones and software and applications for farm management. In the picture below is depicted the number of replies to the above mentioned question (Fig. 12).

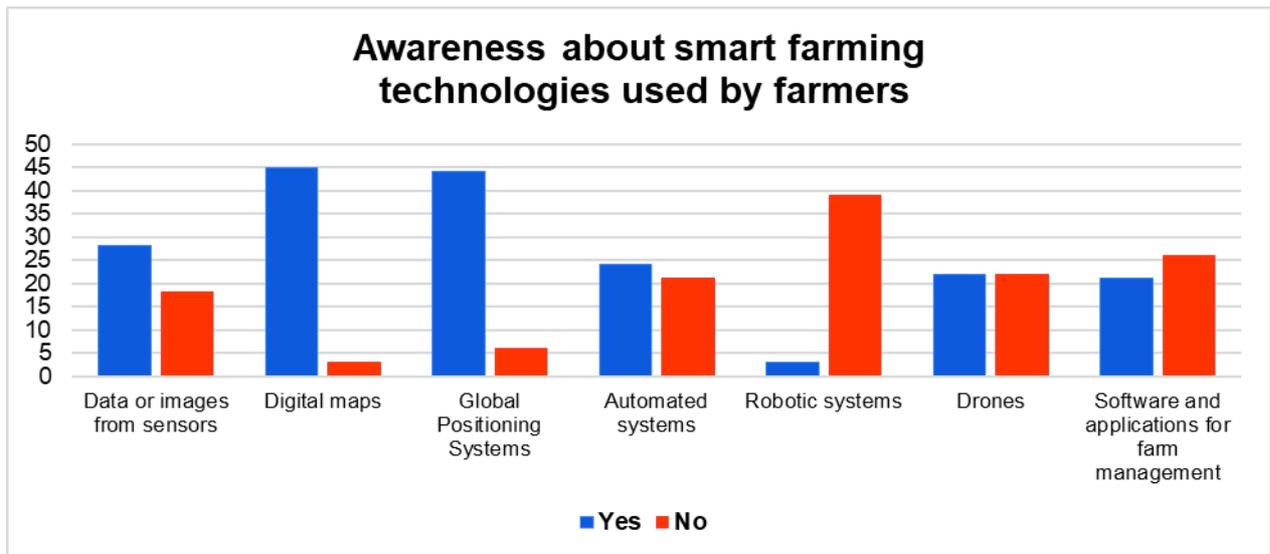


Fig. 13. Stakeholder's awareness about smart farming technologies in the SE Region of Romania

The next question was related to the awareness about the advantages provided by using smart farming. The 90.9% of the stakeholders appreciated that can increase productivity, 60.0% considered the reducing of the environmental impact, 69.1% thought that can lead to high quality products, 72.7% appreciated that can lead to cost reduction and 83.6% in an increased profit, 60.0% considered that can improve activity planning and 85.5% appreciated that can increase labour efficiency.

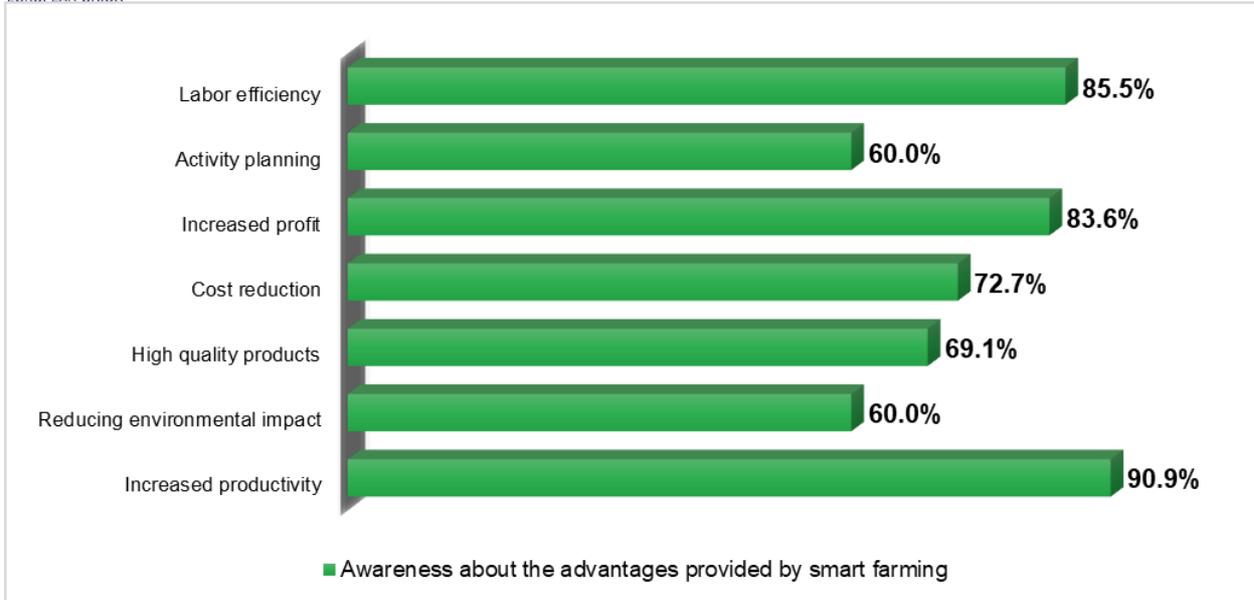


Fig. 14. Stakeholder's opinion about the advantages provided by using smart farming in the SE Region of Romania

Another question was related to the awareness about the agricultural fields that need smart farming technologies in SE Region of Romania.

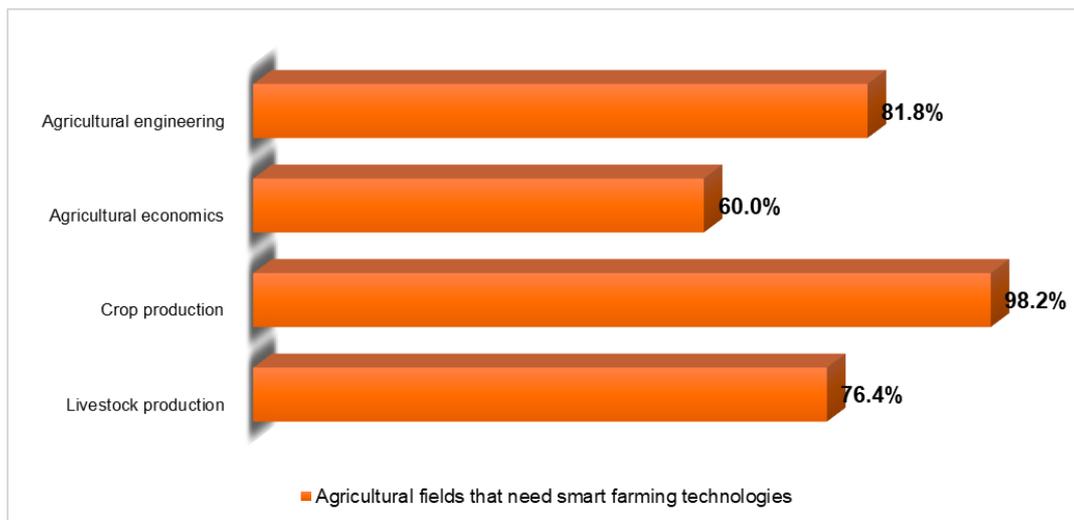


Fig. 15. Stakeholder's opinion about the agricultural fields that need smart farming technologies

The stakeholders considered in a percentage of 98.2% that crop production needs smart farming technologies, 81.8% in agricultural engineering, 76.4% in livestock production and 60% in agricultural economic field.

More specifically, the stakeholders were asked to specify the need (to a scale from 1 to 5) to adopt smart technologies in livestock production systems. Their replies first ranked, with maximum points 5 was, in milking automated systems, second place on feeding or

drinking control, third on cattle/sheep/ health monitoring, fourth on barn monitoring (video surveillance, environment control) and fifth on animal tracking indoor/outdoor (Fig. 16).

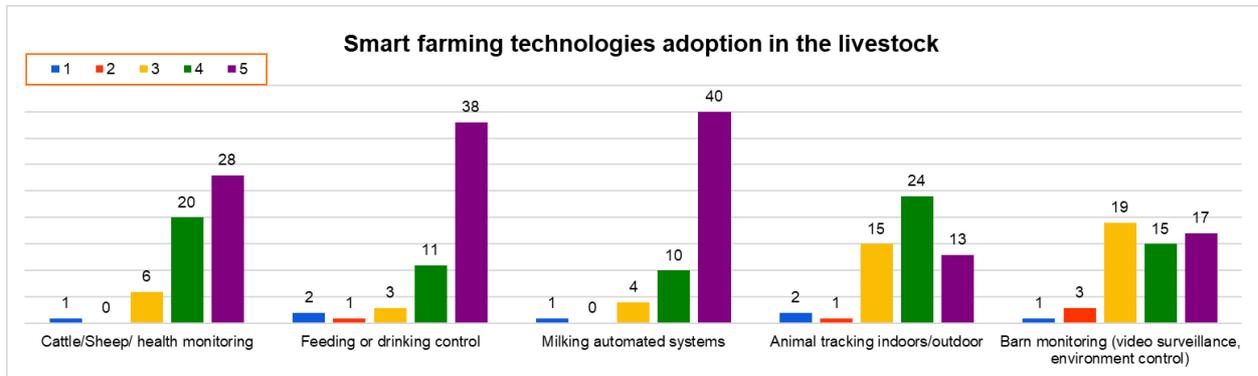


Fig. 16. Stakeholder's opinion about need of smart farming technologies in livestock

Moreover, the stakeholders were asked to specify the need (to a scale from 1 to 5) to adopt smart technologies in crop production systems (Fig. 17). Their replies first ranked, with maximum points 5 was, in irrigation systems, second place on soil and field analysis, third on fertilisations and crop protection, fourth on precision mechanical weeding and fifth on inspection and monitoring using drones.

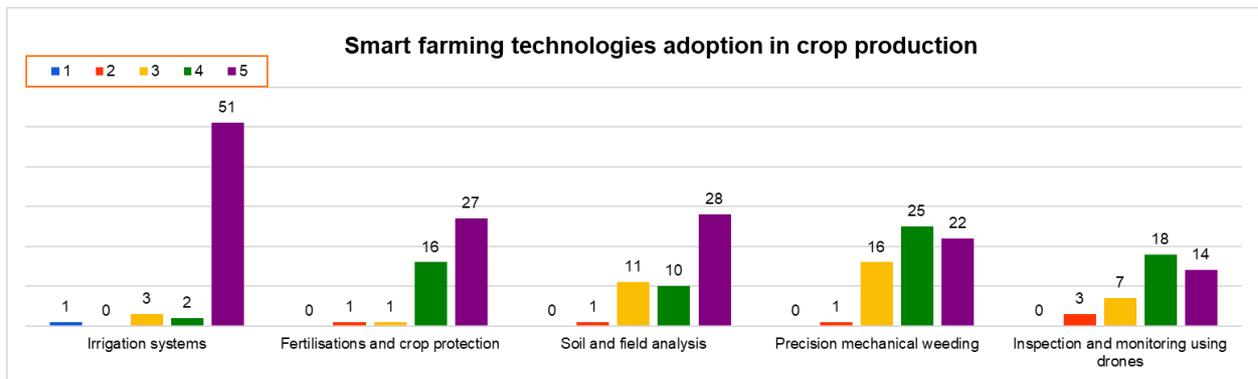


Fig. 17. Stakeholder's opinion about need of smart farming technologies in crop production

To continue the agriculture fields, the stakeholders were asked to specify the need (to a scale from 1 to 5) to adopt smart technologies in agricultural engineering sector. Their replies first ranked, with maximum points 5 was, in IoT and Sensors, second place on automation and robotic systems, third on predictive analytics tools and systems, fourth on Machine to Machine communication (M2M) and fifth on Cloud Computing and Big Data analysis and processing (Fig. 18).

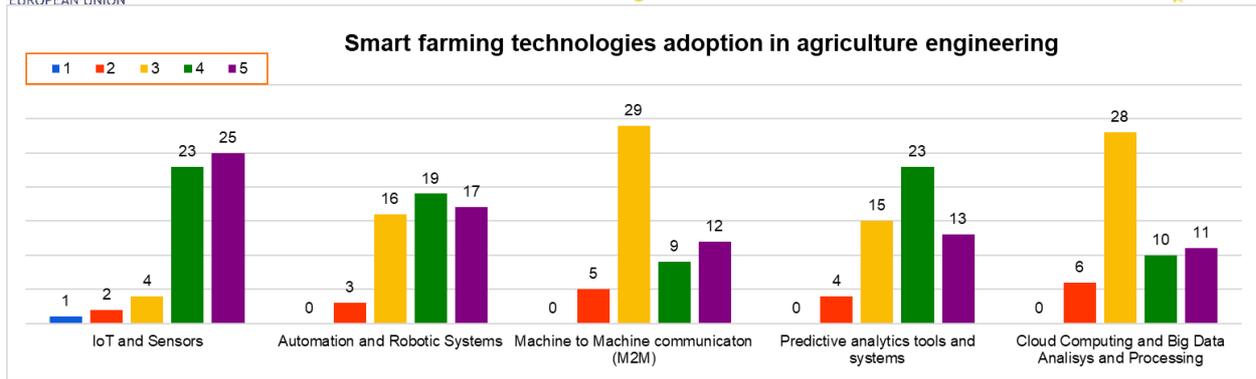


Fig. 18. Stakeholder's opinion about need of smart farming technologies in agriculture engineering

In the end, the stakeholders were asked to specify the need (to a scale from 1 to 5) to adopt smart technologies in agricultural economic specific field (Fig. 19). Their replies first ranked, with maximum points 5 was, in agribusiness, second place on agricultural management, third on environmental management, fourth on commodity trading/markets and fifth on financial sector management.

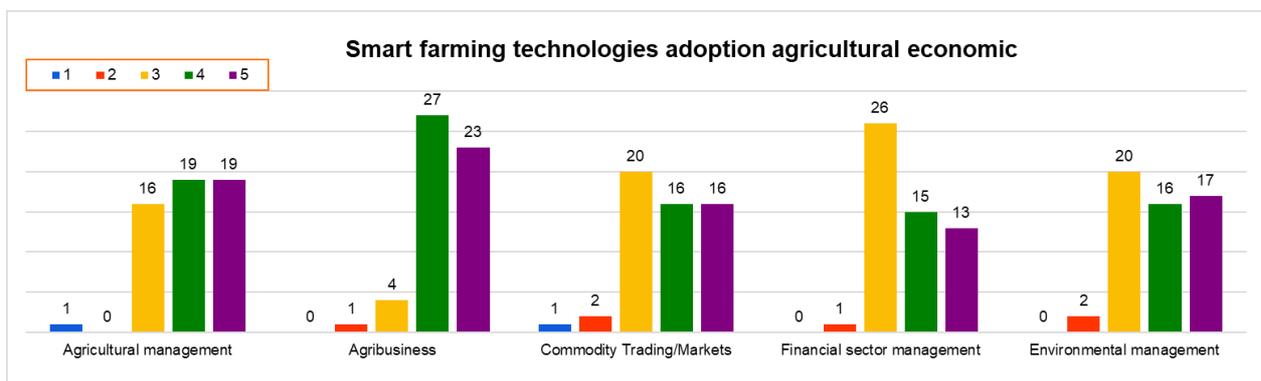


Fig. 19. Stakeholder's opinion about need of smart farming technologies in agricultural economics

The last question was related to the awareness if farmers from SE Region of Romania would like to adopt smart farming technologies. As predicted, the percentage of 93 of the stakeholders that replied “yes” at this question is eloquent about the need of adopting smart farming technologies.

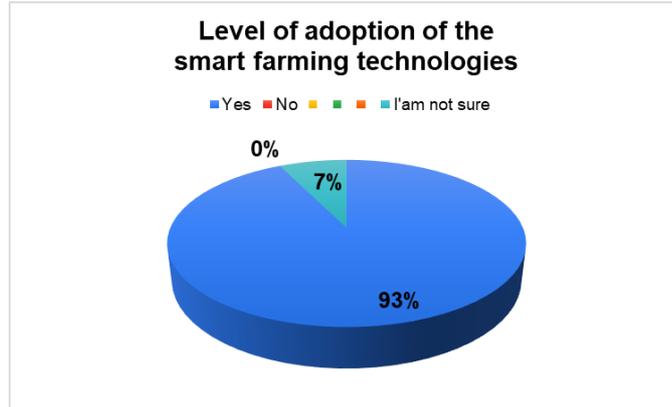


Fig. 20. Stakeholder's opinion about farmers adoption of smart farming technologies in SE of Romania

## Chapter 6. Agricultural needs of the rural communities in SE region of Romania

Agricultural production in the South-East part of Romania is significant, representing 15.86% of national production. Agriculture holds an important share in the region's economy, 40.4% of the region's employed population is in this sector. The agricultural land owns 65% of the total area of the region. The private sector holds the largest share of agricultural land and also produces most of the agricultural production.

The South-East region ranks first in the country, in terms of the area of fertile vineyards, holding 40.3% of the country's vineyard area mostly located in Vrancea County. The region is recognized, both internally and externally, by the quality of wines from famous vineyards, which are found throughout the region: Panciu, Odobesti, Pietroasele, Nicoresti, Niculitel, Murfatlar, Insuratei.

Crops are a main feature of the region, occupying a top position in the production of corn, production of wheat, legumes, vegetables and the in the production of sunflower.

Horticulture is well developed in the entire region (especially in Galati County) which is the first county in Romania, in terms of vegetable production.

Fishing and aquaculture, along with fish processing and trade in fish and fish products, are traditional activities in the South East Region. In some isolated areas, such as the Danube Delta and Meadow, the Danube area, fishing is one of the main activities, which provides jobs and sources of income for the local population. The fisheries sector in the South East Region includes:

- marine fishing activities on the Black Sea, practiced along the Romanian coast;
- fishing activities in inland waters, which are practiced on the Danube as well as in the Danube Delta area;
- Aquaculture. In the South-East Region there are at least 120 fish farms registered in the Register of Aquaculture Units, of which about 35 nurseries and 90 breeders. The largest number of fish farms is located in Tulcea County and Constanta County).

Based on the results of the stakeholder's questionnaire, as presented in Fig. 21, in the agriculture sector revealed that the 43.20% farmers have large farms (more than 10 ha),

43.20% medium farms (4-10ha), 8.10% have semi-medium farms (2-4 ha) and 5.40% have small farm (1-2 ha). It must be noticed that the investigation is still undergoing, and more data from stakeholders should be gathered.

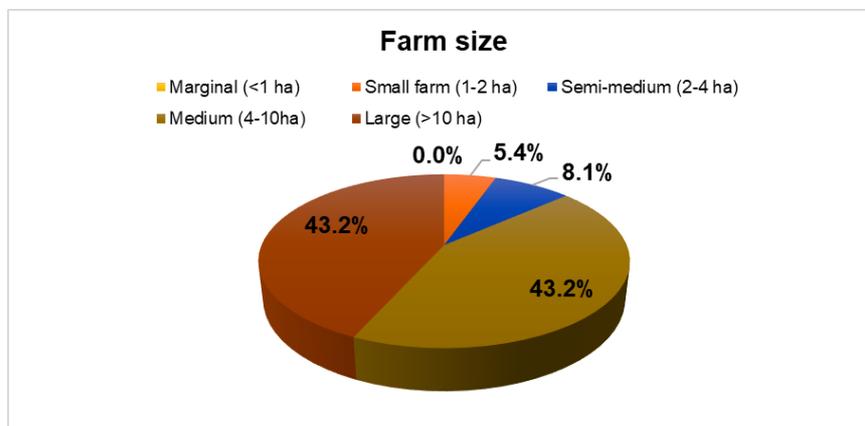


Fig. 21. Farm sizes

The questionnaire revealed that the type of farm of the respondents are concentrated at 63% on conventional farms, 21.6% Traditional Farms, 5.40% Bio farms and 8.10% other type of farms.

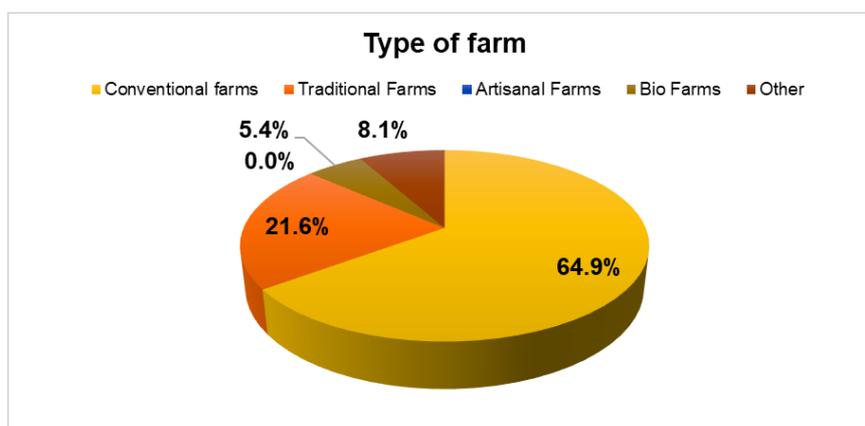


Fig. 22. Type of farm

Moreover, the farmers were asked about their field of activity. Their profiles revealed that the main field of activity are in livestock and crop production and a small amount is involved in agricultural engineering or economics (Fig. 23). Other fields included distribution of the materials and equipment for weed control, pest and diseases detection.

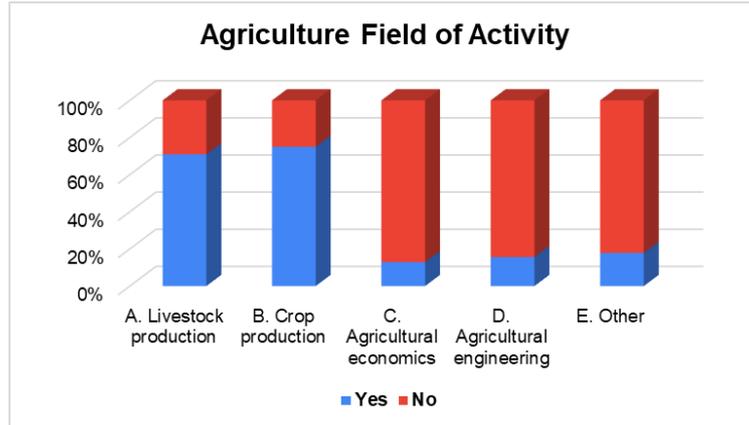


Fig. 23. Agricultural field of activity

In the below picture, from the total number of respondents from the livestock production, is presented the distribution of Cattle, Pigs, Poultry and Sheep farmers (Fig. 24).



Fig. 24. Livestock production

From the total number of respondents from the crop production, in the below picture is presented the distribution of farmers involved in grains, fruits and nuts, viticulture, vegetable and mixed farmers (Fig. 25).

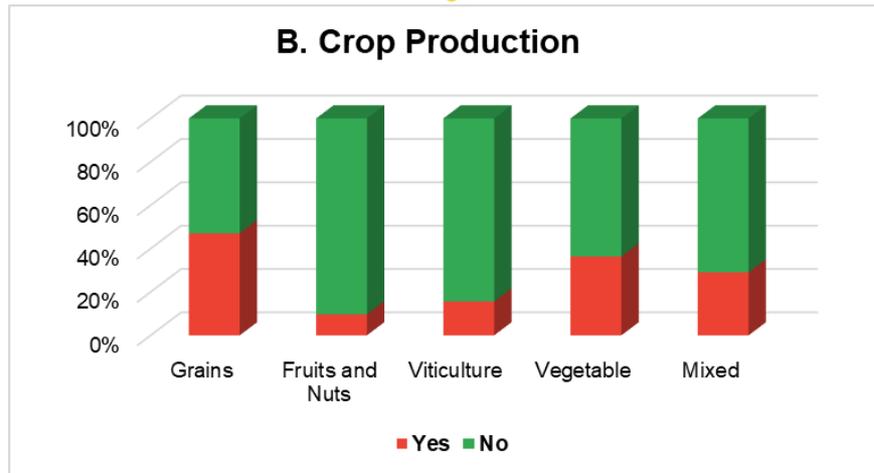


Fig. 25. Crop production

In the below picture, from the total number of respondents from the agricultural economics, is presented the distribution of agrarian system, agribusiness, agricultural extension, agricultural marketing, custom harvesting, economic development and rural community development (Fig. 26).

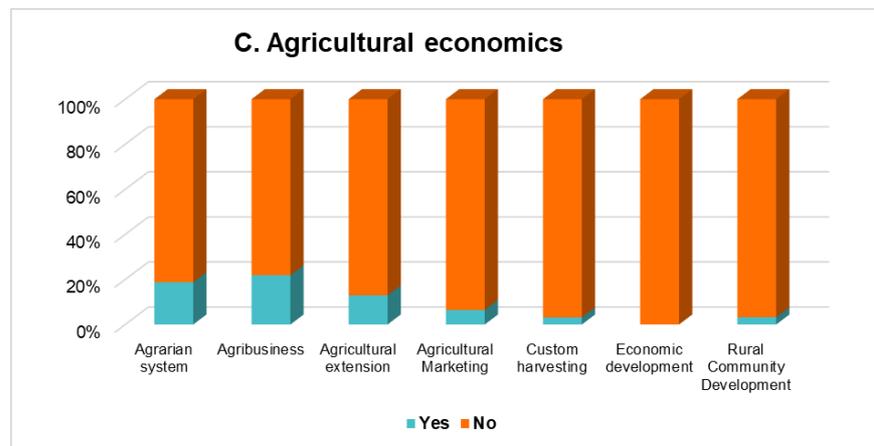


Fig. 26. Agricultural economics

From the total number of respondents from the agricultural engineering, in the below picture is presented the distribution of farmers involved in agricultural machinery, bioprocess engineering, energy & energy efficiency, electronics, farm equipment, food engineering, natural resources, system engineering and workshops (Fig. 27).

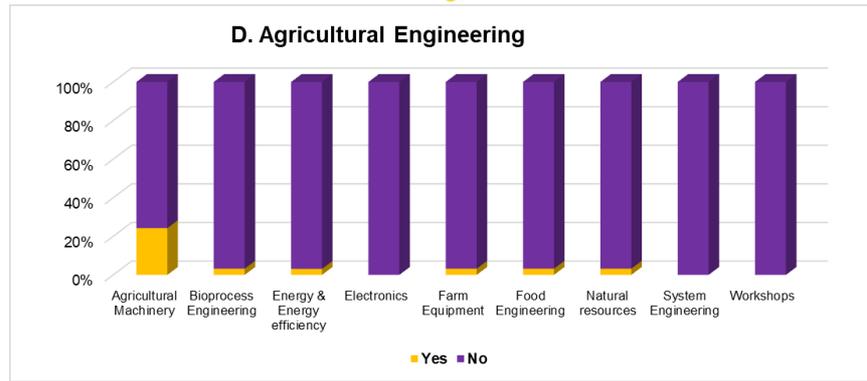


Fig. 27. Agricultural engineering

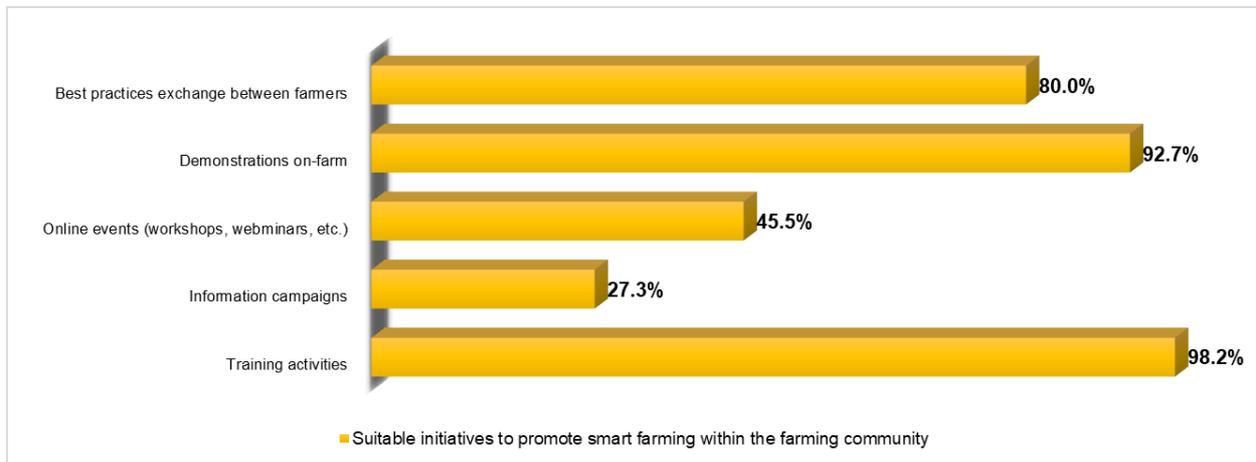


Fig. 28. Type of initiatives are suitable to promote smart farming

Another question was related to the stakeholder's awareness about the type of initiatives suitable to promote smart farming within the farming community in South-East region of Romania. The stakeholders considered in a percentage of 98.2% considered that training activities are suitable, 27.3% in information campaigns, 45.5% on online events (workshops, webinars, etc.), 92.7% on demonstrations on-farm and 80% on best practices exchange between farmers (Fig. 28).

The last question was related how the smart technologies and IoT can lead to proper management of the agriculture field and answer to other main socio-economic challenges in your area, such as the brain drain, youth unemployment and brain waste. Figure below depicts the responses of the stakeholders.

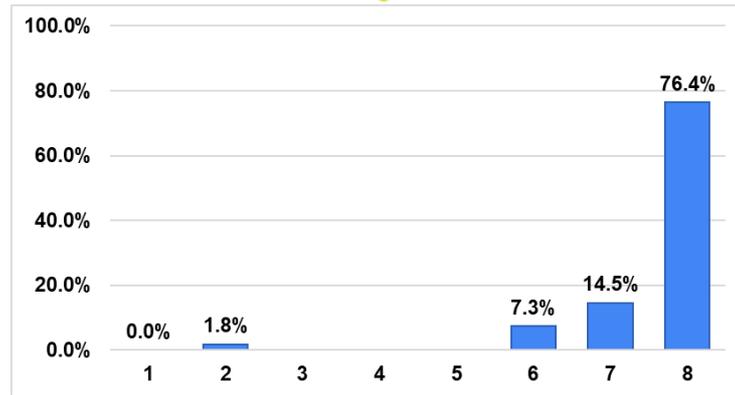


Fig. 29. Smart technologies and IoT and proper management of the agriculture field

## Conclusions and recommendations

Given the present regional analysis of South-East region of Romania, a set of conclusions and recommendations can be drawn, as follows:

- Increase access to technology / information / e-learning etc., by introducing a sustainable ITC infrastructure;
- Increasing receptivity at the level of agricultural holdings to innovative technologies
- Portfolio of results of agricultural research, which are / can be made available to farmers in order to introduce them in the market, in order to increase their competitiveness;
- Development of communication, relationship and leadership skills of stakeholders from agricultural sector;
- The rapid increase and development of e-commerce and the e-business market;
- Increasing the receptivity at the level of farmers and researchers to collaborate in partnership;
- Increasing the degree of access to national / European funding programs dedicated to the innovation and research;
- Development of a system to support effective information / training and support for farmers;
- Adapting training / information / research / consultancy requirements to the needs of farmers;
- support for the promotion of quality products, organic farming, investment in sustainable farms, innovation and livestock welfare;
- Improving the quality of agricultural products obtained from animals that benefit from improved welfare conditions, with benefits on consumer health and food safety;
- Increasing the responsibility of farmers towards the CAP on providing high quality, safe and healthy food, ensuring the welfare of farm animals and protecting the environment and tackling climate change;
- Economic efficiency of extensive / mixed traditional and environmentally friendly agricultural practices.



