STRUCTURE OF PRODUCTION COSTS FOR FIELD CROPS IN ROMANIA – A REGIONAL ANALYSIS

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Abstract
The level and structure of production costs has been subject of constant concern in agricultural economics and policies, as well as in farm practice. Changes in the system of subsidies promoted by the CAP after 2003 were meant to use to a higher extent ways of increasing profitability of farms, such as reducing costs. The paper focuses on calculating the costs per hectare for field crops, by cost components and by regions NUTS2 in Romania. The research relies on an empirical analysis of data provided by the Farm Accountancy Data Network (FADN) for the year 2013. The results reveal significant regional variations of production costs per hectare in connection to variation of yields per hectare. These results are relevant for a more realistic estimation of needs for adapted subsidies to local/regional conditions.
Keywords:
Field crops, economic size of farms, regions NUTS2, operating costs, structure of production costs

Introduction

The substantiation of production costs at the level of a standard farm size relies on the technological standards which estimate the costs of specific crop costs, farming overheads and payment for external factors. These costs are estimated by considering certain soil and climatic conditions. But in fact the costs per hectare and per output unit vary depending on the farm size, technological endowment, specific soil and climatic conditions, as well as on regional/local characteristics of the labour market which determine the labour costs.

The estimation of the average level and structure of production costs per farm and per hectare allows a better understanding of factors that contribute to the profitability of crop production. The aim of the research was to highlight the regional differences at NUTS2 level in the costs per hectare for several main field crops in Romania, considering also the economic size of farms.

The research relies on data provided by the Farm Accountancy Data Network (FADN) regarding the average production costs per farm in Romania in 2013. FADN monitored the production and costs of commercial farms, but the data collected are not suitable for directly estimating the cost of production. The field of observation includes agricultural farms with an economic size of over 2000 EUR (including this limit). The economic size of farms included in the FADN survey is based on the Standard Output (SO) of the farm. The SO is defined as the monetary value of agricultural production at farm-gate price for each agricultural product. The analysis in this paper refers to farms specialized in field crops, including cereals, oilseed-crops, sugar beet, rice, hemp, hops, tobacco and potato.

The data for Romania in 2013 relies on the sample of farms counting initially 6000 farms, of which only 5901 were validated by the European Commission (MADR, 2013). The farm classification by regions allows the use of criteria regarding specific aspects connected to the geographical location. The FADN grouping by regions followed agronomic and bioclimatic criteria, without necessarily adding administrative criteria. Regional data for Romania refer to the eight NUTS2 development regions, considering that each region has relatively homogenous characteristics regarding the conditions for agricultural production.

The analysis reveals significant regional variations of production costs per hectare in connection to variation of yields per hectare. Regional specificities of production costs may be used as benchmarks in decision making in the field of agriculture.

1. Literature review

The level and structure of production costs are subject of constant concern in agricultural economics and policies, as well as in farm practice. Since its beginning the Common Agricultural Policy (CAP) provided subsidies of different kinds, including subsidies to producers for inputs, for credits used for investments, for agricultural services etc. aiming to support part of the production costs and implicitly to ensure a reasonable profitability of agricultural production. The reform stages of CAP marked the transition to a higher degree of market liberalization, while the intervention mechanism for field crops in the period 2007-2013 have changed significantly compared to previous periods (Zahiu, 2006, pp.201-204). At the same time, the unified policy enforcement in EU countries requires the integration of markets for agricultural products, including the new Member States having a less competitive agriculture. Because of the previous CAP subsidy system the interest of farmers regarding cost reduction and higher efficiency was low (Alexandri, 2006, pp.26). Changes in the system of subsidies promoted by the CAP after 2003 were meant to use ways of increasing profitability of farms, such as reducing costs.

The analysis of farm efficiency in Romania in the year of EU accession (2007) shows that, because of low economic efficiency as well as lack of chain organization, farms specialized in field crops were dependent on subsidies, with important regional differences in subsidy level per hectare (Toma, 2010, pp.49-52).

Since increasing farm efficiency became urgent in the last decade in more liberalized agricultural markets, also the concern for improved cost calculation increased. The Farm Accountancy Data Network (FADN) offers valuation methods and is an instrument to provide information to assess the impact of the CAP policy (Barkaszi et al., 2009). Literature provides further methodological improvements for evaluation of production costs (Vasilescu et al., 2010). In recent years the regional aspects of production conditions, costs and sustainability of farmer income within the EU became an important issue for policy makers.

2. Production value per farm and by region

The field crops are an important part of the agricultural production in Romania. Cereals and other field crops, such as oilseeds, potatoes, sugar beet, hops, tobacco and hemp, are best represented in the regions West, South-East and South-Muntenia, where we find the largest areas occupied by these crops per farm (table 1). The regional average size of areas cultivated with cereals reaches only 3 – 9.6 ha per farm in the case of cereals and 0.5 – 3.35 ha per farm for other field crops.

A deeper analysis requires data regarding higher homogeneity of farm groups. Thus, areas cultivated with cereals and other field crops vary by regions, depending on the average farm size. The available date about farms size over 500 000 EUR (including this limit) shows that the largest farms are only in the regions North-East, South-East and South-Muntenia. In the largest farms the average area cultivated with cereals is about 1400 – 1700 ha, while the average area per farm cultivated with other field crops is about 600-760 ha.

Table 1 Areas cultivated with cereals and other field crops, in average per farm, by regions, 2013

-Hectares-

Regions NUTS2	Cereals	Other field crops
North-East	2.94	0.97
South-East	8.53	3.35
South-Muntenia	6.93	2.6
South-West Oltenia	3.85	0.77
West	9.61	2.19
North-West	3.72	0.5
Center	3.48	0.7
Bucharest-Ilfov	2.99	1.19

Source: FADN report for Romania, 2013, Ministry of Agriculture and Rural Development (MARD)

The gap between the regional average of cultivated area per farm and the regional average of the largest farms shows actually the overwhelming domination of the small farms in all regions.

Regarding the yield per hectare, there are regional differences arising from the differences in soil and climate, as well as in technical and economic performance of farms. According to the Institute of National Statistics in Romania, the *highest* yields per hectare for field crops in 2013 were as follows:

- Wheat and barley in the regions West, Bucharest-Ilfov, South-Muntenia and North-West, corn in the regions South-Muntenia, Bucharest-Ilfov and North-East;
- Rice is cultivated only in four regions with favourable condition for this crop, while the highest yield per hectare is in South-Muntenia, followed at great distance by the regions South-East, South-West Oltenia and West;
- Oilseeds, such as sunflower and rapeseed, in the regions West and South-Muntenia;
- Soybean in South-East and South-Muntenia;
- Sugar beet is cultivated only in five regions, with highest yield per hectare in the regions Center and South-East;
- Autumn potatoes in the regions Bucharest-Ilfov and Center;
- Hemp for fibre is cultivated only in regions North-East and Center, while the yield per hectare was four times higher in North-East compared to Center.
- Hop is cultivated only in the region Center.

According to FADN, the production value in Standard Results is a cumulative output, including sales, farm use and farmhouse consumption and variation of the value of stocks. The SO does not include direct payments, VAT or product charges.

The average value of crop production per farm in each region is given in table 2.

Table 2 Value of crop production, in average per farm, by regions, 2013

- EUR -

Regions NUTS2	Total value of crop production	Cereals	Protein crops (does not include soya)	Potatoes (including early potatoes)	Sugar beet	Oilseed-crops	Industrial crops (incl. hop, tobacco, hemp)
North-East	4868	1972	8	102	71	636	0
South-East	10272	5047	46	37	20	2007	10
South-Muntenia	9330	4657	60	336	0	1850	3
South-West Oltenia	5620	3004	5	28	0	442	0
West	11698	7299	0	210	118	1639	29
North-West	6554	2469	2	358	51	276	0
Center	7212	2392	11	1152	309	144	7
Bucharest-Ilfov	4725	2424	0	15	0	729	38

Source: FADN report for Romania, 2013. Standard results. Ministry of Agriculture and Rural Development, pg. 39-40

In accordance with the average size of areas cultivated with field crops presented in table 1, the average value of crop production per farm is higher in regions with high average size of farms (West, South-East and South-Muntenia), where cereals cover 50-62% of the total value of crop production, while cereals and oilseed-crops cover all together 69-76%.

3. Specific costs

The specific costs for each crop are calculated as the sum of costs of seeds and seedlings (purchased and produced and used on the farm), fertilizers and soil improvers, crop protection products and other specific crop costs. The average specific costs per farm for each field crop are presented in table 3. The highest costs for seeds, seedlings and fertilizers, in average per farm, are in region West, which is a possible explanation for the top positions (1-2) of this region regarding the yield per hectare for wheat, barley, sunflower and rape.

The calculation of specific costs per hectare consists of dividing the costs per farm by the average Utilized Agricultural Area (UAA) per farm. Results are available in table 4. The same specific costs from table 3 calculated per hectare bring in top position the region South-Muntenia, followed by region West.

These averages however hide extreme differences within each region, by classes of economic size, since variable costs increase with total output. But these costs, as average per hectare are relatively comparable in regions.

Table 3 Specific costs of field crops, in average per farm, by region, 2013

– Euro-

Regions NUTS2	Seeds and seedlings	Fertilizers	Crop protection products	Other specific crop costs	TOTAL Specific costs
North-East	345	455	227	79	1106
South-East	948	897	607	154	2606
South-Muntenia	762	1234	972	99	3067
South-West Oltenia	330	414	232	81	1057
West	1112	1645	720	49	3526
North-West	474	536	255	150	1415
Center	698	557	362	395	2012
Bucharest-Ilfov	220	494	321	13	1048

Source: FADN report for Romania, 2013, Standard results, Ministry of Agriculture and Rural Development, pp.41-42.

Table 4 Specific crop costs, in average per hectare, 2013

- Euro/ha -

Regions NUTS2	Seeds and seedlings	Fertilizers	Crop protection products	Other specific crop costs	TOTAL Specific costs
North-East	47.13	62.16	31.01	10.79	151.09
South-East	65.56	62.03	41.98	10.65	180.22
South-Muntenia	69.34	112.28	88.44	9.01	279.07
South-West Oltenia	51.97	65.20	36.54	12.76	166.46
West	68.60	101.48	44.42	3.02	217.52
North-West	54.48	61.61	29.31	17.24	162.64
Center	64.81	51.72	33.61	36.68	186.82
Bucharest-Ilfov	43.74	98.21	63.82	2.58	208.35

Source: own calculations based on FADN data

The differences that occur in calculations of specific costs per hectare depend on the various structures of crops, on the quality of seeds (higher quality costs more), as well as on the extent to which farms comply with the standard technology recommended for each crop regarding fertilization and crop protection.

4. Farming overheads

Costs of production that do not depend on specific production lines, as average per farm, indicate the same hierarchy of regions. Thus the farms that spend most, in average, for current upkeep for machinery and equipment, motor fuels, energy and contract works are situated in the regions South-Muntenia, West and South-East (table 5).

Table 5 Farming overheads, in average per farm, 2013

- Euro-

Region NUTS2	Current upkeep for equipment	Energy	Contract works	Other farming overheads	TOTAL non-specific costs
North-East	172	633	828	78	1710
South-East	351	1038	959	285	2634
South-Muntenia	470	1273	797	399	2939
South-West Oltenia	419	838	425	69	1751
West	605	1427	513	220	2765
North-West	561	799	359	134	1853
Center	417	851	717	169	2155
Bucharest-Ilfov	220	609	155	54	1038

Source: FADN report for Romania, 2013, Standard results.

Table 6 Farming overheads, in average per hectare, 2013

-Euro/ha-

Region NUTS2	Current upkeep for equipment	Energy	Contract works	Other farming overheads	TOTAL non-specific costs
North-East	23.50	86.48	113.11	10.66	233.61
South-East	24.27	71.78	66.32	19.71	182.16
South-Muntenia	42.77	115.83	72.52	36.31	267.42
South-West Oltenia	65.98	131.97	66.93	10.87	275.75
West	37.32	88.03	31.65	13.57	170.57
North-West	64.48	91.84	41.26	15.40	212.99
Center	38.72	79.02	66.57	15.69	200.09
Bucharest-Ilfov	43.74	121.07	30.82	10.74	206.36

Source: own calculations based on FADN report for Romania, 2013 and data from Farm Accountancy Data Network

The same overheads calculated per hectare UAA show that the highest farming non-specific costs are in the region South-West Oltenia (table 6). This is due to the smaller farm size, but mostly to the fact that owners of tractors and agricultural equipment provide services to other farms.

5. Depreciation

Depreciation in average per farm reaches the highest level in region South-Muntenia (2079 EUR/farm), followed by regions Bucharest-Ilfov (1969 EUR/farm) and South-West Oltenia (1274 EUR/farm). The same regions have high levels of average depreciation per hectare (table 7).

However the reasons for this situation are different. According to a study conducted in 2010 (Gavrilescu, 2010), the highest number of tractors was available in the regions South-Muntenia and South-East, each having about 20% of total number in the country, followed by the regions West and Center, with 18% each. The first position occupied by the region South-Muntenia is determined by the high degree of mechanization based on own equipment. The high average depreciation per hectare in Bucharest-Ilfov, South-West Oltenia and even North-East may indicate an apparent excess endowment, which in fact is used by farmers for providing services to other farms, usually of small size.

Table 7 Depreciation, average per farm and per hectare, 2013

-Euro-

	Depreciation per farm	**Utilized Agricultural Area, average per farm (UAA)**	**Depreciation per hectare**
Region NUTS2	**Euro**	**Ha**	**Euro/ha**
North-East	1055	7.32	144.13
South-East	1006	14.46	69.57
South-Muntenia	2079	10.99	189.17
South-West Oltenia	1274	6.35	200.63
West	1503	16.21	92.72
North-West	899	8.70	103.33
Center	1048	10.77	97.31
Bucharest-Ilfov	1969	5.03	391.45

Source: FADN report for Romania, 2013 and own calculations.

6. Payment for external factors

Payment for external factors consists of remuneration of inputs which are not in the property of the holder. This payment per farm and per ha (table 8) depends on the mechanization degree of agricultural operations and implicitly on the skill level of the employees, as well as on the supply/demand balance on local markets of the production factors.

The highest costs per hectare are in regions Bucharest-Ilfov and South-Muntenia. It is necessary to emphasize that the wages paid recorded by this indicator are based on contracts, while wages paid for mechanized operations are higher than wages for manual operations. That is why in regions with large farms and highly mechanized operations the wages are also higher. In addition, the supply/demand balance on the labour market determines the wage level. In North-East and South-East the labour supply in agriculture is higher than in other regions and the wages are lower.

The highest rent paid per hectare is in the regions South-Muntenia and South-East (table 8), in sharp contrast to all other regions. The high level of the rent is determined by the soil quality and by the demand on the land market from major agricultural producers who extent the cultivated areas of the farms in order to reach the advantages of economies of scale and implicitly higher profits. These large farms have the capacity to take bank loans for investment and therefore to function like modern business. Consequently the value of land increased and also the rent paid to land owners, while the rent became an important component of the production costs.

Table 8 Payment of external factors, in average per hectare, 2013

- Euro/ha -

Regiune NUTS2	Wages and social security	Rent paid	Interest paid	TOTAL Payment of external factors
North-East	38.66	41.8	3.69	84.15
South-East	43.71	68.05	6.09	117.84
South-Muntenia	75.52	70.79	18.74	165.06
South-West Oltenia	79.37	27.4	0.94	107.72
West	46.02	53.67	1.42	101.17
North-West	78.28	31.49	2.07	111.95
Center	75.39	37.33	3.44	116.06
Bucharest-Ilfov	177.73	36.78	n.a.	214.31

Source: FADN report for Romania, 2013 and own calculations based on data from Farm Accountancy Data Network

The lack of data regarding the amount that could be received by unpaid workers is distorting the data regarding labour costs. It is likely that in large farms dominate the permanently employed workforce with contract, while in small farms unpaid work has a much larger share. Also the geographical proximity to a large city like Bucharest determines higher labour costs because agricultural workers have employment alternatives.
As employment alternatives arise in rural areas, as a result of diversification process specific to all Central and East European Countries (Čapkovičová, 2016), it is expected that the remuneration of work increases and will rely more on a contractual basis.

Conclusions

The empirical analysis of FADN data about Romanian agriculture in 2013 indicate that the level and structure of production costs as average per farm and per hectare have significant variation between the eight regions of Romania. The average costs per hectare (excluding remuneration for unpaid workers) are the highest in regions Bucharest-Ilfov and South-Muntenia. The lowest costs per hectare are in South-East and West.
These regional differences have various explanations connected to the operational costs, depreciation, rent paid and interest paid, as well as the variation of wages paid. The local/regional prices of production factors and the size and profile of farms are decisive factors of costs.
Higher costs per hectare are recorded mainly in regions dominated by large sized farms which function as modern businesses and obtain also the highest yields per hectare for field crops. Therefore, in an agriculture in transition increasing costs per hectare is a positive trend as long as it is determined by the shift to modern technologies and to the use of skilled workers, in strong connection to higher productivity.

Aknowledgement

This paper has been supported by the research project ADER 13.1.2. entitled ”Technical and economic substantiation of production costs and estimations of prices for wheat, barley, corn, sunflower, rape, soya, sugar beet, rice, hemp, hops, tobacco and potatoes for the conventional and ecological agriculture”, period 2015-2018. The research project is coordinated by the Research Institute for Agricultural Economics and Rural Development and financed by the Romanian Ministry of Agriculture and Rural Development.

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