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ORGANIC CEREAL CROPS IN THE WORLD, IN EUROPE AND IN ROMANIA – COMPARATIVE ANALYSIS

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Abstract: Organic crops have recorded variable dynamics in cultivated areas, with an increasing trend globally. This study analyzed the situation of the area (A) of cereal crops in the organic system worldwide - A(W), in Europe - A(E), and Romania - A(RO), during the 2013 – 2023 period. At the global level, there was an increasing trend in area over the study period, with a deviation in 2014. At the Europe level, there was an increasing trend in area over the period 2013 - 2020, and after the maximum in 2020 followed by a decreasing trend. At the level of Romania, there was a decreasing trend in the area between 2013 and 2016 (with a minimum in 2016), and an increasing trend between 2016 and 2023. Polynomial models described the variation of cereal crop areas in the organic system in relation to the time factor (T, years), with $R^2 = 0.983$ in the case of A(W), $R^2 = 0.980$ in the case of A(E) and $R^2 = 0.946$ in the case of A(RO). According to PCA, the principal components explained 98.564% of the total variance, and Cluster Analysis grouped the years of the study period based on similarity.

• Introduction

Cereals (Poaceae: Gramineae) include a series of crop plants (e.g. wheat, rice, barley, rye, corn, millet, sorghum) from which the main production (starch-rich seeds) but also the secondary production (ligno-cellulosic stems) are used in food, animal feed, and as raw material for various industrial sectors [24], [30], [21], [8]. Cereal cultivation in an organic system was analyzed in comparison with conventional systems, from the perspective of the sustainability of crop systems, production quality, the relationship of plants with soil and nutritional factors, climatic conditions, plant protection [16], [3], [25]. Specific elements on the agri-food chain of organic products were also analyzed, in relation to consumer demands and product assurance [6], [10], [23]. The study analyzed the dynamics of areas cultivated with cereals in an organic system in the world, in Europe and in Romania, in the 2013 - 2023 period.

• Material and method

The study analyzed the variation in areas with cereals cultivated in an organic system in the world, in Europe and in Romania. The study considered data recorded between 2013 and 2023. For the situation recorded in the world and in Europe, data recorded based on FiBL were accessed [31]. For the situation in Romania, data recorded in the MADR database were accessed [32].

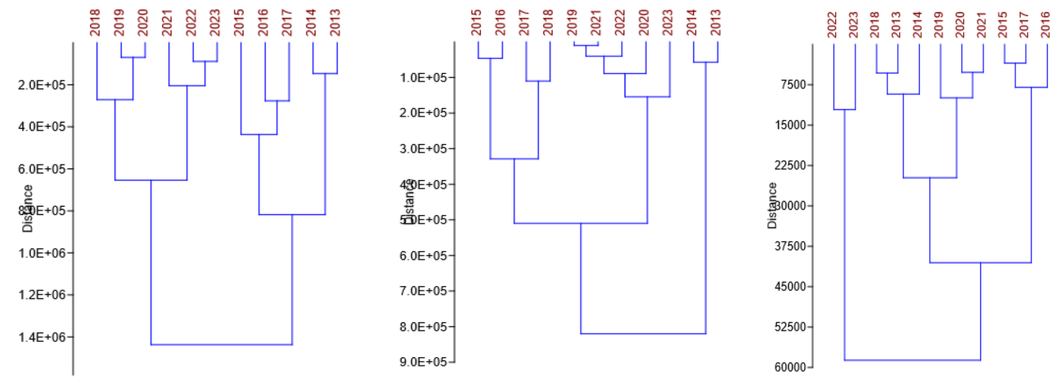
Table 1. Area cultivated with cereal crops in an ecologic system, in the world, in Europe and in Romania, period 2013 - 2023

Year	Cereal crops area			Calculated ratio		
	A(W)*	A(Eur)*	A(RO)**	A(Eur/A(W)	A(RO)/A(Eur)	A(RO)/A(W)
	(ha)			Ratio		
2013	3435682	1854727	109105	0.5398	0.0588	0.0318
2014	3288991	1911845	102531.5	0.5813	0.0536	0.0312
2015	3889353	2232921	81439.5	0.5741	0.0365	0.0209
2016	4187874	2279155	75198.31	0.5442	0.0330	0.0180
2017	4464347	2529808	84925.51	0.5667	0.0336	0.0190
2018	4782363	2639748	114427.5	0.5520	0.0433	0.0239
2019	5018958	2957165	126843	0.5892	0.0429	0.0253
2020	5088503	3027517	134170.2	0.5950	0.0443	0.0264
2021	5480988	2947005	139378.2	0.5377	0.0473	0.0254
2022	5641202	2911927	160154.7	0.5162	0.0550	0.0284
2023	5730109	2806551	172283.8	0.4898	0.0614	0.0301

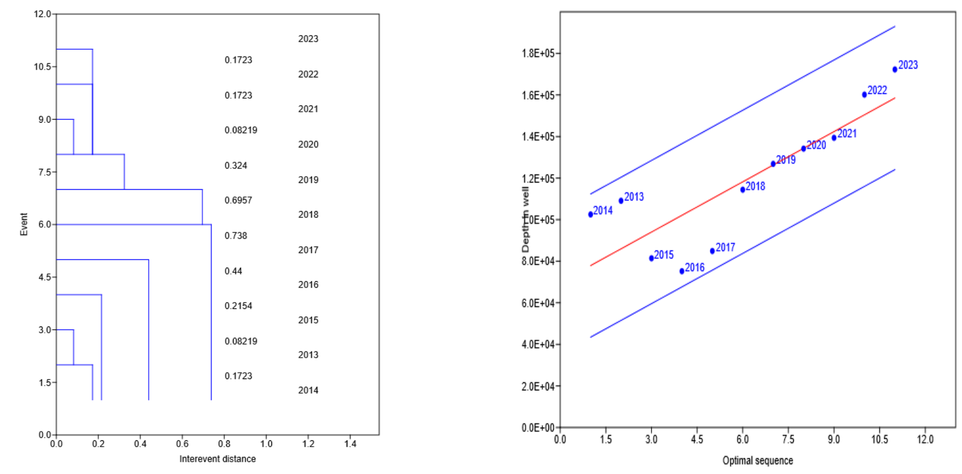
* FiBL database, ** MADR database

• Results and discussions

Based on the data, the ratios between the area cultivated with cereals in Europe (A(Eur)) and the area in the world (A(W)), between the area cultivated with cereals in Romania (A(RO)) and the area in Europe (A(Eur)), and respectively between the area cultivated with cereals in Romania (A(RO)) and the area in the world (A(W)) were calculated. The values of the areas cultivated with cereals in the organic system during the study period, and the values of the calculated ratios, are presented in Table 1. Cluster analysis was applied to generate dendrograms regarding the area cultivated with cereals in the organic system in the world (Coph.corr. = 0.748), in Europe (Coph.corr. = 0.812) and in Romania (Coph.corr. = 0.760), figure 2. As a cumulative effect of the areas cultivated with cereals in the organic system, the ranking analysis placed the years in descending order, figure 6 (a). An inversion was recorded in the ranking diagram of the years 2013 and 2014. The scattergram distribution of the years over the study period, for the situation in Romania, is presented in figure 6 (b).



Cluster dendrograms regarding the area with cereals in the organic system, period 2013 - 2023; (a) – in the world; (b) – in Europe; (c) – in Romania



Ranking diagram of the years during the study period (a), and scattergram diagram with the distribution of years for conditions in Romania (b)

• Conclusions

The variation of areas cultivated with cereals in an organic system in the world, in Europe and in Romania was described by polynomial models in relation to time during the study period 2013 - 2023. Certain deviations from the graphical distribution models of the equations were recorded for each level of data coverage. From the situation in the world during the study period, a trend of stabilization of the growth of the areas cultivated with cereals in the organic system was observed. At the European level, a decreasing trend of the areas cultivated with cereals in the organic system was observed, after the maximum recorded in 2020. In the conditions of Romania, a wide fluctuation of the areas cultivated with cereals in the organic system was recorded during the study period, with a minimum in 2016 and an increasing trend in recent years.

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