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TRENDS IN VARIATION OF ORGANICALLY CULTIVATED AREAS WORLDWIDE – COMPARATIVE STUDY

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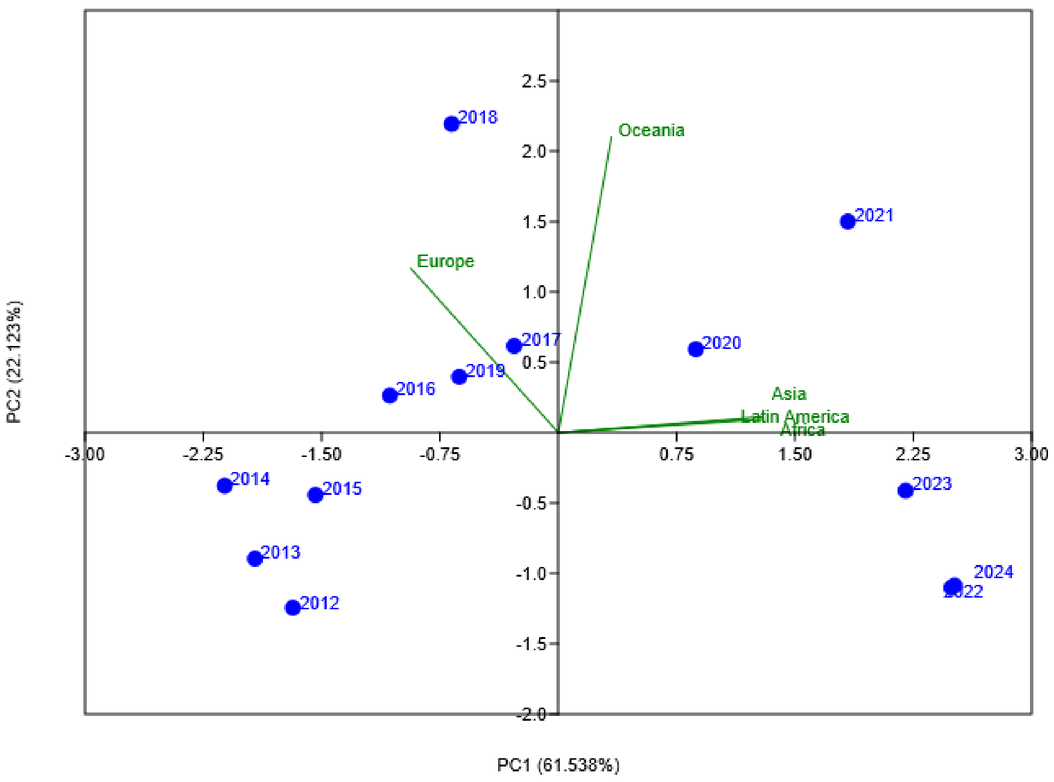
Abstract: Organic agriculture is expanding worldwide, supported by high consumer demand for organic products in the global market. This study analyzed the area cultivated organically, in terms of distribution trends by continent between 2012 and 2024. Organically cultivated areas showed variations in terms of distribution across continents and time interval considered. Low variability was recorded for data from Europe (CV = 13.23) and Latin America (CV = 11.12), and high variability for data from Africa (CV = 34.91), Asia (CV = 35.90) and Oceania (CV = 47.86). Multivariate analysis explained the correlation of years with reference areas (continents), and the two main components (PC1, PC2) explained 83.661% of the total variance. The cluster analysis grouped the years and reference areas based on similarity in relation to the area cultivated in the organic system during the study period (Coph.corr. = 0.828). Asia ranked with a high score during the years 2022, 2023 and 2024.

• Introduction

Organic agriculture, as an agricultural and food production system, generates a series of ecological, economic and social benefits through agricultural practices, the quality of food resources, the environment and human health [9], [10], [15], [16]. The important role of knowledge and innovation in organic production systems has been highlighted through quantitative and qualitative studies and fieldwork [18], [14]. As an alternative to conventional agriculture, organic agriculture is based on a series of technological innovations [2], [17]. This study analyzed the areas of land cultivated in organic systems in the world, between 2012 and 2024, starting from the FiBL database, and used appropriate mathematical tools, such as regression analysis, multivariate, comparative, with appropriate statistical parameters to describe variation trends, similarities and differences between the reference categories considered..

• Material and method

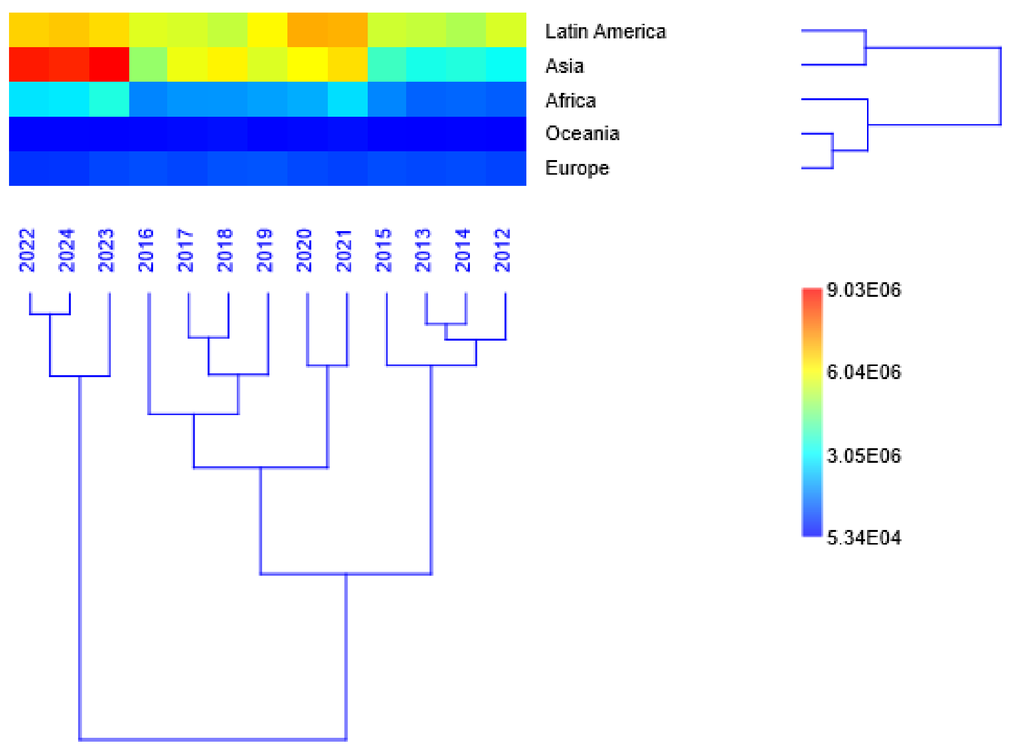
The study analyzed data recorded by FiBL between 2012 and 2024 [23]. The organically cultivated areas (OCA, ha) recorded in the database for Africa, Asia, Europe, Latin America, Oceania and Total Area were analyzed. Descriptive statistical analysis was performed for the general characterization of the data series. The distribution of the data, and the presence of outliers in the data series were evaluated. The evolution of organically cultivated areas (OCA) on each geographic landmark (continent) was evaluated in relation to the time factor, over the study period.



PCA diagram based on the values of organically cultivated areas during the study period

• Results and discussions

Based on the coefficient of variation (CV) values, low variability of organically cultivated areas was assessed in Europe (CV = 13.23), and in Latin America (CV = 11.12). Moderate variability was recorded for the total area (CV = 21.79). High variability was recorded for Africa (CV = 34.91), for Asia (CV = 35.90) and for Oceania (CV = 47.86). The variation of organically cultivated areas was evaluated for each geographical landmark (continent) in relation to the years during the study period. Regression analysis led to polynomial models, which described the variation of organically cultivated areas. The increasing trend of OCA over the study period resulted for Africa, Asia, Latin America, and Total Area. In the case of Europe, the polynomial model presented an increasing trend in the first part of the study period, with a ceiling in the area growth during the years 2018 – 2019, followed by a decreasing trend. Similar results were recorded for Oceania, with the highest values in the years 2018 and 2021 (fluctuating situation in the respective interval) and a decreasing trend after 2021, towards the end of the study period. The multivariate analysis generated the PCA diagram, Figure 2, with the correlated distribution of years against geographical landmarks (continents, as biplot) in relation to organically cultivated areas. The two main components (PC1, and PC2) explained 83.66% of the total variance. The cluster analysis generated a dendrogram with the grouping of years and geographical landmarks (continents) based on similarity in relation to organically cultivated area (Coph.corr. = 0.828), Figure 3. The cluster dendrogram indicated Asia with the highest OCA values during the years 2023, followed by 2022, respectively 2023. Higher values were recorded for Asia and Latin America during the study period, compared to the other three continents, Oceania, Europe and Africa.



Cluster dendrogram

• Conclusions

Regression analysis found polynomial models that described the variation of organically cultivated areas (OCA) over time, during the study period. An increasing trend of OCA over the study period resulted for Africa, Asia, Latin America, and Total Area. In the case of Europe and Oceania, the models showed an increasing trend in the first part of the interval, capping growth (for Europe), and variability (for Oceania) throughout the interval, and a decreasing trend during the last years of the studied interval. The modeling analysis would be interesting to apply considering a series of potential influencing factors, specific to each geographical landmark.

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