



WORLD DRY LEGUME CROP AREA IN ECOLOGICAL SYSTEM VIEWED BY MULTIVARIATE ANALYSIS

ANDREEA LIDIA JURJESCU¹, FLORIN SALA^{1,2*}

¹Agricultural Research and Development Station Lovrin, Lovrin, 307250, Romania

²University of Life Sciences "King Mihai I" from Timisoara, Timișoara, 300645, Romania

Abstract: The area of dry legume crops (protein crops) in the ecological system was analyzed between 2013 and 2023 period. With an average area of 454589.8 ha (71.91%), Europe ranked first, followed by North America (12.71%), Asia (10.72%), Africa (2.81%) and Latin America (1.85%). The area cultivated with dry legumes showed low variability over the study period in Europe and North America, and high variability in Asia and Africa. In the case of multivariate analysis, the two main components (PC1, PC2) explained 80.821% of the total variance. In relation to the main components, the study areas presented differentiated loading, with high values recorded in PC1, Europe (0.5475), in PC2 Asia (0.6631), in PC3 Latin America (0.5484), in PC4 North America (0.7360), and in PC5 Latin America (-0.6005). The cluster analysis grouped the years and reference areas based on similarity in relation to the dry legume area (Coph. corr. = 0.898). The year 2017 occupied an independent position in the cluster diagram, and the other years were grouped into two clusters with several subclusters, based on similarity.

• Introduction

Dried legume crops (protein crops) include a number of plants (beans, peas, soybeans, lentils, chickpeas, etc.) and are important in human nutrition, for animal feed and for various sectors of the economy [1], [9]. For food security, in human nutrition and animal feed, dry legume crops are important for the production of protein, fiber, folate, mineral elements etc. [11], [16]. Protein crops are of high interest and have been analyzed from the perspective of increasing food demands, dietary patterns, but also in the context of agricultural land degradation and climate change scenarios [3], [9].

• Material and method

Dry legume crops (protein crops) were analyzed based on the area cultivated worldwide, between 2013 and 2023. Data recorded in the ecological system between 2013 and 2023 [4] were taken into account. Areas for Africa, Asia, Europe, Latin America, and North America were considered. Based on the multi-annual data recorded, average values were calculated for each reference. The percentage share of each reference in the total area cultivated with dry legumes was evaluated. The variability of the dry legume area was evaluated over the study period (2013 – 2023) for each reference, based on the diversity profile.

Multivariate analysis was applied to find out the correlation of the references (continents) with the years considered in the analysis interval, based on the areas cultivated with dry legume. Cluster analysis was applied to find out the level of similarity between years and references, in relation to the dry legume area.

• Results and discussions

Dry legume crops (protein crops) in the organic system recorded variable areas at the level of each continent during the study period, according to records in the statistical database [4]. With mean area of 454589.8 ha (71.91%), Europe ranked first, followed by North America (12.71%), Asia (10.72%), Africa (2.81%) and Latin America (1.85%), Figure 1. Multivariate analysis (PCA) showed the correlation of the years of the study period with the reference areas (continents), in relation to the area cultivated with dry legumes, Figure 3. Cluster analysis grouped the years and reference areas based on similarity in relation to the areas of dry legume crops cultivated, Figure 4.

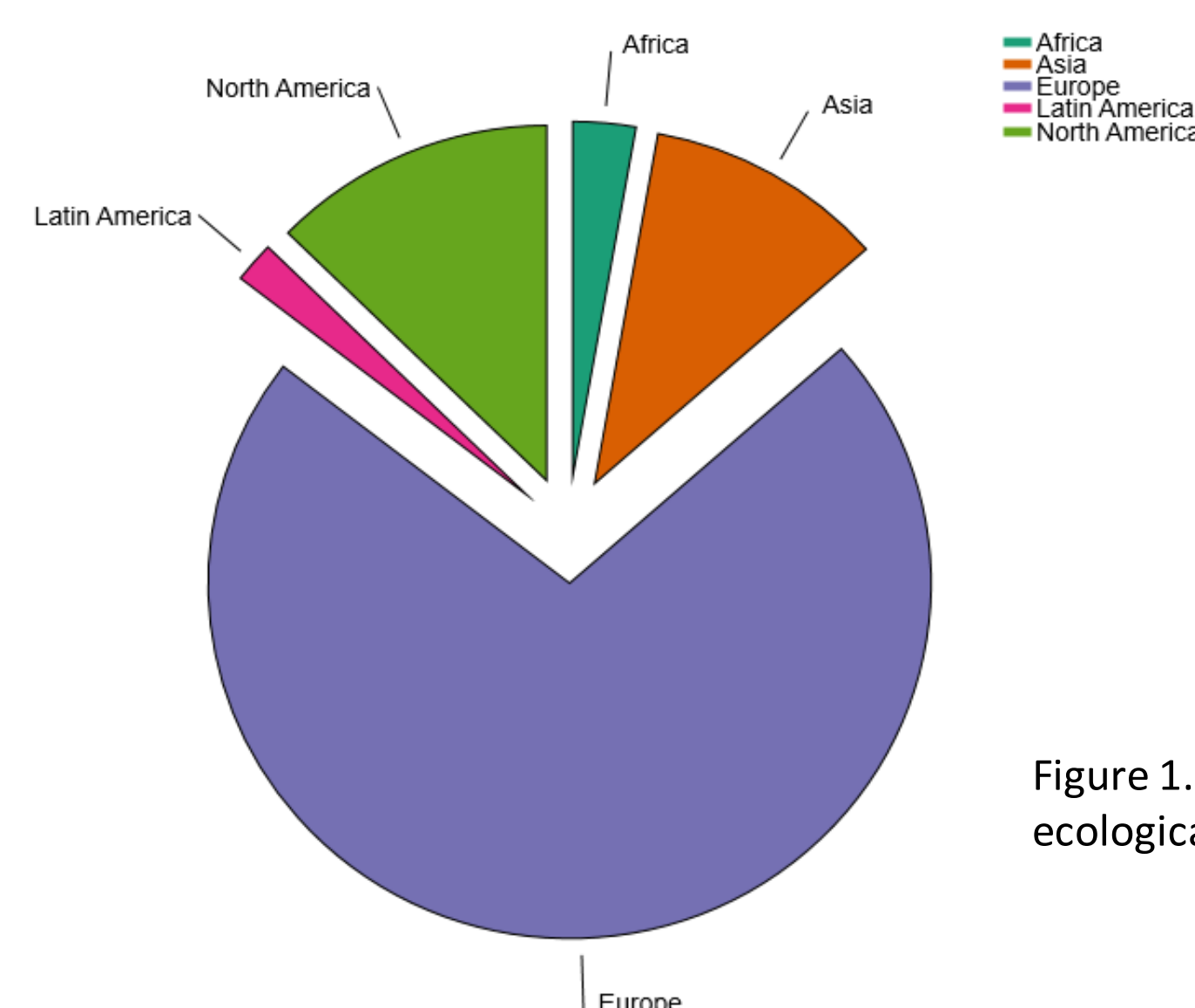


Figure 1. Cultivated area, dry legumes in ecological system, 2013 – 2023 period

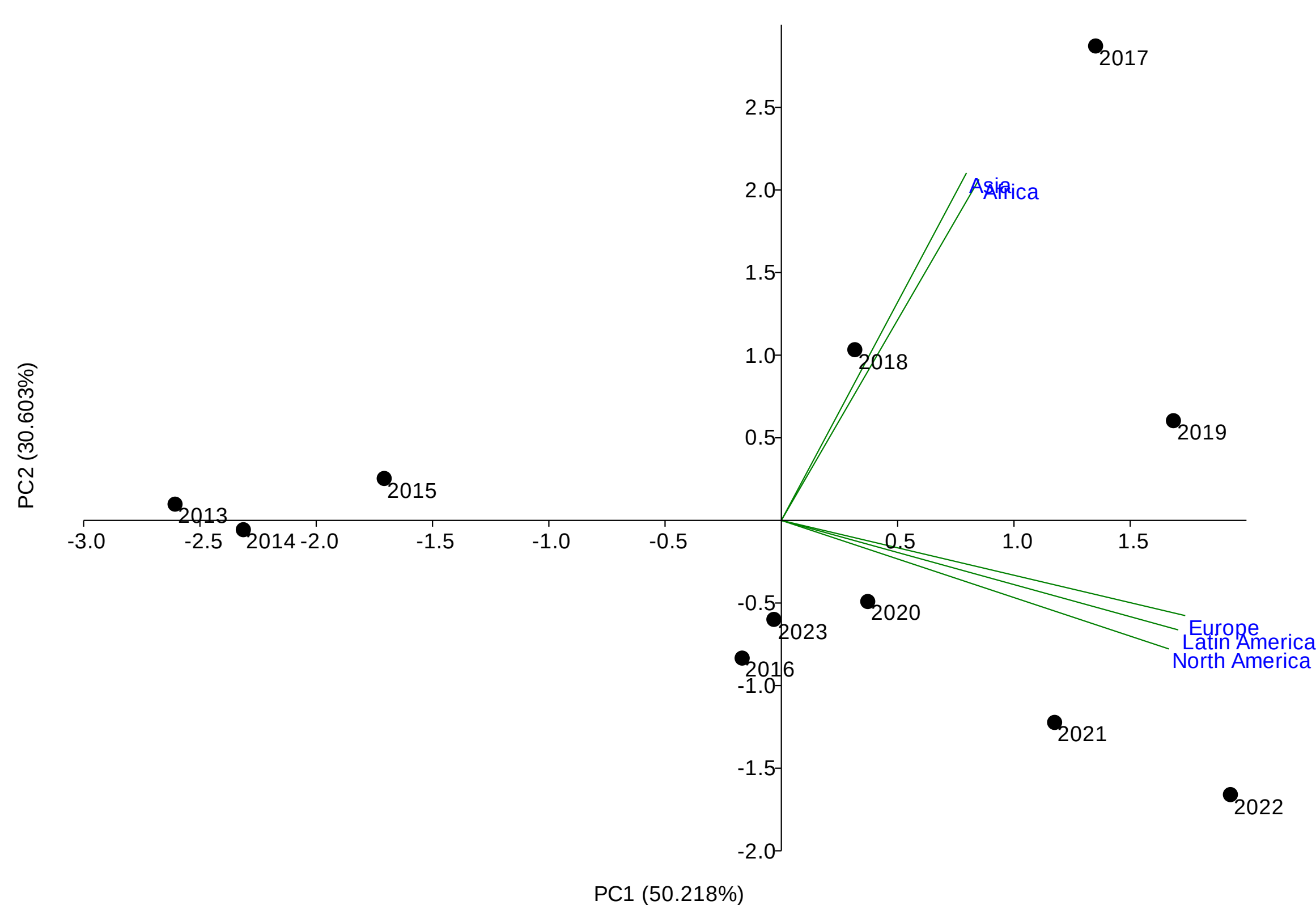


Figure 3. PCA diagram based on dry legume areas in ecological system

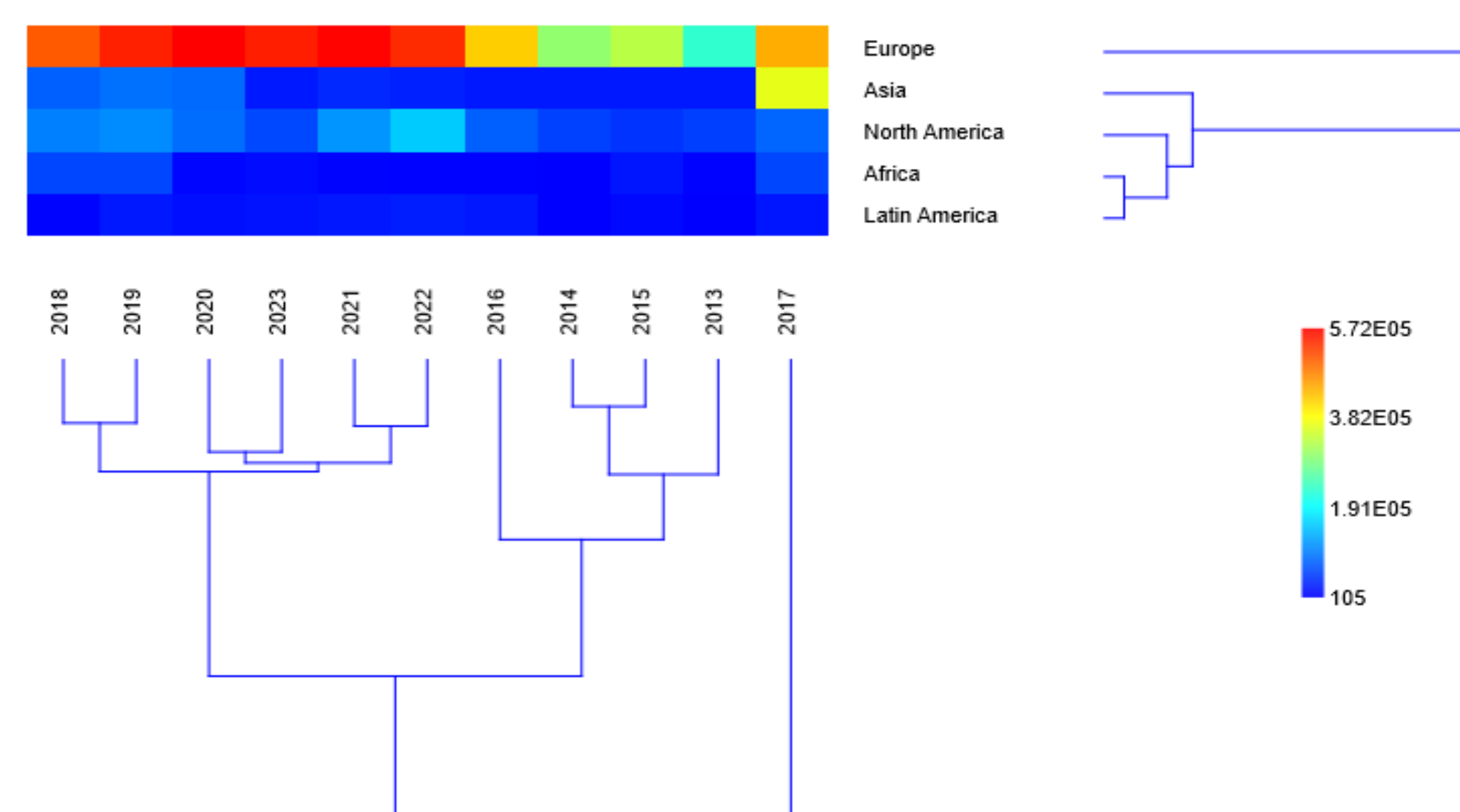


Figure 4. Cluster diagram for dry legume crops in ecological system

• Conclusions

Dried legume crops (protein crops) are of major interest worldwide for ecological production systems (organic farming), and the data analyzed for the period 2013 - 2023 showed a differentiated share in relation to the reference areas. Low variability of area in the ecological system for dry legume crops was recorded in Europe, followed by North America, which showed the stability of interest in these crop categories. High variability was recorded in Asia, followed by the situation in Africa. Multivariate analysis explained a high proportion of the total variance based on the first two principal components, and the correlation of years with reference areas over the study period. Similarity-based grouping of years and reference areas was generated by cluster analysis, in relation to the area of dry legume crops in ecological system..

Acknowledgement:

The authors thank the ARDS Lovrin for facilitating this study.