

Rural areas, rural population, and rural space in central Europe (JCEA countries): Research visualization in Scopus and Web of Science

Podeželska območja, podeželsko prebivalstvo in podeželski prostor v srednji Evropi (države JCEA): vizualizacija raziskovanja v Scopus in Web of Science

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Received: September 30, 2021; accepted: January 21, 2022

ABSTRACT

This study, based on bibliometrics (related to scientometrics) and science mapping, along with some sociological analytical insights, assesses contexts of the concept 'rural' in articles written by authors affiliated to JCEA (Journal of Central European Agriculture) member countries: Bulgaria, Czech Republic, Croatia, Hungary, Poland, Romania, Serbia, Slovakia, Slovenia (with addition of Austria because of geographical proximity and historical ties), using citation databases Scopus and Web of Science (WoS), and visualization software VOSviewer. Most papers are published outside the scope of agricultural production studies, clustered strongly in the fields of medicine, physical environment, social sciences, and ecological interactions. A small proportion of the reference to "rural" in agricultural science seems self-assumed in the general association of agricultural production with rural space. The papers mainly refer to geographical area, space or territory where interactions between specific social and natural processes take place. Topics tackling rural space as a societal form and arrangements, e.g. sustainable rural development and transformation, are the most recent. National and regional journals show strong recent presence but papers are also published in principal international journals. Co-author networking (countries / institutions / affiliations) indicates strong regional co-operation which is strongest in the immediate neighborhood. Co-authorship based on spatial proximity can be partly explained by less ambitious internationalization of research activities. Although publication patterns in both databases show similar traits, some database effect can be observed, also due to the inclusion of ESCI (Emerging Sources Citation Index) in 2015.

Keywords: rural issues, rurality, bibliometrics, science mapping, research evaluation, interdisciplinary research

IZVLEČEK

Raziskava, temelječa na bibliometriji (sorodno scientometriji) in znanstvenem kartiranju, skupaj z nekaterimi sociološko-analitičnimi vpogledi preverja kontekst pojma 'podeželje' v člankih avtorjev, povezanih z državami članicami JCEA (Journal of Central European Agriculture): Bolgarija, Češka, Hrvaška, Madžarska, Poljska, Romunija, Srbija, Slovaška, Slovenija (in Avstrija zaradi zemljepisne bližine in zgodovinskih povezav), z uporabo citatnih baz podatkov Scopus in Web of Science (WoS) ter programske opreme za vizualizacijo VOSviewer. Večina prispevkov je objavljenih zunaj študij kmetijske proizvodnje, najbolj pa so prisotna področja medicine, fizičnega okolja, družboslovja in ekoloških interakcij. Majhen delež omembe pojma rural v kmetijski znanosti se zdi privzet ob splošni asociaciji kmetijske proizvodnje s podeželskim prostorom. Prispevki se nanašajo predvsem na geografsko območje, prostor ali ozemlje, kjer potekajo medsebojni vplivi med specifičnimi družbenimi in naravnimi procesi. Obravnave, ki se lotevajo podeželskega prostora kot

družbene forme in ureditve, npr. trajnostni razvoj in preoblikovanje podeželja, so najnovejše. Nacionalne in regionalne revije kažejo močno prisotnost objavljanja v zadnjem času, dela pa so objavljena tudi v uglednih mednarodnih revijah. Vendar pa soavtorstvo (držav / institucij / naslovov) kaže na zelo močno regionalno sodelovanje, ki je najmočnejše v neposredni sosesčini. Soavtorstvo, ki temelji na neposredni prostorski bližini, je mogoče delno razložiti z manj ambiciozno internacionalizacijo raziskovalnih dejavnosti. Čeprav vzorci objavljanja kažejo podobne lastnosti v obeh bazah podatkov, je mogoče opaziti učinek baze podatkov, tudi zaradi nedavne vključitve WoS ESCI (Emerging Sources Citation Index).

Ključne besede: ruralna vprašanja, ruralnost, bibliometrija, kartiranje znanosti, vrednotenje raziskovanja, interdisciplinarne raziskave

INTRODUCTION

Motivation & background

The bulk of traditional agricultural activities (e.g., farming) is conducted in rural areas. However, the term rural is very rarely used in abstracts of scientific papers when referring to agriculture. In fact, agriculture (and the related farming) is an activity, which is predominantly conducted in commonly understood rural areas, leaving aside the many variations of not strictly rural agricultural contexts (e.g., fishing industry, silviculture, protected cultivation, vertical agriculture). And yet, the Web of Science (WoS) database returns more than 180,000 journal articles which contain rural as a term in an abstract (as of July 2021). We conducted a background analysis and found that only 8,100 such articles are mapped to WoS Research Area Agriculture, or other agriculture-related areas such as Veterinary Sciences (2,100), Food Science Technology (1,600), etc. While the self-evident association of agricultural sites and rural context is reflected in the absence of this term, it is clear that the rural, when deliberately articulated, strongly relates to the issues outside the scope of agricultural sciences. The predominant use of the term rural in relation to non-agricultural science in narrow sense illustrates the growing complexity of the permeation of the natural environment and social processes. This includes reducing the traditional dividing line between rural and urban in terms of spatial and social organization. At the same time, rurality can be a term, category, symbolic imagination, or concept that encompasses multifaceted meanings, states, activities, and processes. With socio-spatial changes, the dominant pre-industrial association of the rural as an integration of nature and culture, or the

geographical space of living and production, is gradually reducing its specificity. A sharp division into rural and urban societal arrangements, including the production of food, marks the industrial period. The post-industrial period is marked by more diverse and complex socio-spatial production arrangements in terms of a continuum of human settlement systems.

The academic debate on the rural-urban distinction has a long history (Bonner, 1998). This dichotomy was the subject of extensive empirical studies and target of many criticisms as largely irrelevant, since the interaction of the processes of globalization and localization and the bureaucratization of society had led to a predominantly urbanized population as far as "Western society" is concerned (Hutter, 1988; Hale, 1990). However, scholars and policy makers continue to consider rurality as an important variable: e.g., EU (European Union) policies such as the Rural Development Programme with LEADER refer to the rural with multiple meanings and functions, whether as a place for agricultural production or as a place for recreation, relaxation and leisure, nature conservation and, last but not least, quality living (Long term, 2021; White paper, 2017). For the purpose of this research, we cannot go into a detailed analysis of the changing concepts of rurality.

To relate to the reflection of social processes in agricultural science and scientometric treatment of the problem it is sufficient to mention the typical conceptual dilemmas of the rural areas.

These dilemmas could best be labelled as thematization in the sense of "re-thinking rurality". Studies that attempt to characterize rurality include both conceptually and empirically intertwined issues of

economic restructuring and social re-composition in rural areas (Clope and Goodwin, 1992), ecosystems (Webb et al., 2017), spatial structures and social organizations (Kremen et al., 2012) in geographical, environmental, settlement, symbolic and linguistic contexts. Halfacree (2004) highlights the need for alternative models for the geography of the countryside that would combine material and narrative understandings of the phenomenon. Reid (2021) highlights “metro-normative” assumptions about the research practice of rural issues. Rasmussen et al. (2018) discuss conditions that support positive social-ecological outcomes in relation to the issue of land-use intensification in agrarian landscapes. More narratively analytical studies, directly related to our scientometric study, expose the linguistic cacophony of the term rural. Gkartzios et al. (2020), for example, point to the predominant univocal Anglophone linguistic use, interpretation and symbolic meaning of the rural when it comes to scientific publishing. “Ubiquitous and universal uses of the term ‘rural’, particularly in non-anglophone empirical contexts (through translation for example), mask critical historical, spatial and cultural understandings about the rural communities we investigate, reducing the quality of debate in rural studies (p. 326)”. The geographical diversification of rural research has not been accompanied by linguistic diversity.

In the following paragraphs we summarize some similar bibliometric studies, which will also be discussed in the experimental sections. The term rural has already been addressed in bibliometric (scientometric) studies, for example, in the context of a research on rural geography (Wang and Liu, 2014). Lu and de Vries (2021) employed visualization programs HistCite, CiteSpace, VOSviewer, Map, and Alluvial Generator to assess intellectual structure of rural development.

Sustainability seems to be a buzz-word also in rural topics, for example, in science mapping on farming systems and rural communities (Malanski et al., 2021), sustainability of small rural properties (Vian et al., 2020), relations between urban and rural areas (Sheikhnejad and Yigitcanlar, 2020), rural communities and participative conservation practices (Zárate-Rueda et al., 2021),

coordination of urban and rural development (Zhang et al., 2020), or watershed management (Roy et al., 2021). However, in some cases, the occurrence of a novel term may not indicate a very novel concept. Sometimes it merely replaces an 'older' one (Stopar and Bartol, 2019).

Health was also investigated with bibliographic tools. McLean et al. (2007) conducted a research on rural communities in remote areas. More recently, it was addressed by Zhang et al. (2019) and Palozzi et al. (2020). Social issues and economics were evaluated with such tools as well, for example, interconnections between urban and rural areas (Baffoe, 2020) and tourism in rural areas (Álvarez-García et al., 2019). Rural businesses run by women were investigated by Kaushal et al. (2021) while rural depopulations were addressed by Rodríguez-Soler et al. (2020). More generally, Pato and Teixeira (2016) have also investigated rural entrepreneurship quantitatively, while the authors have also assessed output from rural economy department researchers (De Looze et al., 1996) and output of a rural sociology journal (Jokić and Zauder, 2013).

Aims

Articles included in our analysis tackle rural areas, rural space and population. But which disciplines and scholarly journals publish such research outside the immediate agricultural scope? Namely, it has already been shown that a great part of agricultural research gets published outside agricultural categories (Bartol et al., 2016). At the same time, we also assume that the agricultural countryside is changing along with other trends in nature and society, such as the intertwining of urban and rural, when non-productive aspects already prevail in relation to rurality, being study subjects of other disciplines (Hocevar, 2012).

We aim to ascertain this tendency with a sample of research articles published by authors affiliated to institutions in central Europe, more specifically in member countries of the editorial board of the multilingual international open access *Journal of Central European Agriculture* (JCEA): Bulgaria, Czech Republic, Croatia, Hungary, Poland, Romania, Serbia, Slovakia, Slovenia.

Austria as a geographically contiguous country with four member states (Czech Republic, Hungary, Slovakia, Slovenia) is also included because of historical links and various common features of rural space.

Although until a few years ago Scopus was considered to include more articles than WoS, the recent advent of WoS ESCI (Emerging Sources Citation Index) seems to have reversed this trend. So, what are similarities and differences between the two?

In particular, we wish to answer the questions:

What are the relations between the many journals and how are the journals linked in terms of shared references, what are the characteristic clusters of journals that can be detected in each database, and what is the development of these links over time?

What is the output of countries, based on authors' affiliation, and how is the cooperation (co-authorship) reflected in regional patterns?

What are the main areas of interest (subjects, topics, fields, research disciplines)?

The above questions will be investigated in both citation databases, both in terms of subject matter as well as trends in time.

MATERIALS AND METHODS

Our study employed international citation databases Scopus and Web of Science Core Collection, both frequently used in research evaluation studies. We also used both databases to assess database-specific differences which can influence the perception of research outcomes of countries.

The selected topic under observation was the occurrence of the term *rural* with all possible contexts and implications. The term *countryside* would also be possible; however, it also addresses topics not necessarily related to *rural*. All such records would increase the total number of articles by only a couple of percentage points and were therefore not considered.

The focus was scientific production of authors from JCEA member states. These countries traditionally

represent regions of central Europe which has received little attention in research evaluation studies (Arnaldi et al., 2021). Although some other countries could also be included, the JCEA network was decided on as a predetermined common denominator.

Both databases apply 'controlled' standardized names for countries to be used in search fields: *AFFILCOUNTRY(country)* in Scopus and *CU=country* in WoS. We evaluated the period between 1995-2020. We found that the assignment of country codes is still not completely consistent with 'new' geopolitical terminology. Namely, some of the countries under analysis are now independent units although the names of no-longer existing entities can sometimes still be found in relation to these countries. Some other inconsistencies in terms of country classification were also detected in similar studies (Hocevar and Bartol, 2021a).

In the present study, we cannot go into these details. The aforementioned cases serve only as methodological background and working example, and as a reminder of specific bibliometric limitations.

Searches were conducted in July 2021. Search syntax (query or statement) was designed as follows:

Scopus (7,510 articles):

(ABS(rural) AND AFFILCOUNTRY(austria OR bulgaria OR czech OR croatia OR hungary OR poland OR romania OR serbia OR slovakia OR slovenia)) AND PUBYEAR > 1994 AND PUBYEAR < 2021 AND (LIMIT-TO (DOCTYPE , "ar"))

Web of Science (6,240 articles):

AB=rural AND CU=(austria OR bulgaria OR czech OR croatia OR hungary OR poland OR romania OR serbia OR slovakia OR slovenia) AND DOCUMENT TYPES:Article AND Timespan=1995-2020.

The records were processed by program VOSviewer. Key feature of the software is visualization and subsequent analysis of bibliometric networks presented in clusters of connected items. Our methodology uses the terms in the Manual (Van Eck and Waltman, 2020). We processed journal articles by way of *cluster density visualization*.

The color of a position of a journal in the map is attained by mixing the colors of different clusters. The weight of a journal (number of articles) is represented by size.

Next step was to determine links between countries established on the address of an author (*AFFILCOUNTRY* in Scopus, and *CU* in WoS) by *network visualization*. Country names are also represented by a circle. The higher the number of records in that country, the larger the name and the circle. Links are shown by lines. Related countries are arranged in clusters of specific colors. Because of many items, the names and circles overlap so not all countries are visible.

Last analysis addressed text data in abstracts and titles. The requirement of our retrieval procedures were such database records where the term 'rural' came about in abstracts. Although there were also records where the term 'rural' was present only in the titles we preferred to exclude such records. Namely, some records do not have an abstract. In such cases, the terms in titles are too limited to comprehensively reflect the topic of a paper. Our visualizations, however, are based on both abstracts and titles as all records with abstracts also contain titles.

By way of thesaurus, we excluded terms which refer to sections such as *introduction*, *methods*, *results* etc. as they have no specific reference to the topic. Text maps are especially dense with strong overlap therefore only selected terms are visible. While in the program itself it is possible to zoom and scroll the data this cannot be shown in textual settings. Maps are complemented by *overlay visualization* where the items (journal, countries, text data) are colored according to average occurrence of an item in time. White to yellow colors represent earlier accents whereas orange to red represent more current trends.

RESULTS AND DISCUSSION

Journals and articles

The introductory part shows the growth of records. Our study identified 7,510 Scopus and 6,240 WoS records. WoS has *per annum* recently overtaken Scopus (Figure 1). This goes mostly on account of the recent inclusion of a new index - WoS ESCI.

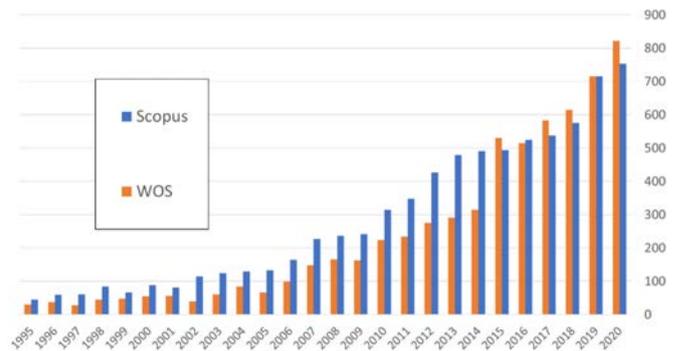


Figure 1. Growth of records in Scopus and WoS (1995-2020)

Figure 2 and Figure 3 show network density established on clusters of journals related through references they share. Networks are similar. In Scopus, 2,374 journals were detected, and 1,973 journals in WoS (such journals which published at least 5 articles each). Journals in a particular discipline cite each other more strongly although links with other fields also exist. Many journals are not visible because of overlap.

The red group covers mostly biomedical (also veterinary) journals. Strong connection between rural (agriculture-related) topics and health-related journals was also noted by other authors (Malanski et al., 2021; McLean et al., 2007). This cluster is (in both databases) dominated by the journal *Annals of Agricultural and Environmental Medicine*. *International Journal of Environmental Research* and *Collegium Antropologicum* hold second and third place. We noted an error in Scopus: a few articles were mapped to *Annals of 'Agriculture'... Medicine* instead of *Annals of 'Agricultural'... Medicine*. This affects visualizations and presents a limitation in bibliometric analytics which derives data from original datasets.

Blue group is defined by topics on physical environment (physico-chemical contexts). Journal *Science of the Total Environment* (which is located in this group) was noted already a quarter a century ago as a core WoS journal where scientists from a rural economy department published their research (De Looze et al., 1996).

Green group shows interdisciplinary links with the more dispersed and less defined clusters. It exhibits attributes of social sciences (rural sociology, agricultural economics) where a topic of rural entrepreneurship

has already attracted a bibliometric analysis on its own (Pato and Teixeira, 2016). In this cluster (Figure 2) we can note the journal *Sociologija i Prostor* (Figure 2) which was evaluated by Jokić and Zauder (2013). The highest number of articles was published in the Open Access journal *Sustainability*.

These three defined clusters are followed (again in both databases) by yellow cluster (fourth by the number of articles in the cluster), which links topics on ecological interactions, including botany and zoology (not to be confused with the physical environment in the blue cluster). This dispersed cluster shows a high degree of interdisciplinarity and links with several clusters.

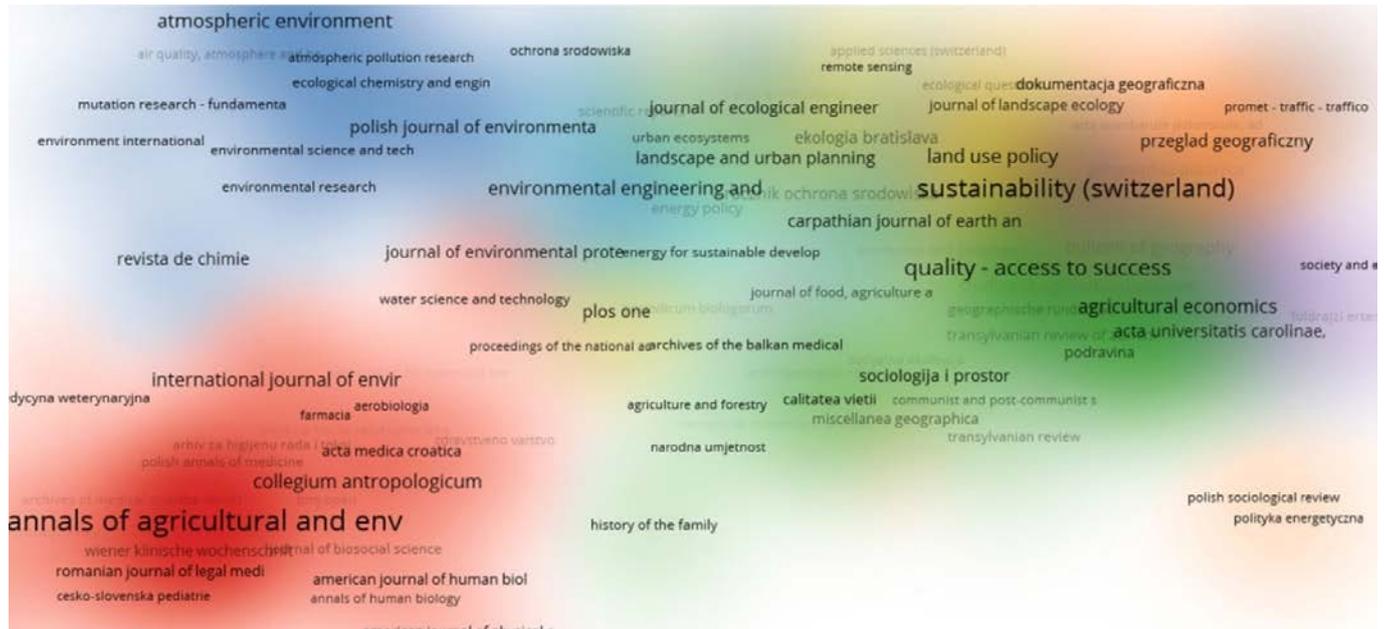


Figure 2. Cluster density network of connected journals in Scopus (established on shared references)

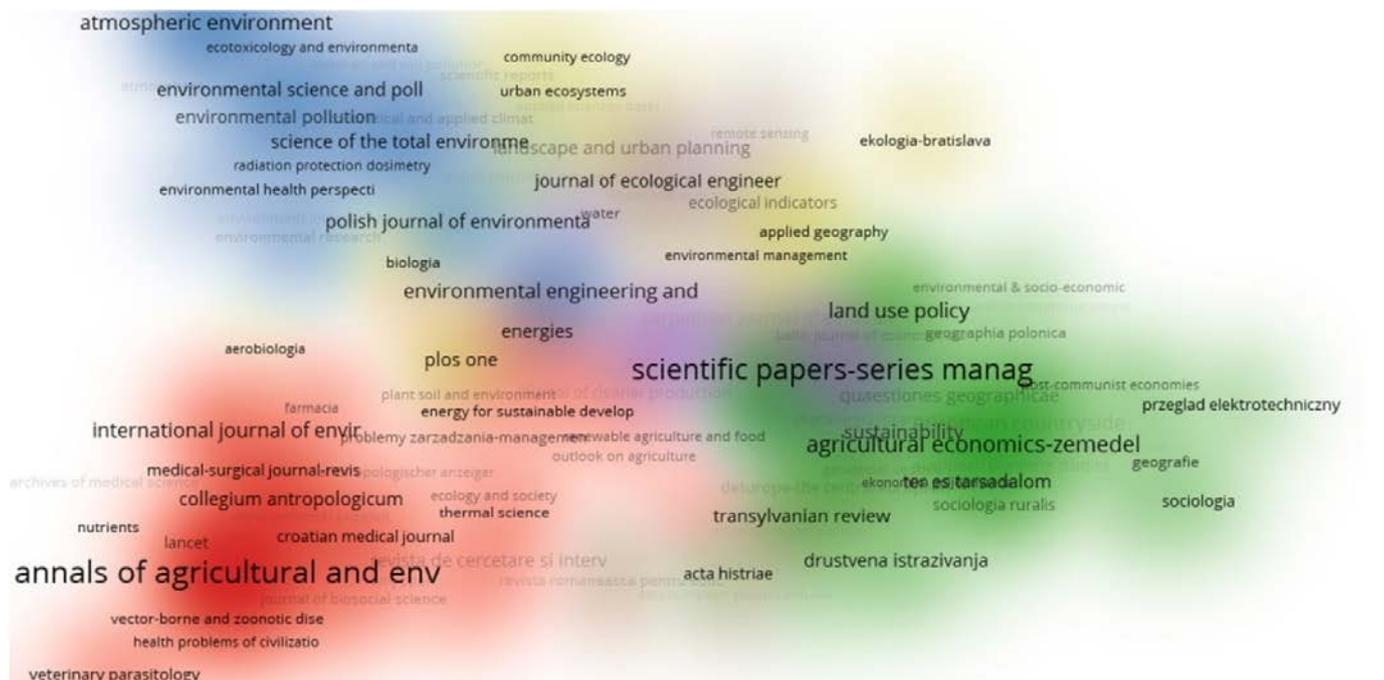


Figure 3. Cluster density network of connected journals in WoS (established on shared references)

While Figure 2 and Figure 3 show relatedness of topics, advances over time are revealed in Figure 4 and Figure 5. More recent research fronts are shown in the righthand side of maps, especially in the frame of ecological interactions. There are also recent accents in the context of social sciences (agricultural economics). The strength of economics-related journals is not surprising. Some

scientific environments consider rural economics as a major sub-subject within general economics (Mondal and Roy, 2018). We need to remark that the names of journals don't always reflect very strictly all topics covered by a journal. Many national journals are multifaceted and publish a broad range of topics.

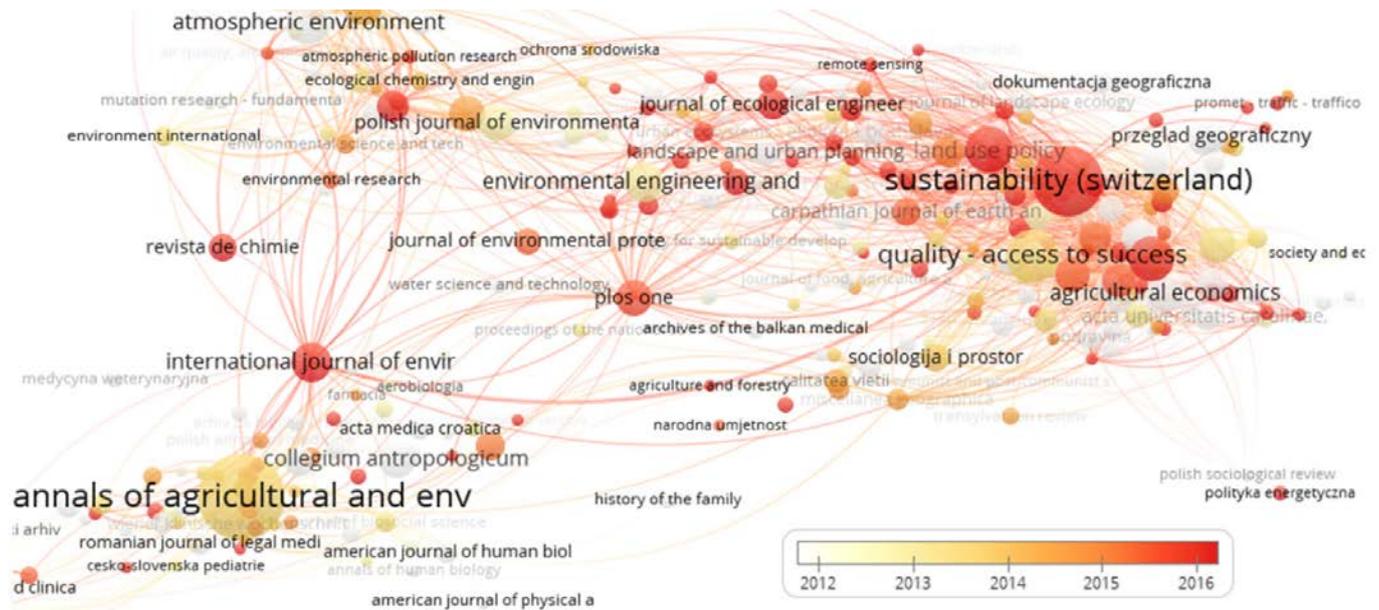


Figure 4. Journals in Scopus, connected through shared references (timescale)

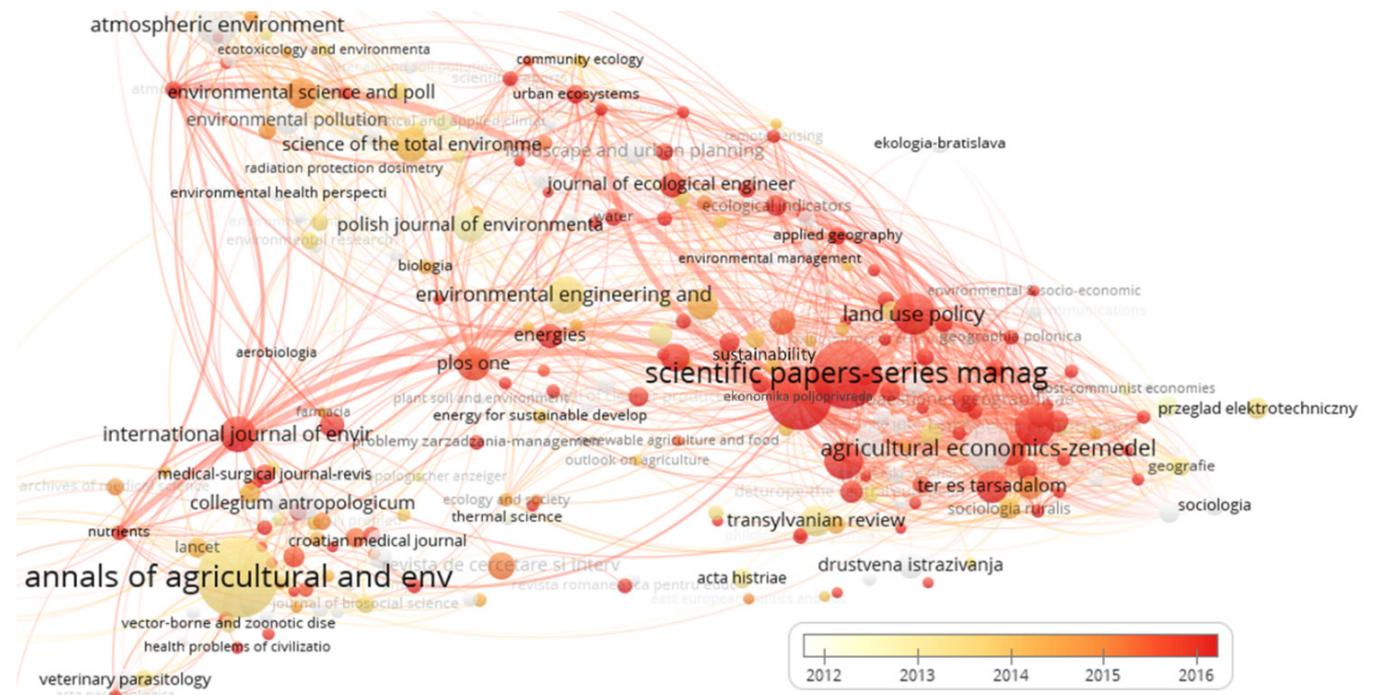


Figure 5. Journals in WoS, connected through shared references (timescale)

Scopus displays trends in time more linearly while WoS (ESCI) began to index specific journals only a few years ago which accounts for a jump in the recent period (Hocevar and Bartol, 2021b). This is shown on the example of *Scientific Papers- Series Management Economic Engineering in Agriculture and Rural Development* which is in WoS quite dominant in the righthand side of the map (Figure 5).

To wrap up, among the ten principal journals (the largest circles), eight are the same in both databases (Agricultural Economics, Annals of Agricultural and Environmental Medicine, Atmospheric Environment, Environmental Engineering and Management Journal, European Countryside, International Journal of Environmental Research and Public Health, Land Use Policy, Sustainability). Our journal maps show that the researchers in Central Europe conduct truly multidisciplinary rural studies. Such interdisciplinarity in rural research is in line with findings by Lu and de Vries (2021) who detected many journals which are also present in our analysis. The maps also contain top rural studies journals identified by Wang and Liu (2014).

Network of co-authorship and countries

This section focusses on the input by countries and co-operation between authors based on the country of authors' affiliation (address of an institution). As in the previous section, we present the links of similarity (Figure 6A and Figure 6B) and timeline (Figure 7A and Figure 7B). On the righthand side of the maps, there are many countries (from all continents) which each participated in just a few documents. This part of the maps is therefore truncated as this was only an occasional co-operation.

The lines and distance between circles show co-authorship strength. Most JCEA countries collaborate intensely and are located in the same cluster excepting Czech Republic and Austria indicating that geographical proximity and historical ties are not necessarily reflected in co-authorship in the present. Strong links in the south western parts of the JCEA region are evident. Such collaboration was also noticed by Wagner and Leydesdorff (2003). We also point at some database-specific differences in the representation of countries which may skew visualizations. For example, WoS divides the United Kingdom into constituent nations.

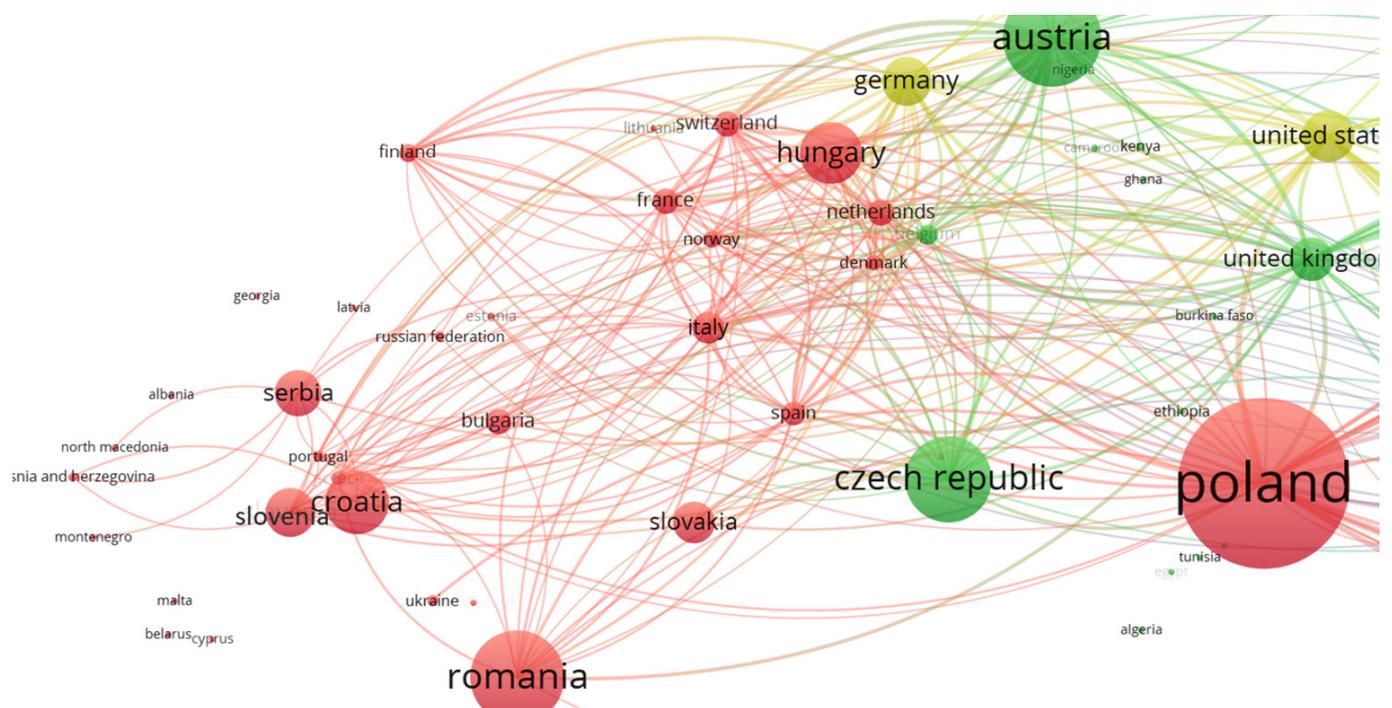


Figure 6A. Connections between countries, established on co-authorship (Scopus)

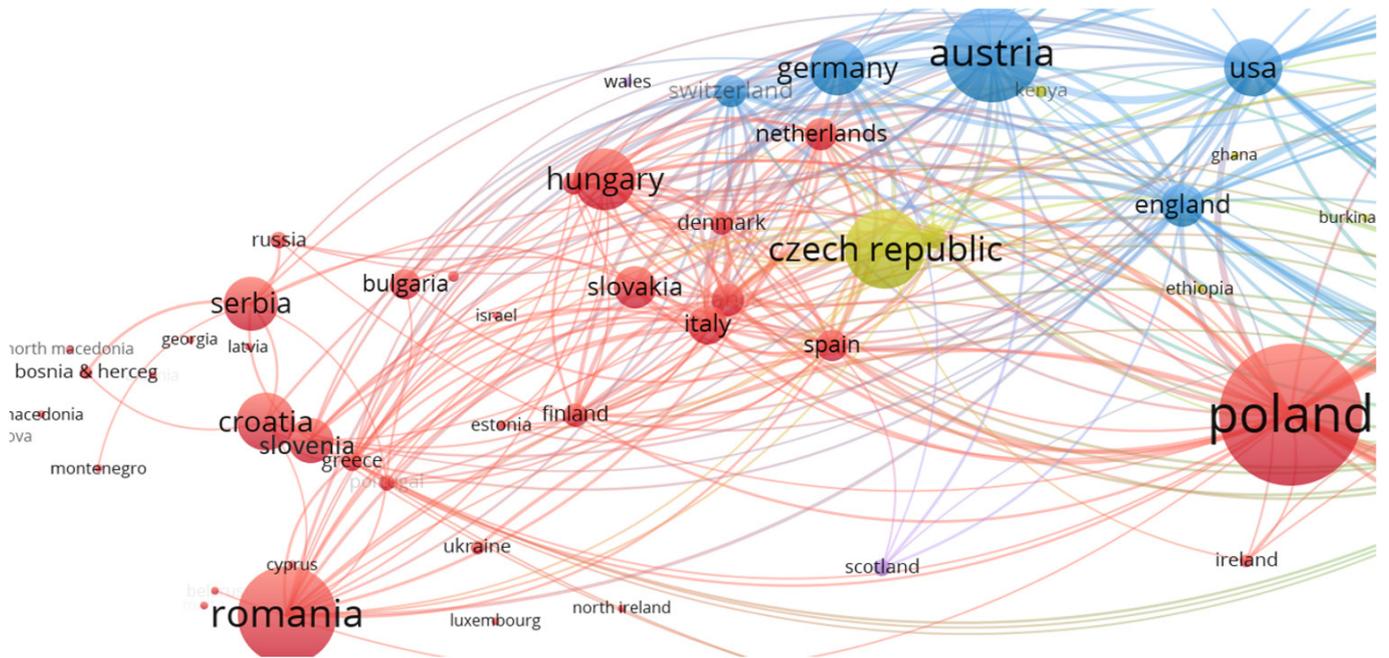


Figure 6B. Connections between countries, established on co-authorship (WoS)

England, Scotland and Wales are in figures therefore visualized separately. Also in WoS, some older articles are attributed to Macedonia, whereas newer articles are attributed to North Macedonia.

We complement the color clusters by timescale (Figure 7A and Figure 7B). Serbia exhibits the most recent average participation in Scopus. In WoS, however, the very

recent output is assigned to Romania. This corroborates findings in Figure 5 and the recent inclusion of journal *Scientific Papers-Series Management Economic Engineering in Agriculture and Rural Development*. Database effect is strong. WoS timeline exhibits a 'jump' in publishing in the more recent period.

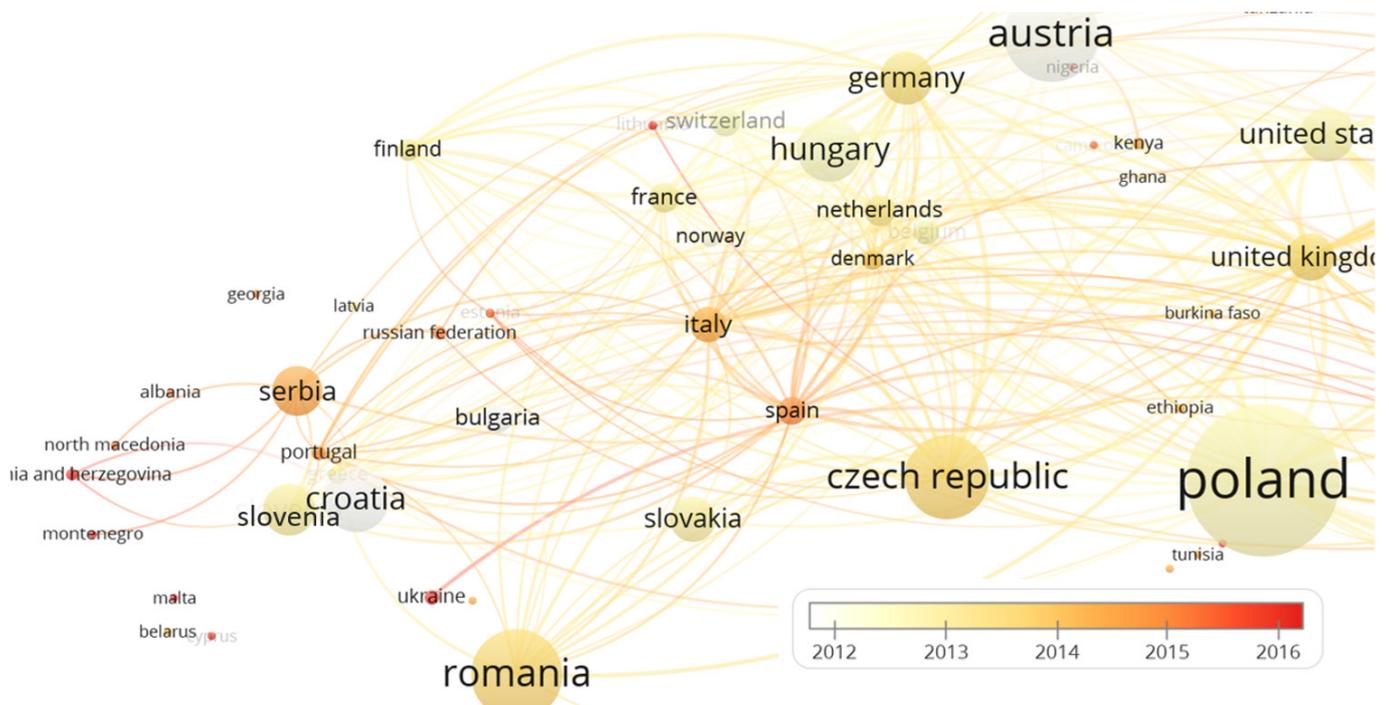


Figure 7A. Connections between countries, established on co-authorship (Scopus timescale)

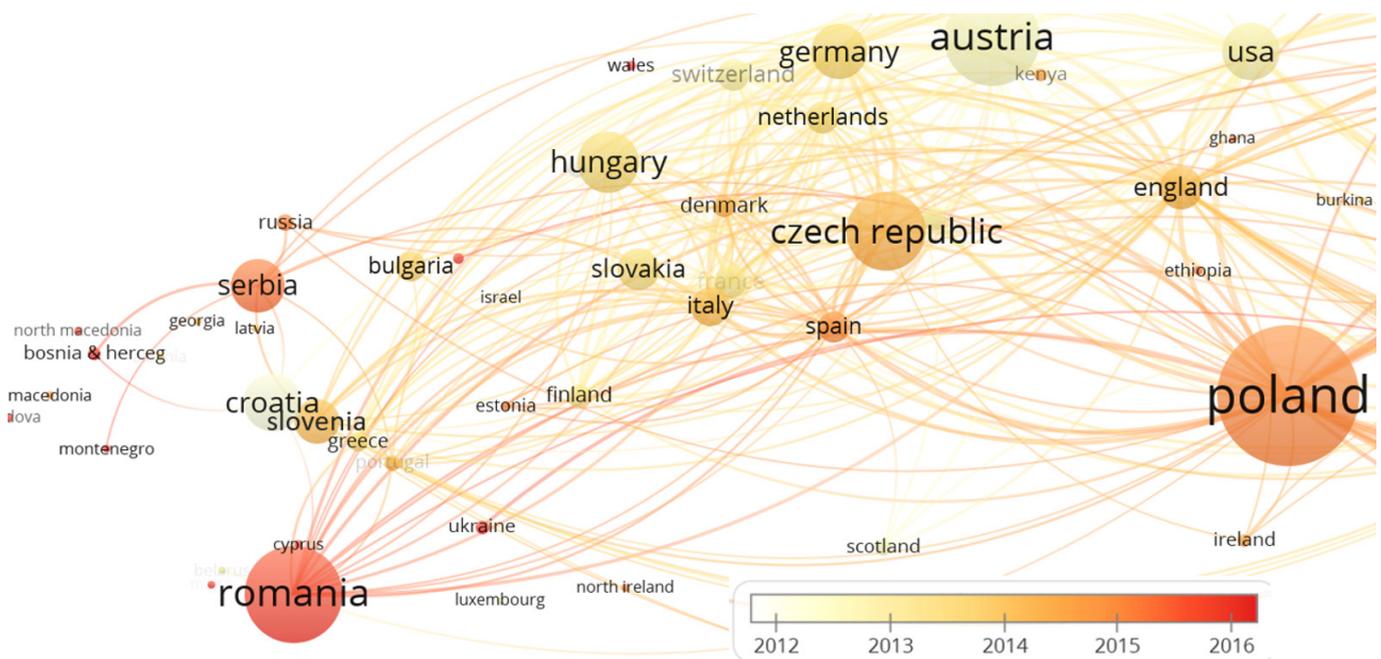


Figure 7B. Connections between countries, established on co-authorship (WoS timescale)

Network of terms in abstracts and titles

Visualization in this section shows connections between terms derived from abstracts and titles of the articles. In Scopus (Figure 8) and WoS (Figure 9), 138,000 and 118,000 respective terms were extracted. Only the most relevant terms with at least 10 occurrences are included in the maps. The terms are shown in clusters according to the similarity of research foci. We can clearly detect (similar) general research directions in each cluster. Three different groupings are revealed.

The red cluster is related to rural space (and various related societal arrangements). On closer look, it is most strongly marked by topics pertaining to social sciences, especially agricultural economics and rural sociology. As the map is very dense we can point to a few most frequently occurring terms: *policy*, *rural development*, *economy*, *transformation*, etc. There are many tourism-related concepts, such as *tourism in general*, *rural tourism*, *agritourism*, *sustainable tourism*, *tourism development*, etc. This indicates shifts from productionist to consumer oriented rurality. References to the EU are provided in the concepts such as *european union*, *eu member state*, *eu fund*, *european commission*, *eu accession*, etc. (we provide names in lower case as the visualization programs ignores capitalization). This cluster also includes specific

environmental issues (linked to economic and social issues). Climate change is not visible in default settings. However, it is a recent and emerging topic of importance if assessed on author keywords but keywords were not a subject of this analysis. In this cluster, there is also the general concept of *agriculture*. Many social issues which come about in this cluster are in fact related to work in agriculture (Malanski et al., 2021). There are also concepts such as *landscape*, *land use*, *ecosystem*, *energy*. These issues are linked with ecological interactions in blue and yellow clusters.

Blue cluster connects environmental topics in the sense of physical environment. It represents many studies which have taken place in the rural areas (*rural site*). This cluster is strongly interlinked with a smaller yellow cluster which includes references to organisms (*animal*, *species*, *taxa*) and topics on environmental (ecological) interactions (*habitats*). Some concepts are located very close to the red cluster (*urbanization*, *ecology*), indicating a note of social sciences. On the righthand side of the map, the links with biomedical issues are reflected in concepts such as *allergen*, *parasite*, *pollen*, *rural environments*. Blue and yellow clusters show high interdisciplinarity through associations with red as well as green clusters.

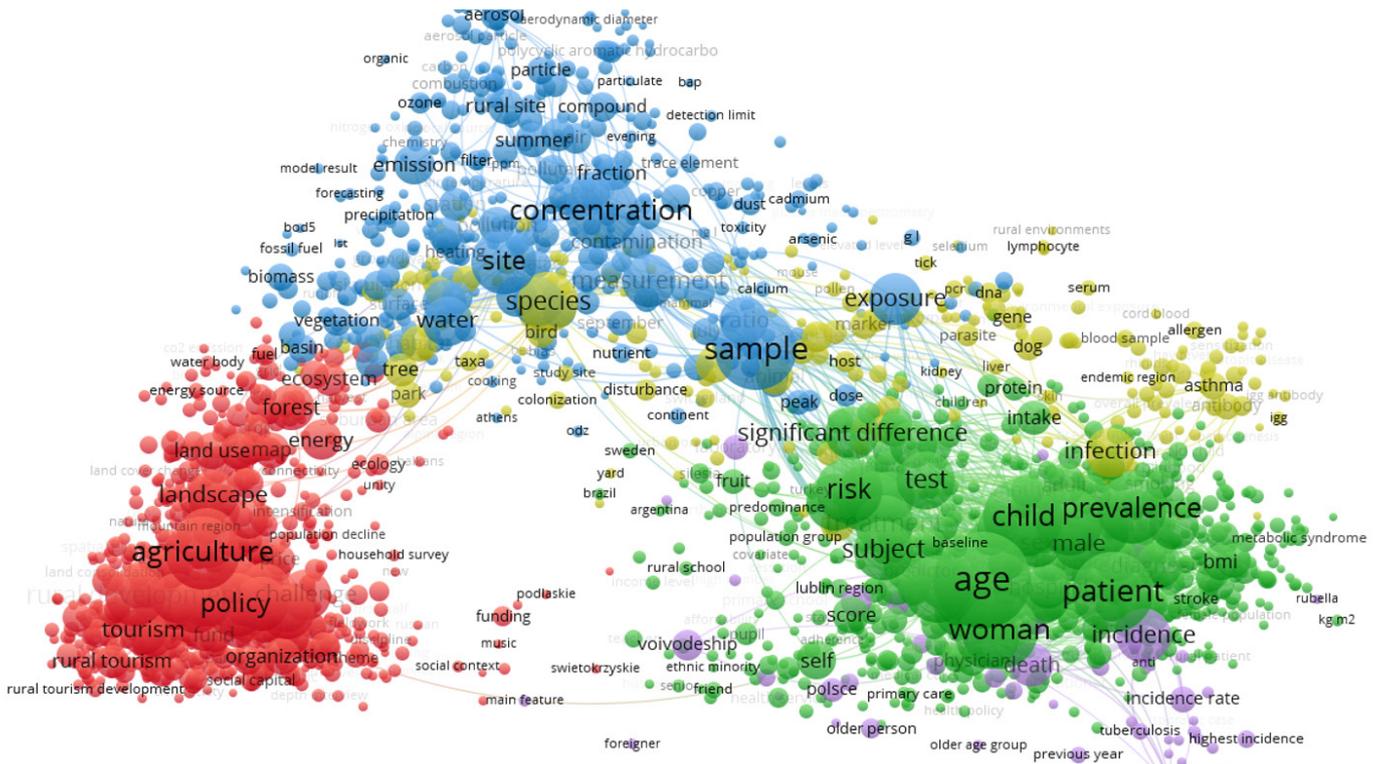


Figure 8. Clusters of related topics, based on terms in abstracts and titles (Scopus)

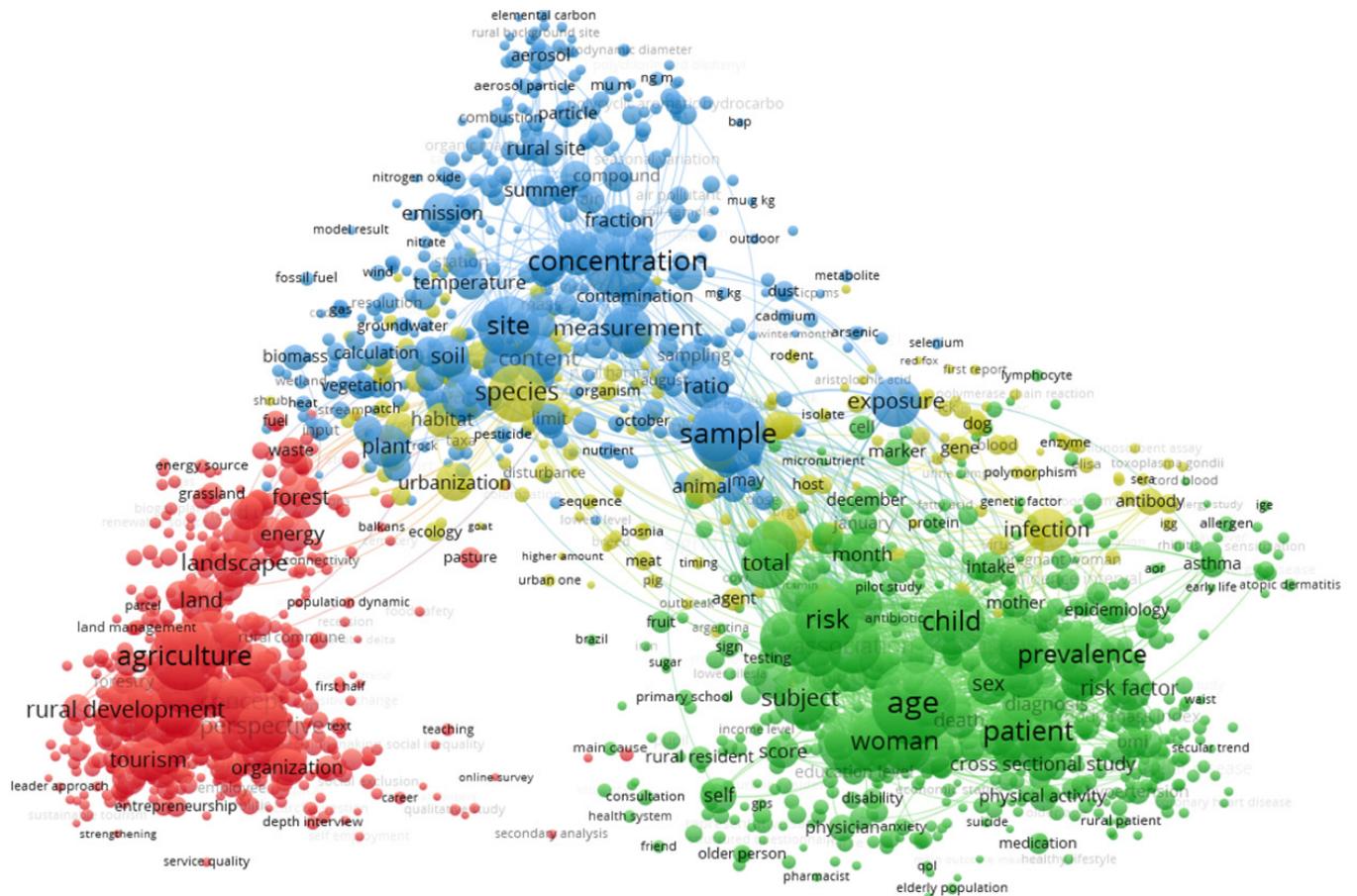


Figure 9. Clusters of related topics, based on terms in abstracts and titles (WoS)

One cluster is strongly interdisciplinary and includes physico-chemical topics and the interactions between organisms and the environment. The cluster is linked to the medical (health) cluster. More broadly, this 'environmental' cluster uses rural areas as sites for experimentation and study.

The medical cluster relates to the health problems of the rural population. Rural populations as such are more often the focus of interest in the medical sciences than in the social sciences, with recent interest in rural affairs, however, increasing most in the social sciences.

In terms of temporal trends, Scopus shows more balanced growth in time, as this database has been indexing journals on a steadier basis with no very noticeable hike in any given year under analysis, whereas there is a well pronounced hike in WOS in 2015 which coincides with the introduction of ESCI. However, we cannot prefer one database over the other, as both have database-specific features. We recommend consulting both when possible. The similarities in coverage are nevertheless such that both databases can be used to identify essential content.

In our case, the rural issue under consideration shows a high degree of interdisciplinarity, spanning different scientific disciplines and fields. We can conclude that it is a research trend that many authors call "re-thinking rurality". To some extent, it can serve as a good general model for evaluating publication trends in the region.

ACKNOWLEDGEMENTS

This work was supported by the Slovenian Research Agency, Grant P4-0085 (Agroecosystems).

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