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Review Article

BIBLIOMETRIC ANALYSIS OF RESEARCH IN THE FIELD OF AGRICULTURAL INSURANCE IN THE PERIOD 1996–2025

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Abstract: *This paper presents a bibliometric analysis of scientific production in the field of agricultural insurance over the period 1996–2025. Using data retrieved from the Web of Science database and analytical tools from the bibliometrix package (version 4.5.0), a total of 2,287 documents were examined to identify key trends and the intellectual structure of the field. The results indicate a strong growth in scientific output, with an average annual growth rate of 12.25%, primarily driven by an increasing multidisciplinary focus on innovative index-based insurance models and intensive research on the impact of climate change on agricultural risks. Within this upward trend—particularly accelerated after 2010—a growing network of international collaboration is evident, dominated by authors from the United States and China. The findings suggest that future research opportunities lie in the development of hybrid models that combine indemnity-based insurance with modern technologies, alongside the introduction of loss verification mechanisms based on actual damage. Such approaches aim to reduce basis risk and enhance farmers' trust in agricultural insurance systems.*

Key words*: agricultural insurance, bibliometric analysis, basis risk, index insurance, climatology, data science.*

JEL classification*: Q1, G22, C88, O33*

1. INTRODUCTION

Agricultural insurance can be broadly defined as a set of risk transfer mechanisms designed to mitigate production and climate-related risks in agriculture under conditions of high uncertainty. It encompasses both traditional indemnity-based instruments—such as crop, yield, and farm insurance—and more recent approaches, including index-based, parametric, and climate risk insurance. While traditional models rely on actual loss compensation and are often constrained by high administrative costs and information asymmetry (Just et al., 1999), index-based approaches improve efficiency through the use of objective indicators such as rainfall or satellite-based vegetation indices, but remain limited by basis risk (Binswanger-Mkhize, 2012). Despite the growing importance of these instruments, existing bibliometric and scientometric studies remain fragmented. Prior research has focused on specific

subdomains, such as agricultural risk management (Novickytė, 2019), weather index insurance (Adetoro et al., 2022), or pricing and adoption of parametric insurance (Gairola and Dey, 2023), often within limited time frames and disciplinary boundaries. As a result, there is a lack of up-to-date, comprehensive analyses capturing the evolution of the field, its increasing multidisciplinary nature, and emerging global research patterns.

This study addresses these gaps by providing a comprehensive bibliometric analysis of agricultural insurance research covering the period 1996–2025. In particular, it contributes by (i) extending the temporal coverage to include recent developments related to climate change and digitalization, (ii) capturing the integration of economic, environmental, and data-driven research domains, (iii) examining the structure of international collaboration with a focus on emerging research hubs, and (iv) linking bibliometric patterns to the growing relevance of hybrid insurance models.

In this context, the search query was designed to reflect the conceptual breadth of agricultural insurance as defined above and operationalized through a set of relevant search terms, as detailed in the Methodology section.

Given that a search of the Web of Science database for the period 1996–2025 resulted in 2,287 documents, and considering the complexity of scientific production in this field, the aim of this study is to conduct a systematic mapping of the literature in order to identify the main directions of its development. Advanced bibliometric methods were applied to provide answers to the following research questions (RQs):

RQ1: What are the dynamics and annual growth trends of global scientific production in agricultural insurance from 1996 to 2025?

RQ2: How is the scientific output distributed between developed and developing nations, and has the relative contribution from authors in developing countries shifted over time?

RQ3: How has the thematic focus evolved, specifically regarding the transition from traditional indemnity-based models to innovative index-based and climate-risk insurance?

RQ4: To what extent is agricultural insurance transitioning from a narrowly defined economic discipline into a multidisciplinary field integrating climatology, meteorology, and data science?

RQ5: What is the structure and intensity of international scientific collaboration in agricultural insurance research, and how are global research networks organized across regions?

In addition to a chronological and thematic analysis of the most influential publications, the paper provides directions for future research in the field of agricultural insurance.

2. METHODOLOGY AND DATA

The analysis presented in this paper is based on the bibliometric processing of data collected from the Web of Science (WoS) database, using the “Basic Search” interface.

The search query was developed based on the conceptual framework established in the Introduction.The search strategy was based on a combination of keywords related to agricultural insurance, including publications in journals, conference proceedings, and book chapters.

The search was conducted within the Topic field, which includes publication titles, abstracts, and author keywords, using the following query: “agricultural insurance” OR “crop insurance” OR “index insurance” OR “parametric insurance” OR “climate risk insurance” OR “farm insurance” OR “yield insurance”.

In order to ensure comprehensive temporal coverage, the results were further filtered by publication year, covering the period from 1996 to 2025, including publications available in “online first” format. The selected time frame enables the identification of long-term trends and the evolution of research in the field of agricultural insurance.

To achieve a multidisciplinary approach, the search encompassed multiple scientific fields within Web of Science categories, including Agriculture, Multidisciplinary; Agricultural Economics & Policy; Environmental Sciences; Economics; Meteorology & Atmospheric Sciences; and Water Resources.

After removing retracted publications, abstracts, and book reviews, and assessing the relevance and coverage of the results, the final dataset consisted of 2,287 publications addressing agricultural insurance from economic, environmental, climatic, and policy perspectives.

The data selection process followed a structured and transparent approach, informed by established reporting guidelines such as PRISMA (Page et al., 2021).

The analysis was conducted using the R programming language, employing the *bibliometrix* package (version 4.5.0) and the *biblioshiny* application**.**

Table 1. Basic information about the dataset

Description	Results
Timespan	1996:2025
Sources (Journals, Books, etc)	604
Documents	2287
Annual Growth Rate %	12.25
Document Average Age	7.07
Average citations per doc	20.56
References	77,865
Authors	6,135
International co-authorships %	27.94

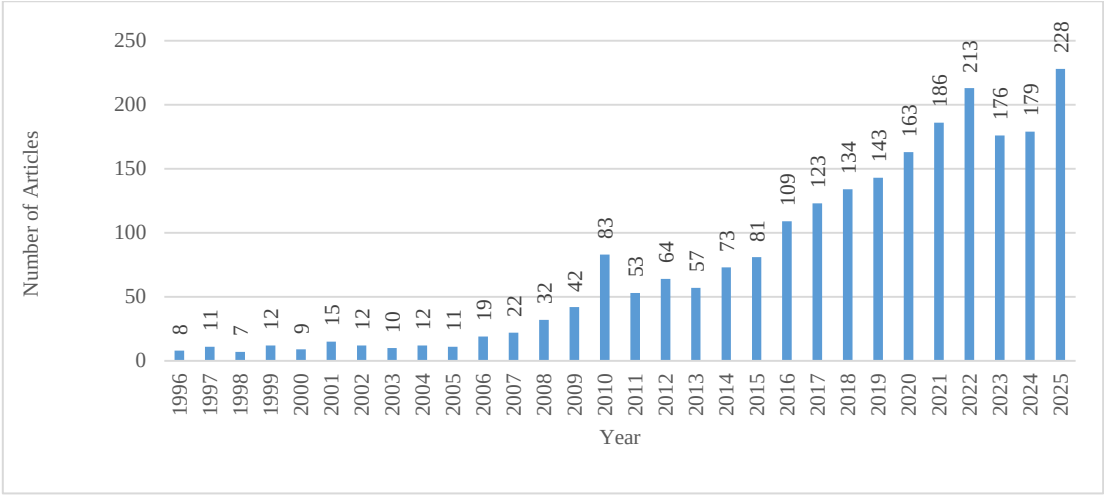
Source: Author's analysis via Biblioshiny (Bibliometrix R 4.5.0), Web of Science data (2026)

It is important to emphasize that the analyses of scientific output and citations by countries and institutions are based on the principle of full counting, whereby each publication and all its citations are attributed to all author affiliations. As a consequence, the total number of publications and citations at the country and institutional levels may exceed the overall number of publications, and this effect is particularly pronounced under conditions of intensive international collaboration.

3. ANALYSIS OF SCIENTIFIC OUTPUT

An overview of the number of publications in the field of agricultural insurance indexed in the Web of Science database for the period 1996–2025 indicates that scientific production increased from 42 papers in 2009 to 228 publications in 2025, with an average annual growth rate of 12.25% (Figure 1).

Figure 1. Annual scientific production in the period 1996–2025



Source: Author's analysis via Biblioshiny (Bibliometrix R 4.5.0), Web of Science data (2026)

Out of a total of 6,135 authors, 25 stand out with nine or more publications in the observed period. A considerableshare of scientific output is attributed to Musshoff and Wang, each contributing to 26 publications (Table 2), with two publications each in 2025.

However, while Musshoff ranks 17th in terms of citations within the analyzed set, Wang—despite being active in this field for over a decade and demonstrating high productivity—ranks 60th by citation count.

Finger, with 25 published papers, ranks third both in terms of productivity and citation impact within the analyzed dataset. The most cited author in the observed group is Goodwin (281 citations), who contributed to 22 scientific publications and is distinguished by continuous research activity in agricultural insurance since the beginning of the observed period, remaining active as recently as 2024. In addition, Smith, who has been publishing since 1996, ranks sixth in terms of local citations but has not published any papers in the last four observed years (Figure 2).

Barnett ranks second in terms of impact with 215 citations, despite contributing to only eight publications, placing him 26th in terms of productivity.

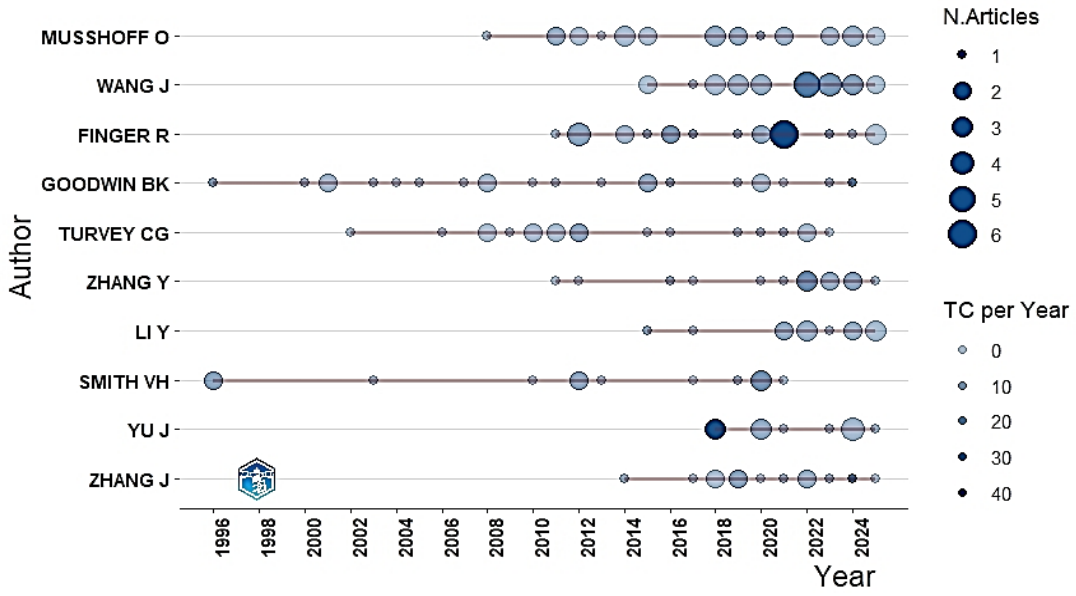
Mahul, although involved in only four publications, is the fourth most cited author (182 citations), confirming that a small number of strategically important publications can exert a greater influence on scientific trends than a high volume of output.

Table 2. Overview of author productivity and citation impact

Author	Number of documents	Author	Local citations
Musshoff, O.; Wang, J.	26	Goodwin, B. K.	281
Finger, R.	25	Barnett, B. J.	215
Goodwin, B. K.	22	Finger, R.	197
Turvey, C. G.	19	Mahul, O.	182
Zhang, Y.	14	Miranda, M. J.	179
Li, Y.; Smith, V. H.; Yu, J.; Zhang, J.	13	Smith, V. H.	171
Li, J.; Liu, Y.	12	Karlan, D.; Osei, R.; Osei-Akoto, I.; Udry, C.	142
Li, X.; Porth, L.	11	Dalhaus, T.	124
Li, H.; Wang, Y.; Zhang, L.; Zhang, Z.	10	Carter, M.	113
Mishra, A. K.; Mushtaq, S.; Njegomir, V.; Shee, A.; Wang, L.; Wang, X.; Zhang, X.	9	Mishra, A. K.	112

Source: Author's analysis via Biblioshiny (Bibliometrix R 4.5.0), Web of Science data (2026)

Figure 2. Scientific production of the 10 most productive authors over time (1996–2025)



Source: Author's analysis via Biblioshiny (Bibliometrix R 4.5.0), Web of Science data (2026)

Six of the top ten institutions listed as author affiliations are located in the United States, with Cornell University leading with 79 publications, followed by the University of California, Davis with 69 publications.

The fourth and sixth positions in terms of the number of published papers are held by two universities from China: Beijing Normal University with 57 publications and Sichuan Agricultural University with 56 publications (Table 3).

Table 3. Leading research institutions by number of publications

Institution	Number of articles
Cornell University	79
University of California Davis	69
International Food Policy Research Institute	60
Beijing Normal University	57
Kansas State University	56
Sichuan Agricultural University	56
Columbia University	52
Swiss Federal Institute of Technology Zurich	51
The Ohio State University	49
University of Illinois Urbana-Champaign	46

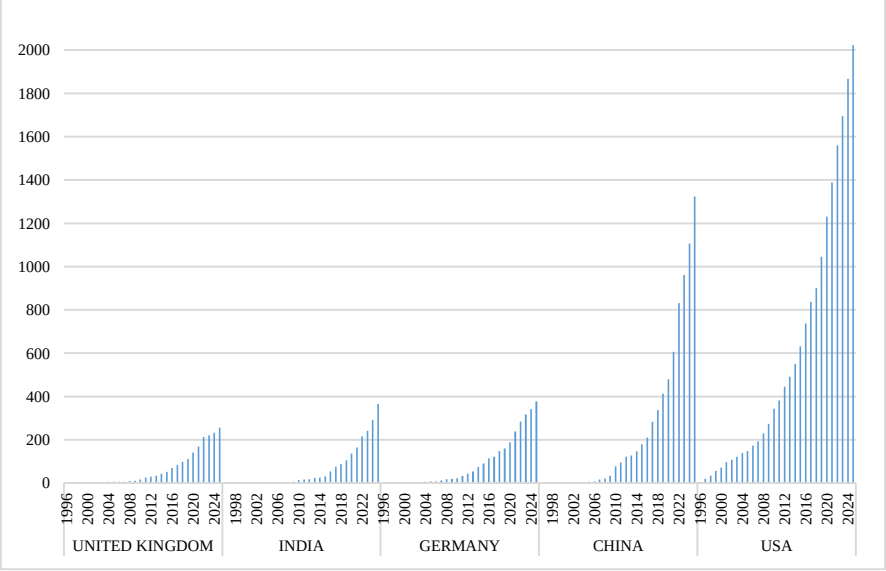
Source: Author's analysis via Biblioshiny (Bibliometrix R 4.5.0), Web of Science data (2026)

Figure 3 presents cumulative data on publications that include at least one author from the United States, China, Germany, India, and the United Kingdom. The number of publications involving authors from these countries has increased steadilyover time. It should be noted that, due to international co-authorship and the full counting approach, a single publication may be attributed to multiple countries.

The results indicate that authors from developed countries have a dominant share in scientific output, while authors from developing countries exhibit lower but steadily increasing production. Countries were classified into developed and developing categories following the World Bank's classification based on GNI per capita (World Bank, 2024)

Considering the presence of institutions such as the Swiss Federal Institute of Technology Zurich (51 publications) and the International Food Policy Research Institute (60 publications), a clear global diversification of authors engaged in agricultural insurance research is evident.

Figure 3. Cumulative scientific production by country of author affiliation (top five countries)



Source: Author's analysis via Biblioshiny (Bibliometrix R 4.5.0), Web of Science data (2026)

Authors affiliated with institutions in Germany, France, and Italy demonstrate a stable scientific impact, with total citation counts of 2,316, 1,499, and 1,090, and average citations per article of 20.50, 24.20, and 16.50, respectively.

India appears on the list with 1,180 citations but records the lowest average citation rate (9.90) among the observed countries, which may indicate insufficient international visibility and impact of scientific publications in this field.

As in previous cases, the effect of international co-authorship and the full counting approach should not be overlooked when interpreting citation data by country of author affiliation.

Table 4. Citations by country of author affiliation

Country	TC	Average article citations
USA	18,137	32.70
China	4,988	12.60
United Kingdom	3,076	45.90
Germany	2,316	20.50
France	1,499	24.20
Switzerland	1,464	45.80
Canada	1,330	20.20
India	1,180	9.90
Italy	1,090	16.50

Source: Author's analysis via Biblioshiny (Bibliometrix R 4.5.0), Web of Science data (2026)

Table 5 shows that the largest number of publications has been published in the journals Agricultural Finance Review (110), American Journal of Agricultural Economics (94), and Sustainability (80).

Table 5. Leading journals by number of publications

No.	Scientific journal	Number of documents
1.	Agricultural Finance Review	110
2.	American Journal of Agricultural Economics	94
3.	Sustainability	80
4.	Agriculture-Basel	52
5.	Agricultural Economics	43
6.	Applied Economic Perspectives and Policy	36
7.	Journal of Development Economics	34
8.	Economics of Agriculture	33
9.	Frontiers in Sustainable Food Systems	30
10.	World Development	30

Source: Author's analysis via Biblioshiny (Bibliometrix R 4.5.0), Web of Science data (2026)

Such a structure of journals confirms that the research field is multidisciplinary, integrating finance, traditional economics, and aspects of sustainable development.

4. SCIENTIFIC MAPPING AND CONCEPTUAL STRUCTURE

The analysis of keyword frequency (author keywords) shows that, in addition to the terms agriculture (232), crop insurance (219), insurance (213), and agricultural insurance (166), there is a high occurrence of the term climate change (178), suggesting that climate change is recognized as a major source of uncertainty in agricultural production.

The presence of the keyword China, with 77 occurrences among the top ten terms, indicates that it is one of the most prominentand frequently studied agricultural insurance markets in the dataset.

Table 6. Most frequent author keywords

Words	Occurrences
agriculture	232
crop insurance	219
insurance	213
climate change	178
agricultural insurance	166
risk	142
risk management	118
China	77
index insurance	76
adaptation	71

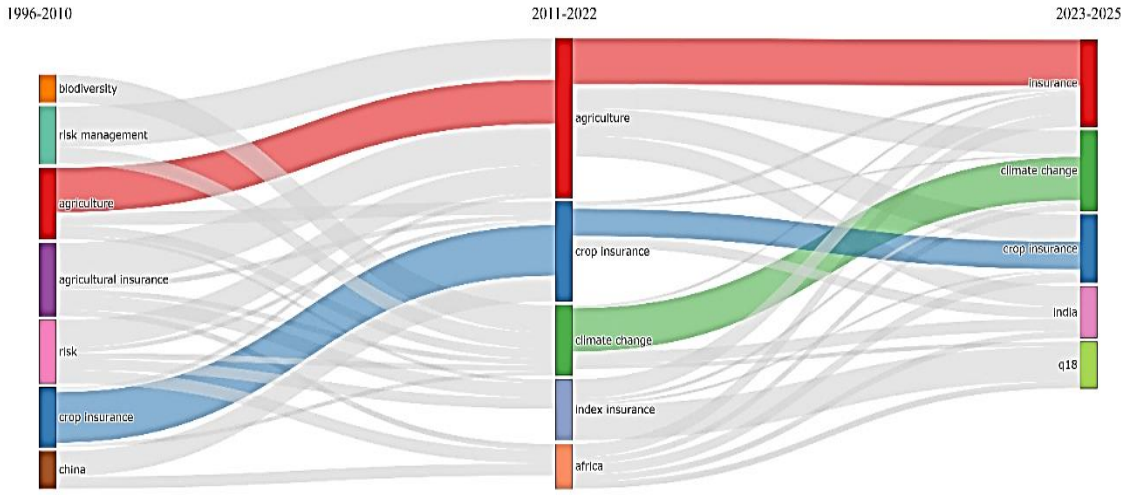
Source: Author's analysis via Biblioshiny (Bibliometrix R 4.5.0), Web of Science data (2026)

The evolutionary trajectory of research themes was mapped using author keywords across three defined time periods, with breakpoints identified in 2010 and 2022. These breakpoints were determined based on observed changes in publication dynamics and the development of the research field.

The methodological framework includes the analysis of 100 keywords with a minimum cluster frequency of 3 per thousand documents.

The application of the Louvain algorithm enabled the identification of thematic clusters, while the relationships between them were measured using the Inclusion Index (weighted by keyword frequency), with a minimum threshold value of 0.1.

Figure 4. Thematic evolution of the research field



Source: Author's analysis via Biblioshiny (Bibliometrix R 4.5.0), Web of Science data (2026)

The thematic evolution within the analyzed research field reveals a clear transformation of research interests across three time periods:

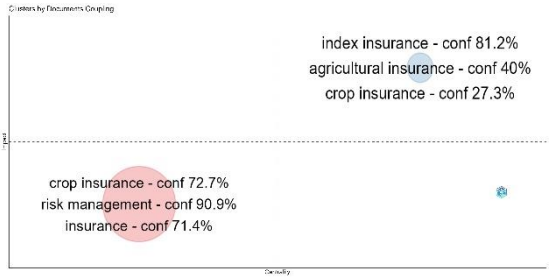
Period 1996–2010: In the initial phase, the focus is on fundamental concepts such as crop insurance, biodiversity, and traditional forms of risk management.

Period 2011–2022: Crop insurance remains the dominant theme, while new key terms emerge, including climate change and index insurance, along with an expansion of research focus toward Africa.

Period 2023–2025: Crop insurance continues to be the dominant topic; however, recent trends indicate a strong orientation toward contemporary challenges related to climate change, as well as institutional and macroeconomic frameworks through which governments manage agricultural risks and ensure food security (in line with JEL classification Q18: Agricultural Policy; Food Policy), with a notable geographical focus on India.

The following figure presents the intellectual structure of the domain based on the analysis of 100 documents grouped according to shared bibliographic references. The selection of the 100 most relevant documents was made to achieve a balance between network clarity and the preservation of informational value. The importance of publications within clusters was assessed using the Global Citation Score, while the clusters themselves were identified using the Louvain algorithm with a resolution parameter of 0.5 and labeled based on author keywords.

Figure 5. Cluster analysis of documents based on bibliographic coupling



Source: Author's analysis via Biblioshiny (Bibliometrix R 4.5.0), Web of Science data (2026)

The previous figure identifies clusters of publications that share similar theoretical and methodological foundations, positioning them according to their centrality (i.e., importance within the network) and their impact, expressed through the global number of citations.

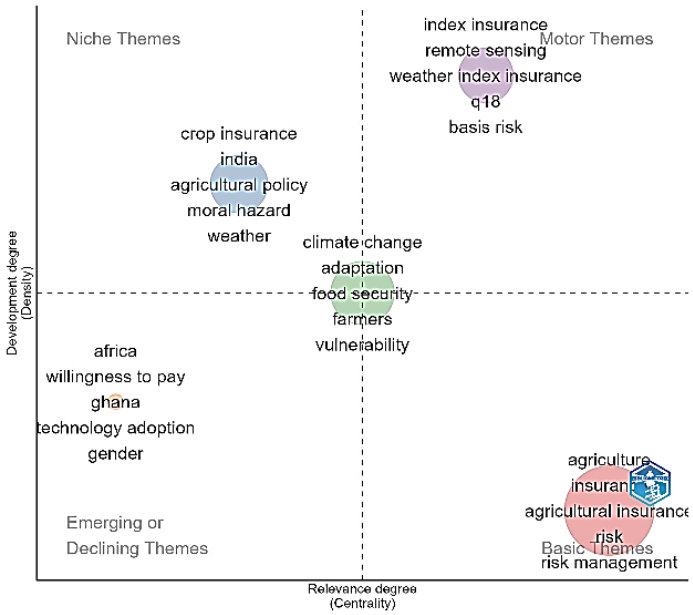
The red cluster comprises publications primarily focused on traditional concepts of crop insurance and agricultural risk management. The position of this cluster indicates that these topics are less connected to more recent research directions, which may be attributed to the fact that part of the literature represents earlier or conventional approaches to insurance with limited integration into contemporary models. This cluster reflects foundational research themes that currently attract less attention compared to newer approaches.

In contrast, the blue cluster represents a more recent and contemporary research direction in the field of agricultural insurance. The prominence of the term *index insurance* suggests that this type of

insurance is increasingly used as a tool for managing climate and production risks in agriculture, indicating that this cluster represents a dominant and current trend in the literature.

The positioning of key concepts within the field is further visualized through a strategic map based on author keywords (Figure 6).

Figure 6. Thematic map of the research field based on author keywords



Source: Author's analysis via Biblioshiny (Bibliometrix R 4.5.0), Web of Science data (2026)

The analysis includes the 100 most frequentterms, applying the Louvain algorithm for community detection with a resolution parameter of 0.5 to ensure clearer cluster separation. Only terms with a minimum frequency of 3 occurrences per thousand keywords were included. Cluster positions are determined based on their centrality and density, allowing the classification of themes into motor, basic, peripheral, and emerging categories.

Based on the thematic maps of author-defined keywords, the basic and fundamental themes (*Basic Themes*), which serve as the foundation for more advanced research in the observed period, include: *agriculture*, *insurance*, *agricultural insurance*, *risk*, and *risk management*.

The motor themes (*Motor Themes*), representing the main drivers of research—i.e., topics that are both central and highly developed—are related to index insurance and technology, specifically index insurance, remote sensing, weather index insurance, and basis risk.

Themes such as climate change, adaptation, food security, and farmer vulnerability are positioned at the center of the map. These represent transitional themes that connect fundamental concepts with highly developed research niches.

Topics such as crop insurance, agricultural policy, and moral hazard are positioned as niche themes (Niche Themes), meaning that they are well developed but may not yet exert a broad influence across the entire field.

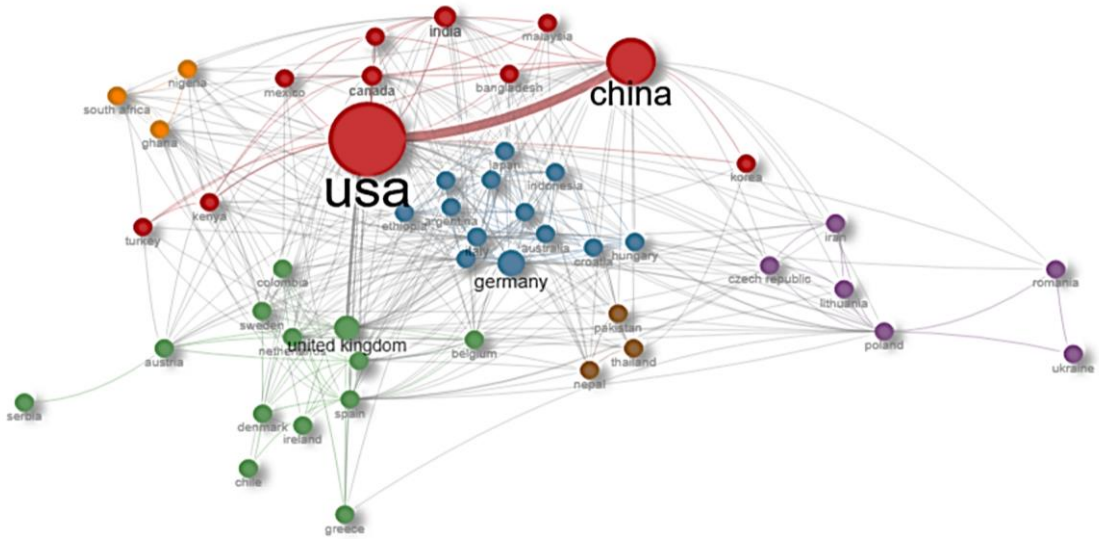
On the other hand, themes such as willingness to pay and technology adoption, particularly in the context of Africa (e.g., Ghana), are identified as emerging themes.

It can be concluded that the thematic focus of research has evolved over time; while traditional concepts remain dominant, there is a noticeable increase in interest in innovative approaches such as index insurance and climate change adaptation models

Figure 7 presents the structure of global scientific collaboration analyzed at the level of countries of author affiliation, where nodes represent countries and links represent co-authorship relationships. The network includes the 50 most active countries, with the Association method applied to normalize link strength.

The Louvain algorithm was used to identify clusters indicating regional and international connectivity among research centers. Isolated nodes and publications with an extremely high number of authors (>20) were excluded from the analysis to ensure the validity of the collaboration network

Figure 7. International collaboration network by country of author affiliation



Source: Author's analysis via Biblioshiny (Bibliometrix R 4.5.0), Web of Science data (2026)

The identified clusters indicate regional patterns of collaboration and the dominance of specific research centers.

The United States (USA) and China are not only the largest nodes in the network but also share the strongest link (edge), indicating the most intensive scientific collaboration between authors from these countries. Although *India* is classified as a Niche Theme in the thematic map (i.e., a well-developed but specialized area), its position within collaboration networks suggests that authors affiliated with institutions in this country are key partners in research on crop insurance and agricultural policy.

The green cluster represents a strong European collaboration network, led by the United Kingdom and the Netherlands. It is important to note that authors from Serbia are included in this network and are primarily connected with authors from Austria.

The purple cluster reflects a specific regional collaboration among authors affiliated with Eastern European countries—Poland, the Czech Republic, Ukraine, and Romania. The blue cluster illustrates connections between authors from two European countries, Germany and Italy, and their counterparts in Australia and Japan. The orange cluster includes authors from South Africa, Nigeria, and Ghana, indicating that these countries are not isolated within the global research network.

Although the United States and China have the highest absolute number of internationally co-authored publications (MCP – 111 and 80, respectively), Table 7 shows that European countries exhibit the highest level of collaboration (MCP Ratio). The United Kingdom leads with a coefficient of 0.627, indicating that over 60% of its research output results from international cooperation. Germany (0.354), France (0.355), and Spain (0.350) also demonstrate a strong orientation toward cross-border research, highlighting the role of European research centers as key hubs within the global network.

Among Asian countries, in addition to China, India ranks third in terms of the total number of publications (119), with a notableshare of international collaboration (0.193).

Table 7. International collaboration by country of the corresponding author

No.	Country	Articles	SCP*	MCP**	MCP Ratio
1.	USA	554	443	111	0.200
2.	China	396	316	80	0.202
3.	India	119	96	23	0.193
4.	Germany	113	73	40	0.354
5.	United Kingdom	67	25	42	0.627
6.	Canada	66	39	27	0.409
7.	Italy	66	49	17	0.258
8.	France	62	40	22	0.355
9.	Spain	60	39	21	0.350
10.	Poland	46	41	5	0.109

** SCP (Single Country Publications): Publications in which all authors are affiliated with the same country.*

**MCP (Multi-Country Publications): Publications resulting from international collaboration.*

Source: Author's analysis via Biblioshiny (Bibliometrix R 4.5.0), Web of Science data (2026)

5. ANALYSIS OF THE THEMATIC FOCUS OF KEY LITERATURE

In this section, the 20 most locally cited publications are analyzed in order to identify the intellectual foundations and the most influential ideas in the field of agricultural insurance. This analysis enables, in line with the previously presented thematic evolution, contributes to the understanding of key phases in the development of both theory and practice of agricultural insurance.In the first phase (1996–2010), the research focus was on traditional crop insurance models (multiple peril crop insurance – MPCI) and on issues that hinder the development of efficient markets in developed countries, particularly in the United States. Smith and Goodwin (1996) and Coble et al. (1997) examined how moral hazard in insurance can influence farmers' decisions regarding investments and the use of fertilizers and pesticides. Mishra et al. (2005) further analyzed the impact of income insurance on the environment.

Just et al. (1999) investigated adverse selection problems faced by insurance companies when low-risk farmers opt out of insurance due to high premiums, leaving only high-risk participants, which leads to insufficient premium collection and long-term market instability without substantial government subsidies. In this context, insurance becomes more of a transfer mechanism toward riskier and potentially less efficient producers rather than a tool for reducing economic uncertainty.

Miranda and Glauber (1997) addressed systemic agricultural risks, such as drought, which simultaneously affect farmers within a given region, limiting the possibility of risk diversification without adequate reinsurance and potentially destabilizing the entire market. Fafchamps et al. (1998) examined how rural households in semi-arid regions of West Africa cope with extreme climatic shocks without access to formal insurance, demonstrating that traditional risk management strategies are insufficient to protect farmers from severe shocks.

In the second phase (2011–2022), research shifted toward index insurance, technological applications, and the expansion of studies into developing countries, particularly in Africa and Asia, with the aim of addressing moral hazard and high transaction costs. Karlan et al. (2014), through an experiment in Ghana, showed that risk—rather than lack of capital—is the primary constraint on agricultural investment.

Dercon and Christiaensen (2011) found that farmers in Ethiopia do not avoid fertilizer use due to lack of knowledge, but due to justified concerns that drought could lead to the loss of invested resources and severe reductions in household food consumption, thereby trapping farmers in poverty. Carter et al. (2016, 2017) analyzed how index insurance can promote the adoption of new technologies (e.g., seeds, machinery) by linking insurance with credit access.

Binswanger-Mkhize (2012) critically challenged the overly optimistic expectations of international development organizations that promoted index insurance as a universal solution to rural poverty. The author emphasized that such expectations often overlook economic realities, particularly the issue of basis risk—the possibility that farmers experience actual losses without receiving compensation due to mismatches between index measurements and real conditions—leading to skepticism, especially among poorer farmers.

The following three studies focus on improving model precision and reducing basis risk through advanced data usage, forming the basis for the third phase, which, in line with keyword evolution trends, began after 2023. Dalhaus and Finger (2016) introduced the use of gridded precipitation data and phenological observations to enhance the accuracy of insurance models and reduce basis risk, contributing to the transformation of agricultural insurance into a multidisciplinary field integrating data science and climatology.

Hill et al. (2019) examined hybrid insurance products in Bangladesh that combine multiple approaches for improved risk protection, including dry-days indices and area yield indices based on official statistical data. Jensen et al. (2018) analyzed adverse selection in index insurance using advanced behavioral models, showing that farmers adjust insurance demand based on environmental signals, which may threaten insurers' profitability.

Overall, this analysis provides a comprehensive understanding of the temporal, geographical, and thematic evolution of scientific thought regarding agricultural risk.

6. DISCUSSION AND CONCLUSION

Based on quantitative data on scientific production in the field of agricultural insurance indexed in the Web of Science database for the period 1996–2025, as well as bibliometric analysis, this study examines the proposed research questions. The analysis of annual scientific output indicates a stable growth trend, with an average annual growth rate of 12.25%. A sharpincrease was recorded in 2010 (83 publications) compared to 2009 (42 publications), which may be associated with the growing focus of researchers on index insurance and the analysis of climate change impacts. With

228 published papers, 2025 represents the most productive year in the development of this research field, confirming a continuous upward trend in global scientific production and clearly illustrating the dynamics and annual growth patterns over the observed period.

Authors from the United States account for the largest share of publications, reflecting both their strong representation and intensive international collaboration as well as the fact that early research contributions originated from this country. At the same time, authors affiliated with institutions in China and India, demonstrate the most dynamic growth in the past decade, indicating a gradual shift in the geographical distribution of scientific output and an increasing contribution from developing countries over time.

The findings also reveal a clear evolution in thematic focus, from traditional indemnity-based insurance models (Coble et al., 1997; Goodwin, 2001; Just et al., 1999; Smith & Goodwin, 1996) toward more innovative approaches, such as index insurance and climate risk analysis (Hill et al., 2019), highlighting a structural transition in research priorities in response to emerging global challenges (Adetoro et al., 2022; Dalhaus & Finger, 2016; Jensen et al., 2018).

The analysis of thematic clusters and the overall structure of the research field further indicates an increasing integration of diverse scientific disciplines. Although most publications originate from the fields of economics and risk management, the field is progressively evolving into a multidisciplinary domain that incorporates climatology, meteorology, and data science, as evidenced by the work of Dalhaus and Finger (2016)

The results of the international collaboration network analysis point to the existence of a well-developed and expanding global research network. The strongest connection is observed between the United States and China, while a robust European network is led by authors from the United Kingdom and the Netherlands, with Serbian researchers primarily participating through collaboration with Austria. Additionally, a distinct cluster of authors from Eastern European countries—Poland, the Czech Republic, and Ukraine—has been identified. The linkage between European and Asian research centers is further confirmed by the cluster connecting Germany and Italy with Japan. Quantitative indicators show that European countries, particularly the United Kingdom, exhibit a high level of collaboration, while China and India represent key Asian hubs in the global exchange of knowledge, reflecting a strong and structured intensity of international scientific collaboration, especially between Europe and Asia.

The strong integration of the global research community has also resulted in higher aggregate counts of publications and citations at the country level due to the full counting approach.

The scientific community, which has developed a substantial level of international collaboration over the observed period, has played a important role in identifying key challenges in agricultural insurance markets. The findings suggest that index-based models, although effective in addressing information asymmetry, introduce a critical issue of basis risk that often discourages farmers. Research in the past decade indicates that improving model accuracy requires reliance on multidisciplinary data sources, such as satellite-based vegetation monitoring and phenological observations, rather than simple meteorological averages. In this context, the application of artificial intelligence and digital technologies further enhances analytical capabilities and decision-making processes in modern economic systems (Damjanović, 2025).

Future development of agricultural insurance is unlikely to rely on either traditional or index-based models in isolation, given the inherent limitations of both approaches discussed in the preceding sections. In this context, future research may focus on hybrid models that combine the strengths of both approaches by integrating advanced technologies for primary coverage with verification mechanisms based on actual loss assessment, as also highlighted in the literature on hybrid index insurance (Hill et al., 2019). Such models aim to improve risk transfer efficiency, enhance user trust, and reduce information asymmetry through objective data sources.Although the study provides a systematic insight into the research field, several limitations should be acknowledged. First, the analysis relies on a single database (Web of Science) and includes only English-language publications within the defined time frame (1996–2025), which may limit the overall coverage of relevant research. Second, the bibliometric approach inherently reduces data to patterns of term co-occurrence and citation structures, which may overlook the deeper conceptual and contextual contributions of individual studies. While the analysis of the most locally cited publications partially addresses this limitation by providing insight into the intellectual foundations of the field, the findings should still be interpreted with caution, as they do not fully capture the diversity and nuance of the broader literature.

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