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Women's entrepreneurial journey in developed and developing countries: a bibliometric review

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Abstract

This paper presents a comprehensive bibliometric review of the scientific literature on women's entrepreneurship in agriculture across developed and developing countries. The paper delineates the evolving landscape, challenges, and opportunities that shape women's entrepreneurship experiences in agriculture in the contexts of developed and developing countries. Through a detailed bibliometric analysis of 728 papers from 1992 to 2022, employing performance analysis and science mapping, our methodology distinguishes itself by quantifying contributions and mapping the thematic evolution within this domain. Our study reveals the significant contributions of women entrepreneurs to agricultural innovation, sustainability, and rural development while facing systemic biases, limited access to resources, and societal stereotypes that hinder their entrepreneurial path. The paper underscores the disparity in women's entrepreneurship between developed and developing regions, with developed countries showcasing lower participation rates in agricultural entrepreneurship but a higher presence in decision-making roles within agribusinesses.

In contrast, developing countries display a higher engagement of women in entrepreneurship, driven by necessity and marked by significant contributions to food security and economic stability, though under challenging conditions. Notably, the paper highlights the underrepresentation of women's agricultural endeavours in scholarly research, pointing to a gap in the documentation and understanding of their contributions. The study reveals emerging themes such as digital agriculture, climate resilience, sustainability, and innovation, pointing towards future research directions that could further empower women in agriculture. It calls for more inclusive research and policy-making to recognise and support women's vital role in agriculture, advocating for a holistic approach to address women entrepreneurs' challenges in different economic contexts. Through this analysis, the paper contributes to a deeper understanding of gender dynamics in agricultural entrepreneurship and suggests pathways for fostering more equitable and sustainable agricultural practices.

Keywords: Women entrepreneurs, Agriculture, Entrepreneurship, Bibliometric analysis

Introduction

Agriculture has experienced a paradigm shift over the years, initially centred on productivity and efficiency (Banks et al. 2002); modern agricultural practices now face the intricate demands of a sustainability-driven society. As the sector confronts rigorous sustainability criteria, fluctuating market conditions, and changing consumer preferences (Lans et al. 2017), it necessitates innovative problem-solving and entrepreneurial process. This evolving landscape has carved out a niche for women entrepreneurs in agriculture to stand out as instrumental agents of change (Vesala and Mikko Vesala 2009). The role of women entrepreneurs, blending innovation, resilience, and entrepreneurial spirit, not only shapes a comprehensive approach to eco-friendly agricultural strategies (FAO 2023) but also indicates positive transformations in rural settings, enhancing advancements in food security, gender equality, and socio-economic development (Duflo 2012). Academic works highlight women's propensity to pioneer and develop new agricultural ventures (Bock 2004) and their inclination to lead non-agricultural entrepreneurial pursuits (Gasson and Winter 1992). The acknowledgement of women's significant contributions to economic growth reached a notable peak with Claudia Goldin's Nobel Prize in Economics. As the first woman to independently receive this award, Goldin's work profoundly emphasises the integral role of gender in shaping economic development and labour market participation and brings to light the scholarly community's increased focus on gender as a critical factor in understanding economic dynamics (Goldin 2006, 2014, 2021). Yet, their journey is impaired by systemic biases, obstacles, and limited access to critical resources and streams of information, all worsened by deep-seated gender norms and stereotypes (Bianco et al. 2017; Hubert and Stratigaki 2011; Van Heck and Kobuta 2023). Scholarly research often underrepresents and overlooks women's agricultural endeavours, indicating a gap in thorough research and documentation in this pivotal field (Kovačiček and Franić 2019). This lack of representation echoes in the entrepreneurial engagement data, with only 10.3% of women participating in entrepreneurship across all economic activities, thereby creating a 42% gender gap (Boutaleb 2023; FAO 2023).

In emerging economies, women form a significant portion of the agricultural workforce, particularly in agrifood systems, where their representation often surpasses their male counterparts. Notably, in regions like Sub-Saharan Africa and Asia, women constitute 66 and 71% of the agrifood system workforce, responsible for between 60 and 80% of the food supply, underscoring their indispensable role in food production (FAO 2023). Furthermore, it is essential to note that Africa stands out as an encouragement of hope and progress as it is home to the highest percentage of women entrepreneurs globally, with a remarkable 26% of women engaging in entrepreneurship, predominantly within the agricultural sector (Bioulac and Lalhoul 2018). In these regions, women entrepreneurs are disproportionately confronted with challenges that hinder their ability to establish and sustain viable enterprises. Pivotal obstacles include limited access to land, capital, and financial resources, insufficient social support networks, marketing challenges, and the need to balance their professional and personal lives (John and Mishra 2018). The absence of education and technical knowledge further hinders the growth and success of their enterprises. Additionally,

women often bear traditional responsibilities such as unpaid household chores, food provision, and caregiving for children and elderly family members (Gasson and Winter 1992; Duflo 2012).

The landscape of women in agriculture in developed countries differs slightly. Even today, most European farms are held by men, and production management is generally considered a male domain (Van Heck and Kobuta 2023). For instance, only 30% of agricultural entrepreneurs are women in the EU countries (Kovačićek and Franić 2019). The USA portrays a more balanced scenario, where women farmers manage 36% of all farms, 56% of agribusinesses have at least one female in decision-making positions, and 14% are run solely by female managers (USDA 2019). Figure 1 presents the percentage of women entrepreneurs in agriculture in European Countries. Austria leads with the highest percentage of women entrepreneurs by 31%. There is a noticeable range in participation, with Central and Eastern European nations like Poland, Romania, Latvia, and Lithuania showcasing relatively high percentages. In contrast, some Western European nations, such as the Netherlands, Denmark, and Switzerland, present lower figures. Unfortunately, most EU countries remain below 20% in terms of women’s participation in agricultural entrepreneurship.

The entrepreneurial journey of women in agriculture encounters challenges similar to those in emerging economies, such as deeply rooted gender roles within family and work environments, stereotypes surrounding entrepreneurship, and unequal access to information and networking opportunities (Hubert and Stratigaki 2011). Therefore, the significance of women’s entrepreneurship in agriculture cannot be understood without considering the diverse socio-economic contexts in which it unfolds. Understanding the diverse motivations and pathways of women entrepreneurs in agriculture is important to explore the underlying drivers and aspirations. For instance, while women in developed contexts may be driven by desires for independence, power, wealth, and self-fulfilment (Alstete 2002), their counterparts in developing regions may view entrepreneurship as a survival strategy dictated by compelling circumstances such as poverty and high unemployment rates (Sadi and Al-Ghazali 2012), while the motivations mentioned by their counterparts in developed countries come as secondary or tertiary drivers. Moreover, the Global Entrepreneurship Monitoring

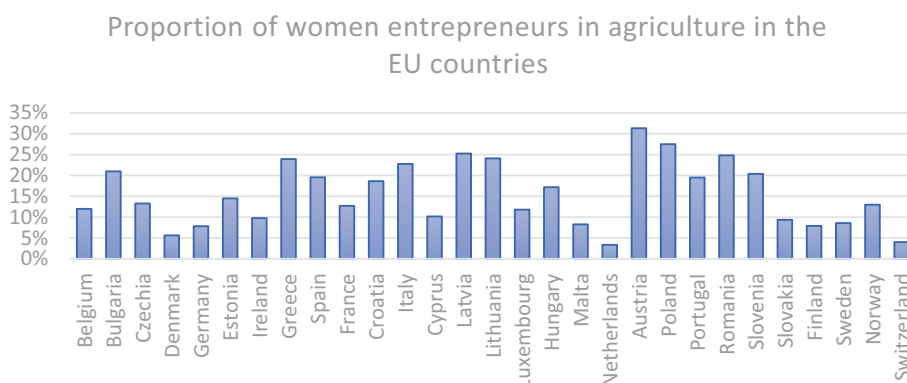


Fig.1 Women entrepreneurs in agriculture in the EU countries—2020 elaboration of data from Eurostat (Eurostat 2023)

report also proves that necessity-driven entrepreneurship initiatives across all sectors are more prominent in developing economies at 35%, as opposed to 17% in developed economies (Boutaleb 2023).

To enhance the understanding of the academic landscape concerning women entrepreneurs in agriculture and better comprehend the evolution and directions of research in this area, we utilize some methodologies of bibliometric analysis. This approach sets a solid foundation for future academic inquiries by systematically analysing and mapping the existing scholarly literature (Zupic and Čater 2014). The primary objective of this study is to provide a detailed and nuanced portrayal of the various challenges, opportunities, and catalysts that influence women entrepreneurs in the agricultural sector. This portrayal is drawn from a wide range of academic research, encompassing studies from both developed and developing economies. By doing so, we aim to identify common themes and divergences in the experiences of these entrepreneurs, thereby offering valuable insights into the factors that facilitate or impede their success. Additionally, this comprehensive analysis aims to contribute to a deeper understanding of the role of gender in entrepreneurial ventures within the agricultural sector and aid in developing more effective policies and strategies to support women entrepreneurs in this field, ultimately leading to more equitable and sustainable agricultural practices globally.

The remainder of the paper is organised as follows. The methodology section details the analytical approach and techniques employed in the bibliometric analysis, offering insights into the data collection and analysis processes used to investigate the literature of the last 30 years. The results and discussion section presents the study's key findings, delving into the emerging themes and trends identified in the research landscape. This section also critically discusses these findings, contextualising them within the broader socio-economic and cultural frameworks of women's entrepreneurship in agriculture. Finally, the conclusions section synthesises the insights from the analysis, summarising the overall contributions of the paper to the existing body of literature.

Methodology

Bibliometric analysis employs a set of tools for evaluating the state of the art on a specific academic topic by analysing scientific literature, author productivity, text, and references (Garfeld 1955; De Solla Price 1965; Kumar et al. 2021; Donthu et al. 2021). It combines quantitative and qualitative methods to explore academic trends, author collaborations, scientific outputs, and future research patterns (Broadus 1987; Kent Baker et al. 2020). This methodology has gained prominence with the advent of bibliometric software and extensive scientific databases like Scopus and Web of Science (Donthu et al. 2021).

This study employed bibliometric analysis to investigate women's entrepreneurship in agriculture. Data collection was conducted on the Web of Science (WoS) using the following query: TS (title, abstract, keyword plus, and author keywords) = (women or female or gender) AND TS = (agri* or farm*) AND TS = (entrepr* or business* or agribusiness or sme*). The asterisks at the end of most searched words are used to capture different variations of the word; for example, the term *entrepr** is used to capture variations like entrepreneurship, entrepreneur, entrepreneurial, etc. The timeframe was limited to 1992 until 2022 to capture the literature of the past 30 years. The data from WoS were retrieved in May of 2023; therefore, the year 2023 is excluded from the analysis

in order not to compromise the results because the year has not been concluded yet. Furthermore, manual data cleaning took place to remove the articles that were outside of the scope of the study, such as articles regarding medicine, pathology, and early child care, to mention a few. This study focused only on articles written in English and excluded non-peer-reviewed sources, resulting in a final dataset of 728 articles.

In bibliometric analysis, two principal domains are widely recognized: performance analysis and science mapping, as delineated by Noyons et al. (1999). Our research incorporates methodologies from both domains to provide a comprehensive assessment. Performance analysis assesses the contributions and impact of various scientific entities, such as countries, academic institutions, prolific journals, and scholars, using bibliographic data as a foundation (van Raan 2004). Science mapping, on the other hand, focuses on visualising the framework and evolving nature of scientific inquiry, using maps to articulate the knowledge framework (Börner et al. 2003). In particular, thematic evolution mapping and cocitation analysis are used in this research.

The thematic evolution map generated by the Bibliometrix R package allows us to perform a longitudinal assessment of the literature, enabling us to categorise and monitor the emergence and progression of research themes over an established timeline. The process begins with the extraction of keywords from all the articles in the dataset, which are then normalised to address variations in terminology. Then, the algorithm conducts a co-word analysis by examining the co-occurrence of keywords within the articles' metadata. It identifies clusters of keywords that appear together frequently and thus are likely to represent thematic concentrations within the research field and represents these clusters longitudinally plotted to illustrate the evolution of research themes over time.

Co-citation analysis is a methodological approach to delineate the structural and thematic contours of a specific research field. This technique operates on the premise that publications cited collectively share thematic resemblance or affinity, thus serving as a reflective measure of the intellectual and thematic coherence within a scientific field (Small 1973). By examining the frequency with which pairs of works are cited together, we can infer a shared thematic relationship or conceptual linkages, indicative of their relevance and influence within the domain. This technique identifies the most central and influential publications and reveals the network of intellectual connections and scholarly dialogue that collectively form the backbone of women's entrepreneurship in agriculture.

To detect current trends and future research priorities within the field, this study also utilises bibliographic coupling, a methodological approach that identifies relationships between documents based on the references they share. By clustering papers that cite similar sources, bibliographic coupling uncovers the thematic structures actively shaping the discourse on women's entrepreneurship in agriculture. This technique, rooted in the foundational work of Kessler (1963), provides a forward-looking analysis, in contrast to co-citation analysis, which tends to emphasise the historical development of a field. Bibliographic coupling is particularly valuable for identifying emerging topics and research fronts, thereby offering insights into where the field is currently headed and highlighting potential areas for future investigation.

The Bibliometrix R package was used for data elaboration (Aria and Cuccurullo 2017) and VOS Viewer for creating and visualising maps and performing co-citation and bibliographic coupling analysis (van Eck and Waltman 2010). In our study, the co-citation

analysis extended beyond mere quantification of citation pairs; it included an exploration of the thematic clusters that emerged from these connections. By interpreting the structure and distribution of these clusters, we gained insights into the evolving trends, seminal works, and foundational theories that have shaped the academic conversation on women’s entrepreneurship in agriculture over the past 30 years.

Results and discussion

The bibliometric data on women entrepreneurs in agriculture from 1992 to 2022, sourced from the Web of Science, comprise 728 documents from 404 sources, demonstrating a notable annual growth rate of 17.03%. These documents have a relatively recent average age of 6.22 years and receive an average of 13.27 citations. The dataset involves 2,162 contributing authors, including 149 single-authored documents, and exhibits collaboration with an average of 3.17 co-authors per document, with 25% being international. The multidisciplinary nature of the literature in the dataset is depicted by the presence of 33,126 references, 1294 Keywords Plus, and 2185 Author’s Keywords.

Figure 2 shows the annual growth of literature throughout the studied period. Until the late 1990s, there were a relatively low number of publications with minimal citation counts, and a gradual growth started in the early 2000s. The significant expansion in the production of literature began in 2010, with over 80% of the total articles being published from 2013 onward, marking periods of heightened research activity throughout the intermittent peaks in 2011, 2016, and 2020. The trend of growing interest in this research field is also evident from the increasing number of authors over time, marked by a significant rise from 3 authors in 1993–419 authors in 2022. Notably, 2020 emerged as a pivotal year with a high number of publications, citations, and authors, suggesting a culmination of research interest in the subject.

Most productive sources

Table 1 provides a comprehensive overview of the most significant sources in the literature on women’s entrepreneurship in agriculture. The table underscores the

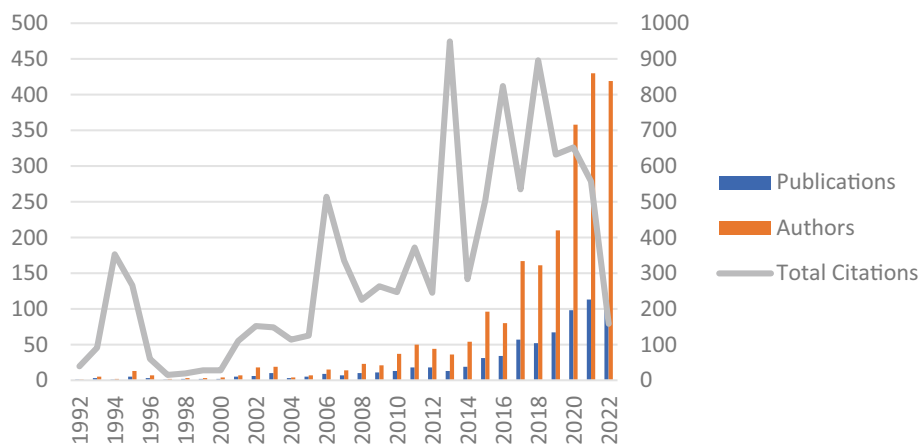


Fig. 2 Publication trends

Table 1 Most productive sources

Sources	Publications on female/women/gender in agribusiness (% of database $N = 728$)	Total publications in source [% of publications on female/women/gender in source]	Publications on agribusiness—NO female/women/gender	% of Agribusiness publications on female/women/gender
Sustainability	38 (4.9%)	72,133 [0.05%]	511	7%
Journal of rural studies	27 (3.5%)	3,395 [0.80%]	182	15%
Journal of agricultural extension	17 (2.2%)	403 [4.22%]	44	39%
Scientific papers-series management economic engineering in agriculture and rural development	13 (1.7%)	2,418 [0.54%]	172	8%
Indian journal of agricultural sciences	11 (1.4%)	7,993 [0.14%]	45	24%
Agriculture-basel	10 (1.3%)	6,444 [0.16%]	92	11%
International food and agribusiness management review	10 (1.3%)	828 [1.21%]	168	6%
Sociologia ruralis	10 (1.3%)	1081 [0.9%]	47	21%
Agriculture and human values	9 (1.2%)	1,535 [0.59%]	59	15%
Land use policy	9 (1.2%)	6,496 [0.14%]	152	6%
Journal of enterprising communities-people and places in the global economy	8 (1.0%)	365 [2.19%]	35	23%
Food security	7 (0.9%)	1,209 [0.58%]	30	23%
British food journal	6 (0.8%)	3,022 [0.20%]	119	5%

somewhat marginalised status of this topic within the academic sphere—the top 10 journals listed account for merely 20% of the overall publications on this subject.

The journal ‘Sustainability’ emerges as the leading source, accounting for 4.9% of the total publications focused on women’s entrepreneurship in agriculture. When compared to the general literature on entrepreneurship in agriculture, ‘Sustainability’ has a total of 511 articles, with only 7% specifically addressing the gender dimension. This indicates a relatively broader focus within the journal, with a significant but still minor representation of gender-related studies in the agricultural entrepreneurship sector.

The ‘Journal of Rural Studies’ follows closely, demonstrating a pronounced focus on this subject with 27 publications (3.5% of the dataset on women). This journal has a total of 182 articles on agricultural entrepreneurship, with 15% focusing on women, suggesting that it places a relatively higher emphasis on gender issues compared to other journals.

The relevance of the research area in developing countries is also evident through the presence of the ‘Journal of Agricultural Extension’, originating from the African context, which holds a significant position among the top sources with 17 publications (2.2% of the dataset on women). Remarkably, 39% of its total 44 publications

on agricultural entrepreneurship focus on women, showing a strong emphasis on gender-related issues within this journal. The 'Indian Journal of Agricultural Sciences' also holds a prominent position among the top five sources, with 11 publications (1.4% of the dataset on women).

Other notable sources include 'Agriculture-Basel', 'International Food and Agribusiness Management Review', and 'Sociologia Ruralis', each contributing 10 publications to the discourse on women entrepreneurship in agriculture. These journals show varying degrees of focus on gender issues, with 'Agriculture-Basel' and 'Land Use Policy' each having less than 1% of their total publications dedicated to gender topics within agricultural entrepreneurship.

Most productive authors

The bibliometric data provided in Table 2 encompass several crucial metrics, including the h-index derived from our database, total citations from our database (TC), the number of published articles on the topic (NP), total publications (TP), the year each author began publishing in this field (starting year), subject categories per author as per the Web of Science, and the respective countries of these authors. The h-index serves as a measure of both the productivity and influence of the authors in the field; a high h-index suggests prolific research output and a substantial impact on the subject matter. In this case, the h-index is calculated based on the papers in our database and the citations received from the documents of the same database.

Table 2 Most productive authors

Author	H-index	TC	NP	TP	Starting year	Subject categories	Country
MANYONG V	5	49	5	53	2020	Agriculture, business & economics, environmental sciences & ecology, science & technology, development studies	Tanzania
CHAHAL VP	2	10	5	45	2014	Agriculture, environmental sciences & ecology, microbiology, plant sciences, science & technology	India
SINGH P	1	7	5	33	2016	Agriculture, science & technology, food science & technology	India
ABDOULAYE T	4	46	4	81	2014	Agriculture, business & economics, food science & technology, environmental sciences & ecology, science & technology	Mali
BARBIERI C	3	168	3	64	2008	Social sciences, environmental sciences & ecology, business & economics, agriculture science & technology	USA
BOCK BB	3	228	3	60	2004	Agriculture, geography, sociology, public administration, development studies	Netherlands
EVANS N	3	143	3	21	1996	Geography, public administration, sociology, environmental sciences & ecology, psychology	England
INWOOD S	3	27	3	20	2020	Education & educational research, public administration, environmental & occupational health, sociology, development studies	USA

H-index derived from our database; total citations (TC) the number of published articles on the topic (NP); total publications (TP); the year each author began publishing in this field (starting year), subject categories per author as per the Web of Science (Subject categories); authors countries (Country)

The diversity in the h-index values of these authors is noteworthy, with Manyong having the highest at 5 to indicate a considerable early impact. Furthermore, Table 2 reveals a low level of author specialization in this field, as evidenced by the maximum number of publications per author being only 5. This figure is relatively modest compared to other fields, such as wine economics, as demonstrated in the bibliometric analysis by (Ruggeri et al. 2023). It is noteworthy to mention the influence in this field of Barbieri and Bock, who have had three publications but have the highest citations among the list, 168 and 228, respectively. The authors' work spans various subjects, but the primary focus remains agriculture and related domains, expanding towards environmental sciences and ecology, business and economics, development studies, geography, sociology, psychology, education, and more.

Most productive countries

Figure 3 provides a comprehensive view of research contributions in women entrepreneurship in agriculture across various countries. The USA and the UK emerged as the preeminent contributors, with 123 and 53 articles, respectively, and a robust balance between single-country publications (SCP) and multiple-country publications (MCP), indicating a strong engagement in both domestic and international research collaborations. The research extends well beyond developed nations, with active participation from African and Asian developing countries. The chart highlights the academic output from the African continent, showcasing Nigeria, Ghana, Kenya, and Tanzania, alongside Asia, represented by India and China. Both Asian countries display a robust volume of single-country publications (SCP) accompanied by a substantial share of multiple-country publications (MCP), suggesting a well-established research infrastructure that supports autonomous investigation as well as collaborative international efforts. Countries like Benin and Tanzania are strongly engaged in international

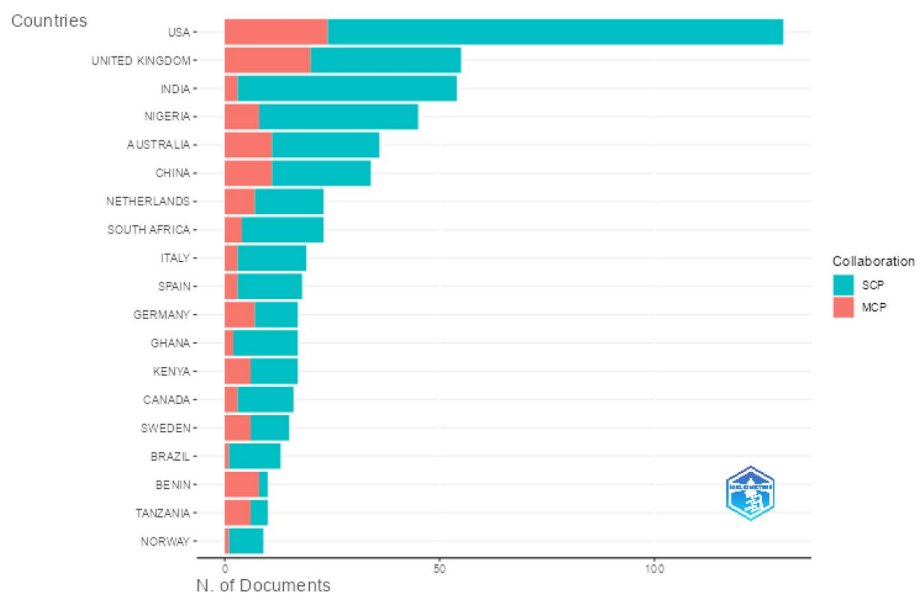


Fig. 3 Corresponding author's countries

collaboration, where most publications are produced through international collaborations. Conversely, countries like India, Italy, Ghana, Brazil, and Norway show that there is room for increased international engagement, as authors primarily work in their specific geographical contexts, which the high SCP ratio can note. In this sense, Fig. 3 not only provides a quantitative assessment of research output but also reflects broader geopolitical and economic influences on scientific research. It does so by underscoring the varying degrees to which different regions engage in collaborative research, which may be influenced—among the others—by factors such as available resources, governmental research policies, and the specific challenges and priorities of each region in the context of agriculture and women’s entrepreneurship.

Table 3 Most relevant articles

Authors and Journal	Title	Year	Local Citations	Global Citations
MCGEHEE NG et al., <i>Tourism Management</i>	Gender and motivation for agri-tourism entrepreneurship	2007	17	158
ANTHOPOULOU T, <i>Journal of Rural Studies</i>	Rural women in local agrifood production	2010	15	74
BOCK BB, <i>Sociologia Ruralis</i>	Fitting in and Multi-tasking: Dutch Farm Women’s Strategies in Rural Entrepreneurship	2004	14	97
SEUNEKE P & BOCK BB, <i>NJAS—Wageningen Journal of Life Sciences</i>	Exploring the roles of women in the development of multifunctional entrepreneurship on family farms: An entrepreneurial learning approach	2015	12	39
BRANDTH B, <i>Journal of Rural Studies</i>	Rural masculinity in transition: Gender images in tractor advertisements	1995	10	177
RIJKERS B & COSTA R, <i>World Development</i>	Gender and Rural Non-Farm Entrepreneurship	2012	10	67
NAGLER P & NAUDE W, <i>Food Policy</i>	Non-farm entrepreneurship in rural sub-Saharan Africa	2017	10	65
SHARPLEY R & VASS A, <i>Tourism Management</i>	Tourism, farming and diversification: An attitudinal study	2006	7	211
BARBIERI C MSHENGA PM, <i>Sociologia Ruralis</i>	The Role of the Firm and Owner Characteristics on the Performance of Agritourism Farms	2008	7	144
TRAUGER A et al., <i>Agriculture and Human Values</i>	Women farmers and civic agriculture in Pennsylvania, USA	2010	7	64
MARKANTONI M & VAN HOVEN, <i>Journal of Rural Studies</i>	Bringing ‘invisible’ side activities to light. A case study of rural female entrepreneurs in the Veenkoloniën, the Netherlands	2012	7	28
CAVICCHIOLI D et al., <i>Journal of Rural Studies</i>	Farm succession at a crossroads: The interaction among farm characteristics, labour market conditions, and gender and birth order effects	2018	7	54
PRICE L & EVANS N, <i>Sociologia Ruralis</i>	From ‘As Good as Gold’ to ‘Gold Diggers’: Farming Women and the Survival of British Family Farming	2006	6	42
CAVICCHIOLI D et al., <i>Mountain Research and Development</i>	What Factors Encourage Intrafamily Farm Succession in Mountain Areas?	2015	6	31
DIAS CSL et al., <i>Journal of Rural Studies</i>	What’s new in the research on agricultural entrepreneurship?	2019	6	80

Relevant articles

Table 3 presents a selection of research articles on various aspects of women’s entrepreneurship in agriculture, providing insight into the specific topics and their citation impact. The citations received are used as a proxy in identifying the most influential papers, ranked based on the local citations the paper has received. Local citations are citations that the article has gained cited by other articles in our database, and global citations represent the citations the paper received in total until the time the data were retrieved from the Web of Science. Notably, several publications explore the dynamics of rural entrepreneurship, such as Bock’s (2004) article on farm women’s strategies and Markantoni and Van Hoven’s (2012) case study of rural female entrepreneurs. Gender issues and roles in rural areas are addressed in works like Brandth’s (1995) examination of gender images in tractor advertisements and Rijkers and Costa’s (2012) study on gender and rural non-farm entrepreneurship. The table also reflects the global impact of this research, with some articles accumulating significant global citations, such as Sharpley and Vass’ (2006) work on attitudes of farming families in farm diversification, which garnered 211 global citations. It is worth mentioning that while the literature on this topic is rich also in the context of developing countries, most articles presented in Table 3 predominantly explore the subject in the context of developed countries, with Nagler and Naudé’s (2016) work on Sub-Saharan Africa being a notable exception.

Thematic evolution

In the analysis of thematic evolution, the focus is predominantly on the evolution of author keywords over specified time frames, as presented in Fig. 4. The thematic evolution map displays the keywords in chronological segments, allowing us to discern the shifting landscape of research focus from 1993 to 2022 and providing a visual narrative of the research field’s progression, reflecting broader trends, shifts in focus, and the emergence of new topics over time. Generic terms such as ‘women’, ‘gender’, ‘agriculture’, and names of countries have been consciously excluded to facilitate a more focused and

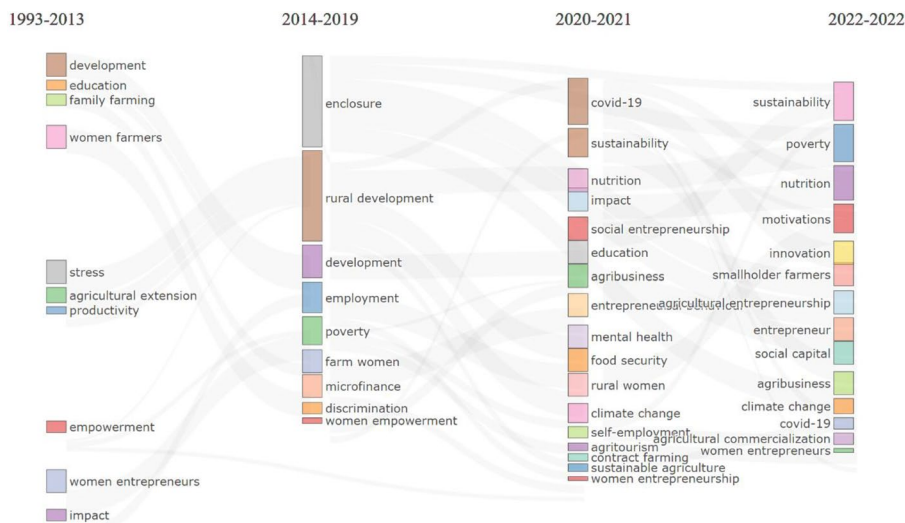


Fig. 4 Thematic evolution

refined exploration of themes. The ‘author keywords’ were used inconsistently throughout the studies in the early years, and we can note that a more consistent presence is seen from 2008 and on, where most of the papers in our domain have author keywords. The years have been divided to emphasise the literature published post-2013, as most of the available papers in the domain have been published in this period, allowing for a more detailed analysis of contemporary trends, themes, and topics.

Foundational layer (1992–2013)

Analysis of keywords in the literature on women’s entrepreneurship in agriculture reveals diverse dimensions and intrinsic interdisciplinarity. ‘Empowerment’ is a central theme that entails the involvement of women in various income-generating activities to enhance women’s autonomy and decision-making capacity within agricultural enterprises. Empowerment is discussed in our domain in terms of access to resources, such as exploring microfinance options for women and understanding their involvement in side activities and informal economies, often forming a significant portion of their entrepreneurial efforts (Khodamoradi and Abedi 2011; Markantoni and Van Hoven 2012). ‘Education’ emerges as a critical factor, potentially empowering women to take on leadership roles in agriculture. The transition of women into operational roles on farms, sometimes challenging traditional gender roles, indicates the changing educational landscape and women’s empowerment through knowledge (Gorlach et al. 2012). This trend underscores the value of customised educational programs in providing women with the skills needed to innovate and assume leadership in agriculture (Alston 2003). The keyword ‘agricultural extension’ shows the importance of disseminating vital information and technologies to women farmers, highlighting the need for and the impact of knowledge transfer in enhancing agricultural productivity and sustainability, especially under challenging conditions like climate change and food security concerns (Jafry 2012).

‘Family farming’ presents another research theme where gender dynamics play a significant role. The interplay between traditional roles and the modernisation of farms, often leading to the reactivation of women’s roles in agriculture, presents a complex narrative of family, labour, and gender (Petrou 2012). The phrase ‘women entrepreneurs’ draws attention to the gender-specific aspects of entrepreneurship, recognising the distinct challenges and prospects women face in initiating and running agricultural enterprises. Lastly, ‘productivity’ is a key measure of success in agriculture, representing the efficiency and output of agricultural activities. In this context, ‘productivity’ is explored with respect to the gendered dynamics of rural entrepreneurship and the potential for diversifying income sources, thus enriching discussions on the economic impact of women entrepreneurs in agriculture and their role in embracing sustainable methods that enhance productivity (Özdemir and Sağlam 2010).

Period of expansion and refinement (2014–2019)

The keywords from the 2014–2019 dataset highlight a range of topics that scholars have explored regarding women’s roles in agriculture and entrepreneurship. The term ‘employment’ persists as a key focus, with a broadened scope that has shifted from merely quantifying economic activity to a deeper analysis of job quality and employment conditions. Moreover, studies during this period provide a more complex insight into

employment's intersection with rural livelihoods, gender roles, and economic growth, revealing a deeper and multifaceted perspective of women's work in agriculture (Popescu and Condei 2015). 'Rural development' has transitioned from a broad concept to one increasingly intertwined with sustainability and entrepreneurship. This indicates a growing recognition that rural development is not just about infrastructure and services but also about fostering women's entrepreneurial ecosystems that sustainably support communities (Tsikata and Yaro 2014). 'Microfinance', previously often celebrated as a panacea for poverty, is now critically examined for its tangible effects on women's entrepreneurial efforts. A substantial body of research now scrutinises microfinance programs' efficacy in fostering economic empowerment and bolstering women's agricultural entrepreneurship, particularly in the context of poverty alleviation in developing nations (Nukpezah and Blankson 2017). 'Discrimination' presents itself through the exploration of systemic gender biases, such as in credit rationing (Sackey 2018) and a barrier women face in farm survival by adhering to patriarchal norms (Bozchelouie and Bozchelouie 2019). 'Enclosure' is a theme that navigates through the transformation of land and livelihoods, often intertwining with gender roles, as women negotiate their positions within changing landscapes, mainly due to inequalities triggered by the weakening of common property rights (Nyberg et al. 2015). Lastly, 'farm women' distinctly highlight the role of women in farm business management, their strategies for financial satisfaction, and their role in dealing with issues such as family breakups (Haugen et al. 2015) and succession (Cassidy 2019).

Evolution towards contemporary concerns (2020–2021)

Recent literature from 2020 forward encompasses themes such as 'agritourism', 'COVID-19', and 'climate change', demonstrating the field's adaptability to global shifts, environmental challenges, and novel entrepreneurial sectors.

Initially, the focus on 'agribusiness' as a keyword across many papers indicates a significant trend towards understanding how agriculture is not merely a subsistence activity but also a business venture that can be optimised, scaled, and integrated into larger economic systems (Jabeen et al. 2020). The term's recurrence signifies a growing awareness of agribusiness as a means to empower marginalised demographics, especially women and youth, within global rural economies (Adro and Franco 2020). Keywords like 'youth participation' and 'agripreneurial intention' underscore the need to involve the younger generation in agriculture, addressing concerns about ageing farmer populations and urban migration (Ogunmodede et al. 2020).

The evolution towards 'agritourism' signifies a diversification within the agricultural sector for women farmers, where farming is blended with tourism, adding value to agricultural products and experiences. The keyword also suggests that different diversification strategies to provide economic opportunities beyond conventional agriculture are being explored, empowering women to find success and fulfilment in the holistic aspects of agritourism (Halim et al. 2020). Furthermore, 'contract farming' emerges as a notable term, reflecting its importance and its dual impact on women in the agricultural sector. On the one hand, it offers stable income and market access, but on the other hand, it might reinforce existing gender inequalities due to the differential access to contracts and differences in payments (Kaur et al. 2021).

'Climate change' underscores the critical intersection between environmental issues and agricultural practices, focusing on how rural women entrepreneurs are affected by and can respond to climate-related challenges. Studies indicate that climate change has a disproportionate impact on rural women, who often bear the dual burden of family care and farm management amid male migration. Research highlights that while climate change itself does not inherently exhibit a gender-specific impact, its effects become gendered due to the societal roles and responsibilities predominantly shouldered by women, especially in developing countries. Studies indicate that climate change has a disproportionate impact on rural women, who often bear the dual burden of family care and farm management amid male migration (Akinbami 2021). 'Food security' is another prominent keyword in our database, as it depends on production, equitable resource distribution, and management, to which women entrepreneurs contribute significantly, especially in resource management (Zossou et al. 2021). Yet, rural women rank among the marginalised demographics vulnerable to food insecurity (Gebre et al. 2021). Finally, 'COVID-19' stands out as an important topic, having greatly disrupted the sector. It has likely led to a renewed focus on the resilience of female-led enterprises in agriculture, with the pandemic serving as a stress test for entrepreneurial ventures (Phillipson et al. 2020).

Contemporary themes (2022)

In 2022, bibliometric analysis revealed women's entrepreneurship in agriculture as a dynamic field, responding to both long-standing and emerging challenges. The enduring relevance of 'climate change' as a keyword reflects its continuous influence on research and agribusiness strategies. Studies exploring the adaptive strategies of small-scale farmers (Kom et al. 2022) signify a deep-rooted concern about the vulnerability of agriculture to climatic shocks and the imperative for resilient practices. These climate-related discussions are not just about environmental impacts but also touch upon the financial frameworks that must evolve to support the transition to climate-smart agriculture, as seen in the financing for organic agriculture adaptation (Coayla and Jiménez 2022), where women are one of the key determinants in this transition. The ongoing impact of the pandemic, indicated by the keyword 'covid-19', remains significant. The challenges and resilience of women informal food traders exemplify the adaptability of women entrepreneurs in these unprecedented times (Sinyolo et al. 2022).

'Poverty', an ever-present concern in the women's agricultural narrative, is closely examined through the lens of entrepreneurship. Examining youth self-employment choices and poverty risk highlights the economic aspects of agribusiness and entrepreneurship's role in poverty alleviation (Melak and Derbe 2022). 'Social capital' underscores the significance of social networks and relationships in the success of women entrepreneurs in increasing their economic income. Evidence from the influence of networks on farmers' incomes (Jiang et al. 2022) and self-efficacy in farm tourism (Ferreira et al. 2022) underscores the equal importance of social resources and financial capital in entrepreneurship.

'Nutrition' emerges as a pivotal aspect of agribusiness, no longer confined to productivity but expanding to encompass the empowerment of women and their communities. Moreover, women's empowerment's effect on nutrition within the food

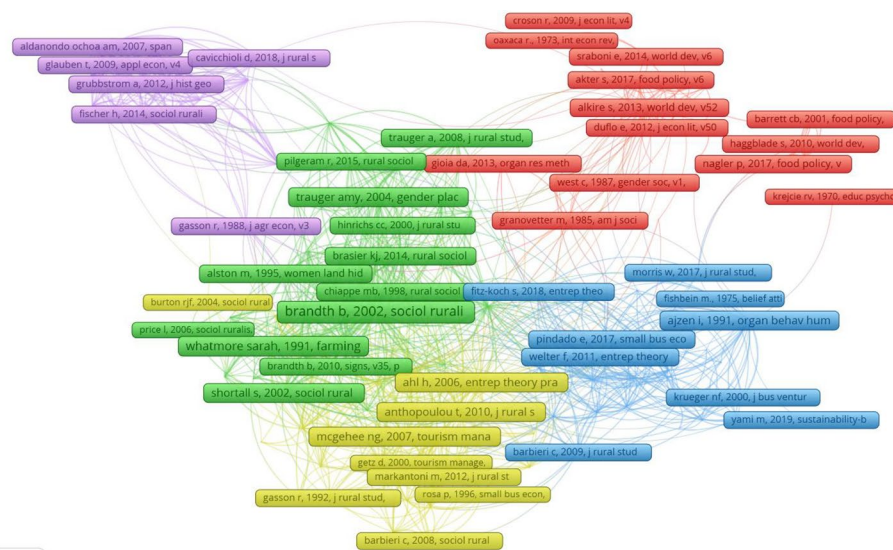


Fig. 5 Co-citation network

processing sector illustrates agribusiness’s contribution to public health and community nutrition (O’Brien et al. 2022).

And lastly, ‘innovation’ is the spark that ignites progress in agribusiness, as illustrated by the anticipation of gender impacts in scaling agricultural innovations (McGuire et al. 2022). It is not merely about technological advancements but also about shaping research and development to meet the sector’s evolving needs.

Co-citation analysis

In bibliometric analysis, the concept of co-citation plays an integral role in elucidating the interconnectedness of research articles within a particular field. Co-citation occurs when multiple articles are frequently cited together in subsequent research papers, illustrating a thematic coherence between them (Small 1973). Within the scope of this study, the co-citation network serves as a conceptual and graphical representation of the synergies between highly cited articles, revealing domains and sub-domains prevalent in the field. The graphical representation of the co-citation network is presented in Fig. 5.

Each node in the network signifies a specific article, and the links between them represent the co-citation relationships, illuminating the intertwined knowledge in the field. The size of the nodes corresponds to the citation frequency of the articles, with larger nodes indicating higher influence and citation prevalence. Conversely, the thickness of the connecting lines, or edges, between the nodes denotes the strength of the co-citation relationships, with thicker lines reflecting more frequent co-citations and, hence, a stronger association and relevance between the connected articles. In our analysis, VOSviewer software algorithmically groups co-cited articles into clusters, visually differentiated by colour coding, each representing a unique thematic area within the field based on the strength and pattern of the co-citation links. At

Table 4 Summary of research clusters from co-citation analysis of women’s entrepreneurship in agriculture

Cluster	Description	Number of articles	Key factors/keywords
Cluster 1—Women entrepreneurship in developing countries	Focuses on the role of gender dynamics in entrepreneurship within developing regions, particularly in Sub-Saharan Africa and Southeast Asia	32	Gender/gender relations/gender equality (15), Agriculture/agricultural development (12), Sub-Saharan Africa (8), Southeast Asia/South Asia (8), Women’s Empowerment (7), Financial Services/access to finance (4), Non-farm Employment/entrepreneurship (4), Poverty/inequality (3), Income/wealth/assets (3), Rural development (3)
Cluster 2—Women entrepreneurship in developed countries	Examines gender issues and the role of women in agriculture and entrepreneurship in developed nations	34	Gender/Roles/Gender Identity (15), Women’s Employment/Women’s Status (10), Family Farming/Farming-Family Configuration (6), Entrepreneurship/Entrepreneurial Learning (5), Sustainable Agriculture (4), Rural Development/Rural Society (4), Agricultural Technology (4), Women Farmers (3), Educational Programming (3), Public Goods/Civic Agriculture (3), Market Participation (3)
Cluster 3—Entrepreneurial behaviour and skills	Focuses on the development of entrepreneurial skills and the dynamics of entrepreneurship in rural areas	30	Entrepreneurship/Entrepreneurial Skills/Entrepreneurial Orientation (14), Agricultural Diversification (9), Human Capital/Social Capital (6), Farm Entrepreneurship (4), Innovation/Learning (4), Technology Adoption (3), Resource-based View/Legitimation (3), Family Business (3), Competence (3), Farmers’ Skills (3), Local Economic Development (3), Youth Engagement/Youth Aspirations (3)
Cluster 4—Women’s entrepreneurship in diversification	Investigates the role of women in farm diversification and rural business activities, particularly in agri-tourism	24	Agri-tourism/Farm Tourism (12), Diversification/Farm Diversification (10), Rural Development/Rural Society (9), Entrepreneurship (7), Gender/Gender Disparity/Gender Role (7), Small Business/Business Development (5), Family Farm (5), Economic Activity/Income (5), Pluriactivity/Off-farm Employment (4), Rural Policy/Decision Making (4), Survival Strategy (3), Empowerment (3), Socioeconomic Impact (3)
Cluster 5—Farm Succession	Analyses the challenges and dynamics of intergenerational farm succession, with a focus on gender roles	17	Farm Succession/Intergenerational Succession/Transfer (15), Family Farm/Family Farming (10), Gender (8), Education (5), Farm Growth/Farm Survival (5), Young Farmers/New Entrants (5), Rural Migration/Development (5), Agricultural Policy/Policy (3), Health and Safety (3), Aging Farmers/Farmers’ Ageing (3), Inheritance (3), Theory of Planned Behaviour/Perceived Norms (3), Generational Turnover (3)

the end of this section, Table 4 summarises the key insights derived from the clusters within the co-citation network.

Cluster 1—Women entrepreneurship in developing countries

The documents in the first cluster in the co-citation network focus on women's empowerment, gender inequality, and the role of women in agricultural and entrepreneurial contexts, with a specific emphasis on developing regions like Sub-Saharan Africa, Southeast Asia, and South Asia, delving into the dynamics of gender roles in these areas. The discourse in the documents in the first cluster is centred on non-farm income diversification, women's roles in agriculture, and gender disparities in wealth and assets, highlighting keen interest in the socio-economic challenges faced by women in agriculture.

The intersection of gender and agriculture reveals complexities in empowerment, equity, and economic participation, and researchers have been studying ways to measure the layers of empowerment using different tools, such as the Women's Empowerment in Agriculture Index (WEAI), revealing multifaceted dimensions of empowerment across different cultures (Alkire et al. 2013). The WEAI's application in Southeast Asia revealed surprising trends of gender parity in certain domains, such as access to land and control over income, challenging typical narratives of gender inequality (Akter et al. 2017). Women's empowerment is also positively associated with food security, ensuring calorie availability and dietary diversity at the household level (Sraboni et al. 2014). However, the literature indicates that women's empowerment alone may not lead to development without consistent policy emphasis on gender equality (Duflo 2012).

Concurrently, issues of financial inclusion have emerged as critical to the discourse. The gender gap in financial access, fuelled by stereotypes of women's inferiority, potentially restricts women's entrepreneurial prospects, hindering business ownership and growth (Marlow and Patton 2005). The gender asset gap is also a notable topic, underlining the systemic factors that may contribute to gender inequality in socio-economic structures (Deere and Doss 2008). The persistent wage discrimination, revealed through wage rate regressions, echoes the systemic barriers to achieving gender parity despite women's significant contributions to diversifying household income sources, especially in rural Africa (Blinder 1973). This discrimination is further underscored by gender differences in preferences and social entrepreneurship, showing that even though women have the potential for economic empowerment through collective entrepreneurship, gender biases in traditional institutions still constrain them by lowering their self-esteem (Li et al. 2022). Other studies introduce alternate viewpoints, suggesting that disparities in accessing formal financial services stem from secondary factors like lower income and education levels in women, advocating for an intersectional approach in financial policy interventions (Aterido et al. 2013).

Income diversification in rural Africa remains central to livelihood strategies, where non-farm income, in particular, is crucial to food security and poverty alleviation (Barrett et al. 2001; Owusu et al. 2010). However, the contribution of women in non-farm entrepreneurship is often underestimated, and their enterprises face challenges in experiencing lower productivity and limited market access (Haggblade et al. 2010; Nagler and Naudé, 2016). These differences are not isolated phenomena; rather, they mirror broader societal and economic inequalities (Rijkers and Costa 2012). Women's non-farm

enterprises, for instance, might not only be smaller and less productive compared to those of men but also might be limited to sectors that are typically lower in profitability and scalability. This disparity can be attributed to several factors, including differential access to capital, resources, training, and networks, as well as societal norms and expectations regarding gender roles (Rijkers and Costa 2012). Access to resources is also extended to differences in the technological adoption rate uptake by women, influenced by their limited access to essential complementary inputs like land, labour, and extension services, pointing to the need for gender-sensitive policy design in technology dissemination (Doss and Morris 2001).

Cluster 2—Women entrepreneurship in developed countries

The second cluster extensively explores the socio-cultural aspects of gender in agriculture from developed countries' perspectives, particularly in European contexts. This cluster emphasises the transformative role of women in the agricultural sector, investigating issues such as gender identity, the masculinisation of agriculture, and the implications of gender role shifts for rural societies. These studies suggest a critical evaluation of gender inequalities in farming and shed light on the transformative changes occurring, particularly focusing on women's empowerment and the influence of socio-cultural factors on their farming practices and roles. Emerging women's identities in agriculture are well documented, with an increasing trend of women identifying as farmers rather than merely as farm wives or daughters, challenging traditional gender roles on farms (Bruni et al. 2004; Sachs et al. 2016). Farm tourism's intertwining of gender and work becomes evident as farm-based tourism reshuffles traditional gender roles, leading to more managerial positions for women and diversified tasks for men (Brandth and Haugen 2010).

This cluster further explores avenues for women's growth and empowerment in developed countries. Women's pivotal roles are being more recognised, especially in introducing new practices and identities on farms, accessing new networks, and negotiating within farming families, highlighting their contributions in driving family farms towards multifunctional entrepreneurship and increasing farm income (Seuneke and Bock 2015). Women also emerge as breadwinners due to their active role in farm diversification, ensuring farm survival (Kelly and Shortall 2002). The paradigmatic shift of agriculture towards sustainable practices is argued to have potential implications for women in agriculture, as alternative agriculture could offer a more inclusive framework that aligns with a broader set of values, including community and environmental sustainability (Beus and Dunlap 1990). Value-added agriculture also offers a context in which women can gain economic and social agency; however, such economic activities must be organised in a way that does not inadvertently reproduce oppressive structures, as empowerment is not a uniform process and must be actively negotiated (Wright and Annes 2016).

The challenges and gender imbalances have also been demonstrated within the cluster. For instance, research within the Norwegian context has observed a decline in female labour participation in agriculture, suggesting persistent gender imbalances and the complexities of encouraging women's engagement in the sector despite political advocacy for gender equality (Almås and Haugen 1991). This is compounded by the challenges women face in accessing farmland, a significant barrier to their empowerment in agriculture, often having to look beyond traditional methods such as inheritance or

marriage (Pilgeram and Amos 2015). Women's progress in agricultural leadership roles is tentative in a male-dominated sector, with evolving perceptions placing women in new, occasionally contentious roles that challenge the traditional family farming status quo (Pini 2005; Price and Evans 2006). Unfortunately, the gendered nature of family farming in Europe has been a reoccurring topic, where a hegemonic discourse has traditionally subordinated women to supportive roles (Brandth 2002), although signs of detraditionalisation and diversification are emerging. However, literature reviews reveal a significant gap in economic research on female farmers, particularly in developed countries (Ball 2020), highlighting the need for more understanding of women's productivity and resource access compared to men.

Lastly, the intersection of gender and technology in agriculture is critically examined through the lens of masculine identity. The cultural construction of masculinity in rural life, further reinforced by technological appropriation, attaches masculine symbolism to agricultural technology, such as tractors symbolising male power, thus exacerbating gender role imbalances in the sector (Saugeres 2002). However, earlier studies show a changing portrayal of masculinity in tractor advertisements, signalling a departure from traditional, rugged masculinity towards a new paradigm that aligns with modern, business-oriented roles (Brandth 1995).

Cluster 3—entrepreneurial behaviour and skills

The third cluster of the co-citation analysis focuses on the intersection of entrepreneurial intentions and behaviours, emphasising the role of self-efficacy, perception, and the environmental context in shaping women's entrepreneurial activities. Ajzen's Theory of Planned Behaviour (Ajzen 1991) serves as a foundational model for understanding the cognitive aspects of entrepreneurial action, indicating that attitudes, subjective norms, and perceived behavioural control significantly influence an individual's entrepreneurial intentions. This framework is crucial in unpacking the complex decision-making processes of women entrepreneurs, whose business intentions and performances are shaped by their internal belief systems and the external socio-cultural environment. Adding to this perspective, studies on perceptual variables such as opportunity alertness and self-efficacy (Bandura 1977; Arenius and Minniti 2005) underscore the importance of these psychological traits in the entrepreneurial process. Specifically, entrepreneurial self-efficacy—the belief in one's ability to undertake entrepreneurial tasks (Chen et al. 1998)—emerges as a key driver of entrepreneurial activity. These insights are critical when considering the gendered aspects of entrepreneurship that are often shaped by specific societal norms and educational experiences, as research points to significant differences in self-efficacy between male and female entrepreneurs, which can impact their entrepreneurial intentions and actions by either empowering or constraining them (Wilson et al. 2007).

The significance of social capital in entrepreneurship is underscored through its demonstrated impact on nascent business activities and sustainability, particularly emphasising the importance of networks and community support in the entrepreneurial journey (Coleman 1988). Community interaction and business networks play a significant role in predicting entrepreneurial success, though their impact varies across the entrepreneurial

lifecycle (Davidsson and Honig 2003). Family considerations also shape entrepreneurial decisions, revealing an intricate blend of economic, social, and lifestyle factors (Hansson et al. 2013).

Studies in this cluster advocate for a nuanced comprehension of entrepreneurship, extending beyond mere skillsets to include learning processes, identity formation, and the interplay of diverse competencies (Barbieri and Mahoney 2009), and highlight the need for a more robust and contextually nuanced framework to accommodate the diverse realities and challenges women entrepreneurs face across different cultures and regions (Welter 2011; Shinnar et al. 2012).

Cluster 4—women's entrepreneurship in diversification

The fourth cluster in the co-citation network presents how gender influences the development of rural economies, particularly through agri-tourism, agro-food production, and farm management. In agritourism, studies focus on the motivations and performance of rural women in agro-food production and tourism activities. Economic constraints often put pressure on farmers to explore off-farm diversification opportunities (Nickerson et al. 2001), highlighting how women's innovative diversification activities contribute to the survival of marginal farms (Meert et al. 2005). Further research suggests that farm tourism and diversification often go hand in hand, offering an alternative income stream and the potential for sustainability in changing agricultural markets (Sharpley and Vass 2006). However, these diversification efforts are often intertwined with family obligations, seen not merely as economic ventures but as extensions of household responsibilities, enhancing family income and life quality (McGehee and Kim 2004; McGehee et al. 2007; Tew and Barbieri 2012). The economic success of these ventures is linked to factors like business longevity, operation scale, and the entrepreneur's community and market engagement (Barbieri and Mshenga 2008). However, it is also indicated that traditional gender roles and the symbolic value of 'productivist' behaviour may influence these enterprises' perceived legitimacy and success (Ollenburg and Buckley 2007).

The documents in this cluster also delve into gender roles and how female entrepreneurs navigate societal structures and their various responsibilities. A Dutch study provides valuable insights into how women entrepreneurs in off-farm settings negotiate their roles as business owners while simultaneously fulfilling traditional expectations, showcasing the complexities of gender roles and work-life balance challenges (Bock 2004). Similarly, a case study from Greece investigates the vital role of rural women in local agro-food production, exploring how entrepreneurial initiatives intertwine with family strategies, reflecting the multifaceted contributions of women in the agro-food sector and their efforts to address community needs while pursuing entrepreneurial endeavours (Anthopoulou 2010). On the contrary, an investigation into comparatively lower levels of entrepreneurial activity among rural women in Spain draws attention to potential barriers and gender disparities in specific contexts (Driga et al. 2009). The findings reveal that Spanish rural women tend to display lower involvement in entrepreneurial endeavours and are less optimistic about their entrepreneurial abilities. Interestingly, fear of failure does not significantly deter their entrepreneurial participation.

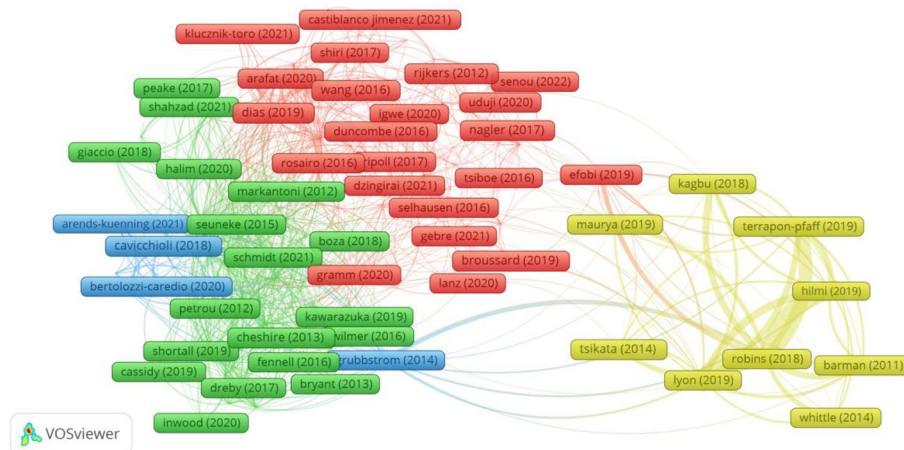


Fig. 6 Bibliographic coupling network

The shift of focus from part-time farming to pluriactivity in Europe reflects broader socio-economic changes and the need for policy research that acknowledges the complexity of family-run farms (Fuller 1990). This is complicated by the gendered division of labour, where pluriactivity challenges existing gender roles but does not necessarily empower women unless it is accompanied by shifts in traditional attitudes (Gasson and Winter 1992). This is further enhanced when analysing gender's impact on start-up capital, revealing that female entrepreneurs might face specific barriers in acquiring start-up capital due to discriminatory effects (Verheul and Thurik 2001).

Cluster 5—farm succession

The fifth cluster encompasses a set of research works that predominantly focus on the complex dynamics of farm succession and generational transmission in agricultural family businesses, shedding light on the socio-economic, psychological, policy-driven, and contextual factors that influence these processes. The study of Scottish farm families exemplifies this theme, viewing farm succession through endogenous cycles that intertwine successor identity development with farm structure changes (Fischer and Burton 2014). Similarly, research on Estonian family farms highlights the influence of emotional bonds and the transfer of intangible assets, showing how family traditions and sentiments affect succession decisions (Grubbström and Sooväli-Sepping 2012). The study shows how traditional gender roles may influence decisions about farm succession. For example, men's knowledge was generally highly valued when choosing the successor of family land, pointing to potential biases women might face in this field.

The gendered aspect of farm succession further presents itself in the findings of the Italian Alpine Valley study. It indicated a higher likelihood of intrafamily succession when the farm is managed by a woman and emphasised the key role of women in the persistence of family farming (Cavicchioli et al. 2015).

A key factor frequently identified in the literature is the role of policy support and farm growth in securing farm continuity and longevity (Mishra and El-Osta 2008; Leonard et al. 2017). It is important to note that the determinants of farm succession often extend beyond the control of policymakers and that the interplay between farm attributes and

labour market conditions is crucial in determining farm succession outcomes. The geographical context in which a farm is located and the availability of off-farm employment opportunities is additional factors that significantly impact farm succession decisions (Aldanondo Ochoa et al. 2007). Furthermore, the timing and probability of farm succession or closure in family firms are explored by Glauben et al. (2011), delving into the complex relationship between family dynamics, farm performance, and the broader economic environment.

Bibliographic coupling and future research trends

To gain deeper insights into the current trends and future priorities in the field of women's entrepreneurship in agriculture, a bibliographic coupling analysis was conducted using VOSviewer. This method allowed us to detect clusters of related documents based on shared references, thus revealing the underlying thematic structures and potential directions for future research. The analysis identified several distinct clusters, each reflecting different research foci within the broader field (see Fig. 6).

Notably, while there are similarities and some degree of overlap between the clusters identified in the co-citation and bibliographic coupling analyses, each method serves different analytical purposes. The co-citation analysis tends to highlight the foundational theories and influential works that have shaped the field over time, while the bibliographic coupling analysis is more indicative of current research trends and emerging topics that are beginning to gain traction. This section concludes with Table 5, summarising the key research focuses and future trends of the bibliographic coupling clusters.

Cluster 1: gender roles and agricultural entrepreneurship

The first cluster focuses on recent developments in gender roles within agriculture, examining how women engage in farm entrepreneurship and the challenges they encounter. This cluster reflects a growing recognition of the complex interplay between gender and agricultural practices, highlighting emerging trends that are reshaping traditional roles.

As women increasingly redefine their roles in agriculture, particularly through initiatives in agritourism, sustainable farming, and environmental stewardship, as explained in the fourth cluster of the cocitation, future research must delve into the broader implications of these shifts. For instance, the redefinition of farming identities (Newsome 2021; Savage et al. 2022; Unay-Gailhard and Bojnec 2021) presents an opportunity to explore how women's leadership in these areas can serve as a model for integrating economic development with environmental sustainability. This research could be pivotal in understanding how such leadership impacts farm productivity, sustainability, and the overall socio-economic landscape of rural communities.

Moreover, while women are carving out new spaces in agricultural entrepreneurship, they continue to face significant barriers related to resource access, safety risks, and societal expectations, as highlighted in documents like (Schmidt et al. 2021; Shortall et al. 2019). Addressing these persistent challenges requires future studies to focus on dismantling structural barriers, ensuring that female farmers can operate in safer, more equitable environments.

Table 5 Summary of research focuses and future trends identified in bibliographic coupling analysis of women's entrepreneurship in agriculture

Cluster	Focus	Future Research Trends
Cluster 1: gender roles and agricultural entrepreneurship	Explores the evolving roles of women in agriculture, particularly through agritourism, sustainable farming, and environmental stewardship	<p>Examine the broader implications of women's leadership in agritourism, diversification, and sustainable farming for economic development and environmental sustainability</p> <p>Investigate the structural barriers such as resource access, safety risks, and societal expectations to create safer, more equitable environments for female farmers</p> <p>Analyse the intersectionality of gender with family responsibilities and socio-economic contexts, focusing on policy and intervention development to support women's dual roles</p>
Cluster 2: agricultural entrepreneurship, innovation, and gender dynamics	Investigates the role of knowledge transfer, innovation adoption, and gender dynamics in shaping agricultural entrepreneurship	<p>Investigate the role of social networks and support systems in facilitating innovation adoption among women and smallholder farmers across different socio-economic environments, with a focus on identifying effective strategies and models that enhance these networks' impact</p> <p>Investigate effective knowledge transfer mechanisms, including the use of digital platforms, to empower women and smallholders, especially in regions with limited traditional knowledge sharing</p> <p>Assess the impact of foundational barriers like equitable access to land and credit to enhance the capacity for innovation and knowledge transfer</p>
Cluster 3: gendered dimensions of agricultural and rural development	Focuses on the socio-economic challenges faced by women in agricultural and rural settings, with emphasis on gender-targeted initiatives	<p>Examine the effectiveness of gender-targeted interventions in altering existing gender norms, with an emphasis on assessing how these interventions influence women's economic empowerment, particularly in terms of resource control and decision-making authority</p> <p>Explore the historical and cultural contexts that perpetuate gender inequalities, with a focus on developing culturally sensitive strategies to dismantle these patterns</p> <p>Explore strategies and tools that address structural barriers limiting women's empowerment, considering intersectional factors like class, ethnicity, and regional specifics</p>

Table 5 (continued)

Cluster	Focus	Future Research Trends
Cluster 4: farm succession and gender dynamics	Examines the complexities of farm succession, particularly the influence of gender, generational turnover, and socio-economic factors	<p>Investigate how changing societal norms and supportive policies can enhance gender equality in farm succession, with a focus on successful strategies across different regions</p> <p>Explore the impact of educational and economic interventions on equitable succession practices, particularly in different cultural and economic contexts</p> <p>Focus on policy measures that support farm succession in marginal and less-favoured regions, including cooperative models and new technologies to maintain farm viability</p>

Another critical area for future research lies in the intersectionality of gender with family responsibilities and socio-economic contexts; for example, Rissing et al. (2021) emphasize the unique pressures women face in balancing childcare and farm management. Future research should aim to develop policies and interventions that effectively support women in these dual roles, allowing them to thrive in their agricultural pursuits without compromising family responsibilities.

Furthermore, the socio-economic contributions of women in areas like agritourism and farm diversification, as highlighted by (Halim et al. 2020; Savage et al. 2022), underscore the need to recognise and support these multifaceted roles. Future research should explore how these contributions can be better integrated into rural development strategies, with a particular focus on preserving cultural heritage and promoting sustainable tourism practices.

Cluster 2: agricultural entrepreneurship, innovation, and gender dynamics

Cluster 2 explores the critical role of knowledge transfer and innovation adoption in shaping agricultural entrepreneurship, particularly within the context of gender dynamics and diverse geographical regions. The studies in this cluster collectively emphasise how access to resources, social networks, and tailored support systems can significantly influence the ability of women and smallholder farmers to innovate and succeed in agricultural ventures.

As highlighted in many documents in this cluster (De Rosa et al. 2021; Gramm et al. 2020), the effectiveness of innovation adoption is significantly linked to the strength of social networks and the availability of support systems. Future research should investigate how these elements can be optimised in varying socio-economic environments, especially in rural areas where these networks may be underdeveloped, to create interventions that facilitate widespread innovation adoption among women and smallholders. Knowledge transfer plays a crucial role in sustaining innovation over time (Arafat et al. 2020; Bannor et al. 2021). Future research could focus on identifying the most effective knowledge transfer mechanisms that empower women and smallholder farmers, particularly in regions where traditional knowledge sharing might be constrained. This research could also explore how digital platforms and other modern communication tools can enhance knowledge exchange in agricultural communities.

Geographically, the cluster spans regions such as Sub-Saharan Africa, India, and Europe, each offering unique insights into the challenges and opportunities for innovation adoption. For example, studies in this cluster (Igwe et al. 2020; Wale et al. 2021) examine how local factors such as education, market access, and land tenure systems impact the ability of smallholder farmers in Nigeria and South Africa to adopt innovative practices. These findings underscore the importance of context-specific research that can identify scalable solutions for promoting innovation across different agricultural settings.

Moreover, while innovation and knowledge transfer are central to this cluster, future studies should not overlook the foundational barriers that can either enable or hinder these processes. For instance, equitable access to resources like land and credit remains a critical issue, as noted in (Efobi et al. 2019). Future research should explore how to address these barriers to enhance the capacity for innovation and knowledge transfer,

particularly among women and smallholder farmers who are often the most disadvantaged in accessing these resources.

Cluster 3: gendered dimensions of agricultural and rural development

Cluster 3 explores the socio-economic challenges faced by women in agricultural and rural settings, focusing on how gender intersects with other socio-economic factors. A key theme is the effectiveness of gender-targeted initiatives in agriculture. For instance, research on 'smart-economic' initiatives in Mexico's coffee industry reveals that while these programs aim to empower women, they often reinforce traditional gender roles rather than challenge them, limiting women's economic decision-making power and access to resources like land (Lyon et al. 2019). Similarly, studies on large-scale infrastructure projects in Morocco show that while these projects are generally well-received, the benefits are not always equitably distributed, with women potentially marginalised (Terrapon-Pfaff et al. 2019). Future research should focus on refining gender-targeted interventions to ensure they effectively challenge rather than reinforce existing gender norms, as more in-depth studies are needed to explore the nuances of how these initiatives operate in different cultural and economic contexts. For example, future work could examine how to design programs that genuinely empower women by increasing their control over economic resources and decision-making processes, moving beyond tokenistic participation.

The historical and cultural contexts influencing gender roles are another critical area of focus. Research reveals longstanding patterns of marginalisation that continue to affect women's roles in agriculture today (Tsikata and Yaro 2014). Future research should explore how to dismantle these deep-rooted gender inequalities by addressing the cultural and historical factors that perpetuate them. This might involve comparative studies across different regions to identify best practices and develop culturally sensitive strategies that can be adapted to various settings.

Additionally, women farmers face several socio-economic constraints such as limited access to resources and health-related issues tied to their occupational roles (Mosha 2003). Future research should aim to design gender-targeted interventions that not only include women but also address the structural barriers limiting their empowerment. This includes focusing on intersectional factors like class and ethnicity and considering regional and cultural specifics to create more effective and equitable agricultural policies.

Cluster 4: farm succession and gender dynamics

Cluster 4 builds on themes previously identified in the co-citation analysis, where farm succession, particularly the influence of gender, generational turnover, and socio-economic factors, emerged as critical areas of study. In the bibliographic coupling analysis, this topic evolves to explore further the complexities and emerging challenges associated with farm succession, emphasising how these dynamics are influenced by changing societal norms, educational attainment, and economic viability.

The gendered nature of farm succession remains central, as traditional norms continue to favour male heirs. For example, research such as Cavicchioli et al. (2018), examining farm succession in Italy, reaffirms that male and first-born children are more likely

to inherit the family farm, reflecting persistent traditional beliefs. Similarly, studies on Irish farms (Cassidy 2019) explore different pathways for female successors, suggesting that while opportunities for women in farming are expanding, they remain constrained by existing gender norms. As this topic evolves, future research should focus on how changing societal norms and supportive policies can further enhance gender equality in farm succession, identifying successful strategies across different regions that overcome these persistent barriers. Moreover, education and market conditions are increasingly recognised as crucial factors in shaping succession outcomes. This evolution suggests that future research should investigate how educational and economic interventions can lead to more equitable succession practices. There is a growing need to explore the long-term impacts of these interventions across various cultural and economic contexts, focusing on enhancing the marketability and competitiveness of farms managed by women.

The challenges of farm succession in marginal and less-favoured regions also receive more nuanced attention in this cluster. Studies (Bertolozzi-Caredio et al. 2020; Cavicchioli et al. 2015) emphasize the importance of individual and familial factors in succession decisions, suggesting that policy interventions should not only target the willingness of successors but also ensure the economic viability of farms. Future research could expand on this by focusing on innovative policy measures that support succession in these challenging environments, such as cooperative models or the use of new technologies to maintain farm viability. Investigating how these strategies can be adapted to different regional contexts will be crucial for sustaining family farms in less-favoured areas.

Conclusions

This study's bibliometric analysis reveals the dynamic role of women entrepreneurs in agriculture, emphasising their critical contributions to sustainability, socio-economic development, and food security across both developed and developing countries. Through an extensive review of literature spanning three decades, we have highlighted not only the achievements but also the systemic challenges faced by these women, including gender biases and resource limitations. A significant rise in scholarly interest, as indicated by the increase in publications, citations, and authorship, marks the importance of this field within the academic community. Yet, the underrepresentation of international collaborations points towards an opportunity for enhanced global knowledge exchange and partnership, which could bridge existing knowledge gaps and integrate diverse perspectives.

The findings from our analysis highlight a persistent gender gap in entrepreneurial engagement and the unique challenges women face due to deeply ingrained societal norms and structural inequalities. However, the study also brings to light the resilience and innovative capacity of women in agriculture, demonstrating how they navigate and overcome these barriers to contribute significantly to the sector's sustainability and the broader socio-economic landscape. Key themes emerging from the literature include the critical importance of empowerment, education, access to resources, and the impact of gender roles on women's entrepreneurship in agriculture. These themes are crucial for understanding the multifaceted nature of women's entrepreneurship in agriculture and for identifying the levers of support that can enhance their participation and success.

The evolution of research themes over time also reflects a growing recognition of the need for a more nuanced understanding of women's roles in agriculture, moving beyond traditional perspectives to acknowledge their entrepreneurial spirit, leadership, and contribution to innovation and sustainability in the sector. Moreover, the research indicates a shift from viewing agriculture as a site of productivity to acknowledging it as a complex arena where sustainability, economic vitality, and gender empowerment intersect. This shift is particularly evident when comparing the experiences of women entrepreneurs in agriculture between developed and developing countries, which has emerged as a recurring theme in the literature. The thematic evolution also points to emerging concerns such as climate change, COVID-19, and the need for sustainable and innovative agricultural practices, which present both challenges and opportunities for women entrepreneurs in agriculture.

The co-citation analysis has revealed a strong network of scholarly works, with distinct clusters focusing on various dimensions of women's entrepreneurship in agriculture, especially in comparing the research in developed and developing countries. The comparison between the two contexts reveals a common thread of resilience and adaptability among women entrepreneurs facing systemic constraints, though the nature of their constraints and coping strategies varies significantly. In developing countries, women's agricultural roles are often seen as extensions of their domestic responsibilities. Even though the participation of women in entrepreneurship is higher in these regions, their entrepreneurial endeavours are frequently driven by necessity rather than opportunity, a response to poverty and limited employment options. This necessity-driven entrepreneurship is critical for livelihoods but often lacks the support and recognition needed to transform into sustainable, growth-oriented businesses. In contrast, in developed countries, women in agriculture often battle traditional gender roles and stereotypes, which typically relegate them to secondary positions in farming enterprises. The European context, in particular, showcases a lower percentage of women in agricultural entrepreneurship compared to their counterparts in developing regions.

The bibliographic coupling analysis highlighted current trends and future research priorities in women's entrepreneurship in agriculture. Emerging themes include the evolving role of gender dynamics, challenges related to resource access, the impact of societal expectations, the importance of knowledge transfer, innovation adoption, and the intersection of gender with socio-economic factors. Future studies should explore how these changes impact farm productivity and rural socio-economic structures, address ongoing barriers related to resource access and societal expectations, and identify effective knowledge-sharing mechanisms, particularly in rural areas. Additionally, there is a need to overcome foundational barriers such as access to land and credit and to refine gender-targeted interventions that challenge existing norms and empower women economically.

The paper's limitations stem from the dataset's focus on English language publications, potentially overlooking significant contributions in other languages. The exclusion of grey literature and non-peer-reviewed sources might also limit the breadth of perspectives. Furthermore, the reliance on bibliometric databases could introduce a bias towards more frequently cited articles, which may not necessarily represent the most current or regional-specific challenges and innovations.

In conclusion, the bibliometric analysis illustrates that women's entrepreneurship in agriculture is not a static field but an evolving dialogue between tradition and innovation, survival and empowerment, local practices, and global challenges. The study points to an increasing recognition of the critical role of women in driving innovation and sustainability in agriculture by academic research while underscoring the need for future research to address the gaps and challenges identified. It calls for a multidimensional approach that considers the unique contexts of women entrepreneurs in different economic settings. By focusing on these areas, there is potential to enhance the contribution of women in agriculture, leading to more sustainable, equitable, and resilient agricultural practices.

Abbreviations

EU	European Union
MCP	Multiple-country publications
NP	Number of published articles
SCP	Single-country publications
SME	Small- and medium-sized enterprises
TC	Total citations
TP	Total publications
TS	Topic searches
USA	United States of America
WEAI	Women's Empowerment in Agriculture Index
WoS	Web of Science

Author contributions

RV conceived the study, drafted the manuscript, and analysed and interpreted the data. GR drafted and revised the manuscript critically for important intellectual content and contributed to data analysis. CM focused on revising the manuscript critically for key intellectual content. SM provided the initial information and data essential for the study's conceptualisation. SC supervised the entire work and contributed to its critical revision. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets analysed during the current study are available from the corresponding author upon reasonable request.

Declarations

Consent to publications

During the preparation of this work, the author(s) used Chat GPT for linguistic purposes. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the publication's content.

Competing interests

None.

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