

Mapping the Research Outputs of Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya: A Bibliometric Analysis

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Abstract

This study analysed the research publications of Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur published between 2019 and 2023. The study used bibliometric method to analyse the research publications data retrieved from the Scopus database. Microsoft Excel, Google Spread Sheet and Biblioshiny were used for analysis and visualisation. A total of 751 records were retrieved from the Scopus database and the analysis aimed to assess the institution's annual research productivity, explore the diversity in publication types, identify the top ten research areas by subject, determine the most frequently utilised publication journals, and demonstrate the patterns of international collaboration and affiliations.

Keywords: Bibliometric Analysis, Research Output, CSKHPKV, Himachal Pradesh, Biblioshiny

Introduction

Choudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya (CSKHPKV), formerly known as Himachal Pradesh Krishi Vishvavidyalaya, Palampur, was established on 1st November 1978, marking a significant milestone in the field of agricultural education and research in India. The university's inception was based on the foundation laid by the College of Agriculture, which was established in May 1966 and later became the nucleus of the new farm university. Over the years,

CSKHPKV has been recognised for its outstanding agricultural research and education contributions. This is evident from its accreditation by the Indian Council of Agricultural Research (ICAR) and certification under ISO 9001:2015. The institution's commitment to excellence has been further acknowledged through its ranking at 14th among all farm universities in the country by the ICAR. Additionally, CSKHPKV's significant contributions to the development of human resources, varieties and technologies have been instrumental in enabling the state of Himachal Pradesh to secure the prestigious "Krishi Karman Award" from the Government of India four times in a row for outstanding food grain production among the small states of the country (CSK Himachal Pradesh Agricultural University, 2024).

Bibliometric analysis is a widely adopted approach to comprehensively examine and interpret large scientific datasets. This method plays a crucial role in identifying the developmental trends and emerging domains in different fields of study. According to Donthu et al. (2021), bibliometric techniques offer valuable insights into the evolutionary dynamics of a discipline, highlighting areas that require further exploration. These methodologies are highly useful for informing research strategies, resource allocation and recognising scientific achievements, serving as a cornerstone for decision-making in various scientific endeavours (Mejia et al., 2021). Bibliometric method has become an important tool in the academic and research community for tracking research productivity and identifying influential works and collaboration patterns within and across disciplines. The aim of the present paper

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was to conduct a bibliometric analysis of the research output of CSKHPKV. Through this analysis, the paper offers a comprehensive overview of the research outputs at CSKHPKV, identifying trends, strengths and areas of potential growth in agricultural research and education. By analysing the scholarly contributions of CSKHPKV, this study aims to emphasise the institution's impact on the agricultural sector and provide valuable insights that can guide future research initiatives, collaboration strategies and policy formulation.

Review of Literature

The dynamic landscape of academic and research output in India is highlighted by the growing interest in scientometric and bibliometric studies across a wide range of disciplines of study, especially in engineering, technology, central universities and agricultural research. These analyses span diverse institutions, including the National Institutes of Technology (NITs), Indian Institutes of Technology (IITs), Central Universities and agricultural research institutions. These reflect the patterns and practices of scholarly activities and collaborations within India and with global partners.

A study by Hosamani and Bagalkoti (2014) highlights the exponential growth of Indian engineering research, as evidenced in the Web of Science database from 1999 to 2013. Similarly, Babu et al. (2010) and Muruli and Harinarayana (2023) provide insights into the digital footprint of Indian academia through webometric and scientometric analyses of central universities' websites and faculty publications in the Western Himalayan region, respectively, revealing significant online visibility and scholarly output. Shettar and Hadagali (2022) highlight the NITs' significant contributions to engineering and technology research between 2010 and 2019, highlighting high levels of collaboration and influential publications. This theme is also present in the work of Singh and Singh (2018) and Patel (2017) regarding the productivity of research in computer science at the IITs and NIT Hamirpur.

In the domain of higher education institutions, studies by Sangam and Bagalkoti (2010) and Chauhan (2018) explore the academic rankings and research performance of Indian universities and institutions, employing scientometrics to assess publication growth, collaboration

and impact factors, which serve as critical benchmarks for academic excellence and influence. The agricultural research field studies by Hasan (1999) and Tripathia and Gargb (2010), their study highlights India's significant contributions to cereal crop science research and the bibliometric characteristics of publications in the Himachal Journal of Agricultural Research, pointing to significant research focuses, prolific institutions and the crucial role of collaborative efforts.

Objectives of the Study

The study aims to examine and understand the research output and collaborations of CSKHPKV, Palampur, with specific goals:

- To assess the year-wise productivity of CSKHPKV, in terms of research publications.
- To analyse the types of publications emerging from the university.
- To identify the top ten research areas, underlining the institution's subject-wise focus.
- To determine the preferred sources for publication by the faculty and researchers of CSKHPKV.
- To understand the authorship and collaboration patterns in the research publications.
- To explore patterns of scholarly collaboration, including collaborating countries and institutions.

Methodology

Data Collection

The Scopus database was used to retrieve the research publications data of the CSKHPKV; the Scopus was selected for its extensive indexing of scientific articles (Elsevier, 2023). The search query used to fetch the relevant data was: AF-ID ("CSK Himachal Pradesh Agriculture University" 60021100) AND (LIMIT-TO (PUBYEAR, 2023) OR LIMIT-TO (PUBYEAR, 2022) OR LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2019)). This query was applied to capture all publications affiliated with the university from 2019 to 2023. A total of 751 research publications were exported in CSV file format. The data was retrieved on 5th March 2024, ensuring the

most current information was used for the analysis.

Data Analysis

The data analysis and processing were performed using Microsoft Excel and Google Sheets. Their features were crucial in helping to arrange the data, carry out initial analyses and prepare it for more thorough bibliometric analysis. Biblioshiny, a graphical user interface for Bibliometrix in R Studio (Aria & Cuccurullo, 2017), was used for keyword analysis and visualisation.

Data Analysis and Interpretation

Analysis of Research Output Growth

Table 1 presents the year-wise growth of research output from CSKHPKV over five years. The data was analysed in terms of total publications (TP) and its percentage. The data reflects a significant growth in the research output over the observed period. Notably, 2022 has the highest number of publications (223), accounting for nearly 30% of the total research output in the five years. There is a slight decrease in the TP in 2023, yet the numbers remain significantly higher than in the initial years, showcasing a sustained high research activity. In 2019, the university had the lowest output, suggesting a growing trend in research productivity at the university, starting from a lower base. Overall, the year-wise distribution of research output highlights positive progress in scholarly publications, with a peak in 2022.

Table 1: Research Output from CSKHPKV (2019-2023)

Sr. No.	Year	TP	%
1	2023	155	20.64
2	2022	223	29.69
3	2021	139	18.51
4	2020	127	16.91
5	2019	107	14.25
Total		751	100

Annual Growth Rate Analysis

The Compound Annual Growth Rate (CAGR) of research publications is calculated using the formula:

$$(CAGR = (EndingValue/StartingValue)^{\{1/NumberofYears\}} - 1)$$

Applying this formula to the data provided: Ending Value = Total Publications in the final year of the period (2023), Beginning Value = Total Publications in the first year of the period (2019), n = Number of periods (years) = 5 - 1 = 4.

Start Value (2019 TP): 107; End Value (2023 TP): 155; Number of Periods: 4 years. Therefore, the annual growth rate of research output at CSK Himachal Pradesh Agriculture University from 2019 to 2023 is approximately 9.72%.

Table 2: Distribution of Document Types

Sr. No.	Document Type	TP	%
1	Article	562	74.83
2	Book Chapter	95	12.65
3	Review	75	9.99
4	Book	5	0.67
5	Note	5	0.67
6	Conference Paper	3	0.40
7	Editorial	2	0.27
8	Erratum	2	0.27
9	Letter	1	0.13
10	Short Survey	1	0.13
Total		751	100.00

Distribution of Research Publications by Document Type

The data in Table 2 reveals a significant emphasis on articles, which constitute 74.83% of TP that, indicates a strong preference for this format in communicating research. Book chapters follow at 12.65% and Reviews account for 9.99%. Other document types, such as books,

notes and conference papers, collectively form a smaller portion of the output, illustrating a varied but focused scholarly communication approach. This distribution emphasises the university's commitment to contributing to peer-reviewed literature while engaging with the broader academic dialogue through various formats.

Subject-Wise Distribution of Publications

The Table 3 highlights a strong focus on Agricultural and Biological Sciences research, which dominates the

scholarly output with 71.77% of the TP. This emphasis highlights the university's foundational commitment to advancing agricultural sciences and related biological studies, aligning with its mission and regional agricultural priorities. Biochemistry, Genetics and Molecular Biology also hold a significant share (21.97%), reflecting a multidisciplinary approach. Overall, this distribution showcases CSKHPKV's dedication to agricultural research while also engaging in varied scientific disciplines.

Research Area	2018	2019	2020	2021	2022
Quantum Computing	12	18	25	30	35
Artificial Intelligence	45	52	60	68	75
Renewable Energy	8	10	12	15	18
Space Exploration	5	7	9	11	13
Autonomous Vehicles	15	20	25	30	35

<i>Sr. No.</i>	<i>Subject Area</i>	<i>TP</i>	<i>%</i>
1	Agricultural and Biological Sciences	539	71.77
2	Biochemistry, Genetics and Molecular Biology	165	21.97
3	Environmental Science	131	17.44
4	Veterinary	128	17.04
5	Engineering	55	7.32

Keyword Trends in Agricultural Research

The keyword analysis (Fig. 1) highlights key research areas in CSKHPKV, with a strong focus on crop sciences. “Wheat,” “Himachal Pradesh,” and “yield” are the top keywords, indicating significant interest in wheat cultivation and agricultural productivity within this region. Other frequently mentioned terms like “genetic diversity,” “maize,” and “resistance” suggest a broad engagement with plant breeding, disease management

and crop improvement. The presence of keywords related to advanced genetic research, such as “genomics” and “molecular markers,” points towards efforts in leveraging modern technologies for crop enhancement. Additionally, terms like “environment,” “heat stress,” and “biofortification” reflect concerns over environmental challenges and the nutritional quality of crops. Overall, the keyword analysis reveals a multi-disciplinary approach to improving agricultural outcomes, focusing on sustainability, crop resilience and food security.



Fig. 1: Top 50 Author Keywords

Collaboration with Other Institutions

Table 4 presents the list of top 10 institutions that CSKHPKV, has research collaborations. Dr. GC Negi College of Veterinary and Animal Sciences top the list with 99 research collaborations, followed by Punjab Agricultural University (69) and the ICAR (59). The data indicates strong collaboration within the agricultural and veterinary sciences fields. Collaboration with ICAR institutions and specialised universities like Dr.

Yashwant Singh Parmar University of Horticulture and Forestry emphasises CSKHPKV's engagement in broad agricultural, horticultural and forestry research. Additionally, collaborations with universities such as Panjab University and Shoolini University reflect interdisciplinary research interests, extending beyond agriculture. Overall, the Table 4 data highlights CSKHPKV's commitment to advancing agricultural research through varied partnerships, enhancing its research impact across different scientific domains.

Table 4: Top 10 Collaborating Institutions

Sr. No.	Name of Collaborating Affiliation	TP	%
1	Dr. GC Negi College of Veterinary and Animal Sciences	99	13.18
2	Punjab Agricultural University	69	9.19
3	Indian Council of Agricultural Research	59	7.86
4	ICAR - Indian Agricultural Research Institute, New Delhi	48	6.39
5	Dr. Yashwant Singh Parmar University of Horticulture and Forestry	47	6.26
6	Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir	22	2.93
7	ICAR- Indian Grassland and Fodder Research Institute, Jhansi	20	2.66
8	Panjab University	19	2.53
9	Shoolini University	18	2.40
10	Institute of Himalayan Bioresource Technology India	16	2.13

International Collaborations

Table 5 presents the global partnership patterns of CSKHPKV, according to the data the major international collaborating country is United States. Australia comes next as a major partner, demonstrating a strong connection between these nations and India in agricultural research and development. The diversity of nations such as China, the UK and Spain, among others, is indicative of the international scope and multi-disciplinary character of CSKHPKV's research initiatives. These kinds of worldwide partnerships not only enhance the quality and significance of research but also make it easier to share best practices, innovations and information in the agricultural sciences and allied domains.

Table 5: Top 10 Collaborating Countries

Sr. No.	Country	TP	%
1	United States	29	3.86
2	Australia	20	2.66
3	China	9	1.20

Sr. No.	Country	TP	%
4	United Kingdom	9	1.20
5	Pakistan	6	0.80
6	Spain	6	0.80
7	Japan	5	0.67
8	South Korea	5	0.67
9	Belgium	4	0.53
10	Denmark	4	0.53

Authorship Trends in Research Publications

The collaborative nature of academic research is evident in the distribution of authors in publications as shown in Table 6. The majority of articles have between two and six authors, collectively representing about 72.80% of all publications. Single-authored papers make up a minor portion at 4.53%, emphasising the complexity and interdisciplinary approach often required in contemporary research. Publications with more than 10 authors, though less common at 6.79%, indicate extensive collaborative projects, possibly involving multi-institutional or

international cooperation. Variations in authorship across different publication types reflect disciplinary practices and research nature, with Conference Papers typically having three authors, suggesting a focused approach.

These authorship patterns reinforce the significance of collaboration in advancing scientific knowledge, reflecting the interdisciplinary and complex nature of modern research and development activities.

Table 6: Distribution of Publications by Number of Authors

No of Authors	Article	%	BBC	%	Review	%	CP	%	Other Types	%	Total	%
1	11	1.96	22	22.00	0	0.00	0	0.00	1	9.09	34	4.53
2	87	15.48	15	15.00	11	14.67	0	0.00	3	27.27	116	15.45
3	100	17.79	15	15.00	9	12.00	2	66.67	1	9.09	127	16.91
4	106	18.86	12	12.00	10	13.33	0	0.00	1	9.09	129	17.18
5	81	14.41	15	15.00	14	18.67	1	33.33	2	18.18	113	15.05
6	66	11.74	12	12.00	8	10.67	0	0.00	2	18.18	88	11.72
7	27	4.80	1	1.00	9	12.00	0	0.00	0	0.00	37	4.93
8	18	3.20	2	2.00	3	4.00	0	0.00	1	9.09	24	3.20
9	14	2.49	2	2.00	1	1.33	0	0.00	0	0.00	17	2.26
10	12	2.14	1	1.00	2	2.67	0	0.00	0	0.00	15	2.00
More than 10	40	7.12	3	3.00	8	10.67	0	0.00	0	0.00	51	6.79
Total	562	100	100	100	75	100	3	100	11	100	751	100

Note: BBC=Book & Book Chapter, CP=Conference Paper.

Funding Sources for Research

Table 7 lists the top five funding agencies that sponsor and provide financial support in facilitating scientific inquiry and innovation at CSKHPKV. The ICAR ranks the list with funding for 61 publications or research initiatives, which illustrates its significant investment in agricultural advancements. This is followed by sponsor

from the Department of Science and Technology and the Department of Biotechnology, both under the Ministry of Science and Technology, India, which highlights the government's commitment to strengthen research in science and technology. The list also reveals the diversity of funding bodies, including national research councils, international universities, and specific departments, reflecting a wide-ranging support network that support the university's research ecosystem.

Table 7: Top 5 Funding Sponsors

Sr. No.	Funding Sponsor	TP	%
1	Indian Council of Agricultural Research	61	8.12
2	Department of Science and Technology, Ministry of Science and Technology, India	28	3.73
3	Department of Biotechnology, Ministry of Science and Technology, India	23	3.06
4	University Grants Commission	19	2.53
5	Council of Scientific and Industrial Research, India	16	2.13

Most Frequently Preferred Journals for Publications

Table 8 highlights the primary journals where CSKHPKV researchers frequently disseminate their findings. The *Indian Journal of Animal Sciences* tops the list that highlights its pivotal role within India's research

ecosystem. Following closely is the *Indian Journal of Entomology*, showcasing the critical role entomological research plays in India's agriculture-focused studies. Most listed journals are Indian, mirroring the country's robust input into agricultural research. However, the inclusion of journals from the United States, introduces an international perspective to the publishing landscape of

agricultural sciences. The provided h-index and quartile metrics highlights the journals' influence. These journals cover a wide range of subjects, from animal sciences and

entomology to plant nutrition and soil science, illustrating the multi-faceted nature of agricultural research.

Table 8: Top Five Journals

Sr. No.	Journal	TP	%	Country of Publisher	Publishers	h-index	Quartile (2022)	SJR (2022)
1	Indian Journal of Animal Sciences	33	4.39	India	Indian Council of Agricultural Research	26	3	0.2
2	Indian Journal of Entomology	32	4.26	India	The Entomological Society of India	4	4	0.12
3	Legume Research	19	2.53	India	Agricultural Research Communication Centre	18	2	0.39
4	Indian Journal of Ecology	14	1.86	India	Indian Ecological Society	10	NA	NA
5	Journal of Plant Nutrition	14	1.86	United States	Taylor and Francis Ltd.	85	2	0.54

Note: Data retrieved from SCImago Journal Rank and the metrics based on Scopus® data as of April 2023; NA= Not yet assigned quartile.

Table 9: Highly Cited Articles

Sr. No.	Title	Year	Source Title	Citation	DOI
1	Soil Salinity and Food Security in India	2020	Frontiers in Sustainable Food Systems	175	doi:https://doi.org/10.3389/fsufs.2020.533781
2	The role of disinfectants and sanitizers during COVID-19 pandemic: advantages and deleterious effects on humans and the environment	2021	Environmental Science and Pollution Research	99	doi:https://doi.org/10.1007/s11356-021-14429-w
3	Developing Climate-Resilient Chickpea Involving Physiological and Molecular Approaches With a Focus on Temperature and Drought Stresses	2020	Frontiers in Plant Science	92	doi:https://doi.org/10.3389/fpls.2019.01759
4	The Rise of the CRISPR/Cpf1 System for Efficient Genome Editing in Plants	2020	Frontiers in Plant Science	64	doi:https://doi.org/10.3389/fpls.2020.00264
5	Recent Advances in Materials, Parameters, Performance and Technology in Ammonia Sensors: A Review	2020	Journal of Inorganic and Organometallic Polymers and Materials	52	doi:https://doi.org/10.1007/s10904-019-01208-x

Note: The total citation data is retrieved from the Scopus database as of 5th March 2024.

Highly Cited Articles

Table 9 showcases the top five highly cited research articles published from CSKHPKV. The article “Soil Salinity and Food Security in India” published in 2020 leads the list with 175 citations, highlighting the critical importance of addressing soil salinity for

ensuring food security, a pivotal issue in agricultural research. Following closely is a study on “The role of disinfectants and sanitizers during the COVID-19 pandemic” with 99 citations, which reflects the timely and relevant research conducted in response to the global health crisis, emphasising the environmental and human health considerations of widespread disinfectant

use. The list further includes innovative research in the fields of climate-resilient agriculture, genome editing technologies, sensor development and geriatric care during the pandemic, showcasing the diverse research interests and expertise within the university. Notably, articles on developing heat tolerance in crops, microbial proteases and the health implications of vegetable bioactive compounds illustrate the institution's contributions towards addressing global challenges in agriculture, biotechnology and health.

Findings and Conclusion

The analysis of CSK Himachal Pradesh Agriculture University's research output from 2019 to 2023 reveals a dynamic institution with a growing impact in the academic world. Key findings include:

- A notable increase in research output, peaking in 2022, with a Compound Annual Growth Rate (CAGR) of approximately 9.72%, indicating vibrant research activity and productivity.
- A strong preference for publishing articles, making up 74.83% of total outputs, emphasising the institution's commitment to high-quality, peer-reviewed research.
- A significant focus on Agricultural and Biological Sciences (71.77% of publications), aligning with the university's mission and regional agricultural needs, and addressing key challenges through targeted research areas.
- The impact of the university's research is evidenced by citations, particularly in critical areas such as soil salinity, food security and the COVID-19 pandemic response.
- Extensive national and international collaborations and diverse funding sources highlight the university's broad network and the trust placed in its research capabilities by various funding bodies.

In conclusion, CSK Himachal Pradesh Agriculture University has demonstrated substantial growth and strategic focus in its research endeavors, particularly in agriculture and biological sciences. Its commitment to research excellence, collaboration and addressing societal needs positions it as a key contributor to scientific and community advancements.

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