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Measuring research growth of National Dairy Research Institute: A quantitative analysis

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ABSTRACT

This study assesses the institution's research and intellectual property output from 2016–17 to 2024–25 in terms of books, journal articles, and patents that were awarded. The ecosystem exhibits both a purposeful shift toward quality and strong long-term growth. With chapters accounting for 88.72% of the portfolio, annual book and chapter production reached a 48.48% Cumulative Growth Rate (CGR) (5.07% CAGR). Despite severe volatility, including a brief collapse to zero output in 2023–2024, the patent pipeline had the strongest long-term expansion, rising by 166.67% cumulatively (13.06% CAGR). On the other hand, cumulative annual journal articles decreased by 33.26% (-4.93% CAGR). While mid-tier journals having NAAS between 6–9.99 maintained a steady bedrock presence at 52.4% of the total volume, elite journal publications (NAAS $\geq$ 10) increased from 7 to a peak of 55, indicating a purposeful shift toward high-impact research. To summarize, these patterns validate an emerging research paradigm that trades off lower amounts for better academic rankings and technological innovation.

Keywords: NDRI, Publications, Patents, Productivity, CAGR

Introduction

The ICAR-National Dairy Research Institute (NDRI) located in Karnal, Haryana is a leading institution in the dairy industry. The Institute has significantly aided the expansion of the Indian dairy sector and has been instrumental in establishing India as a prominent global milk producer through its research and advancements in dairy science. NDRI, with a history exceeding a century, traces its origins to the Imperial Institute for Animal Husbandry & Dairying, established in Bangalore in 1923 as a hub for dairy education. It was re-located to its current location in Karnal in 1955 and rebranded as the National Dairy Research Institute. The facilities of the Imperial Institute were preserved as the Southern Regional Station of NDRI, and subsequently, in 1964, the Eastern Regional Station was established in Kalyani, West Bengal. NDRI was placed under the jurisdiction of the Indian Council of Agricultural Research (ICAR) in 1970. The Institute is recognized as a Deemed to be University for its academic programs since 1989. NDRI achieved the top position among all Agricultural Universities in India for five consecutive years in the ICAR rankings from 2016 to 2021. The Institute has received accreditation from the National Agricultural Education Accreditation Board, ICAR, valid until 2026. In 2024, ICAR-NDRI achieved the second position in the National Institutional Ranking Framework (NIRF)-2024 within the Agriculture and Allied Category of the Union Ministry of Higher Education, Government of India. The Institute possesses ISO 9001:2015 certification. This distinctive campus features residential structures, numerous fully equipped research laboratories, and landscaped areas with enduring flora and gardens. The Institute provides well-appointed athletic amenities and appealing recreational options for its students and staff. In addition to the southern station in Bengaluru, the NDRI operates an Eastern Regional Station in Kalyani (*Nadia* district), approximately 50 km north of Kolkata (*Annual Report, 2025*) [1].

The Research productivity is an exceptional foundation for academic personnel to accomplish success and therefore, academics are currently being encouraged to improve their research contributions and efficiency in order to meet the changing needs of the 21st century (Adetomiwa *et al.*, 2023) [2]. In order to guaranty the success of strategic plans and promote continuous development, it is imperative that organizations implement a comprehensive performance measurement system (Ranjan *et al.*, 2015) [3]. Kpolovie *et al.* (2019) [4] assert that the most effective gage of research output in higher education is the publication of research papers in reputed journals as well as in the form of books or book chapters. On the same analogy, Sunday *et al.* (2022) [5] investigated the influence of institutional elements on the research output of academic personnel in Nigeria. Nguyen *et al.* (2022) [6] investigated the output of 398 professors and researchers associated with VNU. Fulari (2021) [7] employed surveys, interviews, and observations to evaluate the research productivity

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of faculty at the Arts and Commerce College, Taharabad, connected with SPP University. [Pal et al. \(2020\)](#) [8] employed an informational framework to examine the literature on research production inside scientific entities such as departments and universities. The authors determined that disseminating research results enables scholars to exchange concepts and receive precise critical evaluations, which is essential for the socialization of science. [Chavhan et al. \(2026^a\)](#) [9] discovered that Veterinary faculties in Maharashtra have proficiently shared knowledge through the organization of 705 seminars, workshops, and conferences; 473 scientific training sessions for field veterinarians, researchers, and academic personnel; 797 short-term training programs for farmers, small entrepreneurs, and unemployed youth; and 1957 expert discussions on radio and television. Similarly, [Chavhan et al. \(2026^b\)](#) [10] also reported year over growth of research publication at IIT, Madras. [Tripathi et al. \(2026\)](#) [11] analyzed top agricultural institutions in India with respect to NIRF India rankings 2025. Despite these studies, there is limited analysis indicating year

over year growth of research outputs of NDRI in particular and therefore the current study was conducted to assess the growth of research of NDRI.

Methodology

The information regarding the publications of research papers, book chapters, books, and patents was gathered from the annual reports for the years 2016-17 to 2025 accessible on the website of ICAR-National Dairy Research Institute (NDRI). The examination of performance metrics, including total output volumes, year-over-year growth, cumulative growth, and Compound Annual Growth Rate (CAGR), were calculated using following formulas.
Year-over-Year (YoY) Growth rate (%) = $\frac{\text{Current year} - \text{Previous year}}{\text{Previous year}} \times 100$
Cumulative growth rate = $\frac{\text{Final value} - \text{Initial value}}{\text{Initial value}} \times 100$

$$\text{Compound Annual Growth Rate (CAGR)} = \left(\frac{\text{Ending value}}{\text{Beginning value}} \right)^{1/n} - 1$$

Where *n* = 8 years

Results and Discussion

Research paper publications by ICAR-NDRI

[Table 1](#) revealed that the ICAR-National Dairy Research Institute (ICAR-NDRI) disseminated a cumulative total of 3,139 research articles in both national and international publications during the nine-year timeframe from 2016-17 to 2024-25. The institution sustained a steady production, averaging 348.78 publications annually. The institute sustained impressive figures, averaging 30.44 high-impact publications per year, or 8.7% of the overall publishing total. An examination of the institution's journal publication trends from 2016–17 to 2024–25 indicates a clear strategic transition toward high-impact research, although a decrease in overall production volume. During the nine-year span, the total yearly publications diminished by 33.26% cumulatively, decreasing from 469 to 313 items, resulting in a negative Compound Annual Growth Rate (CAGR) of -4.93%. This significant downturn was chiefly propelled by a steep decrease in mid-to-low-tier publications; notably, articles in NAAS-rated journals with

scores under 6 plummeted from 155 to 42. Notwithstanding the numerical decline, the quality index of the institutional product had a significant enhancement. Publications in prestigious journals with an NAAS grade exceeding 10 increased dramatically from merely 7 in 2016–17 to a high of 55 in 2020–21, concluding robustly with 37 in 2024–25. Regarding portfolio allocation, NAAS-rated journals with scores ranging from 6 to 9.99 constitute the essential foundation of the institution's research presence, accounting for the predominant share of 52.4% of total publications (1,644 out of 3,139 items) and sustaining a remarkably stable annual average of 182.67 papers. Prestigious journals (with an NAAS rating over 10) and journals without an NAAS rating represent small proportions of 8.7% and 11.5%, respectively. When considered comprehensively, the inverse correlation between the diminishing overall volume and the increasing prominence of high-rated NAAS signifies a purposeful institutional shift. The research landscape has shifted from emphasizing mere publication quantity to focusing on stringent, high-impact studies, exchanging lesser-rated and unassessed papers for prestigious academic positions.

Table 1. Publication of research papers by ICAR-NDRI in National and International journals

Sr. No.	Year	Publications in journals having NAAS rating			Publications in Non NAAS rated Journals	Total publications
		≥ 10	6 to 9.99	below 6		
1	2016-17	7	257	155	50	469
2	2017-18	12	236	141	33	422
3	2018-19	2	143	98	39	282
4	2019-20	24	163	113	44	344
5	2020-21	55	164	79	37	335
6	2021-22	49	151	96	36	332
7	2022-23	53	155	68	47	323
8	2023-24	35	187	67	30	319
9	2024-25	37	188	42	46	313
Total Publication		274	1644	859	362	3139
Mean		30.44	182.67	95.44	40.22	348.78
% Share			52.4	27.4	11.5	
Cumulative Growth Rate (CGR) %						8.7
Compound Annual Growth Rate (CAGR) %						-4.93 %

Cumulative Growth Rate (CGR) of 48.48% throughout the evaluated

Publications as book and book chapters

A data of the institution's book and chapter publication from 2016–17 to 2024–25 reveals strong long-term growth with notable, cyclical variations ([Table 2](#)). The total yearly publications grew by a total

nine-year period, from an initial count of 33 to a final total of 49, indicating a steady Compound Annual Growth Rate (CAGR) of 5.07% annually. Book chapters, which form the fundamental basis of this collection and account for a noteworthy 88.72% of all historical production (346 out of 390 items) and maintain a noteworthy annual average of 38.44 chapters, were primarily responsible for this overall tendency. On the other hand, independent book publishing made up a small portion of the portfolio (11.28%), but as the conclusion of the term approached, their capacity increased significantly, peaking at 13 volumes in 2023–2024. Despite the positive annualized growth numbers, there is considerable yearly fluctuation in the information, which suggests inconsistent reporting or production procedures. Early on,

total publications saw sharp drops that culminated in a low of just six publications in 2018–19. This fall was quickly followed by a remarkable year-over-year gain of 450.00% in 2019–20 and another notable increase of 167.74% in 2021–2022, which drove output to an unparalleled high of 83 publications. The ecosystem's basic structural integrity endures despite a notable 32.88% reduction during the late-stage downturn in 2024–2025. When taken as a whole, the net-positive compound growth rates show that the institution has successfully maintained a positive trend in its long-term literary and chapter production despite irregular batching cycles and regional annual downturns.

Table 2. Publications as books and book chapters

Sr. No.	Year	Book Published	Book Chapters	Total	Year Over Year growth %
1	2016-17	2	31	33	--
2	2017-18	0	18	18	-45.45
3	2018-19	0	6	6	-66.67
4	2019-20	6	27	33	450.0
5	2020-21	7	24	31	-6.06
6	2021-22	7	76	83	167.74
7	2022-23	3	61	64	-22.89
8	2023-24	13	60	73	14.06
9	2024-25	6	43	49	-32.88
	Total	44	346	390	
	Mean	4.89	38.44	43.33	
	Per cent	11.28%	88.72%		
	Cumulative Growth Rate (CGR) %			48.48%	
	Compound Annual Growth Rate(CAGR) %			5.07 % per year	

Patents granted

Despite notable annual variability, an analysis of the institution's intellectual property portfolio from 2016–17 to 2024–25 reveals a robust long-term growth in innovation output (Table 3). A remarkable 166.67% Cumulative Growth Rate (CGR) and a solid 13.06% Compound Annual Growth Rate (CAGR) were achieved as the annual number of patents awarded increased from 3 to 8 during the nine-year span. A cumulative historical total of 46 patents and a steady annual average of 5.11 patents indicate sustained long-term output. Nonetheless, considerable annual fluctuations greatly disrupted this upward trend, indicating a very cyclical approval procedure or batch-processing schedules. Alongside a consistent historical zenith of 8 patents achieved across three separate fiscal periods (2018–19, 2021–22, and 2024–25), the portfolio had substantial annual growth, including a 166.67% rise in 2018–19 and a 133.33% escalation in 2020–21. Conversely, these surges were offset by abrupt declines, culminating in a complete cessation of output in 2023–2024. Primarily, the system exhibited exceptional structural resilience, achieving an immediate recovery from this zero baseline to its historical peak of eight patents in the subsequent year. Ultimately, the multi-year compound growth benchmark substantiates a highly efficient and evolving institutional framework for technology transfer and patent procurement, whereas the erratic annual growth rates underscore the capricious character of external application-to-grant procedures.

Table 3. Year over Year Growth rate of patents

Sr. No.	Year	Patents granted	Year Over Year growth %
1	2016-17	3	--
2	2017-18	3	0.0
3	2018-19	8	166.67
4	2019-20	3	-62.50
5	2020-21	7	133.33
6	2021-22	8	14.29
7	2022-23	6	-25.0
8	2023-24	0	-100.0
9	2024-25	8	--
	Total	46	
	Mean	5.11	
	Cumulative Growth Rate (CGR) %	166.67%	
	Compound Annual Growth Rate(CAGR) %	13.06%	

Conclusion

The thorough examination of the institution's performance from 2016–17 to 2024–25 shows a maturing and resilient research ecosystem that has balanced expansion with a strategic change toward quality. The datasets have sharp cyclical declines and spectacular "batching" increases year-over-year, but the long-term structural tendency is good. Patents and book and chapter publishing have strong 13.06% and 5.07% CAGRs, respectively. Most importantly, a large multi-year spike in journals with NAAS rating > 10 shows that the apparent contraction in journal volume (-4.93% CAGR) is not a productivity decline but a deliberate institutional tilt toward high-impact research. The Institute has shown outstanding systemic resilience, moving away from volume-driven metrics to develop a rigorous, premium footprint in technology transfer and high-impact academic publications.

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