

COMPARING THE RESEARCH OUTPUTS AND PATENT DYNAMICS OF INDIA'S TOP TWO PREMIER AGRICULTURAL RESEARCH INSTITUTES

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Abstract:

The present study is an endeavour to make a comparative analysis of two leading agricultural research institutions of India i.e. ICAR-Indian Agricultural Research Institute (IARI) and ICAR-National Dairy Research Institute (NDRI) over the year 2023–2025. The study uses key performance indicators such as total output volumes, YoY growth, cumulative growth, and Compound Annual Growth Rate (CAGR). The study evaluates the institutional trend across three major performance indicators, namely, research paper publication, book publication, and patent dynamics. The results demonstrate obvious structural and strategic differences between the two Institutes. The IARI had a strong research output with a total of 3,563 articles in three years with CAGR 17.69% owing to its vast, multi-disciplinary institutional framework. NDRI took a more consistent, niche path with 655 articles and a CAGR of 4.01%, indicative of a targeted research climate in dairy science. Book counts varied greatly between both institutes (IARI: 149 total; NDRI: 9 total). Both the organizations recorded a simultaneous and significant increase in patent applications filed as 30 for IARI and 29 for NDRI suggesting aggressive institutional strategies and national ranking incentives emphasizing invention protection. But the actual patent grants were erratic (9 for IARI; 6 for NDRI) which clearly shows a distinct gap due to multi-year prosecution schedules and stringent regulatory examination processes for biological and food related advancements under the Indian Patent Act. The results show that while multi-disciplinary institutes are bound to have bigger absolute numbers, specialized research canters show continuous and constant growth.

Key words : ICAR, IARI, NDRI, Publications, Patents, Growth, productivity

Introduction :

Research involves the attentive, perceptive, and rigorous study or investigation of phenomena to find and reveal new knowledge, information, and facts, while productivity



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implies production or output within a set time. Kpolovie and Dorgu (2019) believe the best ways to measure higher education research productivity are to present research papers in conference proceedings, which are essential references to and acknowledgments of other scientists' widely accessible papers and books, and to publish them in professional journals as journal articles, book chapters, or books. Sunday et al. (2022) examined how institutional factors affected Nigerian academics' research productivity. Nguyen et al. examined 398 VNU professors and researchers' production in 2022. Fulari (2021) evaluated faculty research productivity at SPP University, Pune-affiliated Arts and Commerce College, Taharabad using surveys, interviews, and observations. Pal and Sarkar (2020) assessed research output in scientific institutions like departments and universities using an informational paradigm. The scientists concluded that disclosing research findings can help socialize science by facilitating idea sharing and precise critical feedback. Sawai and Chavhan (2019) examined LIS professionals' research output from 2004 to 2013 using questionnaires, interviews, observations, and CVs.

Agricultural education plays a vital role in the development of research, technological innovation in India. These institutions have contributed in rural development by increasing agricultural productivity (Tripathi et al, 2026). According to Agarwal (2022), Agricultural universities have underlined the significance of ranking systems in terms of their dynamic role in assessing institutional performance and driving policy decisions in higher education environments. Innovative farming practices are supported by these entities. An increasing number of enhanced crop varieties, cutting-edge agricultural technologies, and extension services are available to them. According to Singh and Patel (2021), research investigations conducted by Agricultural Universities provide further evidence of the significance of increasing scientific research and agricultural innovation.

The Indian Agricultural Research Institute is the leading national institution for agricultural research, education, and extension in the country. According to the UGC Act of 1956, it is a "Deemed-to-be-University" and grants Ph.D. and M.Sc./M. Tech. degrees in a variety of agricultural fields. Twenty divisions, one multidisciplinary center (WTC) in Delhi, eight regional stations, two off-season nurseries, one Krishi Vigyan Kendra in Shikohpur, two all-India coordinated research projects with headquarters at IARI, and twenty-four national centers operating under the all-India coordinated research projects comprise the Institute. It has 2276 authorized employees, administrative, technological, and scientific workers. Prof. M S Swaminathan Library of IARI, New Delhi is one of the largest and best agro-biological libraries in South East Asia, with 3.90 lakh plus publications, including 1,43,221 books, 179 UG Books, monographs / bulletins, 1,22,101 bound journals, loose journals 55,717.

One of the top institutes in the dairy industry is the ICAR-National Dairy Research Institute (NDRI) in Karnal, Haryana having ISO 9001:2015 certification. Through its research and cutting-edge areas of dairy science, the Institute has made a significant contribution to the expansion of the Indian dairy sector and helped India become the world's top milk producer. Since 1989, the Institute has been able to carry out its academic programs



with the distinction of being a Deemed to be University. In ICAR's rating of Indian agricultural universities from 2016 to 2021, NDRI consistently achieved the top spot for five years. The National Agricultural Education Accreditation Board, ICAR, has granted the Institute accreditation through 2026. In the 2024 National Institutional Ranking Framework (NIRF)-2024 Agriculture and Allied Category, ICAR-NDRI was ranked second by the Union Ministry of Higher Education, Government of India.

Looking to the national importance of these top two premier agricultural institutes, the present study was conducted to investigate the output of these institutes with respect to the research papers and patents dynamics.

Methodology :

The data pertaining to the publication of research papers, books as well as patents was collected from the annual reports for the year of 2023 to 2025 available at website of ICAR-Indian Agricultural Research Institute (IARI) and ICAR-National Dairy Research Institute (NDRI). For the analysis of performance indicators such as total output volumes, YoY growth, cumulative growth, and Compound Annual Growth Rate (CAGR) following standard formulas were used.

$$\text{Year-over-Year (YoY) Growth rate (\%)} = \frac{\text{Current year} - \text{Previous year}}{\text{Previous year}} \times 100$$

$$\text{Cumulative growth rate} = \frac{\text{Final value} - \text{Initial value}}{\text{Initial value}} \times 100$$

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

Where n= 2 years

Results and discussions :

Research paper Publications :

The comparative publication output, Year-over-Year (YoY) growth rates, cumulative growth, and Compound Annual Growth Rate (CAGR) of the ICAR-Indian Agricultural Research Institute (IARI) and ICAR-National Dairy Research Institute (NDRI) from 2023 to 2025 has been presented in the table 1.

Table 1: Publications output from top two premier National Agricultural Institute of India



Year of publication	Name of the Institute			
	IARI		NDRI	
	No of publications	YOY growth %	No of publications	YOY growth %
2023	927	--	208	--
2024	1352	45.85%	222	6.73%
2025	1284	-5.03%	225	1.35%
Total	3563	--	655	--
Mean	1187.67	--	218.33	--
Overall Cumulative Growth Rate 2023-25	38.51%		8.17%	
Compound Annual Growth Rate (CAGR)	17.69%		4.01%	

During those three years, the two national institutes published 4,218 research articles. The highest number of publications (3,563) and thus the highest three-year average (1,187.67 papers per year) were recorded at IARI (Table 1). The NDRI produces 655 publications constantly, average 218.33 papers annually. The research productivity of IARI increased from 927 publications in 2023 to 1,352 publications in 2024 with a gain of 45.85%. After this pinnacle came a small slump of -5.03% in 2025. However, this fall of IARI in 2025 (-5.03%) does not indicate a decline in output. A bibliometric normalizing period normally follows such an irregular increase in publication number. This is the period during which study cohorts transition from dissemination of results to initiation of new data collection stages. IARI has been able to attain a strong cumulative growth rate of 38.51% and a very excellent CAGR of 17.69% despite the dip in the previous year which suggests that the long term research outlook of IARI is highly promising and expanding.

During the period of review, NDRI has shown steady, but continuous growth. In 2024, there was an increase of 6.73% in publications and an increase of 1.35% in 2025. The aggregate increase of 8.17% amounted to a consistent CAGR of 4.01%. Thus, the overall number of publications (3,563 for IARI and 655 for NDRI) varies widely which is closely related to the structural characteristics, quality of scientific staff and the academic infrastructure of both institutions. IARI, one of India's finest multi-disciplinary agricultural institutions, has multiple departments and a higher fundamental level of research. NDRI, in contrast, has a limited but focused publication presence as it is focused on a more specialized field within dairy science and technology. Growth rates (NDRI) are low but positive, indicating a somewhat steady and resilient research environment. It is a systematic approach where the study findings are maintained on a yearly basis without any major external



interruptions or sudden changes in the infrastructure. The remarkable increase of 45.85% in 2024 for IARI suggests a period of important institutional changes, such the termination of long-term and multi-year funded projects, the creation of new international collaborations or increased institutional pressure to publish in indexed journals. The results very well supported with the finding of Mondal (2024) who studied the impact of capital expenditures on academic excellence and institutional growth in NIRF-ranked Universities

Publication of Books :

Table 2. Book Publications output from top two premier National Agricultural Institute of India

Year of book publication	Name of the Institute			
	IARI		NDRI	
	No of publications	YOY growth %	No of publications	YOY growth %
2023	61	--	3	--
2024	38	-37.70%	0	-100%
2025	50	31.58%	6	NA*
Total	149	--	9	--
Mean	49.7	--	3.0	--
Overall Cumulative Growth Rate 2023-25	-18.3%		100 %	
Compound Annual Growth Rate (CAGR)	-9.46%		41.42%	

*cannot be calculated from a baseline of zero in the year 2024.

The IARI contributed the large majority of the developed text resources, publishing 149 volumes during the study period with a high yearly baseline average of 49.7 books (Table 2). The book output of the institute plummeted by 37.70% from 61 books in 2023 to 38 books in 2024. But in 2025, it presented a strong resilience curve, recovering by 31.58% to reach 50 publications. Despite this recovery, the overall two-year cumulative volume shrank by 18.03%, with a negative CAGR of -9.46%. With a stable historical average of 3.0 publications per year, NDRI worked on a much smaller scale in terms of book publishing, amassing a total of 9 books throughout the three years. The NDRI publication schedule was so erratic. Output of 2024 was 100% declined YoY. The institute's publication of six books in 2025, exceeded its initial 2023 baseline, compensating this brief decline. This recovery led to a net cumulative expansion of 100% and a high long term CAGR of 41.42%. The random



volatility in the book publication counts at ICAR-IARI and ICAR-NDRI, with such dramatic year-on-year variations and a short zero count at NDRI, is in sharp contrast with the more or less steady output of the usual journal research papers, and indicates a basic structural difference. The lifecycle of an academic book is inherently non-linear and lengthy, while journal publishing is highly streamlined, continuous and predictable, on a quarterly or monthly basis. To write, edit, peer-review and publish a comprehensive book or monograph often takes many years. A sudden jump or drop in the annual number is not always a sign of change in raw intellectual activity level. This instability highlights the non-linear, multi-year timelines associated with long-form academic publishing. It also indicates a general academic preference for indexed journals, which carry higher quantitative weight in national institutional rankings.

Intellectual property metrics :

The analysis of intellectual property metrics—specifically patents filed and granted—for the ICAR-Indian Agricultural Research Institute (IARI) and ICAR-National Dairy Research Institute (NDRI) from 2023 to 2025 has been presented in table 3.

During the three years, the development of the number of creative proposals was very similar in both universities (Table 3). Total patent filings for IARI increased from 4 in 2023 to 14 in 2025, a total growth of 250%. NDRI has likewise registered a significant increase from 2 in 2023 to 14 in 2025, indicating a total gain of 600%. The sharp and concurrent surge in patents filed by both IARI (30 in total) and NDRI (29 in total) between 2024 and 2025 reflects a core change of institutional priorities. This exponential expansion is a strong evidence of aggressive institutional strategies implemented by Indian Council of Agricultural Research (ICAR). Incentives such as institutional weights in the National Institutional Ranking Framework (NIRF) have successfully motivated scientists to convert laboratory technologies, agro-processing instruments and novel bio-formulations into formal intellectual property instead of simply harnessing journal publication channels (NIRF, 2025).

Table 3. Patent output from top two premier National Agricultural Institute of India

Year	Name of the Institute			
	IARI		NDRI	
	Patent Filed	Patent Granted	Patent Filed	Patent Granted
2023	4	1	2	6
2024	12	6	13	0
2025	14	2	14	0
Total	30	9	29	6
Mean	10	3	9.67	2

Patents were still being granted in a very uneven manner. In 2024, IARI got 6 patents,



the highest ever given, raising the total to 9. NDRI did not record any grants in 2024 and 2025, but did record a first set of 6 issued patents in 2023. The 2023 six patents awarded to NDRI are a significant combined surge of prior applications in the queue at the same time. The latter decrease to zero in 2024 and 2025 is the normal bureaucratic hurdle. It points out that NDRI has a very strong current pipeline of inventions (27 proposals for 2024-2025), but these are now subject to required examination and adjustment which will likely lead to patent renewals in the subsequent cycles.

The conclusions emphasize that while multi-disciplinary organizations inherently provide larger total quantities, specialized research centers demonstrate reliable and constant advancement. To improve national agricultural research frameworks, institutions need to harmonize rapid journal publication objectives with prolonged book authorship and multifaceted patent commercialization timelines.

Conflict of Interests : The authors declare no conflict of interest.

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