



Forecasting human resource needs for shaping Veterinary and Animal Husbandry sector in *Amritkaal*

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Received: 29 December 2023; Accepted: 27 March 2024

ABSTRACT

The present study provides an in-depth exploration of the demand and supply landscape for human resources within India's Veterinary and Animal Husbandry (VAH) sector, aiming to identify the current and future challenges in meeting the workforce needs. It assesses the demand for veterinary professionals, taking into account various influencing factors such as the sector's historical growth trends, the emerging roles, challenges posed by technological advancements and the expected integration of various sectors. Simultaneously, the supply side is scrutinized through an analysis of educational output, considering both the potential increase in the number of training institutions and the anticipated fluctuations in graduation rates due to policy changes or other external factors. The core objective of this paper is to shed light on the significant discrepancy between the available supply of veterinary graduates and the burgeoning demand within the sector. This gap is underscored by the study's projection of a gradual narrowing over the coming decades, attributed to strategic increases in educational capacity. However, the analysis suggests that substantial efforts in expanding the number of veterinary colleges will be essential to align the supply with the projected demand effectively. This assessment underlines the critical need for a concerted and strategic approach to bolster the sector's human resource base, ensuring its capacity to meet future challenges.

Keywords: Demand, Forecast, Human Resource, India, Supply, Supply-demand, Veterinary and Animal Husbandry sector

India's livestock sector experienced significant growth between 2014-15 and 2020-21, with a 7.93% compound annual growth rate (CAGR), enhancing the agricultural gross value added (GVA) from 24.32% to 30.13%. This sector's evolution, underpinned by technology, policy and a skilled workforce, emphasizes the importance of human resources in its development.

The 20th livestock census (2019) showed India's livestock population at 535.78 million, with bovines making up 302.79 million. However, the count of registered veterinary practitioners stands at just 67,784, substantially below the Veterinary Council of India's (VCI) suggested requirement of 1.1 to 1.2 lakh (Damodaran 2015). This shortage contrasts sharply with the higher ratios of private practitioners in the USA and Europe (Miftahul 2017), underscoring the need for more veterinary professionals in line with the World Organisation of Animal Health's recommendations for improved healthcare and sector productivity.

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To address the challenges of veterinarian shortages and enhance collaboration between research and academia, India boasts a robust network of veterinary education, offering programmes across various levels. This includes Bachelor of Veterinary Science and Animal Husbandry (BVSc and A.H.), postgraduate (PG) and doctoral (PhD) programmes, which open diverse career paths for graduates in government and private sectors, research and the pharmaceutical industry.

In response to the growing demand for veterinary professionals, the number of veterinary colleges has significantly increased. As of 2021, there are 29 AUs and 158 colleges, offering a balanced mix of constituent and affiliated colleges at the undergraduate (UG) level. The government's recent approval for the admission into the first and second year of BVSc and A.H. programmes in 15 new colleges underscores the efforts to meet the professional demand. These initiatives are crucial for bridging the gap between the current and required veterinary professionals, considering the evolving geopolitical landscape, dynamic market demands and technological disruptions.

A study conducted under the National Agricultural Higher Education Project (NAHEP) of the Indian Council of Agricultural Research (ICAR) that aimed to forecast the human resource needs in the veterinary sector over the next 20 years. The ultimate goal is to achieve a

well-balanced and sustainable expansion in the supply of trained veterinary professionals to meet the industry’s needs.

This foresight is essential for planning and developing the necessary educational infrastructure and policy frameworks to ensure the sector’s sustainability and growth, thereby contributing significantly to India’s agricultural and economic development.

MATERIALS AND METHODS

To address the human resource needs within the Indian Veterinary and Animal Husbandry sector, the study implemented an integrated forecasting model, designed for precise demand and supply projections. The approach began with extensive data gathering from primary and secondary sources, enhancing the accuracy of employment estimates, especially in scenarios of data scarcity. This method involved deriving employment figures through sector-specific norms and organizational data, ensuring an understanding of the present employment scenario.

The next phase focused on forecasting future human resource stocks, incorporating sector-specific growth rates and expert inputs to refine projections. This detailed analysis considered various occupational groups and educational levels, elucidating the nuanced human resource requirements across different sectors.

A crucial component of demand forecasting was accounting for workforce attrition, including retirements and deaths, utilizing a Markov Chain analysis to capture

the dynamic interplay of sectoral shifts. The supply-side analysis paralleled this rigor, examining factors like educational output, labour market entrants and the impact of higher education pursuits and migration on the workforce composition. Employing the Minimum Absolute Deviation (MAD) estimator facilitated a nuanced understanding of GVA fluctuations and their implications on labour demands.

This forward-looking approach also anticipated changes in export trends and GVA growth rates, aligning the agricultural manpower forecast with anticipated industry evolutions. The methodology’s reliance on a comprehensive data analysis and validation by domain experts and policymakers underscored its credibility and accuracy. This robust methodology ensures that the projections offered are well-grounded and reflective of the sector’s future human resource requirements, providing valuable insights for strategic planning and policy formulation in the Veterinary and Animal Husbandry sector.

Supply projections have been estimated at Supply Flow Projection (SFP), Outturn Flow Projections (OFP) and Stock Flow Projections (SFP) (Fig. 1.). While estimating the projections, various factors were considered across the types of variables and assumptions such as historical growth rate, increase/decrease in number of seats for each discipline (with/without policy implications), delay in graduation, placement rates/consideration for higher education’s, replacement needs, adjusted stock, etc.

To arrive at the demand projections, various factors have been considered such as historical growth of the respective

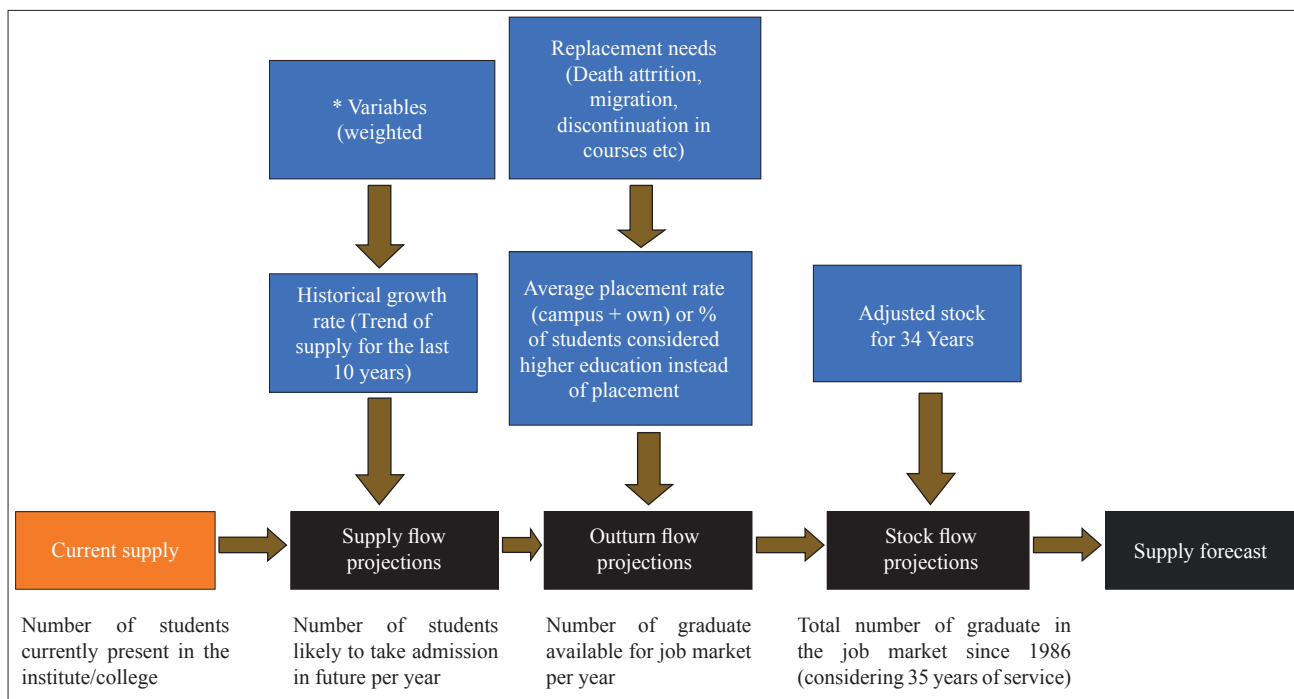


Fig. 1. Analysis process flow for estimating supply forecast. (Note: Supply flow projections = Current supply * (1+ (Historical growth rate ^ (t))+ variables * weighted average). Outturn Flow Projections = Supply flow projections* (1+ (Placement rate or consideration for higher education + replacement needs). Stock Flow Projections = Outturn Flow Projections+ Adjusted stock for 34 years. Variables: Plan for increase/ decrease in seats, % students likely to delay education due to integration/disintegration of course, % student passed out in other countries due to sandwich/integrated courses). Adjusted stock 35 years includes the total outturn for 34 years and attrition rate (death, migration, early retirement, etc.).

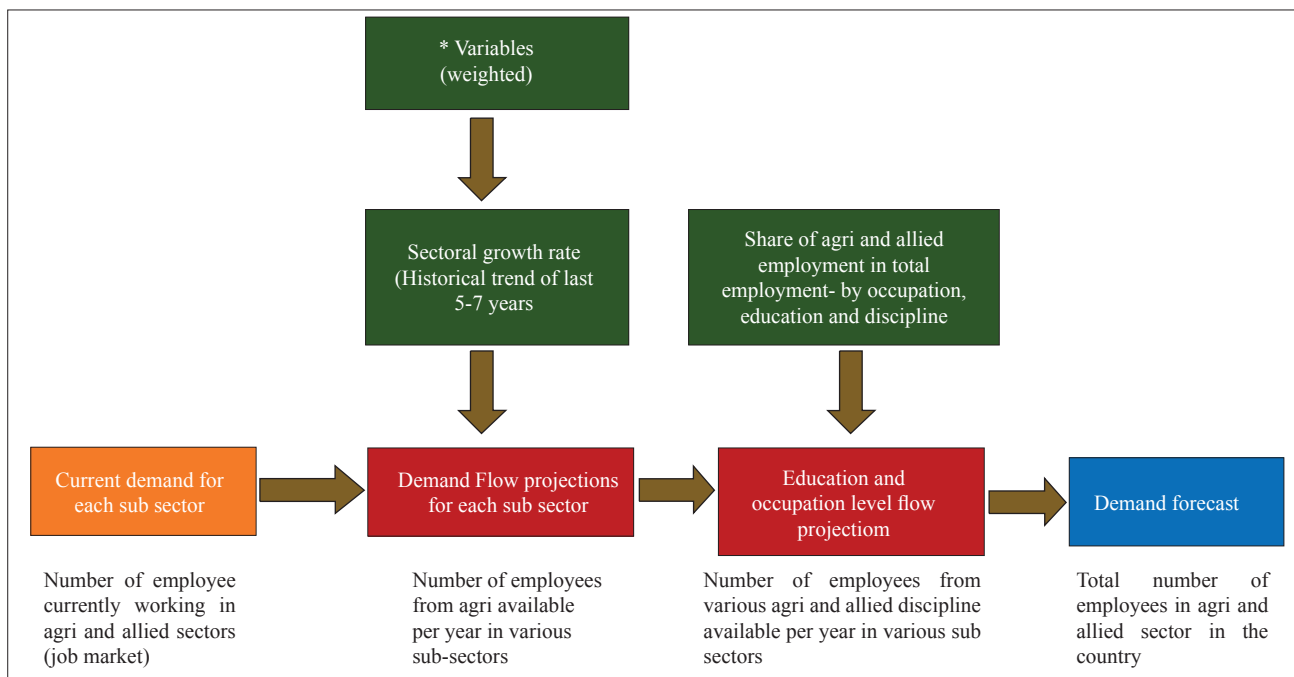


Fig. 2. Analysis process flow for estimating demand forecast. (Note: Demand flow projections = Current demand \times (1+ (Sectoral growth rate \wedge (t)+ attrition, vacancies + other variables \times weighted average). Education and occupational flow projections = demand flow projections \times share of agri and allied employment in total employment-by occupation, education and discipline. Variables: Average attrition rate in the sector, average share of vacancies and non agri-employment in the sector, contractual employment, new job roles that may emerge in future, disruption factors (digital, automation by machinery usage, etc.), policy transformation (likely integration of sub sectors, etc.).

sector, attrition rate, vacancies, and participation of non-agri background graduates in respective sector, contractual employment, new job roles, job loss due to automation, digital interventions, integration of sectors in future, etc (Fig. 2.).

RESULTS AND DISCUSSIONS

Status of agricultural universities (AUs), veterinary universities (VUs) and colleges offering veterinary science degree: Table 1 offers an overview of Veterinary Science education in India, showcasing the distribution of agricultural universities (AUs), veterinary universities (VUs) and colleges across UG, PG and PhD levels for the academic year 2020-2021.

It highlights the educational landscape in Veterinary Science, revealing a mix of constituent and affiliated colleges at the UG level, ensuring a diverse range of options for students seeking veterinary education. In contrast, PG and PhD levels are exclusively catered to by constituent colleges, emphasizing a focus on quality and control in

advanced education and research within these institutions. This distribution indicates a well-structured educational system aimed at producing veterinary professionals, while also pointing out the potential for expansion, especially in affiliated colleges offering higher education levels, to enhance accessibility and diversity in veterinary education.

Career and employment avenues for veterinary graduates: Career opportunities for graduates in Veterinary Science have been steadily expanding due to the increasing demand for their expertise. The efforts made by the current education system have significantly broadened the scope of employment in this field. Through primary surveys conducted with students, alumni, industry professionals, and other key stakeholders in the Veterinary Science ecosystem, several vital career and employment avenues have been identified for these graduates within the agricultural and allied sectors.

To provide a comprehensive outlook, estimations were made for the current and forecasted periods, taking into account the specific career and employment

Table 1. Overview of Veterinary Science education in India (2020-2021)

Education Level	Number of registered universities	Number of colleges (constituent and affiliated semi-aided)	Number of seats	Share of seats (%)
UG	29	69	4,777	60
PG	28	51	2,207	28
PhD	26	38	959	12
Total	29	158	7,943	100

Source: Study analysis and data from Agri Education Division of ICAR.

Table 2. Current and forecasted supply of veterinarians by education level

Program	Current supply		Projections		
	2020	2025	2030	2035	2040
<i>Supply flow projections</i>					
UG	4,777	7,402	11,257	14,442	17,571
PG	2,207	3,067	3,969	4,779	5,540
PhD	959	1,138	1,273	1,339	1,515
Total	7,943	11,607	16,499	20,560	24,626
<i>Outturn flow projections</i>					
UG	3,153	4,885	7,430	9,532	11,597
PG	1,324	1,840	2,382	2,867	3,324
PhD	527	626	700	736	833
Total	5,004	7,351	10,511	13,136	15,754
<i>Stock flow projections</i>					
UG	40,170	54,726	81,873	119,990	166,637
PG	15,847	21,941	31,388	43,221	56,954
PhD	5,926	8,104	10,963	14,041	17,519
Total	61,943	84,771	124,224	177,252	241,110

avenues available to Veterinary Science graduates at different education levels, shedding light on the evolving opportunities and prospects for these individuals within the field.

Supply projections for Veterinary Science graduates and above:

Current supply: A comprehensive analysis of the current supply of Veterinary Science professionals, based on data collected from the AED and a primary survey, is provided in Supplementary Table 1. The supply figures are compared with a 2010 study to assess the accuracy of earlier supply forecasts for the year 2020 (Rao *et al.* 2011). The analysis is presented by education level, including UG, PG and PhD levels. In 2010, the study estimated the supply for these categories and then made supply forecasts for 2020 based on this data.

It is revealed that, overall, the actual supply has surpassed the initial forecasts, indicating a positive trend in the availability of trained veterinary professionals. This reflects well on the sector's capacity to adapt and grow.

Supply projections by education level: Specifically, the supply projections are divided by education level, with estimates extending up to the year 2040. These projections are based on a range of assumptions, taking into consideration the expansion of Veterinary Science higher education as per education policies, input from policymakers, and data collected from surveys.

Table 2 offers a summary of how many veterinarians are available now and predicts how many will be available in the future, up to the year 2040. It breaks down these numbers by their level of education, including UG, PG and PhD. The table shows that the number of veterinarians is expected to grow steadily over the years. It also tracks how many new veterinarians are expected to start working

each year and the total number of veterinarians that will have been trained over time, emphasizing the growth in the veterinary workforce.

Demand projections of human resources in Veterinary Science sector:

Current demand: The assessment of the demand for veterinary professionals across agricultural sub-sectors was conducted through comprehensive data collection from a multitude of public and private sources. This included secondary research and primary investigations, enhanced by consultations with stakeholders, policymakers and experts, aiming to identify critical sub-sectors in need of veterinary graduates.

Following the identification process, employment opportunities within each sub-sector were analysed, taking into account insights from sector representatives to accurately distribute the demand for veterinary graduates. This methodology incorporated various factors and assumptions, revealing an expected surge in professional demand across the Veterinary and Animal Husbandry sectors. From a baseline of 153,354 individuals in 2020, the demand is projected to increase to 176,694 by 2025, further to 201,610 by 2030, then to 234,495 by 2035 and reaching 284,292 by 2040. This anticipated growth across multiple areas, including public animal health, breeding farms, private health services and agri-extension, signifies expansive opportunities in Veterinary Sciences. Such trends underscore the pressing need for strategic education and workforce development strategies to fulfil the evolving demands of these essential sectors.

Demand projections by education level: The demand projections have been categorized by education level, drawing upon insights provided by industry experts and policymakers. These insights have been synthesized to calculate the overall requirements for Veterinary Science human resources across different segments, resulting in forecasts for the years up to 2040. Supplementary Table 2 offers a clear depiction of both the current demand in 2020 and the forecasted demand figures for the years 2025, 2030, 2035, and 2040, segmented by education level. The demand figures demonstrate a steady increase over time, with growing requirements for UG, PG, and PhD graduates in the veterinary science field.

Supply-demand gap of Veterinary Science graduates and above: This study places a crucial emphasis on analysing the supply-demand gap within the veterinary graduate workforce, offering a comprehensive perspective on the total demand and supply figures for veterinary graduates up to the year 2040, as illustrated in Table 3. It also predicts a decrease in this gap by 2040.

The human resources supply-demand gap not only underscores the pressing need to address the shortage of veterinary graduates to keep pace with the sector's expanding demands but also highlights the importance of taking proactive measures. These measures encompass the expansion of educational programs, investments in

Table 3. Supply-demand gap of Veterinary Science graduates and above

Year	Total demand	Total stock	Gap	Gap % as of demand
2020	153,354	61,943	91,411	60
2025	176,694	84,771	91,923	52
2030	201,610	124,224	77,386	38
2035	234,495	177,252	57,244	24
2040	284,292	241,110	43,181	15

workforce development, and strategic planning to align the educational system with the evolving needs of the veterinary sector. The gradual reduction in the supply-demand gap over time indicates a positive path, signalling the potential for future improvements in the availability of qualified professionals in the Veterinary and Animal Husbandry sector.

This study examines the supply and demand for veterinary graduates in India's Veterinary and Animal Husbandry sector, highlighting a significant mismatch that is projected to gradually lessen by 2040. Despite the livestock sector's substantial growth, there is a marked shortfall in the number of veterinary professionals, with the current supply not meeting the escalating demand. The analysis underscores a growing need for veterinary graduates, driven by increased livestock production and the evolving requirements for animal healthcare.

A noteworthy point is the regional disparity in veterinary education's availability, emphasizing the need for a strategic expansion of veterinary colleges to better align with demand. The study forecasts a promising reduction in the supply-demand gap, suggesting that efforts to increase educational capacity are moving in the right direction. However, to adequately address this imbalance and support the sector's future needs, a strategy encompassing educational expansion, research enhancement and collaboration is essential.

Therefore, while challenges persist in matching the supply of veterinary graduates with demand, strategic interventions and enhanced educational infrastructure offer a pathway to significant improvements. This approach is vital for animal welfare, the agricultural sector's growth and ensuring a sustainable future for India's livestock industry.

ACKNOWLEDGEMENTS

Authors acknowledge ICAR, New Delhi, India and World Bank, Washington, DC, United States for financial

assistance of this project. Authors also acknowledge PricewaterhouseCoopers (PwC) for support in carrying out this study. Support from Agricultural Education Division, ICAR is duly acknowledged for secondary data sourcing.

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