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Export performance and diversification of selected livestock products from India

¹Tanya Rozy Toppo, ²VK Khobarkar, ³AA Bhopale and ⁴Swati A Gawande

¹PG Student, Department of Agricultural Economics and Statistics, Dr. PDKV, Akola, Maharashtra, India

²Professor (CAS), Department of Agricultural Economics and Statistics, Dr. PDKV, Akola, Maharashtra, India

³Assistant Professor, Department of Agricultural Economics and Statistics, Dr. PDKV, Akola, Maharashtra, India

⁴Professor (CAS), Department of Agricultural Extension Education, Dr. PDKV, Akola, Maharashtra, India

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Corresponding Author: Tanya Rozy Toppo

Abstract

India's livestock sector is increasingly becoming market-oriented; however, production growth does not always translate into stable export performance. This study assessed the production and export performance of selected livestock products, namely eggs, chicken meat, sheep meat, and natural honey, during 2005–2024. The study period was divided into Period-I (2005–2014), Period-II (2015–2024), and the Overall Period. Growth, variability, instability, and diversification were assessed using CGR, CV, CDVI, and SDI. During the Overall Period, production growth was positive for eggs (6.44%), chicken meat (7.12%), sheep meat (9.20%), and natural honey (9.20%). The export quantity increased for eggs (5.00%), chicken meat (13.00%), and natural honey (13.00%), while sheep meat declined (-1.00%). Export value grew by 2.00%, 14.00%, 5.00%, and 12.00%, respectively. Sheep meat recorded the highest export instability (66.00% CDVI), whereas natural honey showed the lowest (5.00%). The average SDI of 0.61 indicates moderate diversification in the selected livestock export basket. Overall, production growth was stronger than export performance, with natural honey showing the most favourable export growth and stability, while sheep meat faced considerable instability despite strong production growth. The findings highlight the need to better translate India's production potential into stable and diversified livestock exports.

Keywords: Livestock, production, export growth, instability, diversification

Introduction

From the Silver Revolution in poultry to the emerging Sweet Revolution in beekeeping, India's livestock sector has undergone significant transformation. Traditionally associated with food security, employment, and rural livelihoods, the sector has increasingly developed into a commercially important component of agriculture, with growing contributions to production, income, and international trade. The livestock sector accounted for 5.5 per cent of India's total GVA in 2023–24, up from 4.4 per cent in 2014–15, reflecting its growing economic importance (DAHD, 2025) [3]. India has also strengthened its position in livestock production. In 2023, the country produced 142.77 billion eggs, accounting for 8.83 per cent of global egg production, while total meat production reached 12.40 million tonnes, representing 3.52 per cent of global meat production (FAOSTAT, 2023; APEDA) [5]. Natural honey production was approximately 142 thousand tonnes in 2023 (MoA&FW, 2023) [8]. These figures highlight the substantial production base of India's livestock sector and its potential to support both domestic consumption and international trade. The expanding production base has also contributed to India's participation in global markets. India's exports of animal products were valued at US\$ 5,114.20 million in 2024–25 (DGCIS/APEDA). Among the products considered in the present study, natural honey exports reached 100,773

tonnes valued at US\$ 206.47 million, while poultry product exports were valued at US\$ 168.77 million (DGCIS/APEDA). These figures indicate the growing relevance of livestock products in India's export basket. However, growth in production does not necessarily translate into a corresponding increase in exports. Differences in domestic demand, export prices, and international market conditions can influence the extent to which production gains are reflected in export quantity and value. Therefore, assessing livestock product performance requires consideration not only of production and export growth but also of the stability of production and exports and the diversification of the export basket. Such an assessment provides a clearer understanding of the changing performance of India's livestock products and their role in the country's agricultural trade.

Objective

To study the performance of livestock products from India

Data Source and Research Methodology

This study focused on four selected edible livestock-origin products: eggs, chicken meat, sheep meat, and natural honey. The products were selected based on their significance in India's livestock-based export basket, export volume, regular presence in international trade, and availability of consistent

data throughout the study period. The selected products represent different segments of the livestock economy, with eggs and chicken meat representing the poultry sector, sheep meat representing the small ruminant meat sector, and natural honey representing the apiculture sector. This study was not intended to cover the entire range of livestock exports from India; rather, it focused on the selected products that met the specified criteria for inclusion. Accordingly, other livestock export commodities were outside the scope of the present study. The study was based entirely on secondary data on production, export quantity, and export value of the selected products, obtained from the Food and Agriculture Organisation Corporate Statistical Database (FAOSTAT). The study covered a period of 20 years from 2005 to 2024, which was divided into two equal sub-periods to facilitate comparative assessment of performance across time.

- Period-I (2005–2014)
- Period-II (2015–2024)
- Overall Period (2005–2024)

The production and export performance of the selected livestock-origin products was evaluated in terms of growth, instability, and diversification index using the compound growth rate (CGR), coefficient of variation (CV), Cuddy–Della Valle index (CDVI), and Simpson diversification index (SDI).

1. Compound Growth Rate (CGR)

The growth performance of production, export quantity, and export value of the selected livestock products was assessed using the compound growth rate (CGR). An exponential growth function in a semi-logarithmic form was fitted as follows:

$$Y = a \cdot b^t$$

Where,

Y = Production/export of livestock product (i.e., egg, chicken meat, sheep meat and natural honey)

t = Time period in years (2005–2024)

b = Regression coefficient

a = Constant term (Intercept)

Taking logarithms on both sides:

$$\log Y = \log a + t \times \log b$$

The annual rate of compound growth in the livestock products export was worked out by using the formula:

$$\text{CGR (r)} = [\text{Antilog}(\log b) - 1] \times 100$$

Where,

r = Compound Growth Rate

The significance of the estimated regression coefficient was tested using Student's t-test.

2. Coefficient of Variation (CV%)

The Coefficient of Variation (CV) was used as a preliminary

measure of variability in production, export quantity and export value. It was estimated as:

$$\text{CV}(\%) = \frac{\sigma}{\bar{x}} \times 100$$

Where,

σ = Standard deviation

$\bar{x}$ = Mean

$$S = \sqrt{\frac{\sum(x - \bar{x})^2}{n}}$$

Where,

$\bar{x}$ = Arithmetic Mean

x = Variable

n = Number of observations

3. Cuddy-Della Valle Instability Index (CDVI)

The Cuddy-Della Valle Instability Index (CDVI) was used as a trend-adjusted measure of instability:

$$\text{CDVI} = \text{CV} \times 100 \times \sqrt{1 - R^2}$$

Where,

CV = Coefficient of variation in per cent

R^2 = Coefficient of determination from a time trend regression

A higher CDVI indicates greater instability around the trend.

4. Simpson Diversification Index

To measure the diversity of exports of different livestock products, the Simpson index of diversity was used.

$$\text{Simpson Index} = 1 - \frac{\sum A_i^2}{A^2}$$

Where,

A_i = Value of export of i-th livestock products

A = Value of export of total livestock products

The value of the index varies from 0 to 1.

A value of 1 indicates total diversification, whereas a value of zero indicates perfect concentration of trade towards a particular product.

Results and Discussion

The results of the study are presented and discussed in accordance with the objectives of the study. The analysis examines the growth performance, instability, diversification and export competitiveness of selected livestock product exports from India during the study period. The results are presented product-wise to highlight the major changes and patterns in India's livestock product exports and their position in international trade.

Table 1: India's share in the world's total production of selected livestock products (%)

Period	Year	Egg	Chicken meat	Sheep meat	Natural honey
Period-I	2005	0.006	0.061	0.105	0.002
	2006	0.007	0.066	0.109	0.002
	2007	0.007	0.077	0.113	0.002
	2008	0.008	0.082	0.127	0.002
	2009	0.008	0.091	0.134	0.002
	2010	0.009	0.096	0.155	0.002
	2011	0.009	0.109	0.168	0.002
	2012	0.009	0.117	0.180	0.002
	2013	0.010	0.124	0.207	0.002
	2014	0.010	0.133	0.224	0.002
Average		0.008	0.096	0.152	0.002
Period-II	2015	0.011	0.143	0.249	0.002
	2016	0.011	0.151	0.271	0.002
	2017	0.012	0.165	0.293	0.002
	2018	0.013	0.177	0.288	0.002
	2019	0.016	0.190	0.327	0.002
	2020	0.017	0.195	0.375	0.002
	2021	0.018	0.202	0.408	0.002
	2022	0.019	0.209	0.436	0.003
	2023	0.020	0.218	0.486	0.003
	2024	0.020	0.219	0.550	0.004
Average		0.016	0.187	0.368	0.002
Overall Period		0.012	0.141	0.260	0.002

Source: FAOSTAT (Food and Agriculture Organisation Corporate Statistical Database)

Table 1 presents India's share in world production of the selected livestock products during 2005–2024. India's production share increased across all products except natural honey, which remained almost unchanged.

During Period-I (2005–2014), India's average share was (0.008%) for eggs, (0.096%) for chicken meat, (0.152%) for sheep meat and (0.002%) for natural honey. In Period-II (2015–2024), the shares increased to (0.016%), (0.187%), (0.368%) and (0.002%), respectively. Sheep meat recorded

the highest increase, with its share more than doubling between the two periods, followed by chicken meat and eggs. Over the overall period, India accounted for (0.012%) of world egg production, (0.141%) of chicken meat, (0.260%) of sheep meat and (0.002%) of natural honey. Overall, the results indicate a steady improvement in India's relative production share of eggs, chicken meat and sheep meat, while the share of natural honey remained relatively stable.

Table 2: India's share in total world export of selected livestock products (%)

Period	Year	Egg		Chicken Meat		Sheep Meat		Natural Honey	
		Qty	Value	Qty	Value	Qty	Value	Qty	Value
Period-I	2005	0.09	2.44	0.38	0.31	5.85	2.49	4.06	3.57
	2006	4.71	1.82	0.07	0.03	3.62	1.63	1.94	1.56
	2007	4.14	2.62	0.08	0.03	6.00	3.57	3.11	2.43
	2008	3.26	1.66	0.11	0.05	28.45	12.72	3.24	2.51
	2009	2.19	1.31	0.04	0.03	33.23	15.25	3.37	2.28
	2010	1.42	1.04	0.21	0.08	12.39	7.07	5.06	3.69
	2011	1.57	1.06	0.40	0.29	10.00	51.31	6.06	4.40
	2012	0.84	1.14	0.15	0.12	10.09	5.99	4.87	3.31
	2013	0.00	0.02	0.18	0.14	16.26	11.72	5.13	3.57
	2014	0.55	0.66	0.30	0.23	15.94	11.28	4.41	3.22
Average		1.34	1.17	0.20	0.13	14.43	8.88	4.21	3.19
Period-II	2015	0.66	0.82	0.29	0.29	15.02	12.23	6.46	5.18
	2016	0.80	0.90	0.15	0.18	14.74	12.13	6.35	3.10
	2017	0.06	0.87	0.15	0.12	16.37	12.23	7.70	4.17
	2018	1.09	0.91	0.30	0.27	13.07	9.25	9.01	4.33
	2019	0.28	0.85	0.22	0.20	10.69	8.30	10.23	4.83
	2020	0.23	0.51	0.13	0.15	5.38	4.01	7.44	3.38
	2021	0.69	0.53	0.14	0.15	6.16	4.01	9.32	4.84
	2022	1.52	0.88	0.20	0.22	7.46	4.70	11.68	8.20
	2023	3.28	1.49	0.21	0.20	8.09	5.68	13.99	7.53
	2024	2.98	1.55	0.38	0.38	7.89	5.68	12.18	7.77
Average		0.46	0.96	0.22	0.22	10.60	7.52	9.56	5.36
Overall Period		0.68	1.04	0.21	0.17	12.43	8.07	7.38	4.54

Table 2 reveals clear differences in India's position in the global export market for the selected livestock products. Sheep meat remained the strongest export product, although its global share weakened over time. Its average share declined from (14.43%) to (10.60%) in export quantity and from (8.88%) to (7.52%) in export value between Period-I and Period-II. Despite this decline, sheep meat continued to account for the largest share of India's global exports among the selected products. The decline may indicate increasing competition in the international market or changes in global demand and supply conditions.

In contrast, natural honey showed the most positive change. Its average share in world exports more than doubled in quantity terms, increasing from (4.21%) in Period-I to (9.56%) in Period-II, while its value share increased from (3.19%) to (5.36%). This indicates a substantial improvement in India's participation in the global honey market and suggests that natural honey became increasingly important among the selected livestock-origin exports. Egg exports showed a mixed performance. Their average quantity share declined considerably from (1.34%) to (0.46%), while the value share decreased only moderately from (1.17%) to (0.96%). This indicates that the decline in India's export

quantity was not accompanied by a proportionate decline in export value, possibly reflecting changes in export prices or the composition of products exported. Chicken meat, however, remained a relatively small contributor to world trade, with its quantity share increasing only slightly from (0.20%) to (0.22%) and its value share from (0.13%) to (0.22%).

For the overall period, sheep meat recorded the highest average global export share at (12.43%) in quantity and (8.07%) in value, followed by natural honey at (7.38%) and (4.54%), respectively. Eggs accounted for (0.68%) in quantity and (1.04%) in value, while chicken meat accounted for (0.21%) and (0.17%). The higher quantity shares than value shares observed for sheep meat and natural honey indicate that India's presence was relatively stronger in volume terms than in value terms, which may reflect differences in export prices and product composition. Overall, the results show that sheep meat continued to be India's leading product in the global market, while natural honey emerged as the product with the greatest improvement. Eggs experienced a decline in export presence, whereas chicken meat remained relatively marginal in world trade.

Table 3: Period-wise Compound Growth Rates (CGR), Coefficient of Variation (CV) and Cuddy-Della Valle Instability Index (CDVI) of production and export of selected livestock products from India (%)

	Egg			Chicken Meat			Sheep Meat			Natural honey		
Period-I (2005-2014)												
	CGR	CV	CDVI	CGR	CV	CDVI	CGR	CV	CDVI	CGR	CV	CDVI
Production (t)	4.91***	14.51	0.16	9.11***	25.73	0.24	9.25***	27	0.49	2.36***	7.45	0.96
Export Quantity (t)	-7.00	62	68.00	44.00***	102	15.00	12.00*	73	65.00	12.00***	39	14.00
Export Value (1000 USD)	-16.00*	41	27.00	46.00***	106	19.00	23.00***	65	33.00	20.00***	52	12.00
Period-II (2015-2024)												
Production (t)	8.01***	22.83	0.91	5.02***	14.59	0.79	9.07***	27.12	0.64	8.54***	33.43	8.55
Export Quantity (t)	9.00*	61	53.00	0.43	35	39.00	-100***	42	13.00	11.00***	33	4.00
Export Value (1000 USD)	9.00**	53	40.00	3.00	44	46.00	-8.00***	35	18.00	9.00***	38	21.00
Overall Period (2005-2024)												
Production (t)	6.44***	38.45	0.84	7.12***	37.64	0.93	9.20***	51.18	0.25	9.20***	32.55	10.10
Export Quantity (t)	5.00	60	60.00	13.00	66	34.00	-1.00***	63	66.00	13.00***	66	5.00
Export Value (1000 USD)	2.00	49	49.00	14.00**	71	34.00	5.00***	49	43.00	12.00***	64	11.00

(***/**/* significant at 1%,5%, and 10% level of significance respectively)

Table 3 indicates that the selected livestock products generally recorded positive growth in production, but this increase did not always translate into a corresponding increase in exports. During Period-I, production of eggs, chicken meat, sheep meat and natural honey increased by (4.91%), (9.11%), (9.25%) and (2.36%), respectively. However, egg exports declined in both quantity (-7.00%) and value (-16.00%), despite positive production growth. In contrast, the higher production growth of chicken meat (9.11%) was accompanied by very high growth in export quantity (44.00%) and export value (46.00%), indicating a strong expansion of its export market. Sheep meat and natural honey also showed positive production growth of (9.25%) and (2.36%), accompanied by positive export quantity growth of (12.00%) for both and export value growth of (23.00%) and (20.00%), respectively.

During Period-II, production growth remained positive for all products. Egg production increased at (8.01%), accompanied by positive growth in export quantity and value of (9.00%) each, showing that the increase in production was reflected in improved exports. Natural honey also recorded strong

production growth of (8.54%), along with export quantity growth of (11.00%) and export value growth of (9.00%). However, chicken meat production increased by (5.02%), while its export quantity and value grew only by (0.43%) and (3.00%), respectively, suggesting that the increase in production was largely absorbed by the domestic market or did not translate proportionately into exports. Sheep meat showed the clearest divergence, with production growing by (9.07%), while export quantity declined sharply by (-100.00%) and export value by (-8.00%), indicating that higher production did not result in improved export performance.

Over the overall period, production showed strong and significant growth in all four products, ranging from (6.44%) for eggs to (9.20%) for sheep meat and natural honey. Export performance, however, differed considerably. Egg production growth of (6.44%) was associated with only (5.00%) growth in export quantity and (2.00%) in export value. Chicken meat production grew by (7.12%), while export quantity and value increased by (13.00%) and (14.00%), respectively, indicating that exports expanded

faster than production. Sheep meat recorded (9.20%) production growth, but export quantity declined by (-1.00%), while export value increased by (5.00%). Natural honey showed the most favourable export performance, with production growing by (9.20%) and exports increasing by (13.00%) in quantity and (12.00%) in value. Overall, the results suggest that growth in production provided a base for export expansion, but the relationship was not uniform across products. Chicken meat and natural honey were able to convert production growth into stronger export growth, whereas sheep meat and eggs showed a weaker relationship between production expansion and export performance. The relatively high CDVI values for exports also indicate that export performance was more unstable than production, suggesting that factors beyond domestic production, such as international demand, prices and market conditions, influenced India’s export performance.

Table 4: Values of Simpson Diversification Index (SDI) of selected livestock products exported from India

Year	Export Value (1000 USD)				SDI
	Egg	Chicken Meat	Sheep Meat	Natural Honey	
2005	42841	602	18181	26361	0.63
2006	34726	537	12639	13450	0.59
2007	66095	819	29132	22606	0.59
2008	52576	1728	112540	34455	0.59
2009	48751	935	131795	30313	0.54
2010	38790	2948	60172	56214	0.67
2011	40761	14150	53604	76377	0.69
2012	49528	5882	59452	59894	0.69
2013	1015	7579	121445	76049	0.52
2014	34870	11032	131592	77196	0.62
2015	40212	12402	128229	121662	0.64
2016	37534	6207	125331	70761	0.61
2017	39604	4038	134926	104051	0.62
2018	44696	8276	113884	101774	0.65
2019	40785	6212	100861	100872	0.64
2020	24426	4335	48391	83406	0.62
2021	28954	5292	56417	136655	0.56
2022	51792	9538	64713	229261	0.53
2023	96415	7847	71978	170946	0.64
2024	102780	14378	79914	179776	0.65
Average					0.61

Table 4: presents the Simpson Diversification Index (SDI) for India’s selected livestock product exports during 2005–2024. The average SDI was 0.61, indicating a moderate level of diversification in the export basket. The SDI varied between 0.52 and 0.69 during the study period, showing changes in the distribution of export value among eggs, chicken meat, sheep meat and natural honey. The SDI declined from 0.63 in 2005 to 0.54 in 2009, indicating a decline in diversification and relatively greater concentration of export value among fewer products. The index increased to 0.69 in 2011 and 2012, indicating a higher level of diversification during these years. It again declined to 0.52 in 2013, representing the lowest level of diversification during the study period. During the later years, the SDI remained between 0.53 and 0.65, indicating moderate diversification. The SDI was 0.53 in 2022, showing relatively higher concentration, while it increased to 0.64 in 2023 and 0.65 in 2024, indicating improvement in export diversification. The increase in SDI in the later years suggests that the export contribution was

becoming relatively more distributed among the selected livestock products. Overall, the average SDI of 0.61 indicates that India’s selected livestock product export basket was moderately diversified during 2005–2024. The variations in SDI show that diversification changed over time depending on the relative contribution of eggs, chicken meat, sheep meat and natural honey to total export value. Thus, maintaining a balanced contribution from different livestock products can help improve the diversification of India’s livestock export basket.

Conclusion

The study revealed that the selected livestock products recorded positive and significant production growth during the overall period, with CGRs of (6.44%), (7.12%), (9.20%) and (9.20%) for eggs, chicken meat, sheep meat and natural honey, respectively. However, export performance varied across products. Export quantity grew by (5.00%) for eggs, (13.00%) for chicken meat and (13.00%) for natural honey, while sheep meat recorded a decline of (-1.00%). Export value increased by (2.00%), (14.00%), (5.00%) and (12.00%) for eggs, chicken meat, sheep meat and natural honey, respectively. These results indicate that higher production did not always translate into proportionate export growth, particularly for sheep meat. The instability analysis showed considerable variation in export performance. During the overall period, CDVI for export quantity was (60.00%) for eggs, (34.00%) for chicken meat, (66.00%) for sheep meat and (5.00%) for natural honey, indicating the highest stability in natural honey and the greatest instability in sheep meat exports. Similarly, export value recorded CDVI values of (49.00%), (34.00%), (43.00%) and (11.00%), respectively. Production was comparatively more stable, with CDVI values of (0.84%), (0.93%), (0.25%) and (10.10%) for eggs, chicken meat, sheep meat and natural honey, respectively. The Simpson Diversification Index indicated a changing composition of India’s livestock export basket, with increasing importance of products such as natural honey. Overall, the findings show that production performance was stronger and more consistent than export performance, while considerable differences existed among the selected products. Natural honey emerged as the most stable and consistently growing export product, whereas sheep meat, despite its strong production growth, experienced substantial export instability. Thus, improving the conversion of production gains into stable and sustained exports remains important for strengthening India’s livestock export performance.

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