



पशुपालन एवं डेयरी विभाग, भारत सरकार
Department of Animal Husbandry and Dairying
Government of India

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BILL & MELINDA
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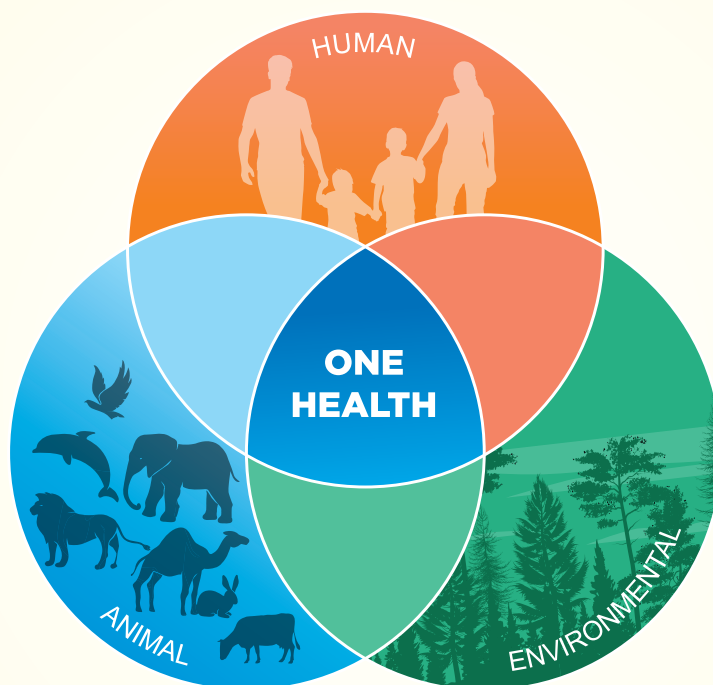


Confederation of Indian Industry

ONE HEALTH PROGRAM

Assessment For State Selection

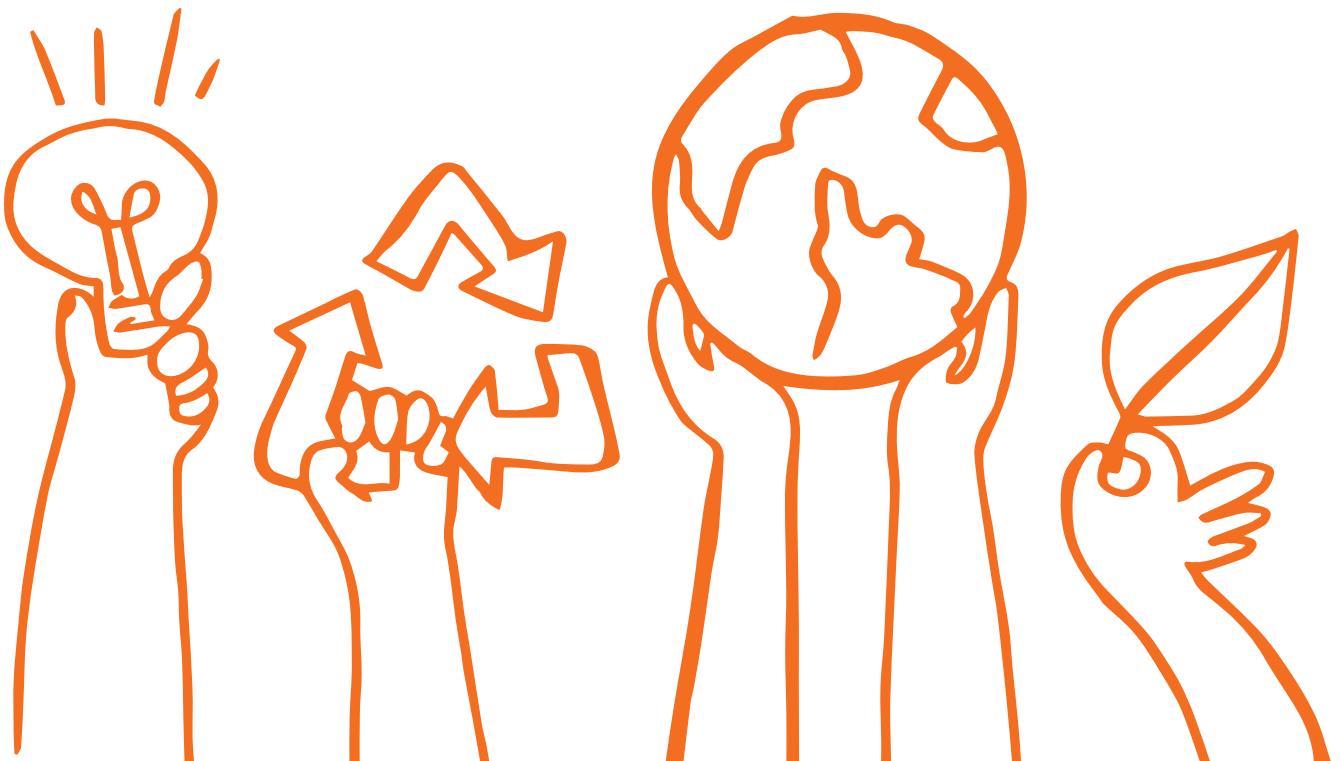
(Uttarakhand & Karnataka)



One Health Support Unit (OHSU)
Department of Animal Husbandry and Dairying, MoFAHD, Government of India

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Executive Summary

The Department of Animal Husbandry & Dairying (DAHD) Government of India has initiated the implementation of the One Health programme by establishing the One Health Support Unit (OHSU). The key objective of the OHSU is to develop a national One Health Roadmap based on the learnings of the pilot implementation in the two selected states of India. Therefore, assessment of key human, animal and ecosystem parameters of Indian states along with operational assessment encompassing presence of diagnostic facilities, digital interventions, occurrence of zoonotic diseases, responsiveness and proactive administration are being considered in the assessment.

The selection of states was based on two categories. These categories were non-operational and operational assessment categories. The non-operational categories consisted of four indices to assess the human, animal and environment parameters. These comprised Human-Animal Interaction Index, Ecosystem Health Indices, Health Infrastructure Index, and Livestock Disease Diversity Index (Simpson Index). The operational category comprised of presence of diagnostic facilities, digital interventions, occurrence of zoonotic diseases, responsiveness, and proactive administration.

Based on these assessments, a total of 5 states (Uttarakhand, Karnataka, Assam, Maharashtra and Odisha) will be considered for future World Bank project interventions after the completion of the gap assessment. Out of these five states, Uttarakhand and Karnataka have been identified for piloting One Health platform.

This ambitious project on One Health will be completed in a two-and-a-half-year period with pilot implementation of the project in the Uttarakhand and Karnataka along with Confederation of Indian Industry (CII) as an implementing agency funded by Bill and Melinda Gates Foundation (BMGF). This project will lead to the development of a roadmap by scaling up the pilot interventions to build a national level One Health platform.

1. Introduction



The selection of states is based on two categories i.e., Non- Operational and Operational assessment categories.

1. A. Non-operational Assessment Category:

A total of 4 indices were developed in the non-operational category to assess the human, animal and the environmental parameters through One Health approach.

1. Human-Animal Interaction Index

This index is used to measure the interaction level among human and animal population, which is prepared by using the methodology of Chand & Sirohi (2012). Livestock population, poultry population, changes in livestock & poultry population and livestock & poultry density are taken into considerations while calculating the Human-Animal Interaction Index, which are collected from the 19th and 20th Livestock Census.

2. Ecosystem Health Indices

- i. FCI: Forest Cover Index is used to measure the forest density of states, which covers total forest cover, very dense forest, moderate dense forest, open forest and change in total forest cover. The data has been sourced from Indian State of Forest Report-2019.
- ii. Biodiversity Index (Shannon-Weiner Index): This index is used to assess the level of biodiversity of states. This index is published in Indian State of Forest Report-2019, Forest Survey of India.

3. Health Infrastructure Index

This index measures both the level of human and animal health infrastructure across different states. This index is prepared by using the methodology of Goel and Garg (2018). For human health infrastructure, density of various health centres, doctors, AYUSH doctors, Nurses and Pharmacists (Source: National Health Profile, 2019, GOI) and for animal infrastructure density of various veterinary health centres, veterinarians

and paravets (Source: OIE PVS Evaluation Report -India,2018, OIE) are taken into consideration.

4. Livestock Disease Diversity Index (Simpson Index)

This index is used to measure the diversity of cases of different livestock diseases. This index is adopted from the methodology used by Bardhan et al. (2020). To calculate this index, the study collected data on cases of livestock diseases reported in OIE-WAHIS from 2005-2020.

1. B. Operational Assessment Category:

Presence of diagnostic facilities, digital interventions, occurrence of zoonotic diseases, responsiveness and proactive administration have been considered in this assessment.

1. C. Non-operational Category Details

1. Human- Animal Interaction Index

Table no 1.1 Details of Human-Animal Interaction Index

S. No.	Particulars	Assessment method	Parameters
1	Livestock Population	Livestock Population Density Index (LPDI)	1. Livestock population 2. % increase in livestock population 3. Livestock population/1000 human population 4. Livestock population/ Sq. km
2	Poultry Population	Poultry Population Density Index (PPDI)	1. Poultry population 2. % increase in livestock population 3. Poultry population/1000 human population 4. Poultry population/ Sq. km
3	Human-Animal Interaction	Composite Human-Animal Interaction Index (CHAI)	$CHAI = (LPDI + PPDI) / 2$

Methodology: Chand & Sirohi (2012)

Data Source: 19th and 20th Livestock census

Table no. 1.2 State-wise Composite Human Animal Interaction Index (CHAI)

State/UT	LPDI	PPDI	CHAI
Telangana	0.48	0.66	0.57
West Bengal	0.55	0.38	0.47
Jharkhand	0.60	0.30	0.45
Tamil Nadu	0.39	0.48	0.43
Rajasthan	0.62	0.23	0.42
Assam	0.40	0.39	0.39
Karnataka	0.43	0.29	0.36
Madhya Pradesh	0.52	0.18	0.35
Meghalaya	0.38	0.30	0.34
Maharashtra	0.37	0.27	0.32
Bihar	0.48	0.16	0.32
Andhra Pradesh	0.26	0.36	0.31
Gujarat	0.39	0.20	0.30
Uttar Pradesh	0.53	0.06	0.30
Mizoram	0.29	0.29	0.29
Chhattisgarh	0.42	0.14	0.28
Manipur	0.12	0.42	0.27
Haryana	0.20	0.34	0.27
Odisha	0.31	0.23	0.27
Kerala	0.21	0.25	0.23
Jammu & Kashmir	0.34	0.12	0.23
Arunachal Pradesh	0.33	0.12	0.23
Himanchal Pradesh	0.33	0.12	0.22
Sikkim	0.26	0.18	0.22
Uttarakhand	0.27	0.13	0.20
Punjab	0.21	0.17	0.19
Tripura	0.15	0.17	0.16
Nagaland	0.09	0.22	0.16
Goa	0.13	0.12	0.13
India	0.33	0.24	0.28

2. Ecosystem Health Indices

Table no. 2.1 Details of Ecosystem Health Indices

S.No.	Ecosystem Health	Assessment Method	Parameter	Source
1	Forest Cover	Forest Cover Index (FCI)	1- % VDF1 2- %MDF2 3- %OF3 4- %TFC4 5- % change in TFC	Self Estimated
2	Biodiversity	Shannon-Weiner Index (BI)	1. Total individual of one species, 2. Entire species 3. Total individuals 4. The specific abundance of each species	Indian State of Forest Report-2019, Forest Survey of India

a. Forest Cover Index

Table 2.1: State-wise Forest Cover Index

State	FCI
Mizoram	0.55
Meghalaya	0.52
Arunachal Pradesh	0.51
Nagaland	0.51
Tripura	0.50
kerela	0.50
Manipur	0.43
Goa	0.42
Sikkim	0.33
Uttarakhand	0.33
Chhattisgarh	0.31
Assam	0.30
Himanchal Pradesh	0.29
Odisha	0.27
Andhra Pradesh	0.27

State	FCI
Karnataka	0.26
Jharkhand	0.25
Madhya Pradesh	0.22
Telengana	0.20
Tamil Nadu	0.19
West Bengal	0.18
Jammu & Kashmir	0.17
MaharasHtra	0.17
Gujarat	0.13
Uttar Pradesh	0.12
Bihar	0.11
Haryana	0.11
Punjab	0.10
Rajasthan	0.10
India	0.29

b. Biodiversity Index

Table 2.2: State-wise Biodiversity Index

STATE	BI
Odisha	2.89
Chhattisgarh	2.83
Mizoram	2.79
Meghalaya	2.78
Andhra Pradesh	2.74
Arunachal Pradesh	2.65
Tamil Nadu	2.62
Telangana	2.55
kerala	2.50
Assam	2.49
Bihar	2.47
Jharkhand	2.46
Uttar Pradesh	2.46
Jammu & Kashmir	2.42
Karnataka	2.41

STATE	BI
Manipur	2.30
Gujarat	2.29
Madhya Pradesh	2.27
Punjab	2.22
Nagaland	2.20
Maharashtra	2.19
Himanchal Pradesh	2.19
Haryana	2.18
Rajasthan	2.13
Uttarakhand	2.08
West Bengal	2.00
Sikkim	1.89
Goa	1.78
Tripura	1.76
India	2.31

3. Composite Health Infrastructure Index

Table No.3.1 Details of Composite Health Index

S.No.	Health Infrastructure	Assessment method	Parameters
1	Human Health Infrastructure	Human Health Infrastructure Index (HHII)	1. Sub centre/1000 population 2. PHC/1000 population1 3. CHC/1000 population2 4. HWC-SC/1000population3 5. HWC-PHC/1000population4 6. SDH/1000 population5 7. DH/1000 population6 8. MMU/1000 population7 9. MC/100000 population8 10. AD/1000 population9 11. DS/1000 population10 12. AYUSH Dr./1000 population 13. Nurses/1000 population 14. Pharmacists/1000 population

S.No.	Health Infrastructure	Assessment method	Parameters
2	Animal Health Infrastructure	Animal Health Infrastructure Index (AHII)	1. Vet. Hospital/10000 livestock population 2. Vet. Disp./10000 livestock population 3. Vet. Aid centre/10000 livestock population 4. Vet. Doctors/10000 livestock population 5. Paravet/10000 livestock population 6. % Vet in service 7. % Paravet in service
3	Composite Health Infrastructure	Composite Health Infrastructure Index(CHII)	$CHII = (HHII + AHII) / 2$

Methodology used by Goel and Garg (2018)

Table No. 3.2 State-wise Composite Health Index

State	HHII	AHII	CHII
Himanchal Pradesh	0.38	0.47	0.43
Arunachal Pradesh	0.51	0.31	0.41
Sikkim	0.30	0.49	0.39
Kerala	0.26	0.51	0.39
Manipur	0.22	0.47	0.34
Mizoram	0.36	0.31	0.33
Punjab	0.18	0.44	0.31
Nagaland	0.24	0.37	0.30
Jammu & Kashmir	NA	0.30	0.30
Goa	0.24	0.35	0.29
Haryana	0.16	0.37	0.26
Meghalaya	0.18	0.32	0.25
Karnataka	0.19	0.23	0.21
Uttarakhand	0.15	0.26	0.21
Assam	0.17	0.23	0.20
Tamil Nadu	0.22	0.17	0.20
Odisha	0.20	0.19	0.20
Maharashtra	0.17	0.21	0.19
Tripura	0.21	0.16	0.19
Andhra Pradesh	0.13	0.22	0.18
Rajasthan	0.17	0.17	0.17

State	HHII	AHII	CHII
Uttar Pradesh	0.09	0.23	0.16
Telangana	NA	0.16	0.16
Chhattisgarh	0.16	0.14	0.15
Gujarat	0.19	0.09	0.14
Madhya Pradesh	0.15	0.12	0.14
West Bengal	0.12	0.13	0.12
Bihar	0.11	0.05	0.08
Jharkhand	0.08	0.07	0.07
India	0.22	0.30	0.26

4. Livestock Disease Diversity Index (Simpson Index)

Table No. 4.1 Details of Livestock Disease Diversity Index

S. No.	Particulars	Assessment method	Formula	Source
1	Livestock Disease Diversity	Simpson Index	Simpson Index = $1 - \sum A_i^2 / A^2$ Where, A_i- Number of cases due to ith disease A- Total no of cases due to all diseases The value of index varies from 0 to 1 . 1- Value of 1 indicates total diversification 0- Value of 0 indicates perfect concentration of reported cases towards a particular disease.	Methodology used by Bardhan et al. (2020)

Table No. 4.2 State-wise Livestock Disease Diversity Index (Simpson Index)

STATE	Simpson Index
Tripura	0.82
Punjab	0.81
Chhattisgarh	0.79
Odisha	0.77
Maharashtra	0.75
Haryana	0.75
Gujarat	0.73
Jammu & Kashmir	0.73
Uttar Pradesh	0.71
Goa	0.71

STATE	Simpson Index
Tamil Nadu	0.68
Rajasthan	0.68
Manipur	0.67
Kerala	0.67
Karnataka	0.62
Jharkhand	0.62
West Bengal	0.59
Madhya Pradesh	0.59
Arunachal Pradesh	0.56
Mizoram	0.51

STATE	Simpson Index
Himachal Pradesh	0.51
Uttarakhand	0.50
Nagaland	0.48
Assam	0.47
Meghalaya	0.43

STATE	Simpson Index
Andhra Pradesh	0.36
Bihar	0.25
Sikkim	NA
Telangana	NA
India	0.80

1. D. Operational Assessment Category Details

1. **Number of ICAR Animal Diseases Diagnostic Lab Support (02 marks for each Lab)**
2. **Presence of Main RDDDL in State: 02 Marks**
3. **Digital Initiatives by State: 01 mark**
4. **Implementation of Digital Initiatives of Gol: 02 Marks**
5. **Occurrence of specific Zoonotic Diseases: 02 Marks**
 - a. Karnataka: KFD, Anthrax
 - b. Uttarakhand: Trichinosis, Bird flu
 - c. Odisha: Bird flu, Anthrax
6. **Indicators for proactive administration:**
 - a. Website quality
 - b. Website updation
 - c. New schemes (state Initiated)
 - d. Garnering new schemes from Gol (like NDLM)



Table 5: Operational assessment: Criteria for Selection of States: Scoring of/Weightage Assignment to States

State/UT	Administrative/ systemic challenges & opportunities (Admn & Political) Admn/ Political Proactiveness (1-5 marks)	Wildlife Sector Labs/ Network(s) (1-5 marks)	NDLM application (05 marks)	Opportunities for potential synergies (e.g., World Bank)(1-5 marks)	Number of ICAR Animal Diseases Diagnostic Lab Support (1-5 marks)	
Himanchal Pradesh	2	2	--	2	1	
Arunachal Pradesh	2	1	--	2	1	
Sikkim	2	1	--	2	0	
Kerala	2	2	--	2	0	
Manipur	2	1	--	2	1	
Mizoram	2	1	--	2	0	
Punjab	2	1	--	2	0	
Nagaland	2	1	--	2	1	
Jammu & Kashmir	2	2	--	2	0	
Goa	2	1	--	2	1	
Haryana	2	1	--	2	2	
Meghalaya	2	2	--	2	2	
Karnataka	3	3	4	5	3	
Uttarakhand	4	3	4	5	3	
Assam	3	4	--	2	1	
Tamil Nadu	3	4	--	2	0	
Odisha	3	2	--	3	1	
Maharashtra	2	3	--	2	0	
Tripura	2	1	--	2	0	
Andhra Pradesh	2	1	--	2	0	
Rajasthan	2	1	--	2	1	
Uttar Pradesh	2	5	--	2	2	
Telangana	2	1	--	2	0	
Chhattisgarh	2	1	--	2	0	
Gujarat	3	1	--	2	0	
Madhya Pradesh	2	3	--	2	2	
West Bengal	2	1	--	2	1	
Bihar	1	1	--	2	0	
Jharkhand	2	1	--	2	0	

	Presence of Main RDDL in State (02 marks)	Uniqueness of biodiversity (1-5 marks)	Regular Occurrence of specific Zoonotic Diseases (1-5 marks)	Digital Initiatives by State AH Deptt (1-5 marks)	Total Operational Score
	--	3	3	2	15
	--	3	2	2	13
	--	3	2	2	12
	--	3	4 (Nipah)	2	15
	--	3	3 (Cysticercosis)	2	14
	--	3	3 (Cysticercosis)	2	13
	2	2	2	2	13
	--	3	3 (Cysticercosis)	2	14
	--	2	2	2	12
	--	2	2	2	12
	--	2	3	2	14
	--	2	3 (Cysticercosis)	2	15
	2	4	4 (KFD, Anthrax)	3	31
	--	4	4 (Trichinosis)	3	30
	2	3	3 (Cysticercosis)	2	20
	--	2	3 (Anthrax)	2	16
	--	4	4 (Anthrax)	5	22
	2	3	3	2	17
	--	3	3 (Cysticercosis)	2	13
	--	1	3	2	11
	--	1	3 (CCHF)	2	12
	2	1	3	2	19
	--	1	3	2	11
	--	3	3	2	13
	--	2	4 (CDV in Lion; CCHF, Plague))	2	14
	--	3	3	2	17
	2	3	3 (Anthrax)	2	16
	--	2	3	4	13
	--	3	3	3	14

2.0 Data Assessment

2.1 Data assessment (varied scale)

Sl.No.	State	HAI	FCI	BI	CHII	SI	Operational assessment
1	Andhra Pradesh	0.31	0.27	2.74	0.18	0.36	11
2	Arunachal Pradesh	0.23	0.51	2.65	0.41	0.56	13
3	Assam	0.39	0.3	2.49	0.2	0.47	20
4	Bihar	0.32	0.11	2.47	0.08	0.25	13
5	Chhattisgarh	0.28	0.31	2.83	0.15	0.79	13
6	Goa	0.13	0.42	1.78	0.29	0.71	12
7	Gujarat	0.3	0.13	2.29	0.14	0.73	14
8	Haryana	0.27	0.11	2.18	0.26	0.75	14
9	Himanchal Pradesh	0.22	0.29	2.19	0.43	0.51	15
10	Jammu & Kashmir	0.23	0.17	2.42	0.3	0.73	12
11	Jharkhand	0.45	0.25	2.46	0.07	0.62	14
12	Karnataka	0.36	0.26	2.41	0.21	0.62	31
13	Kerala	0.23	0.5	2.5	0.39	0.67	15
14	Madhya Pradesh	0.35	0.22	2.27	0.14	0.59	17
15	Maharashtra	0.32	0.17	2.19	0.19	0.75	17
16	Manipur	0.27	0.43	2.3	0.34	0.67	14
17	Meghalaya	0.34	0.52	2.78	0.25	0.43	15
18	Mizoram	0.29	0.55	2.79	0.33	0.51	13
19	Nagaland	0.16	0.51	2.2	0.3	0.48	14
20	Odisha	0.27	0.27	2.89	0.2	0.77	22
21	Punjab	0.19	0.1	2.22	0.31	0.81	13
22	Rajasthan	0.42	0.1	2.13	0.17	0.68	12
23	Sikkim	0.22	0.33	1.89	0.39	NA	12
24	Tamil Nadu	0.43	0.19	2.62	0.2	0.68	16
25	Telangana	0.57	0.2	2.55	0.16	NA	11
26	Tripura	0.16	0.5	1.76	0.19	0.82	13
27	Uttar Pradesh	0.3	0.12	2.46	0.16	0.71	19
28	Uttarakhand	0.2	0.33	2.08	0.21	0.50	30
29	West Bengal	0.47	0.18	2	0.12	0.59	16

* BI in the range of 0-5

HAI: Human Animal Interaction index, FCI: Forest cover index, BI: Biodiversity Index CHII: Composite Health Infrastructure Index, SI: Livestock Disease Diversity Index (Simpson Index)

2.2. Final Data assessment (0-1 scale)

Sl.No.	State	HAI	FCI	BI	CHII	SI	Operational Assessment Score	Pooled Score
1	Karnataka	0.36	0.26	0.482	0.21	0.62	0.69	0.49
2	Uttarakhand	0.2	0.33	0.416	0.21	0.5	0.66	0.45
3	Odisha	0.27	0.27	0.578	0.2	0.77	0.43	0.37
4	Assam	0.39	0.3	0.498	0.2	0.47	0.37	0.32
5	Uttar Pradesh	0.3	0.12	0.492	0.16	0.71	0.34	0.30
6	Kerala	0.23	0.5	0.5	0.39	0.67	0.23	0.29
7	Maharashtra	0.32	0.17	0.438	0.19	0.75	0.29	0.29
8	Tamil Nadu	0.43	0.19	0.524	0.2	0.68	0.26	0.28
9	Madhya Pradesh	0.35	0.22	0.454	0.14	0.59	0.29	0.27
10	Meghalaya	0.34	0.52	0.556	0.25	0.43	0.23	0.27
11	Manipur	0.27	0.43	0.46	0.34	0.67	0.20	0.27
12	West Bengal	0.47	0.18	0.4	0.12	0.59	0.26	0.26
13	Himanchal Pradesh	0.22	0.29	0.438	0.43	0.51	0.23	0.26
14	Arunachal Pradesh	0.23	0.51	0.53	0.41	0.56	0.17	0.26
15	Mizoram	0.29	0.55	0.558	0.33	0.51	0.17	0.25
16	Tripura	0.16	0.5	0.352	0.19	0.82	0.17	0.25
17	Nagaland	0.16	0.51	0.44	0.3	0.48	0.20	0.25
18	Haryana	0.27	0.11	0.436	0.26	0.75	0.20	0.24
19	Jharkhand	0.45	0.25	0.492	0.07	0.62	0.20	0.24
20	Chhattisgarh	0.28	0.31	0.566	0.15	0.79	0.17	0.24
21	Gujarat	0.3	0.13	0.458	0.14	0.73	0.20	0.23
22	Punjab	0.19	0.1	0.444	0.31	0.81	0.17	0.23
23	Goa	0.13	0.42	0.356	0.29	0.71	0.14	0.23
24	Jammu & Kashmir	0.23	0.17	0.484	0.3	0.73	0.14	0.21
25	Rajasthan	0.42	0.1	0.426	0.17	0.68	0.14	0.21
26	Andhra Pradesh	0.31	0.27	0.548	0.18	0.36	0.11	0.17
27	Bihar	0.32	0.11	0.494	0.08	0.25	0.17	0.16
28	Telangana	0.57	0.2	0.51	0.16	NA	0.11	NA
29	Sikkim	0.22	0.33	0.378	0.39	NA	0.14	NA

2. Conclusion



Based on assessment following states are identified for gap assessment.

- | | | |
|---|---------------|--------|
| 1 | Karnataka | (0.56) |
| 2 | Uttarakhand | (0.52) |
| 3 | Odisha | (0.41) |
| 4 | Assam | (0.36) |
| 5 | Uttar Pradesh | (0.33) |
| 6 | Kerala | (0.32) |
| 7 | Maharashtra | (0.31) |
| 8 | Tamil Nadu | (0.30) |

Based on the data analysis, the final ranking suggests Karnataka and Uttarakhand as leading states for interventions. These states were requested to appoint One Health Nodal Officers on which they responded promptly. Moreover, based on engagement with the states and operationalization of National Digital Livestock Mission (NDLM), Karnataka and Uttarakhand were selected as the two states for pilot interventions.

3. Annexure



- **Formula for converting different scale into a standard 0-1 scale**

$$\frac{\max_{\text{new}} - \min_{\text{new}}}{\max_{\text{old}} - \min_{\text{old}}} * (v - \max_{\text{old}}) + \max_{\text{new}}$$

- **Composite Index**

$$\text{Composite Index} = \frac{\sum (Wi \times Si)}{\sum Wi}$$

- **Indices and weights**

Indicators	Weight
Operational assessment	50
Human Animal Interaction index (HAI)	10
Forest cover index (FCI)	10
Biodiversity Index (BI)	10
Composite Health Infrastructure Index (CHII)	10
Livestock Disease Diversity Index (Simpson Index)	10
Total	100

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HEALTHY ANIMALS, HEALTHY PEOPLE, HEALTHY NATIONS

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