



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

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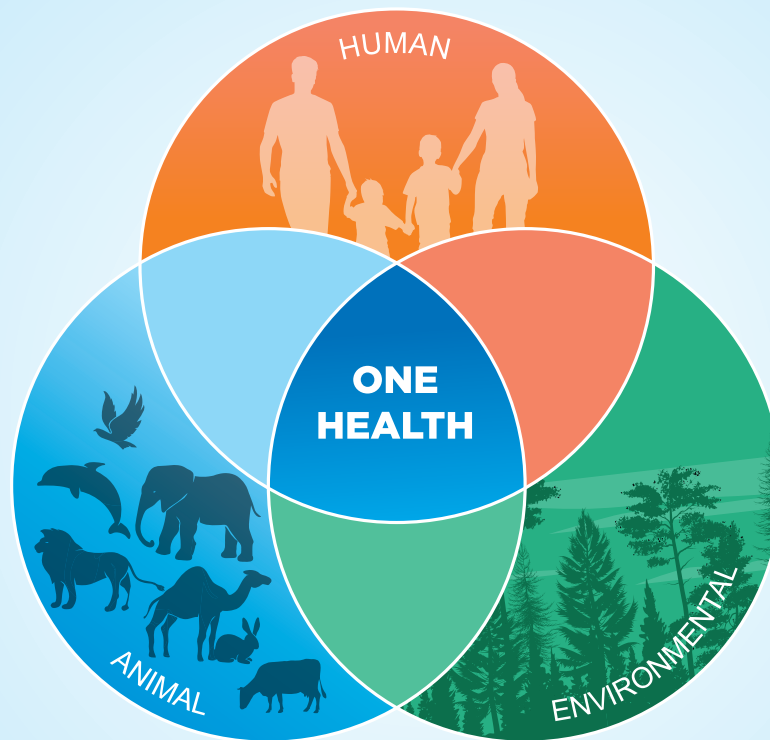


Confederation of Indian Industry

ONE HEALTH PROGRAM

Disease Prioritization

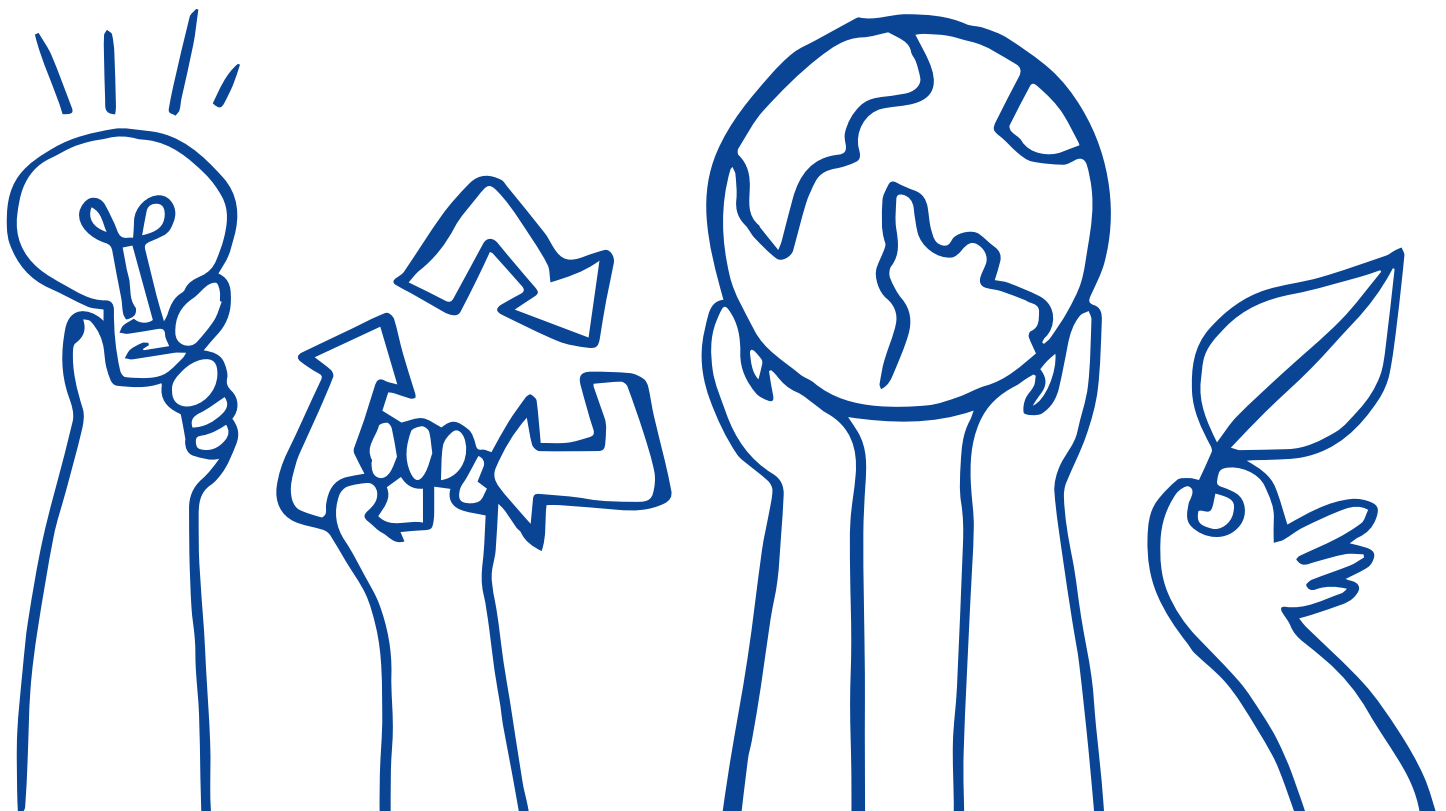
(Uttarakhand & Karnataka)



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

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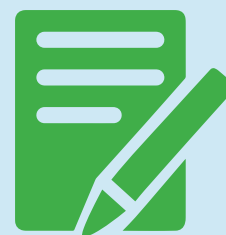


Executive Summary

The Department of Animal Husbandry & Dairying (DAHD), Government of India has initiated the implementation of 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 (Uttarakhand & Karnataka) of India. The OHSU is focusing on preparedness against infectious diseases of zoonotic and economic importance in the state. Therefore, a prioritization exercise was convened to select 2-3 diseases relevant to the state. During this prioritization process, mapping of key zoonotic diseases based on secondary research, stakeholder consultations and quantitative assessments were included. Other considerations included the five aspects of a pathogen namely epizootiology, animal diseases prevention & control, public health, socio-economics & trade and consumer perception & animal welfare. The identified diseases for pilot One Health implementation were discussed with the respective state authorities before finalisation.

The selection of Scrub Typhus, Glanders, FMD, and Tuberculosis for Uttarakhand was done considering the opinion of Experts, importance of the disease with a One Health perspective, and technical/economic feasibility of disease control program with one health interventions. The selection of Anthrax, Brucellosis, and KFD for Karnataka was done following a similar process.

1. Introduction



Microbes have shaped human history and will be doing so in future as well. The human race have witnessed many epidemics and pandemics since time immemorial. Similarly, the epizootics and panzootics have also been witnessed by the animals. However, the last fifty years have witnessed increased in the frequency of infectious diseases in human and animals, such disease incursions lead to heavy burden on human and animal health systems requiring robust preparedness by the animal & health departments to address such outbreaks. As such, it is incumbent upon the policy makers to prioritize the resources towards mitigation of diseases in human, animal (including wild life), plant, and ecosystem health.

In order to pilot the One Health approach in the two selected states, it is important to prioritize zoonotic diseases of greatest concern for all the three departments, i.e., human, animal, and wildlife. Therefore, this process uses a transparent quantitative approach and incorporates equal input from all stakeholders working at the human-animal-wildlife interface.

The goals of the disease prioritization process are to use a multisectoral, One Health approach to

1. Map key zoonotic diseases based on secondary research, consultations from experts and cases of prevalence
2. Prioritize zoonotic diseases of greatest concern through quantitative approach
3. Select top 2-3 zoonotic diseases for pilot One Health implementation - with the consent of the State

2. Methodology



2.1. Prioritisation Category

Five aspects of a pathogen were considered: epizootiology, animal diseases prevention & control, public health, socio-economics & trade, and consumer perception & animal welfare (Annexure I). A review of previous priority settings was used to develop the prioritisation criteria. A total of 37 criteria (Annexure II) were finalized to develop a template for use in the prioritization process. This new template was submitted for expert opinions. The criteria were distributed across five categories as follows: 7 criteria for epizootiology, 13 criteria for animal diseases prevention & control, 7 criteria for public health, 7 criteria for socio-economics & trade, and 3 criteria for consumer perception & animal welfare (Annexure II).

2.2. Scoring of criteria

For each criterion, a score of 0–3 was assigned to each option (Annexure III) according to its role, effect, or rate. Scores were correlated with severity: the higher the score, the more severe the effect.

2.3. Multidisciplinary Expert Panel

A multidisciplinary panel of experts (Annexure IV) - consisting of veterinary, human and wildlife Epidemiologists, Chief Veterinary Officers (CVOs), Economists, Medical Doctors, Veterinary Medical Doctors, and Experts in public health and animal welfare were consulted to complete the disease prioritisation work by inviting them to fill the disease prioritization proforma. They were asked to assign weights to various criteria based on their relative roles, because not all criteria within the same category play the same role in terms of risk and consequences. As the number of criteria varies by category, the number of points distributed was proportional to the number of criteria per category: 19 for epizootiology, 35 for animal diseases prevention & control, 19 for public health, 19 for socio-economic & trade, and 8 for consumer perception & animal welfare. This method was required to prevent criteria classified as major by the Experts (in terms of points distributed) from receiving fewer points because they were part of a larger category. The same panel of Experts was also asked to assign inter-category weightage by distributing 100 points between the 5 broad categories of criteria.

3. Data analysis

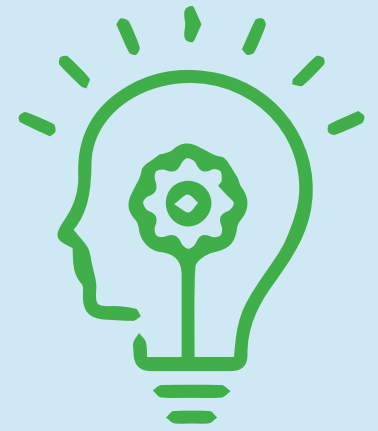


After Experts weighted the different criteria, an overall score was calculated for each disease. To perform the ranking, we used an aggregation method that combined 2 types of weightage assignment. To begin with, criteria score was calculated by multiplying the score (0–3) assigned to the criterion by the average weight distributed by Experts for that criterion. Total criteria score (Annexure V) for each category was calculated by adding the weighted scores for each criterion in the same category. Second, overall score (Annexure VI) for each disease was calculated by taking summation of the product of all total criteria score of category and weightage assigned to each category. Based on the overall score, the diseases were ranked.

Equations:

$$\text{Total Criteria Score: } \sum (\text{Score} * \text{Criteria Weight})$$

$$\text{Overall Score: } \sum (\text{Total Criteria Score} * \text{Category Weight})$$



4.

Results and Conclusion



Prioritization of diseases has acquired major interest in the past few years, especially from public health point of view. However, there was a positive bias towards prioritization of human diseases in existing disease prioritisation process as the same prioritization parameters were adopted for public health as well as veterinary health aspects and its consequences on society. Current exercise is an attempt to develop a set of criteria under a few broad categories which will help in developing a new disease prioritization template which can then be used for state-wise disease prioritization process without any bias towards animal/human/wildlife diseases and provide a list of prioritised diseases to support policy makers for designing interventions with one health approach.

State Disease Prioritisation Workshop

Disease prioritization workshop was conducted for the state of Uttarakhand and Karnataka. Various stakeholders from animal health, public health and wildlife took part in the workshop. After thorough discussions with the individuals from the states, following diseases were considered for pilot one health interventions.

Uttarakhand	Karnataka
Scrub Typhus	Anthrax
Glanders	Brucellosis
Foot-and-mouth Disease (FMD)	Kyasanur Forest Disease (KFD)
Tuberculosis	

Selection of Scrub Typhus, Glanders, FMD, and Tuberculosis for Uttarakhand was done considering the opinion of Experts, importance of the disease with one health perspectives, and technical/economic feasibility of disease control program with one health interventions.

Similarly, selection of Anthrax, Brucellosis, and KFD for Karnataka was done considering the opinion of Experts, importance of the disease with one health perspectives, and technical/economic feasibility of disease control program with one health interventions.

Disease prioritisation workshop: Uttarakhand

Disease Prioritization Workshop

08:59

Request control

Participants: DS, BR, DD, +2, PG

Devendra S..., Brijesh Raw..., Dr. Devanja...

DISEASE PRIORITIZATION PROCESS

PHASE 1: Preparatory Phase

- Map the key zoonotic diseases in India
- Conduct a literature review on initial list of zoonotic diseases
- Design disease prioritization template

PHASE 2: Validation Phase

- Online consultations for validation of template
- Scoring of listed disease by Subject Experts

PHASE 3: Vetting/ Verification

- Disease prioritization workshops
- Data analysis
- Report Generation

The goals of the disease prioritization process are to use a multisectoral, One Health approach to

- Map key zoonotic diseases** based on secondary research, consultations from Experts and case prevalence
- Prioritize zoonotic diseases** of concern through transparent quantitative approach
- Select 2-3 zoonotic diseases** for pilot action with consent from state stakeholders

Dr. Amit Kumar Tripathy

Participants: PG, BR, DS, UD, DT, DD, MD, DR

Parag Gupta (Organizer), Brijesh Rawat (Guest), Devendra Sharma (Guest), Dr. Prasoon Dubey, Uttarakhand ... (Meeting guest), Dr. Amit Kumar Tripathy, Dr. Devanjan Dey, mukesh kumar dumka (Guest), Dr. Rahul Srivastava (No response)

Disease prioritisation workshop: Karnataka

Disease Prioritization Workshop

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Participants: JS, +6, PG

JD SRDDL (...)

DISEASE PRIORITIZATION: PHASE 1

STEP 1: DEVELOP CATEGORIES & CRITERIA

- Template has been developed with 05 broad categories and 37 criteria have been developed for prioritization

Sl. #	Category	Category Weightage
1	Epizootiology	22.50
2	Animal Disease Prevention & Control	22.50
3	Public Health	22.50
4	Socio-economics & Trade	22.50
5	Consumer perception & Animal welfare	10.00
Total		100.00

To help understanding the scoring pattern, a well-defined scorecard has been designed covering each criteria.

STEP 2: WEIGHTAGE & SCORING

- Two weightage patterns were developed, one for the category and other for criteria.
- For each category a weightage was given by Experts wherein the total weightage of all 05 categories is 100.
- For each of the criteria, under a category, criteria weightage will be given by each Expert based on his experience and perception
- For each criterion, a score (scale of 0-3) will be assigned by the Experts following the guidelines of the scorecard developed by OHSU team.

Consultation with experts from ICMR, ICAR, State Animal Husbandry departments, Wild Life Institute of India completed

Dr. Amit Kumar Tripathy

Participants: PG, A, IS, BV, DR, DT, DD, JJ, JS

Parag Gupta (Organizer), additionaldirectorlh (Guest), B R Shome, ICAR-NIVEDI, Benga... (Meeting guest), BALAMURUGAN V (Guest), Dr. Krishna Reddy (Guest), Dr. Amit Kumar Tripathy, Dr. Devanjan Dey, Jagadish Hiremath ICAR-NIVEDI... (Meeting guest), JD SRDDL (Guest)

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Annexure



Annexure I

Category Weightage

Sl. No	Category	Category Weightage
1	Epizootiology	22.5
2	Animal Disease Prevention & Control	22.5
3	Public Health	22.5
4	Socio-economics & Trade	22.5
5	Consumer perception & Animal welfare	10
	Total	100

Annexure II

Criteria-based Scoring & Weightage assignment (based on the data received from Experts)

Category	Criteria	Criteria weightage (All Experts)	Cumulative Score of Experts				
			Influenza A	Anthrax	JE	Brucellosis	
Epizootiology	Incidence rate, %	2.31	1.43	1.00	1.13	1.13	
	Case-fatality rate, %	3.64	1.43	1.14	1.25	0.88	
	Agent specificity (Single- or multi-host) pathogen	2.36	2.57	3.00	2.63	2.78	
	Mode of transmission	2.77	2.29	1.86	2.88	1.38	
	Epizootic potential	2.77	3.00	1.14	1.63	1.50	
	Disease category	2.61	2.00	0.60	0.75	0.13	
	Evolutionary characteristics of pathogen	2.53	2.86	0.14	1.00	0.25	
	Total Criteria Weightage	19.00					
Animal Disease Prevention & Control	Control of reservoir(s) and/or vector(s)	2.57	0.71	0.29	1.25	0.75	
	Availability of Vaccine	3.44	2.57	1.29	2.13	1.50	
	Treatment	3.00	2.29	1.29	2.50	1.75	
	Availability and quality of diagnostic tools	3.27	1.29	1.14	1.50	1.13	
	Knowledge of pathogen	2.80	1.38	1.00	1.13	1.13	
	Surveillance of pathogen	2.42	1.43	1.71	2.13	1.75	
	Existence of mass vaccination programme in animals	3.38	2.63	2.00	2.56	1.44	
	Existence of mass vaccination programme in human	2.57	1.71	2.14	2.00	1.88	

	Cumulative Score of Experts									
	Tuberculosis	Salmonellosis	Glanders	Cysticercosis	FMD	ASF	KFD	Scrub Typhus	Leptospira	Listeria
	1.50	1.25	1.14	1.13	1.63	1.29	1.00	1.13	1.38	1.00
	1.00	1.13	2.14	0.75	1.25	2.57	1.00	1.00	0.88	1.00
	2.75	3.00	2.00	1.63	3.00	1.29	2.13	2.00	3.00	2.75
	2.13	1.50	1.43	1.50	1.88	2.43	2.88	2.88	1.38	1.88
	1.50	1.25	1.00	1.38	2.88	2.71	1.33	1.25	1.50	1.13
	0.50	0.13	2.14	0.13	0.50	1.86	1.63	0.63	0.38	0.25
	0.63	0.50	0.29	0.50	2.50	1.00	1.25	0.75	0.75	0.38
	0.63	0.38	0.43	0.50	0.13	1.57	1.33	0.75	0.50	0.63
	2.00	2.00	2.14	2.00	1.25	2.86	1.88	2.63	1.25	2.63
	1.50	1.25	1.71	1.25	2.63	2.63	2.63	1.14	1.13	0.88
	1.00	1.13	1.29	1.13	1.00	1.29	1.38	1.38	1.25	1.38
	1.13	1.00	1.00	1.25	1.00	1.00	1.33	1.13	1.13	1.00
	1.75	1.86	1.57	2.38	1.25	1.86	1.89	1.88	1.63	2.13
	2.56	2.78	2.25	2.56	0.89	2.50	2.11	2.50	1.78	2.63
	1.13	2.63	2.57	2.63	2.57	2.57	2.38	2.57	2.56	2.57

Category	Criteria	Criteria weightage (All Experts)	Cumulative Score of Experts				
			Influenza A	Anthrax	JE	Brucellosis	
Animal Disease Prevention & Control	Post-vaccination sero-monitoring in animals	2.19	2.43	2.57	2.63	1.13	
	Duration of immunity in animals	2.25	2.50	1.60	1.83	0.13	
	Vaccination Schedule (Single/ double/triple dose)	2.19	1.67	1.80	1.67	1.00	
	Reduction in disease due to mass vaccine	2.54	1.00	1.80	1.60	1.88	
	Possibility of rapid health gains following public health activities	2.39	2.43	2.43	2.43	2.25	
	Total Criteria Weightage	35.00					
Public Health	Zoonotic/non-zoonotic agent	2.77	1.43	1.57	2.13	2.13	
	Type/Classification of zoonoses	2.06	2.29	1.86	2.00	1.75	
	Disease knowledge in humans	1.98	1.43	1.00	1.25	1.13	
	Case-fatality rate, %	3.50	1.14	1.00	1.00	0.88	
	Vaccination	3.15	1.43	1.86	1.38	2.13	
	Treatment	2.68	1.86	1.00	2.25	1.00	
	Availability and quality of diagnostic tools	2.87	1.86	1.57	1.75	1.50	
	Total Criteria Weightage	19.00					
Socio-economic & Trade	Losses of productivity (growth, milk, meat, eggs)	3.52	2.71	1.71	1.25	2.38	
	Additional costs: mandatory slaughtering/ animal Isolation & Maintenance till death/vaccination/ sanitation	2.90	1.86	0.57	0.63	1.50	

	Cumulative Score of Experts									
	Tuberculosis	Salmonellosis	Glanders	Cysticercosis	FMD	ASF	KFD	Scrub Typhus	Leptospira	Listeria
	2.63	2.63	2.57	2.63	0.88	2.71	2.63	2.57	2.57	2.57
	0.38	1.80	2.25	1.83	3.00	2.25	2.00	2.00	2.00	2.00
	0.86	0.80	0.00	1.40	2.25	0.00	1.83	0.00	1.67	0.50
	2.14	1.50	1.33	1.60	2.25	1.33	1.60	1.33	1.40	1.33
	2.43	2.29	2.17	2.29	2.00	2.33	2.25	2.33	2.29	2.17
	2.13	2.13	1.43	1.63	0.13	0.14	1.88	1.75	1.75	1.50
	1.88	1.88	1.71	1.63	0.00	0.43	1.50	1.75	1.50	1.63
	1.25	1.50	1.38	1.63	0.13	0.43	1.50	1.78	1.50	1.50
	1.00	1.13	1.57	1.25	0.13	0.43	1.25	0.88	0.88	0.75
	1.38	1.88	2.57	2.50	0.38	0.00	2.00	2.88	2.00	2.50
	1.13	1.00	1.57	1.00	0.00	0.86	2.38	1.25	1.00	1.00
	1.50	1.38	1.57	1.50	0.50	0.71	1.75	1.75	1.63	1.50
	2.00	2.00	1.43	1.88	2.75	2.57	0.75	0.88	1.38	1.25
	1.25	0.43	1.29	0.13	1.38	1.43	0.50	0.00	0.25	0.13

Category	Criteria	Criteria weightage (All Experts)	Cumulative Score of Experts				
			Influenza A	Anthrax	JE	Brucellosis	
Socio-economic & Trade	Limitation of importation–exportation	2.77	2.14	0.71	0.75	2.38	
	Disturbance of supply and demand (decrease in prices)	1.84	3.00	0.71	1.50	1.25	
	Zoonotic impact (cost of illness)	2.34	2.00	2.00	2.43	1.86	
	Zoonotic impact (costs of prevention per person)	2.39	1.86	1.29	2.25	1.38	
	Zoonotic impact (cost due to human deaths)	3.25	1.71	1.57	2.50	1.25	
	Total Criteria Weightage	19.00					
Consumer perception & Animal welfare	Higher/ Lower Human consumption of animals	2.93	2.71	1.57	1.75	1.13	
	Perception of problem by the consumer (problem poorly known or unknown, problem poorly controllable or uncontrollable, affects a sensitive public)	2.83	2.43	1.57	1.88	2.13	
	Impact on animal welfare and biodiversity	2.23	3.00	1.00	1.88	1.13	
	Total Criteria Weightage	8.00					

	Cumulative Score of Experts									
	Tuberculosis	Salmonellosis	Glanders	Cysticercosis	FMD	ASF	KFD	Scrub Typhus	Leptospira	Listeria
	2.50	2.38	1.00	0.88	3.00	3.00	0.63	0.38	0.50	1.00
	1.50	1.13	0.43	0.88	2.50	2.71	0.50	0.38	0.75	0.88
	2.00	1.57	2.00	2.00	0.00	0.00	2.00	1.71	1.57	1.57
	1.88	1.13	1.29	1.13	0.25	0.14	2.25	1.63	1.38	1.13
	2.00	1.38	1.57	1.25	0.75	1.00	2.38	1.63	1.50	1.25
	1.63	1.63	1.29	1.63	0.88	1.00	0.63	0.50	0.88	1.00
	2.13	1.75	1.43	2.25	0.25	0.43	1.75	1.50	1.63	1.88
	1.00	1.13	2.14	0.75	1.13	2.71	1.13	0.63	0.75	0.75

Annexure III

Score Card Guidance Template

Epizootiology	Score			
Criteria	0	1	2	3
Incidence rate, %	0	<40	41-70	71-100
Case-fatality rate, %	0	<40	41-70	71-100
Agent specificity	0 host species	2 host species	3 host species	4/>4 host species
Mode of transmission	No vector-borne transmission (not contagious)	Contamination by direct contact	Contamination by indirect contact	Vector-borne/ Airborne transmission
Epizootic potential	Never: only sporadic cases, epizootics never reported	Rare: most cases are sporadic; rare possibility of localized epizootic if conditions are ideal: e.g., abnormal multiplication of reservoir(s) and/or vector(s)	Localized: pathogen characterized by localized epizootic potential essentially related to the transmission mode: e.g., food-borne diseases	(Inter)national: epizootic characteristics well known after introduction, possibility of wide spatiotemporal expansion
Disease category	Endemic	Emerging	Re emerging	Emerging & Re-Emerging
Evolutionary characteristics of pathogen	Null: stability of pathogen, stable pathogen-vector(s)/ pathogen-reservoir(s) relationships (no impact on pathogenicity)	Rare: some mutations/ reassortments observed but without any impact on pathogenicity, stable pathogen-vector(s)/ pathogen-reservoir(s) relationships	Moderate: pathogen not characterized for evolutive characteristics yet (recently discovered, limited means of study), mutations with limited consequences on its virulence; stable pathogen-vector(s)/ pathogen--reservoir(s) relationships	High: pathogen has a high mutation rate/ frequent genetic reassortments and creation of new pathogenic variants at each cycle: variable pathogenicity, host(s), reservoir(s), and vector(s)

Animal disease Prevention- control	Score			
Criteria	0	1	2	3
Control of reservoir(s) and/ or vector(s)	Not applicable: no vector- borne transmission and/ or no reservoir(s) known to date	Effective: limited reservoir(s), easy to identify; effective control measures and trapping; reservoir(s)/ vector(s) with limited demographic and geographic repartition; extensive scientific knowledge of vector(s)/reservoir(s); possibility of integrated control method	Limited: limited reservoir(s), easy to identify; effective control measures and trapping but not applicable at a large scale; reservoir(s)/ vector(s) with a limited demographic and geographic repartition; extensive scientific knowledge of vector(s)/ reservoir(s); no integrated control method	Absent/impossible: vector(s)/ reservoir(s) not identified; no effective control measure against vector(s) (no active molecule, ineffective trapping); strong demography and/ or wide repartition of vector(s) and/ or reservoir(s); no scientific knowledge of vector(s)/ reservoir(s); no integrated control method
Vaccination	Not applicable: clinical disease never reported in species considered in the study	Commercialized: commercial vaccine available on a global scale	Local/ monospecies: vaccine available at a regional/ national scale and/or for a targeted species (not systematically available for a global control plan)	Absence: no vaccine available for use in species considered in the study, no experimental vaccine
Treatment	Not applicable: clinical disease never reported in species considered in the study	Available/ effective: effective treatment available; recommended in cases of infection; economical and rational from a zootechnical point of view	Available but not recommended: masks clinical course of disease; contrary to the control plan; not justified economically or from a zootechnical point of view	Absence: no effective treatment available, no experimental treatment available
Availability and quality of diagnostic tools		High: field test(s) available and easy to use, and highly discriminating sensitivity and specificity	Low: tests only used in specialized laboratories/ national reference laboratory	Absence: no diagnostic tools available

Animal disease Prevention- control	Score			
Knowledge of pathogen		high: extensive scientific knowledge of pathogen, extensive scientific literature available on its biology: transmission mode, knowledge of vector(s), infectivity	Moderate: limited scientific knowledge of pathogen because it is still being characterized; pathogen recently discovered/ isolated but belonging to a well known and studied family of pathogens; pathogen characterized by multiple variants not characterized	Low: no scientific knowledge of pathogen (multiplication, infectivity, incubation period, transmission mode); pathogen recently discovered or emerging
Surveillance of pathogen		Generalized: surveillance implemented by all member states (even world-wide surveillance)	States at risk: surveillance of pathogen in the risk states only	Absent: no surveillance of pathogen
Existence of mass vaccination programme in human		all states	few states	no states
Post-vaccination sero-monitoring		all states	few states	no states
Duration of immunity	Life long	2yr	1yr	<6month
Vaccination Schedule (Single/ double/triple dose)		Single Dose	Double Dose	Triple Dose
Reduction in disease due to mass vaccine	0	<30	31-70	70-100
Possibility of rapid health gains following public health activities		Low	Moderate	High

Public health	Score			
Criteria	0	1	2	3
Zoonotic/ common agent†	Not zoonotic or common	Rare: human clinical disease reported in a minority of cases, without necessity of favorable conditions	Frequent: clinical disease often reported in man (multi-species pathogen) without need for favorable conditions	Systematic: clinical disease systematically reported in humans
Classification of zoonoses	Non-zoonotic or common	transmission from wild animals to humans	transmission from wild animals to humans with further human-to-human transmission(s)	transmission from wild animals to domestic animals to humans
Disease knowledge in humans	Not zoonotic or common	high: deep scientific knowledge of pathogen, extensive scientific literature available on its biology; transmission mode, knowledge on vector(s), infectivity	Moderate: limited scientific knowledge of pathogen because it is still being characterized; pathogen recently discovered/isolated but belonging to a well-known and studied family of pathogens; pathogen has multiple variants not characterized	Low: no scientific knowledge of pathogen (multiplication, infectivity, incubation period, transmission mode); pathogen agent recently discovered or emerging
Case-fatality rate, %	Not zoonotic or common	<40	40–70	70–100
Vaccination	Not zoonotic or common	Commercialized: commercial vaccine available on a global scale	Local/monospecies: vaccine available at a regional/ national scale (not systematically available for a global control plan)	Absence: no commercially available or experimental vaccine
Treatment	Not zoonotic or common	Existing/effective: effective treatment commercially available	Available but not recommended: major side effects	Absent: not commercially available or experimental treatment
Availability and quality of diagnostic tools	Not zoonotic or common	High: field test(s) available and easy to use with highly discriminating sensitivity and specificity	Low: tests only used in specialized laboratories/national reference laboratory	Absence: no diagnostic tools available

Socio-economy & trade	Score			
Criteria	0	1	2	3
Individual data (herd/farmer)				
Losses of productivity (milk, eggs, growth)	Null: no impact on animal productivity	Low: losses of productivity <20%	Moderate: losses of productivity of 20%–50%	Severe: losses of productivity >50%
Additional costs: mandatory slaughtering/ vaccination/ sanitation	Not required	Outbreaks only	Outbreaks and restriction areas	??????
Global (sector/market)				
Limitation of importation–exportation	Absent: no impact on the import/export importation/exportation of animal and/or products / byproducts	Local: restrictions of animal and/or by-products movements limited to surveillance areas implemented when an outbreak is confirmed	Regional: animal and/or by-products movements limited in an area greater than the surveillance zone but only in one member state	International: perturbation/limitation of importations/exportations of animal and by-products between several countries
Disturbance of supply and demand (decrease in prices)	Absent: no impact on supply and demand	Low: temporary disturbance of supply and demand in a limited area and low impact on prices	Moderate: temporary disturbance of supply and demand	High: major disturbance of supply and demand and decrease in prices >30% affecting several member states
Impact on Animal husbandry industry	Absent: no impact on Animal husbandry industry	Low:	Moderate:	High
Cost of disease in humans				
Zoonotic impact (cost of illness)	Absent: non-zoonotic or common disease	Low: medical consultation facultative, hospitalization not required, treatment for most severe clinical cases with conventional drugs, maximum incapacity 7 d	Moderate: medical consultation necessary, hospitalization of most severe clinical cases, systematic and adapted treatment with conventional drugs, incapacity 8–14 d	High: medical consultation necessary, systematic hospitalization but of variable duration, required and adapted treatment with second line drugs, incapacity >14 d, quarantine may be required
Zoonotic impact (costs of prevention per person)	Absent: nonzoonotic or common disease	Low: vaccination not advocated, simple and low-cost preventive measures (handwashing, mask carrying, insect repellents)	Moderate: vaccination of populations at risk, simple and low-cost preventive measures (handwashing, mask carrying, insect repellents)	High: generalized vaccination recommended, restricting and expensive preventive measures (thermograph, quarantine, home containment)

Consumer perception & Animal welfare	Score			
Criteria	0	1	2	3
Human consumption of animals	No: no impact on consumption	Low: impact on consumption and a decrease <20% compared with previous consumption	Moderate: impact on consumption and a decrease of 20%–50% compared with previous consumption	High: impact on consumption and a decrease >50% compared with previous consumption
Perception of problem by the consumer (problem poorly known or unknown, problem poorly controllable or uncontrollable, affects a sensitive public)	Not zoonotic or common	Null: clear perception by the consumer; problem well known, controllable, and no impact on the family; short-term effect; does not affect a sensitive public (children, pregnant women)	Low: clear perception by the consumer; problem well known, controllable, and no impact on the family; long-term effect; does not affect a sensitive public (children, pregnant women)	High: bad perception by the consumer; problem poorly known, difficult to control, with an impact on the family; long-term effect; affects a sensitive public (children, pregnant women)
Impact on animal welfare and biodiversity	Null: no impact on animal welfare and biodiversity: no slaughtering, no specific control measures applied to wildlife, no quarantine or containment of animals	Low: no slaughtering but limited control measures and limited containment of species at risk (domestic and wild animals)	Moderate: selective slaughtering of animals showing clinical signs in outbreaks, control and containment of species at risk (domestic and wild animals)	High: systematic slaughtering of domestic and wild animals (outbreaks and surveillance zones), mandatory quarantine, containment of domestic animals at risk

Annexure IV

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Annexure V

Calculation of Total Criteria Score

	Criteria Score						
Criteria	Influenza A	Anthrax	Japanese Encephalitis	Brucellosis	Tuberculosis	Salmonellosis	
Incidence rate, %	3.30	2.31	2.60	2.60	3.47	2.89	
Case-fatality rate, %	5.20	4.16	4.55	3.19	3.64	4.10	
Agent specificity (Single- or multi-host) pathogen	6.07	7.08	6.19	6.55	6.49	7.08	
Mode of transmission	6.33	5.15	7.97	3.81	5.89	4.16	
Epizootic potential	8.31	3.17	4.50	4.16	4.16	3.46	
Disease category	5.23	1.57	1.96	0.33	1.31	0.33	
Evolutionary characteristics of pathogen	7.24	0.36	2.53	0.63	1.58	1.27	
Total Criteria Score	41.68	23.79	30.31	21.27	26.53	23.28	
Control of reservoir(s) and/or vector(s)	1.83	0.73	3.21	1.93	1.60	0.96	
Availability of Vaccine	8.85	4.43	7.31	5.16	6.88	6.88	
Treatment	6.87	3.86	7.51	5.26	4.51	3.76	
Availability and quality of diagnostic tools	4.20	3.73	4.90	3.68	3.27	3.68	
Knowledge of pathogen	3.85	2.80	3.15	3.15	3.15	2.80	
Surveillance of pathogen	3.46	4.15	5.14	4.24	4.24	4.50	
Existence of mass vaccination programme in animals	8.88	6.77	8.65	4.89	8.65	9.40	
Existence of mass vaccination programme in human	4.40	5.50	5.13	4.81	2.89	6.74	
Post-vaccination sero-monitoring in animals	5.31	5.63	5.74	2.46	5.74	5.74	
Duration of immunity in animals	5.61	3.59	4.12	0.28	0.84	4.04	
Vaccination Schedule (Single/double/triple dose)	3.65	3.94	3.65	2.19	1.88	1.75	
Reduction in disease due to mass vaccine	2.54	4.57	4.06	4.76	5.44	3.81	
Possibility of rapid health gains following public health activities	5.81	5.81	5.81	5.38	5.81	5.47	
Total Criteria Score	65.26	55.50	68.38	48.17	54.89	59.52	

	Criteria Score							
	Glanders	Cysticercosis	FMD	ASF	KFD	Scrub Typhus	Leptospira	Listeria
	2.64	2.60	3.76	2.97	2.31	2.60	3.18	2.31
	7.80	2.73	4.55	9.36	3.64	3.64	3.19	3.64
	4.72	3.83	7.08	3.03	5.01	4.72	7.08	6.49
	3.96	4.16	5.20	6.73	7.97	7.97	3.81	5.20
	2.77	3.81	7.97	7.52	3.69	3.46	4.16	3.12
	5.60	0.33	1.31	4.85	4.25	1.63	0.98	0.65
	0.72	1.27	6.33	2.53	3.17	1.90	1.90	0.95
	28.22	18.72	36.19	37.00	30.04	25.92	24.29	22.36
	1.10	1.28	0.32	4.03	3.42	1.93	1.28	1.60
	7.38	6.88	4.30	9.83	6.45	9.03	4.30	9.03
	5.15	3.76	7.89	7.89	7.89	3.43	3.38	2.63
	4.20	3.68	3.27	4.20	4.49	4.49	4.08	4.49
	2.80	3.50	2.80	2.80	3.73	3.15	3.15	2.80
	3.80	5.75	3.03	4.50	4.57	4.54	3.93	5.14
	7.61	8.65	3.01	8.46	7.14	8.46	6.01	8.88
	6.60	6.74	6.60	6.60	6.10	6.60	6.56	6.60
	5.63	5.74	1.91	5.94	5.74	5.63	5.63	5.63
	5.05	4.12	6.74	5.05	4.49	4.49	4.49	4.49
	0.00	3.06	4.92	0.00	4.01	0.00	3.65	1.09
	3.38	4.06	5.71	3.38	4.06	3.38	3.55	3.38
	5.18	5.47	4.78	5.58	5.38	5.58	5.47	5.18
	57.89	62.68	55.28	68.26	67.48	60.71	55.49	60.96

	Criteria Score						
Criteria	Influenza A	Anthrax	Japanese Encephalitis	Brucellosis	Tuberculosis	Salmonellosis	
Zoonotic/non-zoonotic agent	3.96	4.35	5.89	5.89	5.89	5.89	
Type/Classification of zoonoses	4.70	3.82	4.12	3.60	3.86	3.86	
Disease knowledge in humans	2.83	1.98	2.47	2.23	2.47	2.97	
Case-fatality rate, %	4.00	3.50	3.50	3.06	3.50	3.94	
Vaccination	4.50	5.85	4.33	6.70	4.33	5.91	
Treatment	4.97	2.68	6.02	2.68	3.01	2.68	
Availability and quality of diagnostic tools	5.32	4.50	5.02	4.30	4.30	3.94	
Total Criteria Score	30.28	26.69	31.35	28.45	27.36	29.18	
Losses of productivity (growth, milk, meat, eggs)	9.54	6.03	4.39	8.35	7.03	7.03	
Additional costs: mandatory slaughtering/ animal Isolation & Maintenance till death/ vaccination/sanitation	5.38	1.66	1.81	4.35	3.62	1.24	
Limitation of importation-exportation	5.94	1.98	2.08	6.58	6.93	6.58	
Disturbance of supply and demand (decrease in prices)	5.51	1.31	2.76	2.30	2.76	2.07	
Zoonotic impact (cost of illness)	4.69	4.69	5.69	4.35	4.69	3.68	
Zoonotic impact (costs of prevention per person)	4.44	3.07	5.38	3.29	4.48	2.69	
Zoonotic impact (cost due to human deaths)	5.56	5.10	8.11	4.06	6.49	4.46	
Total Criteria Score	41.06	23.83	30.22	33.27	36.00	27.75	
Higher/Lower Human consumption of animals	7.96	4.61	5.13	3.30	4.77	4.77	
Perception of problem by the consumer (problem poorly known or unknown, problem poorly controllable or uncontrollable, affects a sensitive public)	6.88	4.45	5.31	6.02	6.02	4.96	
Impact on animal welfare and biodiversity	6.70	2.23	4.19	2.51	2.23	2.51	
Total Criteria Score	21.54	11.30	14.63	11.83	13.02	12.24	

	Criteria Score							
	Glanders	Cysticercosis	FMD	ASF	KFD	Scrub Typhus	Leptospira	Listeria
	3.96	4.50	0.35	0.40	5.20	4.85	4.85	4.16
	3.53	3.34	0.00	0.88	3.09	3.60	3.09	3.34
	2.72	3.22	0.25	0.85	2.97	3.52	2.97	2.97
	5.50	4.37	0.44	1.50	4.37	3.06	3.06	2.62
	8.10	7.88	1.18	0.00	6.30	9.06	6.30	7.88
	4.20	2.68	0.00	2.29	6.36	3.34	2.68	2.68
	4.50	4.30	1.43	2.05	5.02	5.02	4.66	4.30
	32.52	30.29	3.65	7.97	33.30	32.45	27.60	27.95
	5.02	6.59	9.67	9.04	2.64	3.08	4.83	4.39
	3.73	0.36	3.98	4.14	1.45	0.00	0.72	0.36
	2.77	2.42	8.31	8.31	1.73	1.04	1.39	2.77
	0.79	1.61	4.59	4.99	0.92	0.69	1.38	1.61
	4.69	4.69	0.00	0.00	4.69	4.02	3.68	3.68
	3.07	2.69	0.60	0.34	5.38	3.89	3.29	2.69
	5.10	4.06	2.43	3.25	7.71	5.27	4.87	4.06
	25.17	22.42	29.59	30.06	24.51	17.98	20.16	19.56
	3.77	4.77	2.57	2.93	1.83	1.47	2.57	2.93
	4.05	6.38	0.71	1.21	4.96	4.25	4.60	5.31
	4.79	1.68	2.51	6.06	2.51	1.40	1.68	1.68
	12.60	12.82	5.79	10.21	9.30	7.11	8.85	9.92

Annexure VI

Calculation of Overall Score

	Total Criteria Score					
Diseases	Epizootiology	Animal Disease Prevention & Control	Public Health	Socio-economic & Trade	Consumer perception & Animal welfare	Overall Score
Influenza A	41.68	65.26	30.28	41.06	21.54	39.96
Japanese Encephalitis	30.31	68.38	31.35	30.22	14.63	34.98
KFD	30.04	67.48	33.30	24.51	9.30	32.93
Tuberculosis	26.53	54.89	27.36	36.00	13.02	31.56
Glanders	28.22	57.89	32.52	25.17	12.60	31.28
ASF	37.00	68.26	7.97	30.06	10.21	30.70
Salmonellosis	23.28	59.52	29.18	27.75	12.24	30.39
Cysticercosis	18.72	62.68	30.29	22.42	12.82	29.39
Scrub Typhus	25.92	60.71	32.45	17.98	7.11	28.84
Brucellosis	21.27	48.17	28.45	33.27	11.83	28.60
Anthrax	23.79	55.50	26.69	23.83	11.30	28.22
Listeria	22.36	60.96	27.95	19.56	9.92	28.15
Leptospira	24.29	55.49	27.60	20.16	8.85	27.28
FMD	36.19	55.28	3.65	29.59	5.79	26.10

Annexure VII

Rank	Diseases	Overall Score
1	Influenza A	39.96
2	Japanese Encephalitis	34.98
3	KFD	32.93
4	Tuberculosis	31.56
5	Glanders	31.28
6	ASF	30.70
7	Salmonellosis	30.39
8	Cysticercosis	29.39
9	Scrub Typhus	28.84
10	Brucellosis	28.60
11	Anthrax	28.22
12	Listeria	28.15
13	Leptospira	27.28
14	FMD	26.10

List of Category-wise Prioritized Diseases

(i) Epizootiology

Rank	Diseases	Epizootiology-Criteria Score
1	Influenza A	41.68
2	ASF	37.00
3	FMD	36.19
4	Japanese Encephalitis	30.31
5	KFD	30.04
6	Glanders	28.22
7	Tuberculosis	26.53
8	Scrub Typhus	25.92
9	Leptospira	24.29
10	Anthrax	23.79
11	Salmonellosis	23.28
12	Listeria	22.36
13	Brucellosis	21.27
14	Cysticercosis	18.72

(ii) Animal Disease Prevention & Control

Rank	Diseases	Animal Disease Prevention & Control- Criteria Score
1	Japanese Encephalitis	68.38
2	ASF	68.26
3	KFD	67.48
4	Influenza A	65.26
5	Cysticercosis	62.68
6	Listeria	60.96
7	Scrub Typhus	60.71
8	Salmonellosis	59.52
9	Glanders	57.89
10	Anthrax	55.50
11	Leptospira	55.49
12	FMD	55.28
13	Tuberculosis	54.89
14	Brucellosis	48.17

(iii) Public Health

Rank	Diseases	Public Health- Criteria Score
1	KFD	33.30
2	Glanders	32.52
3	Scrub Typhus	32.45
4	Japanese Encephalitis	31.35
5	Cysticercosis	30.29
6	Influenza A	30.28
7	Salmonellosis	29.18
8	Brucellosis	28.45
9	Listeria	27.95
10	Leptospira	27.60
11	Tuberculosis	27.36
12	Anthrax	26.69
13	ASF	7.97
14	FMD	3.65

(iv) Socio-economics & Trade

Rank	Diseases	Socio-economic & Trade- Criteria Score
1	Influenza A	41.06
2	Tuberculosis	36.00
3	Brucellosis	33.27
4	Japanese Encephalitis	30.22
5	ASF	30.06
6	FMD	29.59
7	Salmonellosis	27.75
8	Glanders	25.17
9	KFD	24.51
10	Anthrax	23.83
11	Cysticercosis	22.42
12	Leptospira	20.16
13	Listeria	19.56
14	Scrub Typhus	17.98

(v) Consumer Perception & Animal Welfare

Rank	Diseases	Consumer perception & Animal welfare- Criteria Score
1	Influenza A	21.54
2	Japanese Encephalitis	14.63
3	Tuberculosis	13.02
4	Cysticercosis	12.82
5	Glanders	12.60
6	Salmonellosis	12.24
7	Brucellosis	11.83
8	Anthrax	11.30
9	ASF	10.21
10	Listeria	9.92
11	KFD	9.30
12	Leptospira	8.85
13	Scrub Typhus	7.11
14	FMD	5.79

[illegible]



HEALTHY ANIMALS, HEALTHY PEOPLE, HEALTHY NATIONS

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