

# Workshop on Integrated Surveillance Framework for Antimicrobial Resistance

*Focusing on Animals and  
Environment*

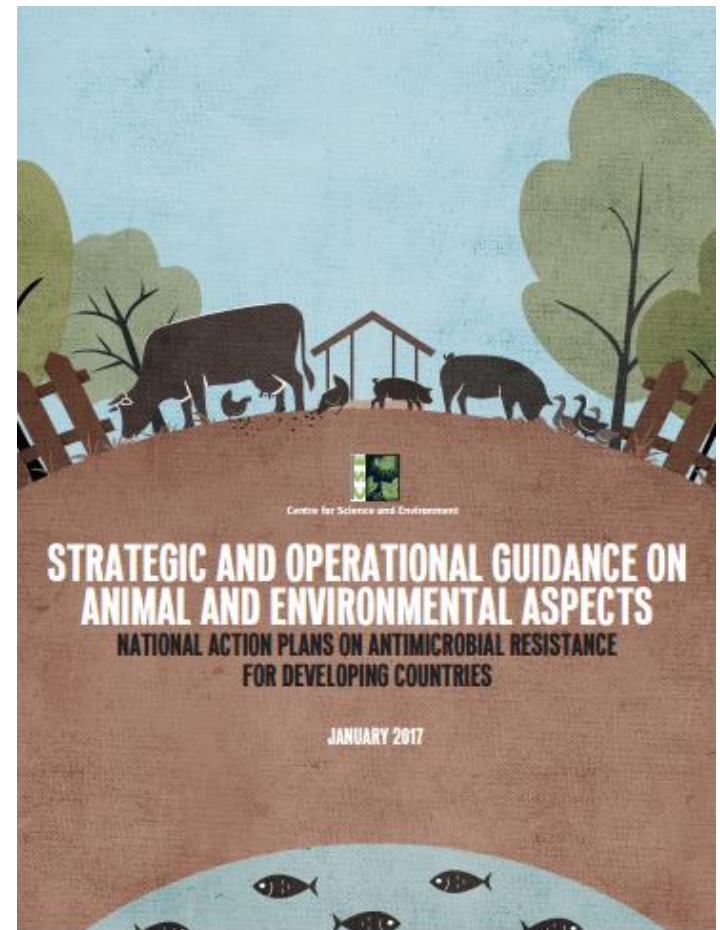
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**AMR surveillance in food animals and environment: policies, systems and  
tools**

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# Strategic and Operational Guidance on animal and environmental aspects of NAP-AMR for Developing Countries, 2016-17

- **International Workshop in Nov 2016.** Experts from governments, inter-governmental organizations, civil society representing human, veterinary and environment sectors
  - **Developed countries:** Denmark, Netherlands, Sweden, UK
  - **Developing countries:** Bangladesh, Kenya, Philippines, South Africa, Sri Lanka, Thailand, Vietnam and India
  - Representation from the **WHO** (SEARO and country-level), **FAO** (Head Quarter and Regional Office for Asia Pacific), **OIE** (Regional Commission for Asia Far East and Oceania)
  - **International organizations:** International Livestock Research Institute (Kenya), ReACT – Action on Antibiotic Resistance (US), Institute for Agriculture and Trade Policy (Europe), Third World Network (Switzerland), Médecins Sans Frontières (India)



# Framework for Guidance

INTERVENTION AREAS	Policy/law/regulations/standards/programmes
	Implementation tools-Infrastructure/capacity/systems/resources
	Advocacy/awareness and education/training/curriculum
	Record keeping/database generation/collation/dissemination and research/survey
	Review/monitoring/feedback

## Responsible Antibiotic Use in Food Animals

THEMATIC AREAS				
Supply of antibiotics	Production Systems			Consumers
	Reduce need for antibiotics	Veterinarians and veterinary services	Farms and farmers	

## Surveillance of Antibiotic Use, Residues and Resistance

THEMATIC AREAS			
Antibiotic use in food animals	Antibiotic resistance in animals and food from animals	Antibiotic residues in food from animals	Environmental surveillance of residues and resistance

## Environment Management to Contain Antimicrobial Resistance

THEMATIC AREAS			
Registration/licensing (based on environment risk assessment)	Biosecurity/sanitation and hygiene/good manufacturing Practices	Waste management	Research

Short-term **(S)**: <1 yr; Medium-term **(M)**: 1-3 yrs;  
Long term **(L)**: 3-5 yrs; Continues throughout: **(S-M-L)**



# RESPONSIBLE ANTIBIOTIC USE IN FOOD ANIMALS

		THEMATIC AREAS				
		Supply of antibiotics	Production systems			Consumers
			Reduce need for antibiotics	Veterinarians and veterinary services	Farms and farmers	
INTERVENTION AREAS	Policy/laws/ regulations/ standards/ programmes	<ul style="list-style-type: none"><li>Assessment of existing laws and regulatory framework before formulation of new laws (S)</li><li>National policy and regulatory framework on responsible antibiotic use with focus on (S):<ul style="list-style-type: none"><li>Approval and authorization of antibiotics for animals</li><li>Standard treatment guidelines for treating animals</li><li>Ban/phasing out of non-therapeutic use such as for disease prevention and growth promotion</li><li>Restricting use of critically important antibiotics for humans</li><li>Antibiotic use under supervision and prescription</li><li>Mitigating livelihood impact on small-holder farmers</li></ul></li><li>Regulations to restrict antibiotics in animal feed and premix, registration of feed and premix, prescription and use of only registered products (S)</li><li>Regulations for importation of feed, feed premix and antibiotics for animal use (S)</li><li>Labelling laws for feed, premix (S)</li><li>Labelling laws for antibiotics for specie-specific use (S)</li><li>Regulations to control online marketing or direct distribution of antibiotics, premix, antibiotic feed or any other products with antibiotics (S)</li><li>Laws to ensure licensing of manufacturers, distributors and sellers of antibiotics, feed, premix and other inputs (S)</li><li>Laws to ensure prescription sale, including penalty for unauthorized sale (S)</li><li>Plan to set reduction targets for antibiotic use by a certain date and with a review process (S)</li></ul>	<ul style="list-style-type: none"><li>Develop guidelines for biosecurity (S)<ul style="list-style-type: none"><li>Plan/programme for internal and external biosecurity</li><li>Programme to support small-holder farmers to implement biosecurity</li></ul></li><li>Programme to research, develop, promote access to alternatives such as vaccination, probiotics etc. (M)</li><li>Plan for research and development of appropriate animal breeds which are, for example, resilient to disease (M)</li></ul>	<ul style="list-style-type: none"><li>Law for licensing/registration of veterinarians and those involved in fisheries (S)</li><li>Law to delink antibiotic prescription and incentives (S)</li><li>Programme for accessible, affordable and quality diagnostic services to support judicious use of antibiotics (M)</li><li>Programme for targeted, livestock specific veterinary services to provide free or low cost advisory services to farmers (M)</li></ul>	<ul style="list-style-type: none"><li>Law for licensing and auditing of commercial farms and farmers (such as intensive/semi-intensive farms or all farms based on country-level scenario) (M)</li><li>Programme to incentivize/dis-incentivize farmers based on extent of antibiotic use (M)</li></ul>	<ul style="list-style-type: none"><li>Labelling law for food from animals produced with or without routine use of antibiotics (S)</li></ul>
	Implementation tools— infrastructure/ capacity/ systems/ resources	<ul style="list-style-type: none"><li>Establish authority for approving veterinary drugs and market authorization (S)</li><li>Develop systems to enable data collection of antibiotic production, sale and import (M)</li><li>Provide enforcement systems through stakeholder agencies including customs, infrastructure, human resource such as those required for auditing/inspecting companies providing inputs (e.g. feed), ensuring prescription sale etc. (M)</li></ul>	<ul style="list-style-type: none"><li>Develop systems to ensure adoption and implementation of appropriate biosecurity measures at the farm level (M)</li><li>Systems to register antibiotic-free alternative products and their use (S)</li><li>Support for programmes on development and adoption of vaccines (M)</li><li>Investment and research in development of appropriate animal breeds with disease resilience (L)</li></ul>	<ul style="list-style-type: none"><li>Set up statutory body for licensing veterinarians and those involved in fisheries (S)</li><li>Develop capacity and infrastructure to ensure veterinary diagnostic services (M)</li><li>Develop system to disincentivize antibiotic prescription by veterinarian (S)</li></ul>	<ul style="list-style-type: none"><li>Se and registration of farmers (S)</li><li>Formulate a system based on incentives and disincentives that can help control antibiotic use (M)</li></ul>	laws (S)
	Advocacy/ awareness and education/ training/ curriculum	<ul style="list-style-type: none"><li>Awareness and training of regulators, customs officials, distributors and sellers to ensure approved sale, documentation etc. (S-M-L)</li></ul>	<ul style="list-style-type: none"><li>Awareness and training of farmers, registered practitioners, veterinarians and other stakeholders on need for biosecurity, judicious antibiotic use and importance of alternatives (S-M-L)</li></ul>	<ul style="list-style-type: none"><li>Awareness, training and education of veterinarians (S-M-L)</li><li>Ensure AMR focus in curriculum and continuous professional education (S-M-L)</li></ul>	<ul style="list-style-type: none"><li>Targeted education on AMR and responsible antibiotic use for farmers (S-M-L)</li><li>Farmer training in agro-ecological/ alternative farming practices, participatory farming approaches (S-M-L)</li></ul>	<ul style="list-style-type: none"><li>Consumer awareness on antibiotics in food and AMR, labelling of food from animals raised with responsible use of antibiotics and role of sustainable diets (S-M-L)</li><li>Awareness and promotion of institutional procurement of food raised without routine antibiotic use (such as through a score card system used to incentivize/dis-incentivize food procurement or through quality assurance accreditation schemes) (S-M-L)</li><li>Inclusion of AMR in school curriculum (S)</li></ul>
	Record keeping/ database generation/ collation/ dissemination and research/ survey	<ul style="list-style-type: none"><li>A national database of licensed antibiotic producers, importers, traders and retailers including defaulters available online (S)</li><li>An online national/regional/sub-regional database on antibiotic production, sale and national database on import of antibiotics (M)</li><li>Online dissemination of updated policy, regulation and data including list of approved and unapproved antibiotics (S)</li><li>Annual report of antibiotic sale correlated with consumption and resistance data (M)</li></ul>	<ul style="list-style-type: none"><li>A national database, available online, for approved and unapproved vaccines and other alternatives (M)</li><li>A list/database of farmers/producers successfully adopting biosecurity and using alternatives and not antibiotics (M)</li></ul>	<ul style="list-style-type: none"><li>A national database, available online, of registered veterinarians, and those who prescribe more antibiotics and without testing (M)</li><li>An updated list of diagnostic services/ laboratories available (S)</li></ul>	<ul style="list-style-type: none"><li>A national database, available online, of registered farms and farmers including those who are non-compliant or use more antibiotics (M)</li></ul>	<ul style="list-style-type: none"><li>Publicly available database of farmers/ producers raising food from animals without routine use of antibiotics (M)</li><li>Database of farmers/producers not in compliance to labelling laws (M)</li></ul>
	Review/ monitoring/ feedback	<ul style="list-style-type: none"><li>Periodic review and mapping of antibiotic production, import, sale as per sectors with consumption and resistance data for continued advocacy, awareness, and future policy and practice (S-M-L)</li><li>Annual report on antibiotic sale (S-M-L)</li></ul>	<ul style="list-style-type: none"><li>Periodic review of use and success of alternatives, with reference to antibiotic use and resistance data at the farm/ sub-regional/regional/national level, for continued advocacy, awareness, and future policy and practice (S-M-L)</li></ul>	<ul style="list-style-type: none"><li>Periodic monitoring of records at veterinary practice levels, for continued advocacy, awareness, and future policy and practice (S-M-L)</li></ul>	<ul style="list-style-type: none"><li>Periodic monitoring of records at farm levels, for continued advocacy, awareness, and future policy and practice (S-M-L)</li></ul>	<ul style="list-style-type: none"><li>Periodic assessment of initiatives with antibiotic use data (S-M-L)</li></ul>

# SNAPSHOT

## Responsible antibiotic use in food animals

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# Responsible antibiotic use in food animals

## Supply of antibiotics

### Policy/Law/ regulations/ standards/ programmes

- Assessment of existing laws and regulatory framework before formulation of new laws (S)
- National policy and regulatory framework on responsible antibiotic use with focus on (S)
  - Approval and authorisation of antibiotics for animals
  - Standard treatment guidelines for treating animals
  - Ban/phasing out of non-therapeutic use such as for mass disease prevention and growth promotion
  - Restricting use of critically important antibiotics for humans
  - Antibiotic use under supervision and prescription
  - Mitigating livelihood impact on small holder farmers

# Responsible antibiotic use in food animals

## Supply of antibiotics

### Policy/Law/ regulations/ standards/ programmes

- Regulation to restrict **antibiotics in animal feed and premix**, registration of feed and premix, prescription and use of only registered products **(S)**
- Regulation on **import of feed, feed premix and antibiotics** for animal use **(S)**
- **Labelling law** for feed, premix **(S)**
- **Labelling law** for antibiotics for specie-specific use **(S)**
- Regulation on **online marketing** and **direct distribution** of antibiotics, premix, antibiotic feed or any other products with antibiotics **(S)**
- Law to ensure **licensing of manufacturer, distributor and sellers** of antibiotics, feed, premix and other inputs **(S)**
- Law to ensure **prescription sale**, including **penalty for unauthorized sale** **(S)**
- Plan to **set reduction targets** for antibiotic use by a certain date and with a review process **(S)**

# Responsible antibiotic use in food animals

## Supply of antibiotics

### Implementation tools -

### infrastructure/ capacity/ systems/ resources

### Advocacy/ awareness and education/ training/ curriculum

### Record keeping/ database generation/ collation/ dissemination and research/ survey

- Authority for approving veterinary drugs and market authorization **(S)**
- Systems to enable data collection of antibiotic production, sale and import **(M)**
- Necessary enforcement systems through agencies including customs, infrastructure and human resource including those for auditing/inspecting companies providing inputs (e.g. feed), ensuring prescription sale etc. **(M)**

- Awareness and training of regulators, customs officials, distributors and sellers to ensure approved sale, documentation etc. **(S-M-L)**

- National online database of licensed antibiotic producer, importer, traders, retailers including defaulters **(S)**
- Online national/regional/sub-regional database on antibiotic production, sale, import **(M)**
- Online dissemination of updated policy, regulation and data including list of approved and unapproved antibiotics **(S)**
- Annual report of antibiotic sale correlated with consumption and resistance data **(M)**

- Periodic review/mapping of antibiotic production, import, sale as per sector **(S-M-L)**; Annual report on antibiotic sale **(S-M-L)**

### Review/ monitoring/fee dback

# Responsible antibiotic use in food animals

## Reduce need for antibiotics

### Policy/Law/ regulations/ standards/ programmes

- Develop **guidelines for biosecurity (S)**
  - Plan/programme for internal and external biosecurity and its enforcement
  - Programme **to support small-holder farmers** to implement biosecurity
- **Programme to research, develop, promote access to alternatives** such as vaccination, probiotics etc. **(S)**
- Plan for research and development of appropriate animal breeds. Which are, for example, resilient **(S)**

### Implementation tools - infrastructure/ capacity/ systems/ resources

- Develop **systems to ensure adoption and implementation of appropriate biosecurity** measures at the farm level **(M)**
- **Systems to register antibiotic free alternative products** and their use **(S)**
- Support for programmes on development and adoption of vaccines **(M)**
- Investment and research in development of appropriate animal breeds with disease resilience **(M)**



# Responsible antibiotic use in food animals

## Reduce need for antibiotics

Advocacy/  
awareness  
and education/  
training/  
curriculum

- Awareness and training of farmers, registered practitioners, veterinarians and other stakeholders on need for biosecurity, judicious antibiotic use and importance of alternatives **(S-M-L)**

Record keeping/  
database  
generation/  
collation/  
dissemination  
and research/  
survey

- National online database for approved and unapproved vaccines and other alternatives **(S)**
- A list/database/rating of farmers/producers successfully adopting biosecurity and using alternatives and not antibiotics **(M)**

Review/  
monitoring/feed  
back

- Periodic review of use and success of alternatives, with reference to antibiotic use and resistance data at the farm/sub-regional/regional/national level **(S-M-L)**

# Responsible antibiotic use in food animals

## Veterinarians and veterinary services

### Policy/Law/ regulations/ standards/ programmes

- Law for **licensing/registration of veterinarians (S)**
- Law to **delink antibiotic prescription and incentives (S)**
- Programme for **accessible, affordable and quality diagnostic services** to support judicious use of antibiotics **(S)**
- Programme for targeted, livestock specific veterinary services to provide free advisory services to farmers **(M)**

### Implementation tools - infrastructure/ capacity/ systems/ resources

- Set up **licensing authority for veterinarians** and those involved in fisheries **(S)**
- Develop **capacity and infrastructure** to ensure veterinary diagnostic services **(M)**
- Develop **system to dis-incentivize antibiotic prescription** by veterinarian **(S)**

# Responsible antibiotic use in food animals

## Veterinarians and veterinary services

### Advocacy/ awareness and education/ training/ curriculum

- Awareness, training and education of veterinarians **(S-M-L)**
- Necessary AMR focus in curriculum and continuous professional medical education **(S-M-L)**

### Record keeping/ database generation/ collation/ dissemination and research/ survey

- National online database of registered veterinarians, and those who prescribe more antibiotics and without testing **(M)**
- An updated list of diagnostic services available **(S)**

### Review/ monitoring/feed back

- Periodic monitoring of records at veterinary levels **(S-M-L)**

# Responsible antibiotic use in food animals

## Farms and farmers

### Policy/law/ regulations/ standards/ programmes

- Law for **licensing and monitoring of commercial farms and farmers** based on country-level scenario **(M)**
- Programme to **incentivize/dis-incentivize farmers** based on extent of antibiotic use **(S)**

### Implementation tools - infrastructure/ capacity/ systems/ resources

- Set up **licensing authority** for farms and registration of farmers **(S)**
- Enabling **system to dis-incentivize/incentivize antibiotic use** at farm level **(M)**

### Advocacy/ awareness and education/ training/ curriculum

- **Targeted education** on AMR and judicious antibiotic use for farmers **(S-M-L)**
- Farmer training in **agro-ecological/alternative/participatory farming practices** **(S-M-L)**

### Record keeping/ database generation/ collation/ dissemination and research/ survey

- **National database of registered farms and farmers** including those who are non-compliant or use more antibiotics **(M)**

- Periodic monitoring of records at farm levels **(S-M-L)**

### Review/ monitoring/feedb ack

# Responsible antibiotic use in food animals

## Consumers

Policy/Law/  
regulations/  
standards/  
programmes

- Labelling law for food from animals produced with or without antibiotics **(S)**

Implementation  
tools -  
infrastructure/  
capacity/ systems/  
resources

- Systems to ensure compliance of labelling laws **(S)**

Advocacy/  
awareness  
and education/  
training/ curriculum

- Consumer awareness on antibiotics in food and AMR, labelling of food from animals raised without antibiotics and role of sustainable diets **(S-M-L)**
- Awareness and promotion of Institutional procurement of food raised without antibiotics (such as through a score card system used to incentivize/dis-incentivize food procurement) **(S-M-L)**

Record keeping/  
database  
generation/  
collation/  
dissemination  
and research/ survey

- Public database of farmers/producers raising farm animals without antibiotic use **(M)**
- Database of farmers/producers not in compliance to labelling laws **(M)**

- Periodic assessment of initiatives with those of antibiotic use data **(S-M-L)**

Review/  
monitoring/  
feedback



# SURVEILLANCE OF ANTIBIOTIC USE, RESIDUES AND RESISTANCE

	THEMATIC AREAS <sup>17</sup>			
	Antibiotic use in food animals	Antibiotic resistance in animals and food from animals	Antibiotic residues in food from animals	Environmental surveillance of residues and resistance
INTERVENTION AREAS	<b>Policy/laws/ regulations/ standards/ programmes</b> <ul style="list-style-type: none"> <li>Assessment of existing laws before formulation of new laws (S)</li> <li>Legal provision for obtaining farm-level antibiotic use data (S)</li> <li>Regulation to ensure prescription audit of veterinarians/authorized practitioners (M)</li> </ul>	<ul style="list-style-type: none"> <li>National AMR surveillance programme to monitor resistance in animals and food from animals across all sectors (M)</li> <li>Law compelling farmers and food processors to provide samples for analysis and share their internal data on resistance (S)</li> <li>Ambitious and achievable resistance reduction targets (S-M-L)</li> </ul>	<ul style="list-style-type: none"> <li>National antibiotic residue monitoring policy/ programme for food from animals (S)</li> <li>Standards for antibiotic residues in food from animals such as chicken, eggs, milk, fish (S)</li> </ul>	<ul style="list-style-type: none"> <li>National AMR surveillance programme to monitor resistance in environment (M)</li> <li>Regulation on antibiotic residues in effluent and waste from industries and farms (S)</li> <li>Standards for waste discharge from farms, slaughter houses, animal food processing industry, pharmaceutical industry, veterinary care and healthcare settings (S)</li> </ul>
	<b>Implementation tools— infrastructure/ capacity/ systems/ resources</b> <ul style="list-style-type: none"> <li>Systems to enable collection and collation of farm-level antibiotic use data (M): <ul style="list-style-type: none"> <li>Harmonized system for data collection and analysis</li> <li>Ensure farmer's responsibility to provide data</li> <li>Factor-in priority markets/sectors</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Commission an expert advisory group/steering committee to decide on key elements such as networking experts/labs, terms of reference, priorities, linkages and international collaboration. This should involve details on target species, sampling site, types and frequency of sampling, testing methods and reporting systems (S)</li> <li>Identify, establish and strengthen national reference laboratories who decide upon standards, protocols, organisms, data management mechanisms (M):<sup>18</sup> <ul style="list-style-type: none"> <li>Ensure quality and harmonization with national/ international data and establish linkages with resistant bacteria and resistance genes in humans and environment</li> <li>Enable collaboration between labs to provide support, build access to WHO, FAO and OIE labs</li> </ul> </li> <li>Develop and strengthen lab infrastructure, professional capacity, standardization of sample collection and testing protocols and assure quality both internally and externally through External Quality Assurance Scheme. (M)—sector specific (L)—integrated quality assurance</li> <li>Ensure surveillance systems for harmonization across all sectors such as animals, humans and environment. Integrated surveillance could begin with a pilot initiative (S-M-L)</li> </ul>	<ul style="list-style-type: none"> <li>Develop comprehensive residue monitoring framework which enables surveillance of approved and unapproved antibiotic use (S)<sup>19</sup> <ul style="list-style-type: none"> <li>Export oriented residue monitoring framework could be considered for adaptation based on domestic antibiotic use</li> </ul> </li> <li>Ensure availability of required funds, infrastructure resources for quantitative data collection (S)</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring and surveillance framework including monitoring of antibiotic residues and AMR in indicator bacteria in environment, farms, factories, slaughter house, wet market, processing unit, health care facilities, veterinary care facilities (prioritization based on ground realities) (M)</li> </ul>
	<b>Advocacy/ awareness and education/ training/ curriculum</b> <ul style="list-style-type: none"> <li>Awareness campaigns for farmers to self-regulate themselves and keep records (S-M-L)</li> <li>Awareness campaigns for veterinarians/ authorized practitioners to prescribe antibiotics judiciously and keep records (S-M-L)</li> <li>Training programme on documentation for farmers and veterinarians/authorized practitioners (S)</li> <li>Training needs assessment of those conducting surveillance, development of training material and protocols for data collection and management followed by enabling environment to collect data (S)</li> <li>Advocacy at community and institutional level based on antibiotic use data reports (S-M-L)</li> </ul>	<ul style="list-style-type: none"> <li>Awareness campaigns on importance and need of resistance surveillance across stakeholders (S-M-L)</li> <li>Training needs assessment for those conducting surveillance (S)</li> <li>Development of training material and protocols for resistance data collection and management followed by enabling environment for resistance surveillance (S)</li> <li>Capacity-building and training programmes including integrated programmes with the WHO, FAO, OIE collaborating centres (M)</li> <li>Advocacy at community and institutional levels based on antibiotic resistance data reports (S-M-L)</li> </ul>	<ul style="list-style-type: none"> <li>Awareness campaigns on importance and need of residue monitoring (S-M-L)</li> <li>Training needs assessment for those conducting surveillance (S)</li> <li>Development of training material and protocols for residue testing and data management followed by enabling environment for residue surveillance (S)</li> <li>Capacity building and training programmes (M)</li> <li>Advocacy at community and institutional level based on antibiotic residue data reports (S-M-L)</li> </ul>	<ul style="list-style-type: none"> <li>Development of training material, protocols and data management (S)</li> <li>Capacity building and training programme (including at university level) (M)</li> <li>Training of peerparticipatory monitoring systems (M)</li> <li>Advocacy at community and institutional levels based on environmental surveillance data reports (S-M-L)</li> </ul>
	<b>Record keeping/ database generation/ collation/ dissemination and research/ survey</b> <ul style="list-style-type: none"> <li>Online systems for collating and analyzing prescription data and farmer use data. This should include antibiotic consumption in different food sectors, therapeutic and non-therapeutic use, with weight as a unit (M)<sup>20</sup></li> <li>Surveys at farm level for data collection across different sectors (M)</li> <li>Setting up of data standards, ensuring the quality assurance of data (S)</li> <li>Establishment of national repository, publishing of annual reports and public dissemination of data to ensure transparency (M)</li> </ul>	<ul style="list-style-type: none"> <li>Data collection, collation and analysis at regional and sub-regional level from laboratories, food processors, imported food and those generated from surveys at farm-level (S-M-L)</li> <li>Correlation with antibiotic use and residue data (S-M-L)</li> <li>Development of an online integrated information system, publishing of annual reports and public dissemination of data to ensure transparency (M)</li> <li>Develop early warning system (S)</li> </ul>	<ul style="list-style-type: none"> <li>Data collection, collation and analysis at regional and sub-regional level from laboratories, food processors, imported food and those generated from surveys at farm-level (S-M-L)</li> <li>Correlation with antibiotic use and resistance data (S-M-L)</li> <li>Development of an online integrated information system, publishing of annual reports and public dissemination of data to ensure transparency (M)</li> </ul>	<ul style="list-style-type: none"> <li>Data collection, collation and analysis at regional and sub-regional level (S-M-L) <ul style="list-style-type: none"> <li>Selection of sentinel sites to begin with</li> </ul> </li> <li>Correlation with animal antibiotic use and AMR data (S-M-L)</li> <li>Development of an online integrated information system, publishing of annual reports and public dissemination of data to ensure transparency (M)</li> <li>Develop early warning system (S)</li> </ul>
	<b>Review/ monitoring/ feedback</b> <ul style="list-style-type: none"> <li>Periodic review and mapping of data on antibiotic use, resistance and residues as part of integrated surveillance for continued advocacy, awareness, and future policy and practice (S-M-L)</li> </ul>	<ul style="list-style-type: none"> <li>Periodic review and mapping of data on antibiotic use, resistance and residue as part of integrated surveillance for continued advocacy, awareness, and future policy and practice (S-M-L)</li> </ul>	<ul style="list-style-type: none"> <li>Periodic review and mapping of data on antibiotic use, resistance and residues as part of integrated surveillance for continued advocacy, awareness, and future policy and practice (S-M-L)</li> </ul>	<ul style="list-style-type: none"> <li>Periodic review and mapping of data with antibiotic use and resistance in animal and human for continued advocacy, awareness, and future policy and practice (S-M-L)</li> </ul>

## SNAPSHOT Surveillance of antibiotic use, residues and resistance



# Surveillance of antibiotic use, residues and resistance

## Antibiotic use in food animals

### Policy/law/ regulations/ standards/ programmes

- Assessment of existing laws before formulation of new laws **(S)**
- Legal provision to obtain **farm-level antibiotic use data (S)**
- Regulation to **ensure prescription audit** of veterinarians/authorized practitioners **(M)**

### Implementation tools - infrastructure/ capacity/ systems/ resources

- **Systems to enable collection and collation of farm-level antibiotic use data (M):**
  - Harmonized system for data collection and analysis
  - Ensure farmer's responsibility to provide data
  - Factor-in priority markets/sectors

### Advocacy/ awareness and education/ training/ curriculum

- **Awareness campaigns for farmers** for self-policing and keeping records **(S-M-L)**
- **Awareness campaigns for vets** to prescribe antibiotics judiciously and keep records **(S-M-L)**
- Training programme on documentation for farmers and veterinarians **(S)**
- **Training needs assessment** of those conducting surveillance, development of training material etc. for data collection and management followed **by enabling environment** to collect data **(S)**
- Advocacy at community/ institutional level based on antibiotic use data reports **(S-M-L)**



# Surveillance of antibiotic use, residues and resistance

## Antibiotic use in food animals

### Record keeping/ database generation/ collation/ dissemination and research/ survey

- Online systems for collating and analyzing prescription data and farmer use data. This should include antibiotics and classes, weight as unit, total antibiotic consumption in different food sector, therapeutic and non-therapeutic use (M)
- Surveys at farm level for data collection across different sectors (M)
- Setting up of data standards, ensuring the quality assurance of data (S)
- Establishment of national repository, publishing of annual reports and public dissemination of data to ensure transparency (M)

### Review/ monitoring/ feedback

- Periodic review and mapping of data on antibiotic use, resistance and residue as part of integrated surveillance for continued advocacy, awareness and future policy and practice (S-M-L)



# Surveillance of antibiotic use, residues and resistance

## Antibiotic residues in food from animals

### Policy/law/ regulations/ standards/ programmes

- National antibiotic residue monitoring policy/programme in food from animals **(S)**
- Standards for antibiotic residues in food from animals such as chicken, eggs, milk, fish **(S)**

### Implementation tools - infrastructure/ capacity/ systems/ resources

- Develop comprehensive residue monitoring framework which enables surveillance of approved and unapproved antibiotic use **(S)**
  - Export oriented residue monitoring framework could be considered for adaptation based on domestic antibiotic use
- Ensure availability of funds, infrastructure, resources for data collection **(S)**

### Advocacy/ awareness and education/ training/ curriculum

- Awareness campaigns on importance and need of residue monitoring **(S-M-L)**
- Training needs assessment for those conducting surveillance **(S)**
- Development of training material and protocols for residue testing and data management followed by enabling environment **(S)**
- Capacity building and training programmes **(M)**
- Advocacy at community/institutional level based on antibiotic residue data reports **(S-M-L)**



# Surveillance of antibiotic use, residues and resistance

## Antibiotic residues in food from animals

Record keeping/  
database  
generation/  
collation/  
dissemination  
and research/  
survey

- Data collection, collation and analysis at regional and sub-regional level from laboratories, food processors, imported food and those generated from surveys at farm-level **(S-M-L)**
- Correlation with antibiotic use and resistance data **(S-M-L)**
- Development of an online integrated information system and publishing of annual reports and public dissemination of data to ensure transparency **(M)**

Review/  
monitoring/  
feedback

- Periodic review and mapping of data on antibiotic use, resistance and residue as part of integrated surveillance for continued advocacy, awareness and future policy and practice **(S-M-L)**





# Surveillance of antibiotic use, residues and resistance

## Antibiotic resistance in animals and food from animals

### Policy/law/ regulations/ standards/ programmes

- National AMR surveillance programme to monitor resistance in animals and food from animals across all sectors **(S)**
- Law compelling farmers and food processors to provide samples for analysis and share their internal data on resistance **(S)**
- Establish ambitious and achievable resistance reduction targets **(S)**

### Implementation tools - infrastructure/ capacity/ systems/ resources

- Commission an expert advisory group/steering committee to decide on key elements such as networking experts/labs, develop, terms of reference, priorities, linkages and international collaboration **(S)**
- Identify, establish and strengthen national reference laboratories who decide upon standards, protocols, organisms, data management mechanisms **(M)**:
  - Ensure quality and harmonization with national/international data and establish linkages with resistance in humans and environment
  - Enable collaboration across labs to provide support, build access to WHO, FAO and OIE labs



# Surveillance of antibiotic use, residues and resistance

## Antibiotic resistance in animals and food from animals

### Implementation tools - infrastructure/ capacity/ systems/ resources

- Develop and strengthen lab infrastructure, professional capacity, standardization of sample collection and testing protocols and assure quality both internally and externally through External Quality Assurance Scheme. **(M)** -sector specific; **(L)** - integrated quality assurance
- Ensure surveillance systems for harmonization across all sectors such as animal, human and environment. Integrated surveillance could begin with a pilot initiative **(S-M-L)**

### Advocacy/ awareness and education/ training/ curriculum

- Awareness campaigns on importance and need of resistance surveillance across stakeholders **(S-M-L)**
- Training needs assessment for those conducting surveillance **(S)**
- Development of training material and protocols for resistance data collection and management followed by enabling environment for resistance surveillance **(S)**
- Capacity building and training programmes including integrated programs with the WHO,FAO,OIE collaborating centers **(M)**
- Advocacy at community and institutional level based on antibiotic resistance data reports **(S-M-L)**



# Surveillance of antibiotic use, residues and resistance

## Antibiotic resistance in animals and food from animals

Record keeping/  
database  
generation/  
collation/  
dissemination  
and research/  
survey

- Data collection, collation and analysis at regional and sub-regional level from laboratories, food processors, imported food and those generated from surveys at farm-level **(S-M-L)**
- Correlation with antibiotic use and residue data **(S-M-L)**
- Development of an online integrated information system and publishing of annual reports and public dissemination of data to ensure transparency **(M)**
- Develop early warning system **(S)**

Review/  
monitoring/  
feedback

- Periodic review and mapping of data on antibiotic use, resistance and residue as part of integrated surveillance for continued advocacy, awareness and future policy and practice **(S-M-L)**

# Surveillance of antibiotic use, residues and resistance

## Environmental surveillance of residues and resistance

### Policy/law/ regulations/ standards/ programmes

- National AMR surveillance programme to monitor resistance in environment **(S)**
- Regulation on antibiotic residues in effluent and waste from industries and farms **(S)**
- Standards for waste discharge from farms, slaughter houses, animal food processing industry, pharmaceutical industry and healthcare settings **(S)**

### Implementation tools - infrastructure/ capacity/ systems/ resources

- Monitoring and surveillance framework including monitoring of antibiotic residues and AMR in indicator bacteria in environment, farms, factories, slaughter house, wet market, processing unit, health care facilities, vet care facility (**prioritization based on ground realities**) **(M)**
- Assess infrastructure needs, accordingly build/strengthen appropriate infrastructure and capacity **(M)**
- Develop systems to adapt, standardize, compare data across countries **(M)**



# Surveillance of antibiotic use, residues and resistance

## Environmental surveillance of residues and resistance

### Advocacy/ awareness and education/ training/ curriculum

- Awareness campaigns on importance and need of environmental surveillance across stakeholders **(S-M-L)**
- Training needs assessment for those conducting surveillance **(S)**
- Development of training material, protocols and data management **(S)**
- Capacity building and training programme (including at university level) **(M)**
- Training of peer/participatory monitoring systems **(M)**
- Advocacy at community/institutional level based on surveillance data reports **(S-M-L)**

### Record keeping/ database generation/ collation/ dissemination and research/ survey

- Data collection, collation and analysis at regional and sub-regional level **(S-M-L)**
  - Selection of sentinel sites to begin with
- Correlation with animal antibiotic use and AMR data **(S-M-L)**
- Development of an online integrated information system and publishing of annual reports and public dissemination of data to ensure transparency **(M)**
- Develop early warning system **(S)**

### Review/ monitoring/ feedback

- Periodic review and mapping of data with antibiotic use and resistance in animal and human for continued advocacy, awareness and future policy and practice **(S-M-L)**



# ENVIRONMENT MANAGEMENT TO CONTAIN ANTIMICROBIAL RESISTANCE

		THEMATIC AREAS <sup>21, 22</sup>			
		Registration/licencing (based on environment risk assessment)	Biosecurity/sanitation and hygiene/good manufacturing practices	Waste management	Research
INTERVENTION AREAS	Policy/laws/ regulations/ standards/ programmes	<ul style="list-style-type: none"><li>• Policy on registration/licencing of farms, factories, slaughter houses, wet markets, processing units, feed manufacturers, healthcare facilities, veterinary care facilities (S)</li><li>• Siting guidelines for farms, factories, slaughter houses, wet markets, processing units, feed manufacturers, health care facilities, veterinary care facilities (S)</li><li>• Policy on environmental risk assessment for registration and renewal of antibiotics for humans and animals (M)</li></ul>	<ul style="list-style-type: none"><li>• Development of biosecurity/sanitation and hygiene guidelines for farms, slaughter houses, wet market, healthcare facilities, veterinary care facilities and good manufacturing practices (GMPs) for pharmaceutical industry and fish/meat/dairy processing units (S)<sup>23</sup></li></ul>	<ul style="list-style-type: none"><li>• Standards for antibiotic residues and microbial quality in effluent and solid waste from pharmaceutical industry, sewage treatment plants, farms, veterinary care facilities, healthcare facilities, processing units, slaughter houses and feed manufacturers (S)</li><li>• Policy on Extended Producers Responsibility for unused antibiotics (S)</li></ul>	<ul style="list-style-type: none"><li>• Assessment of situation/ knowledge on residues and AMR bacteria in effluents and wastes for policymaking and regulations (S)</li><li>• Programme for developing and promoting innovation in environmental monitoring (S)</li></ul>
	Implementation tools— Infrastructure/ capacity/systems/ resources	<ul style="list-style-type: none"><li>• Regulatory system for enforcement of laws, ensuring compliance with adequate funding and capacity (M)<ul style="list-style-type: none"><li>◦ Small producers to be facilitated through required measures</li></ul></li><li>• Tool for environmental risk assessment for siting, registration and renewal of antibiotics (S)</li></ul>	<ul style="list-style-type: none"><li>• Regulatory system for enforcement of laws, ensuring compliance with adequate funding and capacity (M)</li><li>• Adopt progressive pathways to improve management (S-M-L)</li><li>• Develop incentives and disincentives for compliance including performance benchmarks and rating system (such as through pond and farm health cards) (S)</li></ul>	<ul style="list-style-type: none"><li>• Standard Operating Procedures (SOPs) on management of effluent and solid waste from pharmaceutical industry, sewage treatment plant, farms, veterinary care facilities, healthcare facilities, processing units, slaughter houses, wet market, feed manufacturers (S)</li><li>• Regulatory system for enforcement of laws, ensuring compliance with adequate funding and capacity (M)</li></ul>	<ul style="list-style-type: none"><li>• Development and adoption of test protocols (S)</li></ul>
	Advocacy/ awareness and education/training/ curriculum	<ul style="list-style-type: none"><li>• Sensitize regulators, industry and farmers (S)<ul style="list-style-type: none"><li>◦ Inclusion of environmental management in antibiotics awareness week</li></ul></li><li>• Build capacity of regulators (S)</li><li>• Development of customized material for awareness and training (S)</li></ul>	<ul style="list-style-type: none"><li>• Training on biosecurity/sanitation and hygiene/ GMPs (S)</li><li>• Sector-specific manuals and guidelines on progressive management pathways (for e.g., from the FAO<sup>24</sup>) to improve environmental management (M)</li><li>• Inclusion of biosecurity in farmer-field school curriculum (S)</li></ul>	<ul style="list-style-type: none"><li>• Stakeholder training on waste management guidelines and SOPs (S)</li></ul>	
	Record keeping/ database generation/ collation/ dissemination and research/survey	<ul style="list-style-type: none"><li>• Public database of licenced farms, factories, human and veterinary healthcare settings (S)</li></ul>	<ul style="list-style-type: none"><li>• Database on biosecurity/sanitation and hygiene/ GMP compliance performance/rating system (depending on local circumstances decision on public disclosure can be made) (M)</li></ul>	<ul style="list-style-type: none"><li>• Online database on waste discharge quality, rating system, compliance/non-compliance through appropriate pollution monitoring (M)</li></ul>	
	Review/monitoring/ feedback	<ul style="list-style-type: none"><li>• Comprehensive review framework for policy/ regulations and standards (S-M-L)</li></ul>	<ul style="list-style-type: none"><li>• Review of progressive pathways to improve biosecurity/sanitation and hygiene/GMPs (S-M-L)</li><li>• Review of guidelines for their success and impact (S-M-L)</li></ul>	<ul style="list-style-type: none"><li>• Development of success/failure indicators/milestones as part of review framework (M)</li><li>• Compliance status with review framework (S-M-L)</li></ul>	

SNAPSHOT  
Environment  
management to  
contain  
antimicrobial  
resistance

**SNAPSHOT**  
Environment  
management to  
contain  
antimicrobial  
resistance



# Environment management to contain antimicrobial resistance

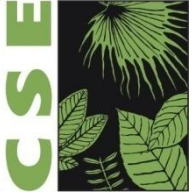
## Registration/licensing (based on env. risk assessment)

### Policy/law/ regulations/ standards/ programmes

- Policy on registration of farms, factories, slaughter houses, wet markets, processing units, feed manufacturers, health care facilities, veterinary care facilities **(S)**
- Siting guidelines and licensing for farms, factories, slaughter houses, wet markets, processing units, feed manufacturers, health care facilities, veterinary care facilities **(S)**
- Policy on environment risk assessment for registration and renewal of antibiotics for humans and animals **(M)**

### Implementati on tools - infrastructure / capacity/ systems/ resources

- Regulatory system for enforcement of laws, ensuring compliance with adequate funding and capacity **(M)**
  - Small producers to be facilitated through required measures
- Tool for environmental risk assessment for siting, registration and renewal of antibiotics **(S)**



# Environment management to contain antimicrobial resistance

## Registration/licensing (based on env. risk assessment)

Advocacy/  
awareness  
and  
education/  
training/  
curriculum

- Sensitise regulators, industry and farmers **(S)**
  - Inclusion of environment management in antibiotics awareness week
- Build capacity of regulators **(S)**
- Development of customised material for awareness and training **(S)**

Record  
keeping/  
database  
generation/  
collation/  
dissemination  
and research/  
survey

- Public database of licensed farms, factories, human and veterinary healthcare settings **(S)**

Review/  
monitoring/  
feedback

- Comprehensive review framework for policy/regulations and standards **(S-M-L)**

# Environment management to contain antimicrobial resistance

## Biosecurity/sanitation & hygiene/good manufacturing practices

Policy/law/  
regulations/  
standards/  
programmes

- Development of **guidelines, best practices** for farms, factories, slaughter houses, wet market, health care facilities, veterinary care facilities **(S)**

Implementation  
tools -  
infrastructure/  
capacity/ systems/  
resources

- **Regulatory system for enforcement of laws**, ensuring compliance with adequate funding and capacity **(M)**
- **Adopt progressive pathways** to improve management **(S-M-L)**
- Develop **incentives and disincentives for compliance** including performance benchmarks and rating system (such as through pond and farm health cards) **(S)**

Advocacy/  
awareness  
and education/  
training/  
curriculum

- Training and hand-holding on biosecurity **(S)**
- Sector-specific manuals and guidelines on progressive management pathways to improve environment management **(M)**
- Inclusion of biosecurity in **farmer-field school curriculum** or similar such approaches **(S)**

Record keeping/  
database  
generation/  
collation/  
dissemination  
and research/  
survey

- **Database on biosecurity/sanitation and hygiene/GMP compliance** performance/ rating system (depending on local circumstances decision on public disclosure can be made) **(M)**

- **Review of progressive pathways** to improve biosecurity management **(S-M-L)**
- **Review of guidelines** for their success and impact **(S-M-L)**

**Review/  
monitoring/  
feedback**



# Environment management to contain antimicrobial resistance

## Waste management

### Policy/Law/ Regulations/ Standards/ Programmes

- Standards for antibiotic residues and microbial quality in effluent and solid waste from industries, sewage treatment plants, farms, health care facilities, processing units, slaughter houses **(S)**
- Policy on Extended Producers Responsibility for expired antibiotics **(S)**

### Implementation tools - Infrastructure/ Capacity/ Systems/ Resources Advocacy/ Awareness and Education/ Training/ Curriculum

- Standard Operating Procedures (SOPs) on waste management for industries, sewage treatment plants, farms, health care facilities, processing units, slaughter houses, wet market, feed manufacturers **(S)**
- Regulatory system for enforcement of laws, ensuring compliance with adequate funding and capacity **(M)**

- Stakeholder training on waste management guidelines and SOPs **(S)**

### Record keeping/ Database generation/ Collation/ Dissemination and Research/ Survey

- Online database on waste discharge quality, rating system, compliance/non-compliance **(M)**
- Development of success/failure indicators/milestones as part of review framework **(M)**
- Compliance status with review framework **(S-M-L)**

### Review/ Monitoring/ Feedback



## Environment management to contain antimicrobial resistance: Research

### Policy/Law/ Regulations/ Standards/ Programmes

- Assessment of situation/ knowledge on residues and AMR bacteria in effluents & wastes for policy making and regulations **(S)**
- Programme for developing and promoting innovation in environmental monitoring **(S)**

### Implementation tools - Infrastructure/ Capacity/ Systems/ Resources

- Development and adoption of test protocols **(S)**
- Research on waste treatment technology w.r.t. resistant bacteria, genes, APIs **(S-M-L)**
- Research on transmissions pathways of AMR among different environment compartments including human, animal and agriculture for prioritizing intervention **(S-M-L)**
- Cost-benefit analysis to assess socio-economic implications of antibiotics use **(M)**
- Documentation of best practices **(M)**

# Environment management to contain antimicrobial resistance

## Research

### Advocacy/ Awareness and Education/ Training/ Curriculum

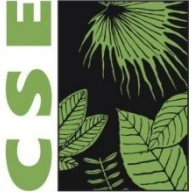
- Survey of existing knowledge, attitude and practice at ground level **(S)**
- Stimulation of international collaboration on research related to AMR **(M)** practice **(S-M-L)**

### Record keeping/ Database generation/ Collation/ Dissemination and Research/ Survey

- Centralised database on ongoing research/ research output **(S)**
- Sharing data on an international platform (for e.g., Global Environment Monitoring System) **(S-M-L)**

### Review/ Monitoring/ Feedback

- Review of research agenda for future policy and practice **(S-M-L)**



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