




Ecohealth Approach to Develop a Strategy for the Prudent Use of Antimicrobials to Control Antimicrobial Resistance in Human, Animal, and Environmental Health in Asia

IDRC CRDI

APEIR
Asia Partnership on Emerging Infectious Diseases Research

Team leaders of each country

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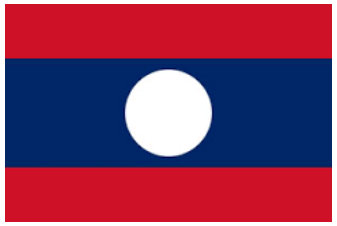
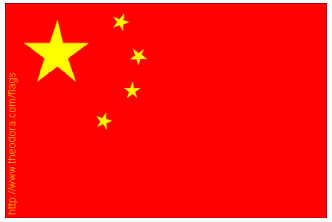
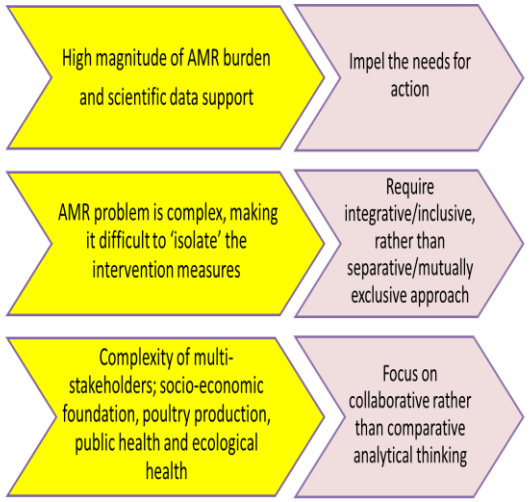




Rationales and concepts

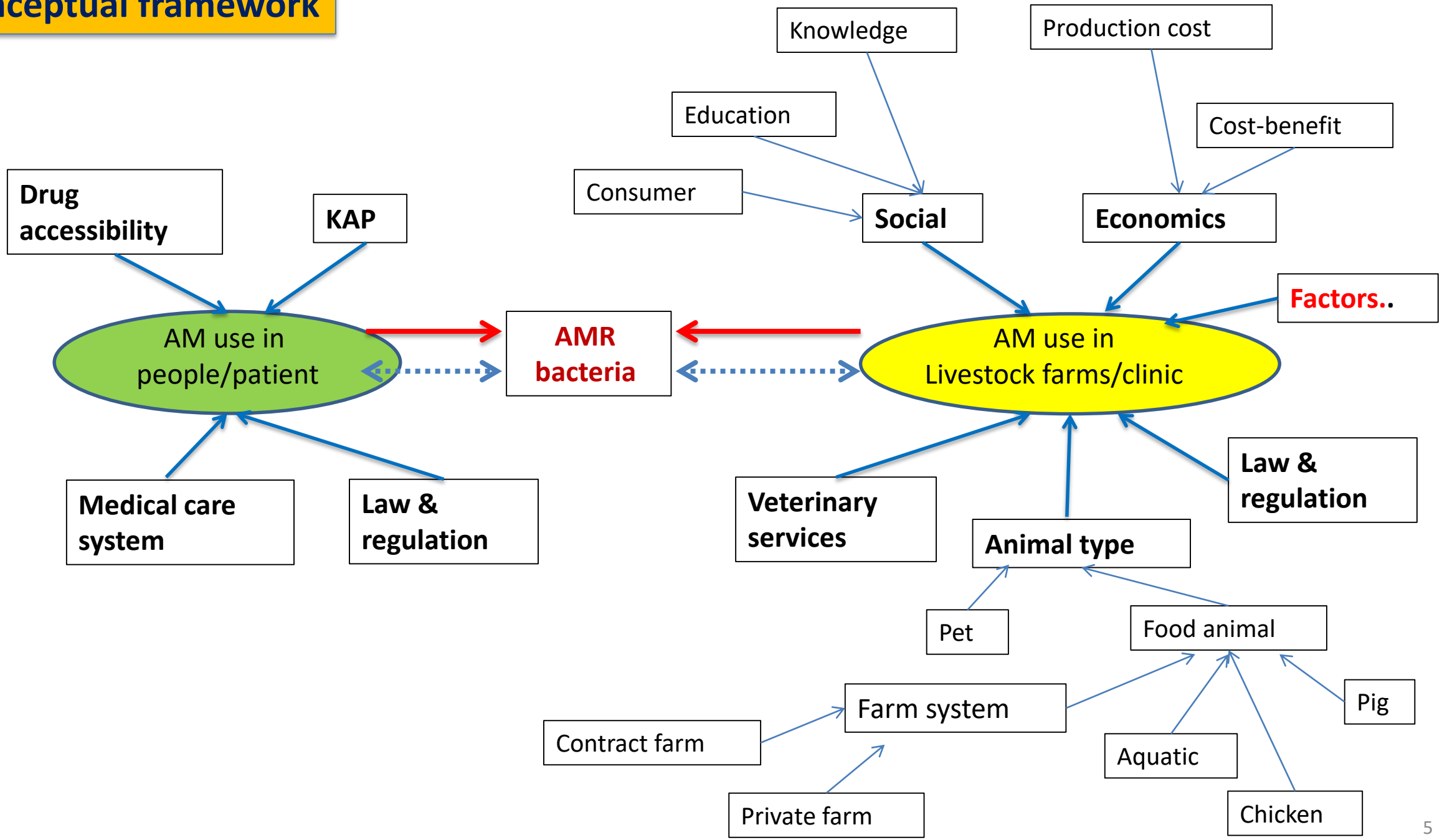
High magnitude of AMR burden and scientific data support	Impel the needs for action
AMR problem is complex, making it difficult to 'isolate' the intervention measures	Require integrative/inclusive, rather than separative/mutually exclusive approach
Complexity of multi-stakeholders; socio-economic foundation, poultry production, public health and ecological health	Focus on participatory action rather than comparative analytical thinking

6 objectives derive from rationale and concepts



1. To assess the current AMR situation in veterinary and human medicine
2. To gather/assess evidence on antimicrobial resistance of *E. coli* as the indicator bacteria available at study sites (animal, human, and environment)
3. To compare the costs of livestock raising (traditional & prudent use of AM)
4. To identify and develop a potential intervention strategy based on results of first objective and available evidence
5. To demonstrate to policy makers the results of reduction in use of antimicrobials over time in the selected communities applicable for the farmers, public health/human medicine, and environment

Conceptual framework



Methodology

Assessment

1. Laws and Regulation
2. AMR situation
3. Possible intervention
4. Farm production and cost
    1. Before intervene
    2. After intervene
5. Policy advocacy

Areas

Two Areas
- CM-LP
- Cholburi

Methods

1. Desk study
2. Field study
3. Intervention study

Target Population

1. Government officer
    -animal health
    -Public health
    -Others
2. Livestock farmers
    -Layer
    -Swine
3. Farm consultant veterinarian

Methodology

Documentary review: scientific literature other documents

Field observations, questionnaire, and sample collection

Baseline data

Possible intervention in selected farms

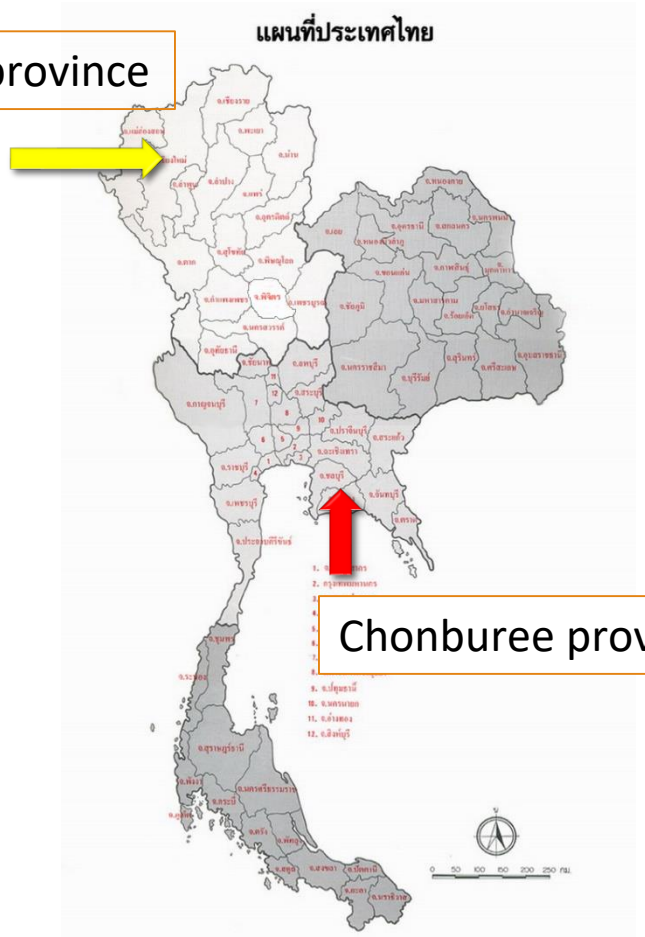
Interview with stakeholders and group discussion

Discussions with policy level-officers

Criteria for study sites selection

- Dense area of livestock farming
- Having different type of farms; large-small
- Collaboration with AMR in human

Chiang Mai-Lamphun province



Key findings: AMR situation

- **National policy relating to AMR**
  - National strategies on EID (2013-2016)
  - National drug policy & strategies 2011 regarding rational drug use & AMR
  - National strategic plan to control antimicrobial resistance (2016-2021)

Suriya Wongkongkathep , 2014. Antimicrobial resistance control in Thailand. Ministry of Public Health, Thailand

Vision: Mitigate to health and economic burden from antimicrobial resistance

Mission : 1. To address policy and develop national mechanism to tackle AMR problem using OneHealth concept
2. Develop effective and sustainable systems to control AMR problem

Target : 1 Reduce human cases 50%
2. Reduce AM use in human 20%
3. Reduce AM use in animal 30%
4. People have better knowledge and perception
5. Address international AM control > 4 level

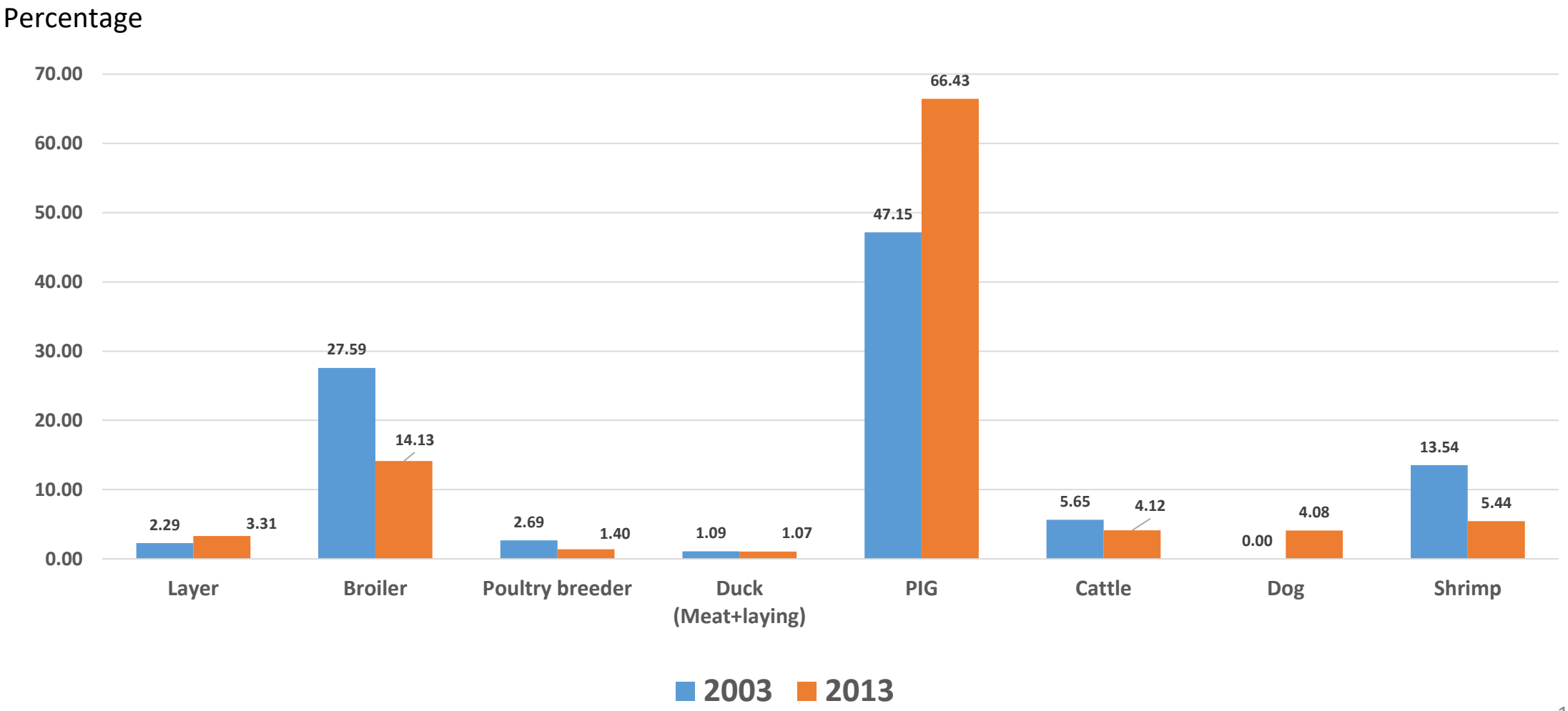
Strategy 1: One health approach	**Strategy 2:** Control of AM distribution in Thailand	**Strategy 3:** Control of AMR and AM use in hospital settiings	**Strategy 4:** Control of AMR and AM use in Livestock & agriculture	**Strategy 5:** Creation and promotion for better knowledge
1. Develop AMR surveillance system 2. Increase potentiality of laboratory network 3. Increase the potentiality of AMR epidemiological network	1. Improve the control system, traceability of drug distribution in Thailand 2. Legal empowerment	1. Integrative AMR control in healthcare facilities 2. Improve medical potentiality 3. Control of AM use in hospital clinic and retail pharmacies	1. Rational use of AM in livestock and aqua. 2. Control of AMR in food chain 3. Control of AM use in vet hospital settings 4. Improve knowledge of all stakeholders	1. Social empowerment 2. Community engagement 3. Creation of knowledge and perception on AMR

Strategy 6: Sustainable management & political involvement

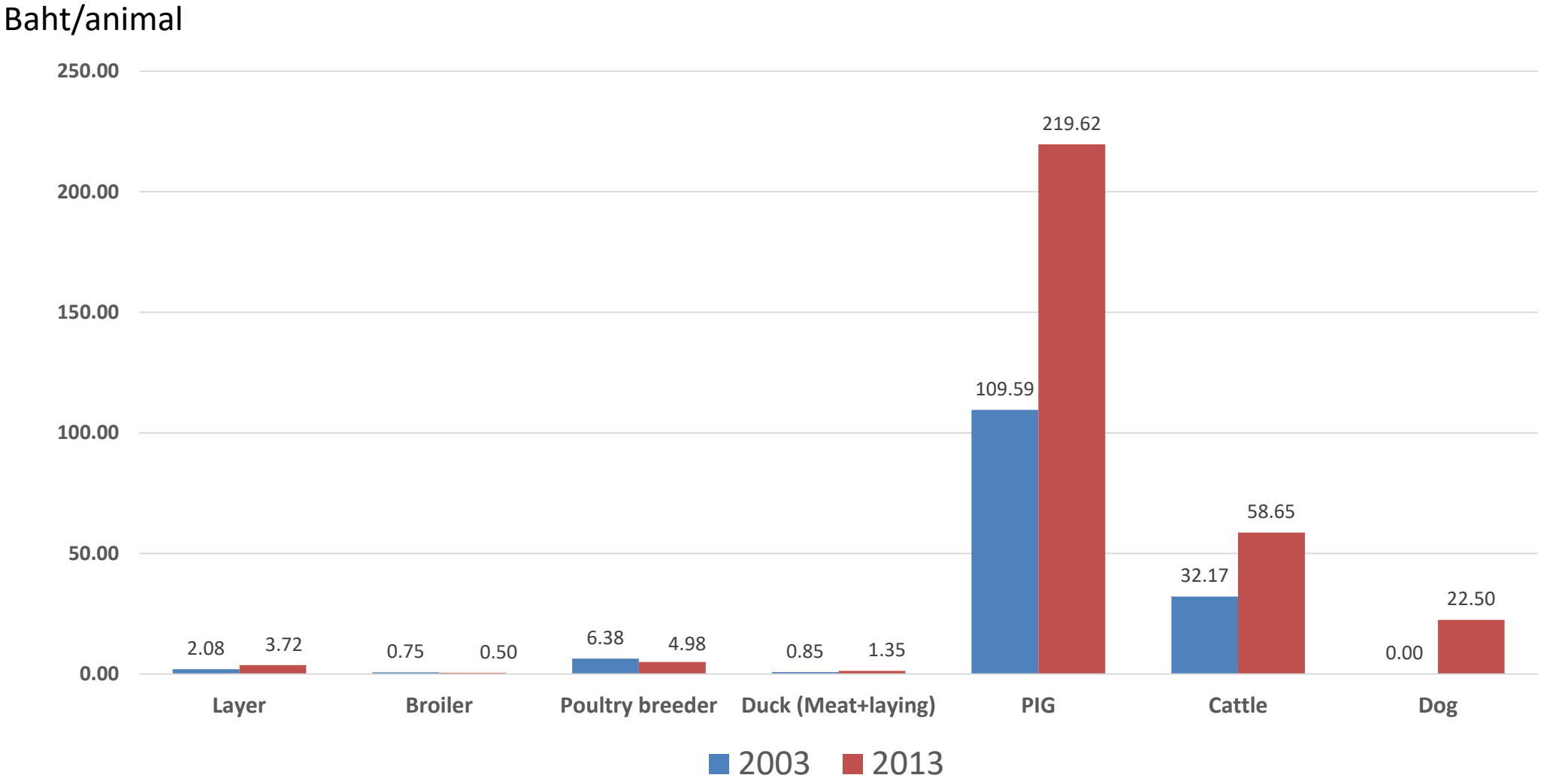
Key findings: AMR situation (Obj.1)

- Department of Livestock development is the main organization for control the drug and increase food safety
- Standard farm certification and farm consultant veterinarian is the key of control of drug use in farms
- Antimicrobials in livestock production are largely used for disease prevention (respiratory and gastrointestinal diseases) rather than treatment

Key findings:
Antimicrobials usage in livestock production in Thailand



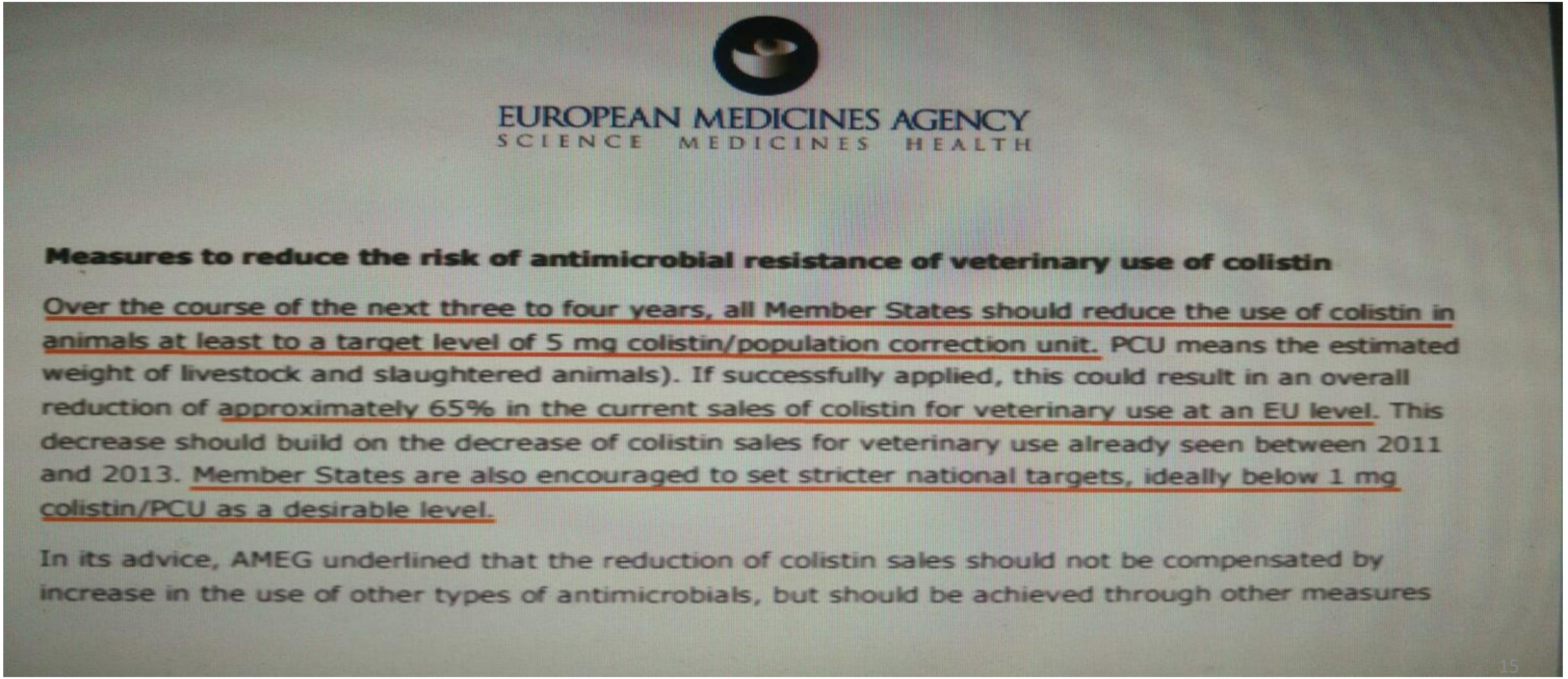
Key findings:
Production cost of AM in livestock production



Result: Colistin usage in Thailand

Species	PCU=population*Average weight		PCU
	Population	Average weight	
Poultry			
Broiler	1,449,000,000	1	1,449,000,000
Layer	95,238,162	2	190,476,324
Breeder	1,032,324	1	1,032,324
Swine			
Fattening pig	16,000,000	65	1,040,000,000
Breeder pig	1,084,305	240	260,233,200
			Total PCU 2,940,741,848
Total amount of colistin used in livestock in 2013 = 109,226 kg →Mg colistin /PCU of Thailand			**= 37.14 mg/PCU**

Result: AM control in EU countries



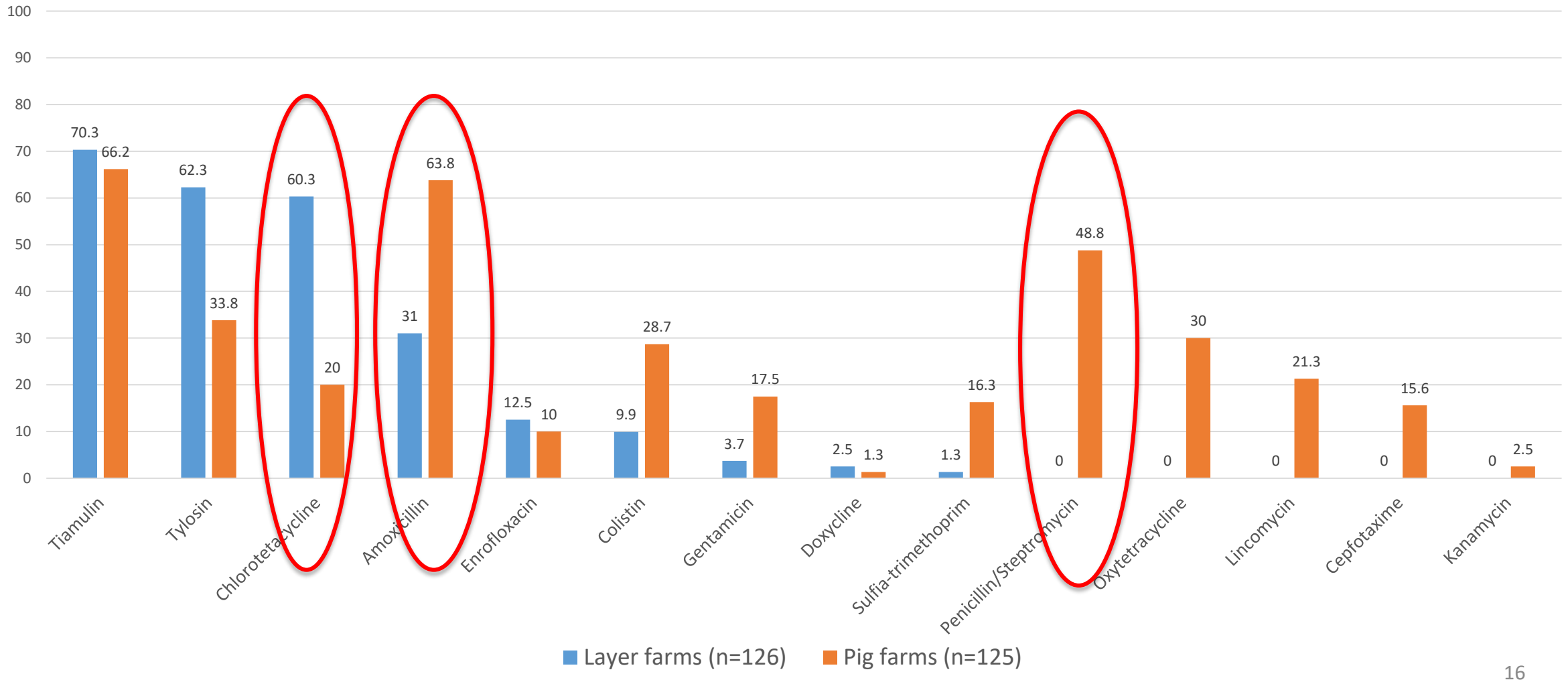
EUROPEAN MEDICINES AGENCY
SCIENCE MEDICINES HEALTH

Measures to reduce the risk of antimicrobial resistance of veterinary use of colistin

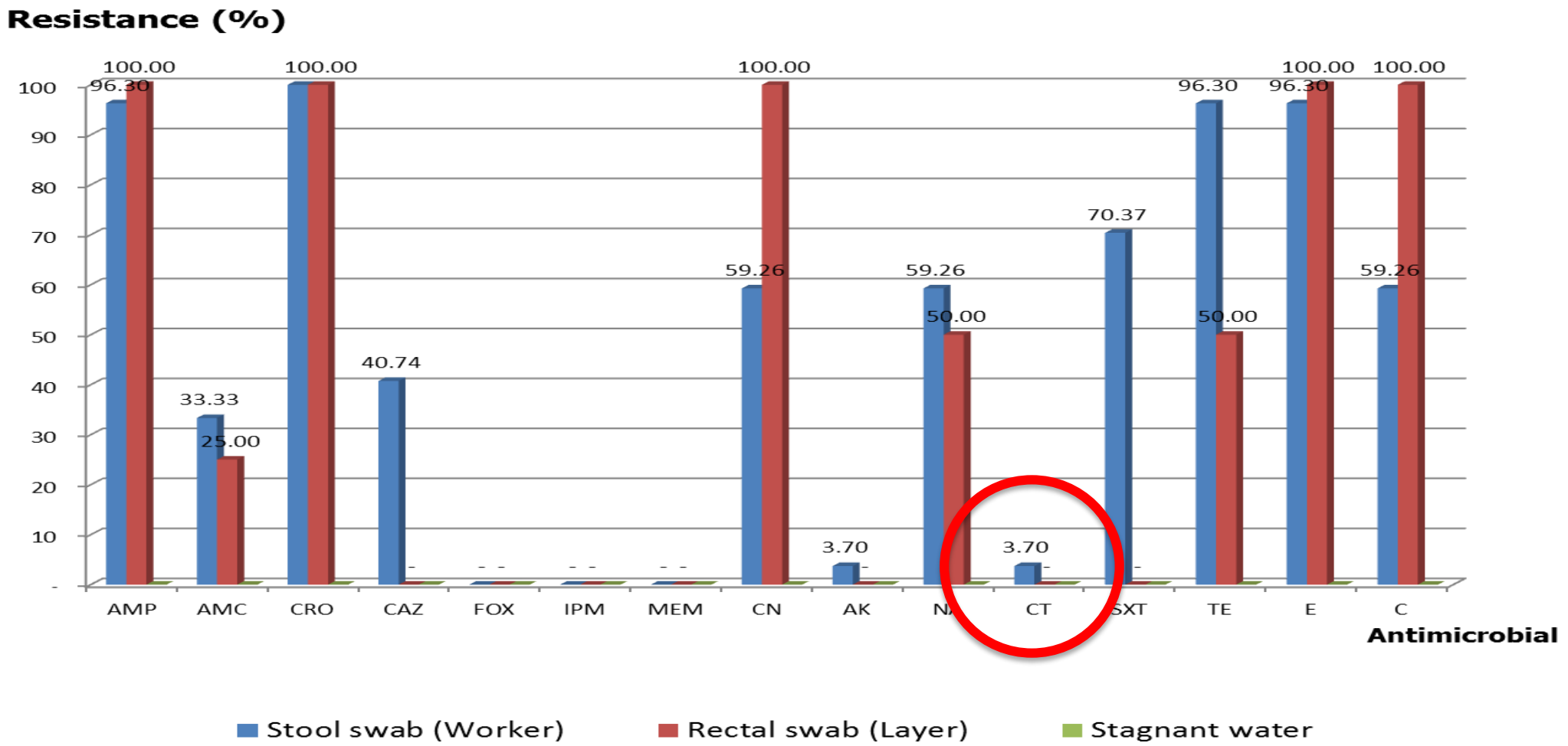
Over the course of the next three to four years, all Member States should reduce the use of colistin in animals at least to a target level of 5 mg colistin/population correction unit. PCU means the estimated weight of livestock and slaughtered animals). If successfully applied, this could result in an overall reduction of approximately 65% in the current sales of colistin for veterinary use at an EU level. This decrease should build on the decrease of colistin sales for veterinary use already seen between 2011 and 2013. Member States are also encouraged to set stricter national targets, ideally below 1 mg colistin/PCU as a desirable level.

In its advice, AMEG underlined that the reduction of colistin sales should not be compensated by increase in the use of other types of antimicrobials, but should be achieved through other measures

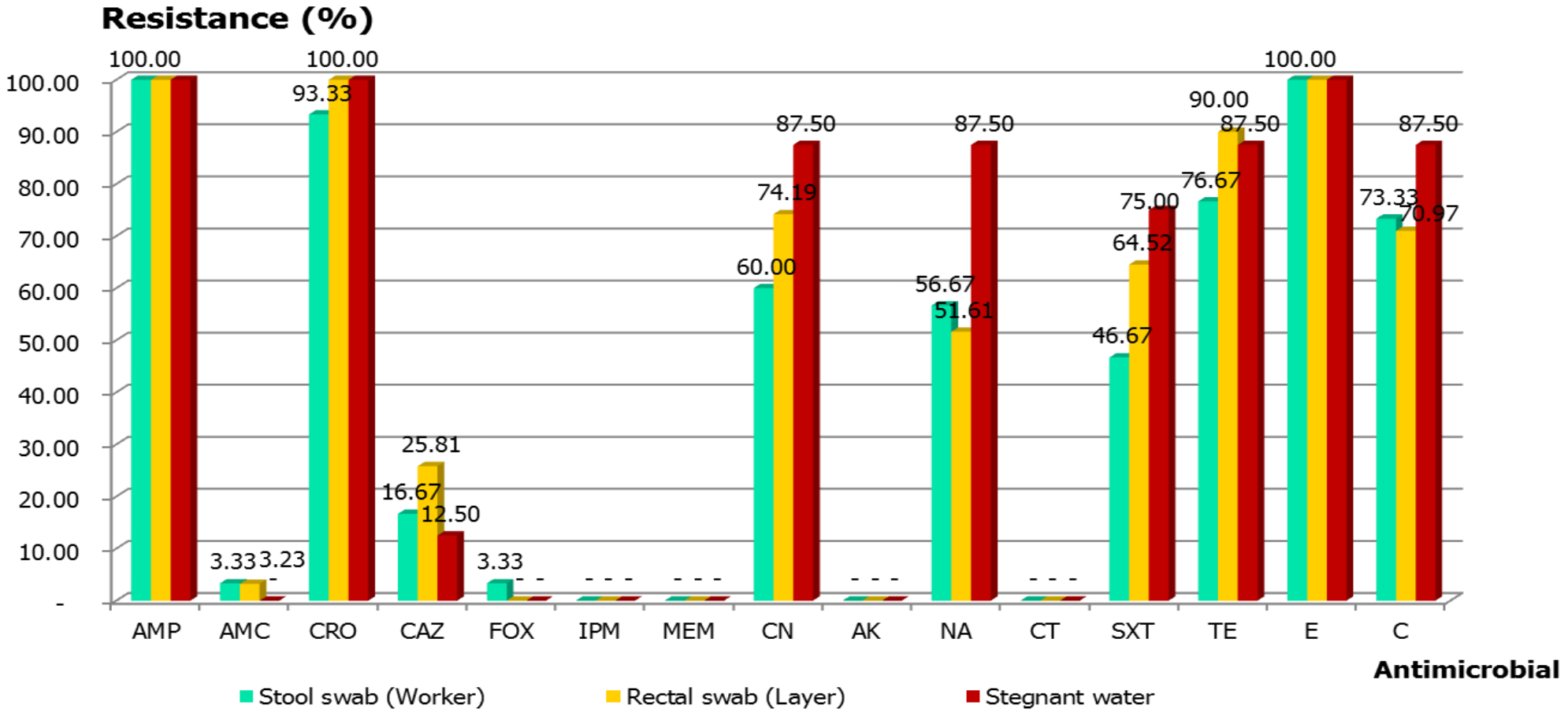
Key findings:
Antimicrobials usage in livestock production (n=251 farms)



Key findings: evidence of AMR (Obj.2)
Antimicrobial resistance of ESBL positive *E. coli* on layer farms

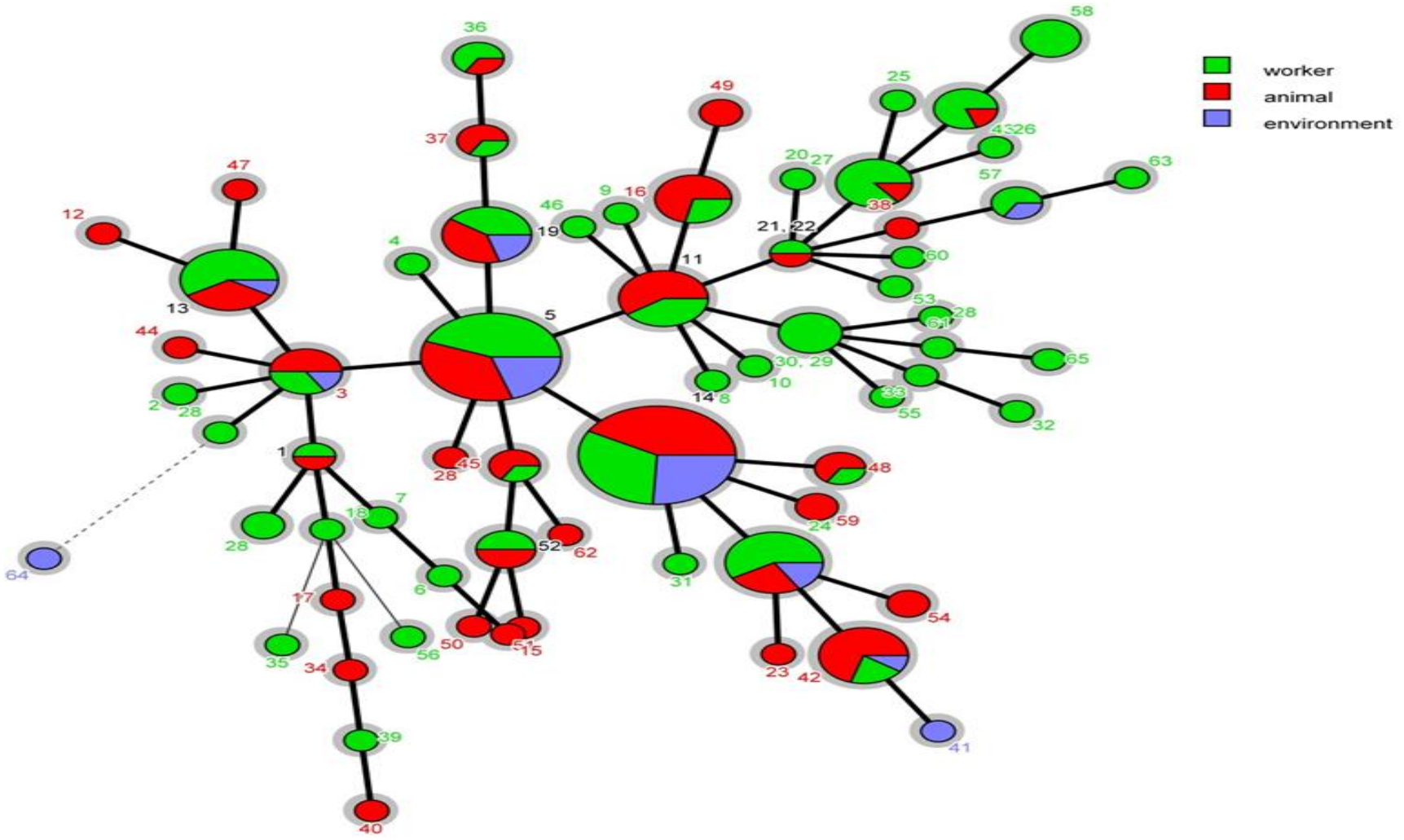


Key findings: evidence of AMR
Antimicrobial resistance of ESBL positive *E. coli* on pig farms



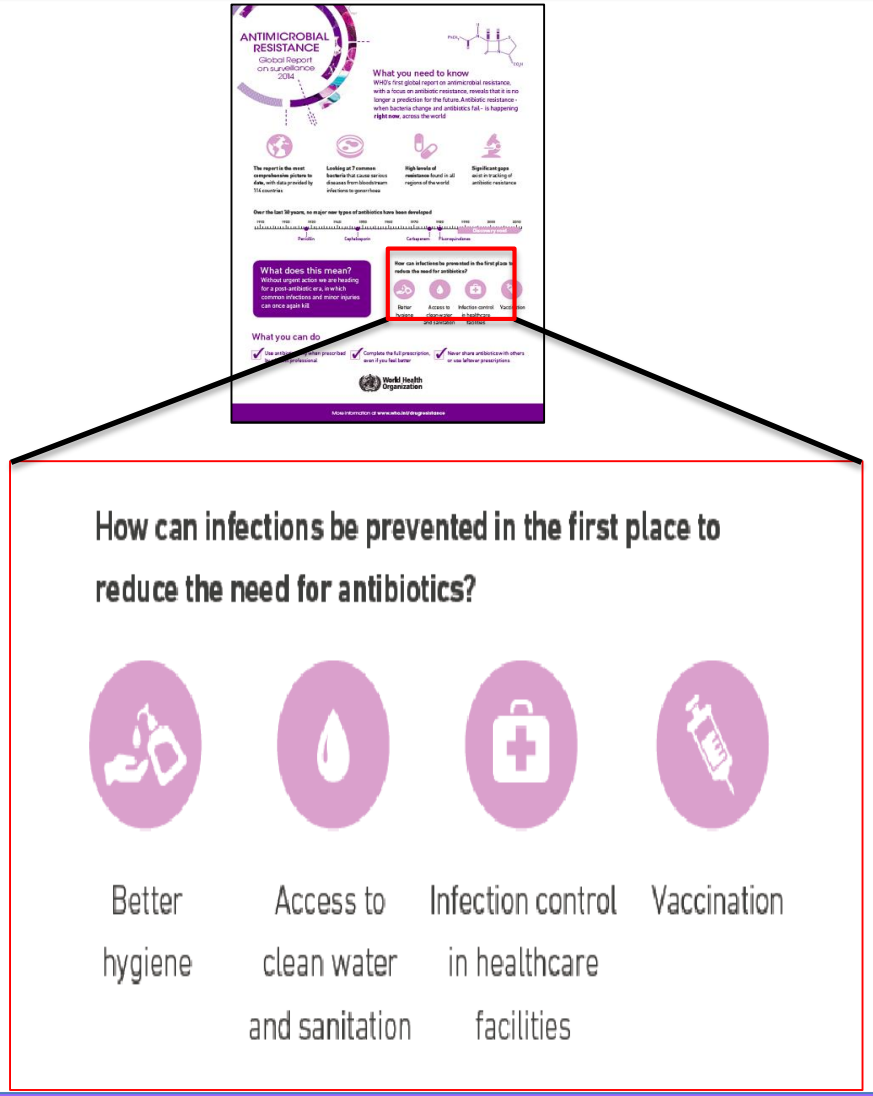
Key findings

Minimum spanning tree association of AMR pattern among human-animal-environment (ESBL *E.*



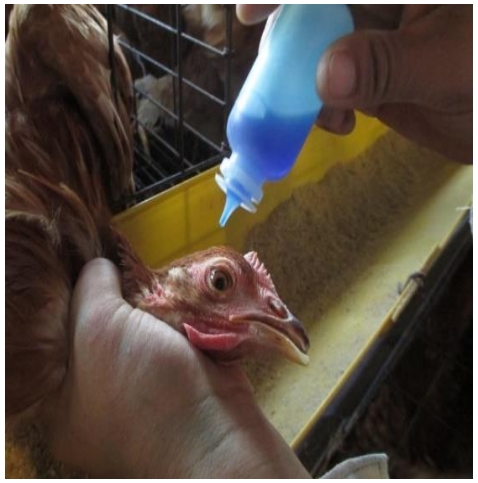
The use of AM in agriculture

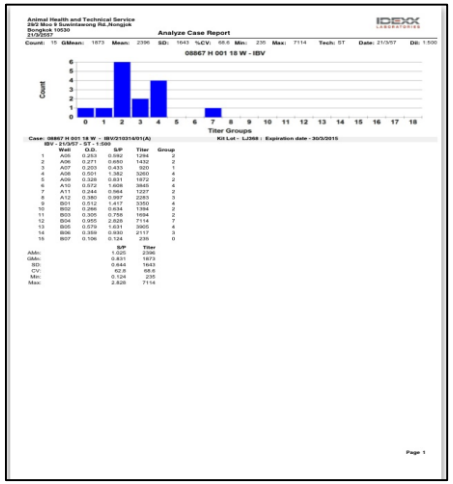
Key findings: Intervention development (obj.4)



1. Infection control and sanitation
   - ✓ Farm biosecurity
2. Improve health management
   - ✓ Vaccination program → Mycoplasma
   - ✓ Brooding management
   - ✓ Housing management
3. Using AM replacement “for disease prevention”
   - ✓ Probiotic, Phytobiotics, acidifier, ect.
4. Place important on farm consultant vet
   - ✓ Develop guideline/handbook for vet

Implementation



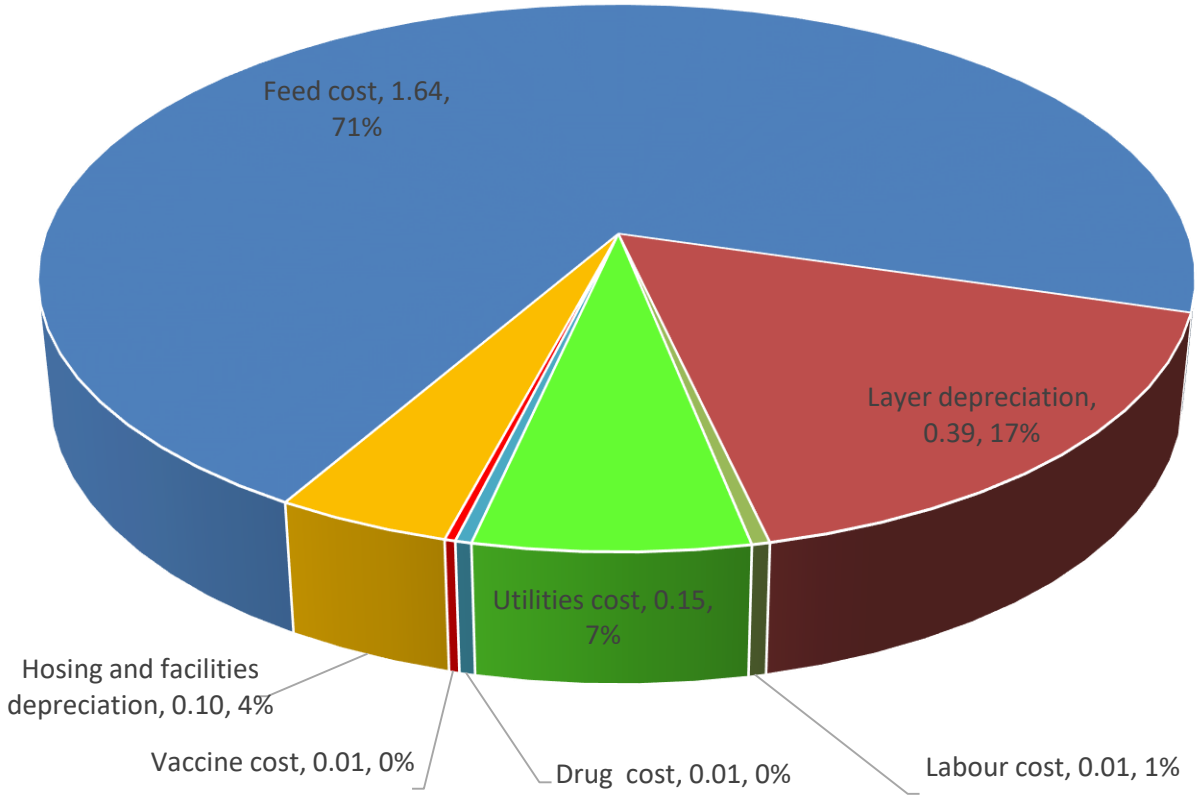


Key findings: Reduction of AM use in layer farms

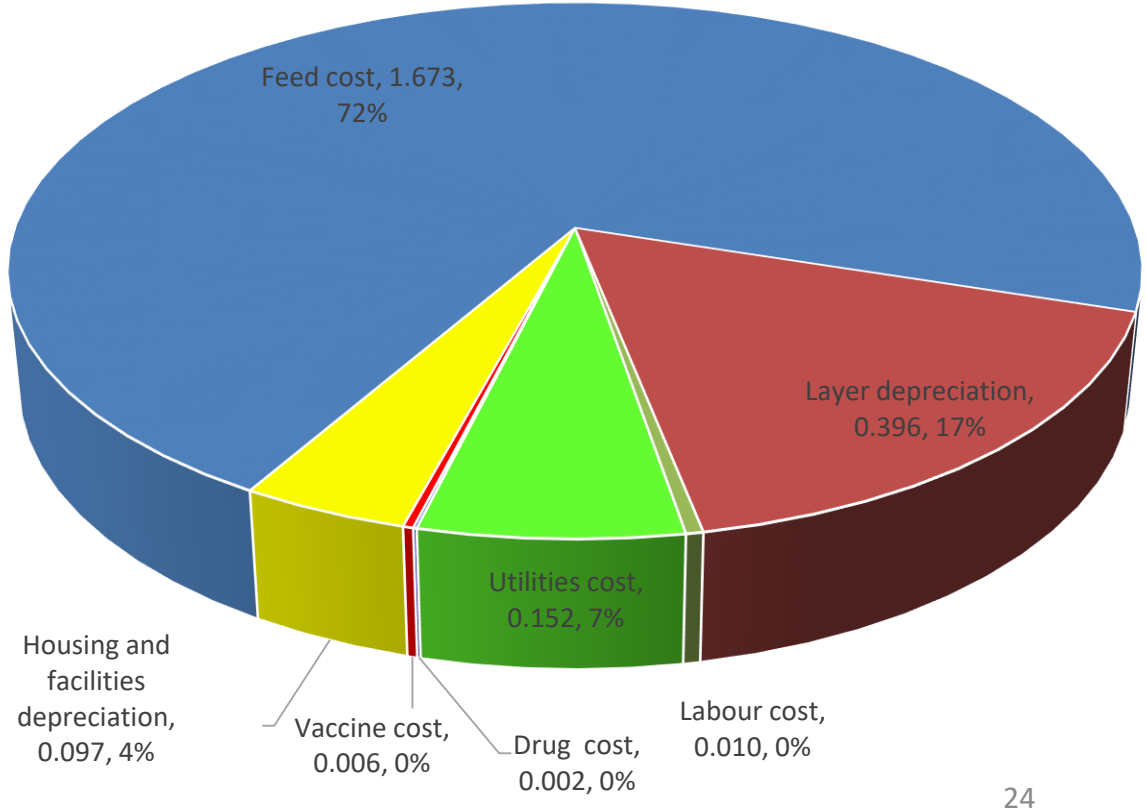
Farm	Number of layer	Amoxicillin (mg/PCU)		Chlortetracycline(mg/PCU)		Tiamulin(mg/PCU)	
		Before	After	Before	After	Before	After
A	1,000,000	201.25	100.625	1,449.00	241.50	483.00	80.5
B	300,000	218.75	0	1,575.00	393.75	525.00	131.25
C	250,000	215.25	0	1,549.80	129.15	516.60	43.05
D	100,000	406.00	101.5	1,461.60	243.60	487.20	81.2
E	70,000	222.25	0	1,600.20	400.05	533.40	133.35
F	60,000	108.50	0	1,562.40	130.20	520.80	43.4
G	50,000	420.00	105	1,512.00	126.00	504.00	42
H	30,000	215.25	107.625	1,549.80	258.30	516.60	86.1
I	22,000	227.5	113.75	1,638.00	273.00	546.00	91
J	10,000	448.00	112	1,612.80	537.60	537.60	179.2
Average		268.275	64.05	1,551.06	273.315	517.02	91.105

Key findings: (Obj. 3)
Compare of egg production before-after intervention

Before intervention (2.30 Baht/egg)



After intervention 2.33 Baht/egg



Key findings: policy advocacy (Obj.5)

- The research results were advocated to the DLD and the Veterinary Council of Thailand
  - Policy brief
  - AMR taskforce meeting
  - Meeting with policy-level DLD officers

➢ Colistin was strictly prohibited in livestock farming system

➢ Next phase→ prohibit antimicrobials used in human medicine

Key findings: policy advocacy

- Expand the research outputs to address wide impact
- MOU with DLD and farmers to reduce of AM use in layer and pig farms in Thailand (20 June 2017)
  - ✓ 1st year → 20% reduction
  - ✓ 2nd year → 40% reduction
- Funding: DLD, National committee of Science and Technology of Thailand and Office of the Higher Education Commission)

Key findings: policy advocacy

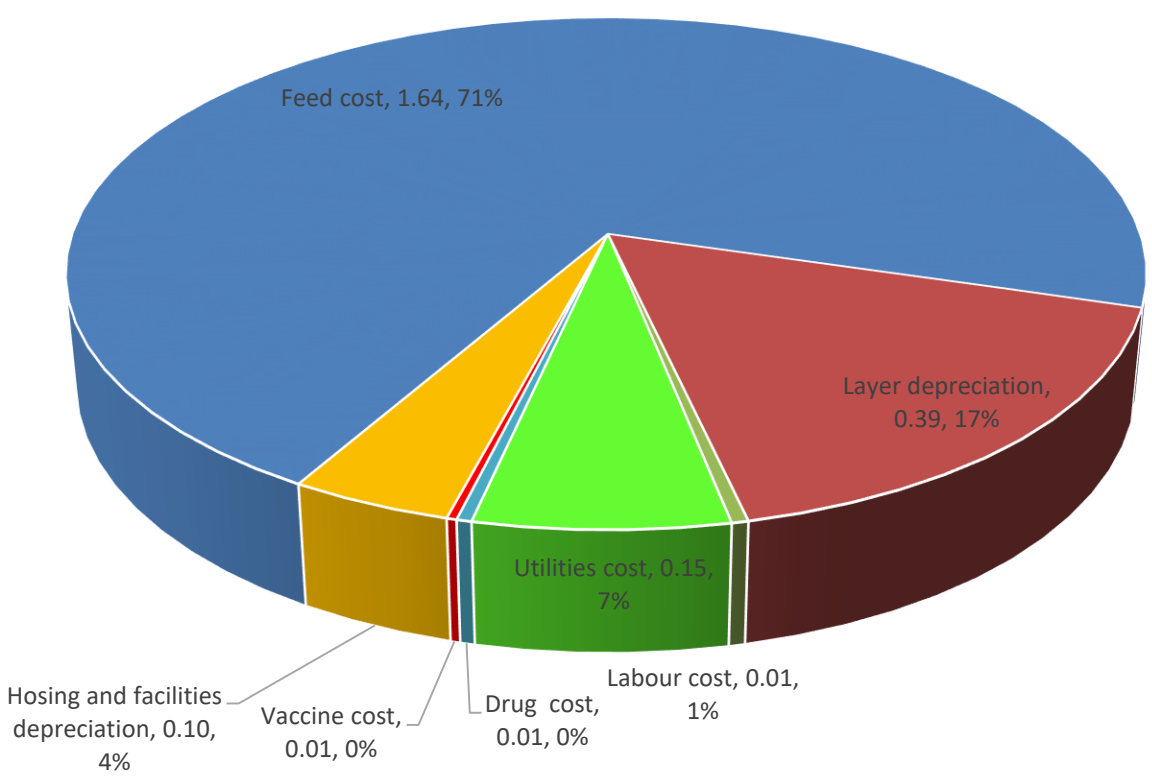
- Improve of farm management and biosecurity in native chicken farming system
- Collaborate with National Bureau of Agricultural Commodity and Food standard to develop the Good Agricultural practices (GAP) in free range chicken farming
  - Promote organic and food safety in native chicken farming system

Conclusion

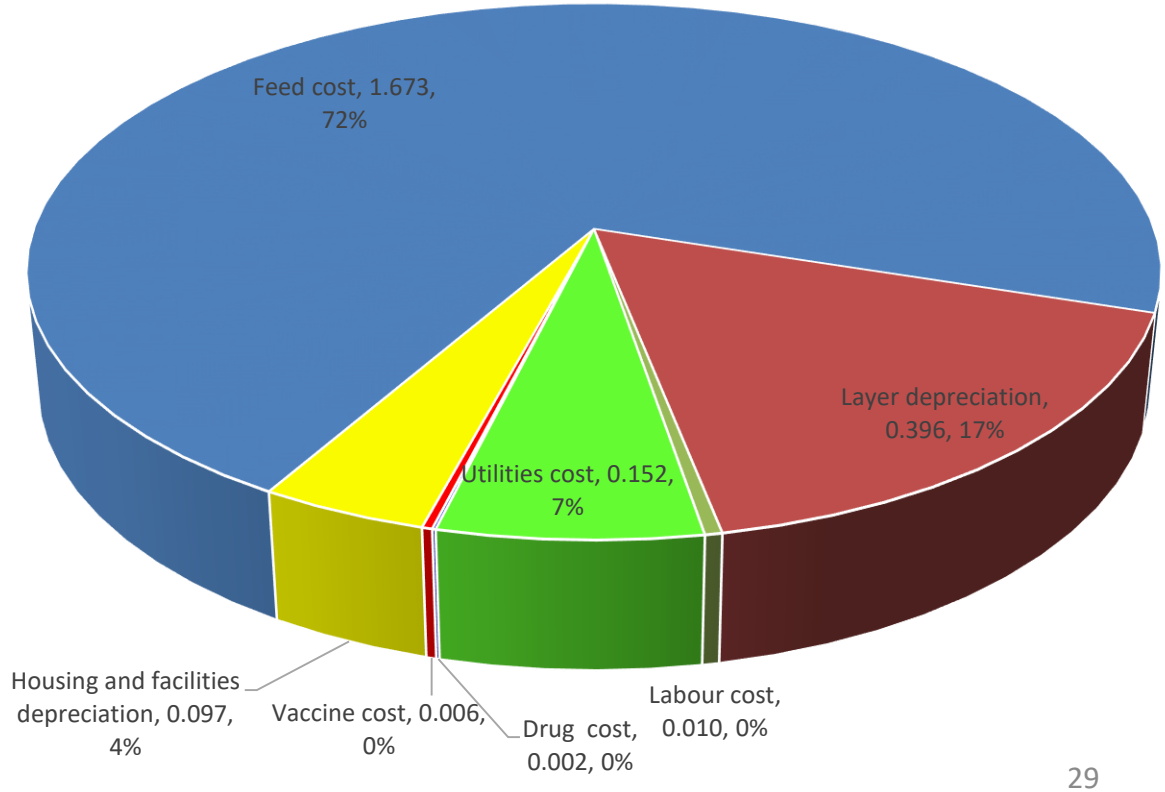
- The main reasons of AM use in livestock production are for disease prevention and prevent economic loss
- Effective infectious diseases control and farm management are the keys of success
- This study could elucidate the possibility and effectiveness of AM prudent use in layer and pig farms without production loss
- Holistic approach, Ecohealth, is effective tool for complex problems as AMR
- However, economic incentive should be addressed

Challenge

Before intervention (2.30 Baht/egg)



After intervention 2.33 Baht/egg



Next step….

Rationale AM use VS Free AM usage
Economic incentive

Production performance
"Re-emerging diseases"
Farmer's acceptance
Long-term impact

Sustainability


Thank you
Thank you
Thank you
Thank you

Thank you

Department of Livestock Development, Thailand

International Development Research Centre, Canada

Asian Partnership on Emerging Infectious Diseases Research

National Science Technology and Innovation Policy Office, Thailand

Health System Research Institute, Ministry of Public Health, Thailand