Food safety and antimicrobial resistance research: A One Health perspective

Hung Nguyen

International Livestock Research Institute

The Emerging Pathogens Institute Seminar Series

Gainesville, University of Florida, USA

26 July 2019




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Outline

- International Livestock Research Institute
- Food safety in LMIC and case studies in South-East Asia
- AMR / EIDs
- One Health use for this and conclusion

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CGIAR Research Centers

CGIAR research is carried out by the 15 Centers, members of the CGIAR Consortium, in close collaboration with hundreds of partners, including national and regional research institutes, civil society organizations, academia, development organizations and the private sector.

CENTERS

1. AfricaRice
2. Bioversity International
3. Center for International Forestry Research (CIFOR)
4. International Center for Agricultural Research in the Dry Areas (ICARDA)
5. International Center for Tropical Agriculture (CIAT)
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7. International Food Policy Research Institute (IFPRI)
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11. International Potato Center (CIP)
12. International Rice Research Institute (IRRI)
13. International Water Management Institute (IWMI)
14. World Agroforestry Centre (ICRAF)
15. WorldFish

REDUCED POVERTY

IMPROVED FOOD AND NUTRITION SECURITY FOR HEALTH

IMPROVED NATURAL RESOURCE SYSTEMS AND ECOSYSTEM SERVICES

EQUITY, CAPACITY AND ENABLING ENVIRONMENT

CGIAR is a global research partnership for a food secure future

CGIAR

International Livestock Research Institute (www.ilri.org)

Reduced poverty

Improved food and nutrition security for health

Improved natural resource systems and ecosystem services

ILRI's mission is
to improve food and nutritional security
and to reduce poverty in developing countries through research for
efficient, safe and sustainable
use of livestock —
ensuring ***better lives through livestock.***

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ILRI Resources

- Staff: 670
- 130 scientists from 40 countries
- 56% of internationally recruited staff are from 22 developing countries
- 34% of internationally recruited staff are women.
- Large campuses in Kenya and Ethiopia
- Regional or country office in 14 countries
- $ 80 million/year

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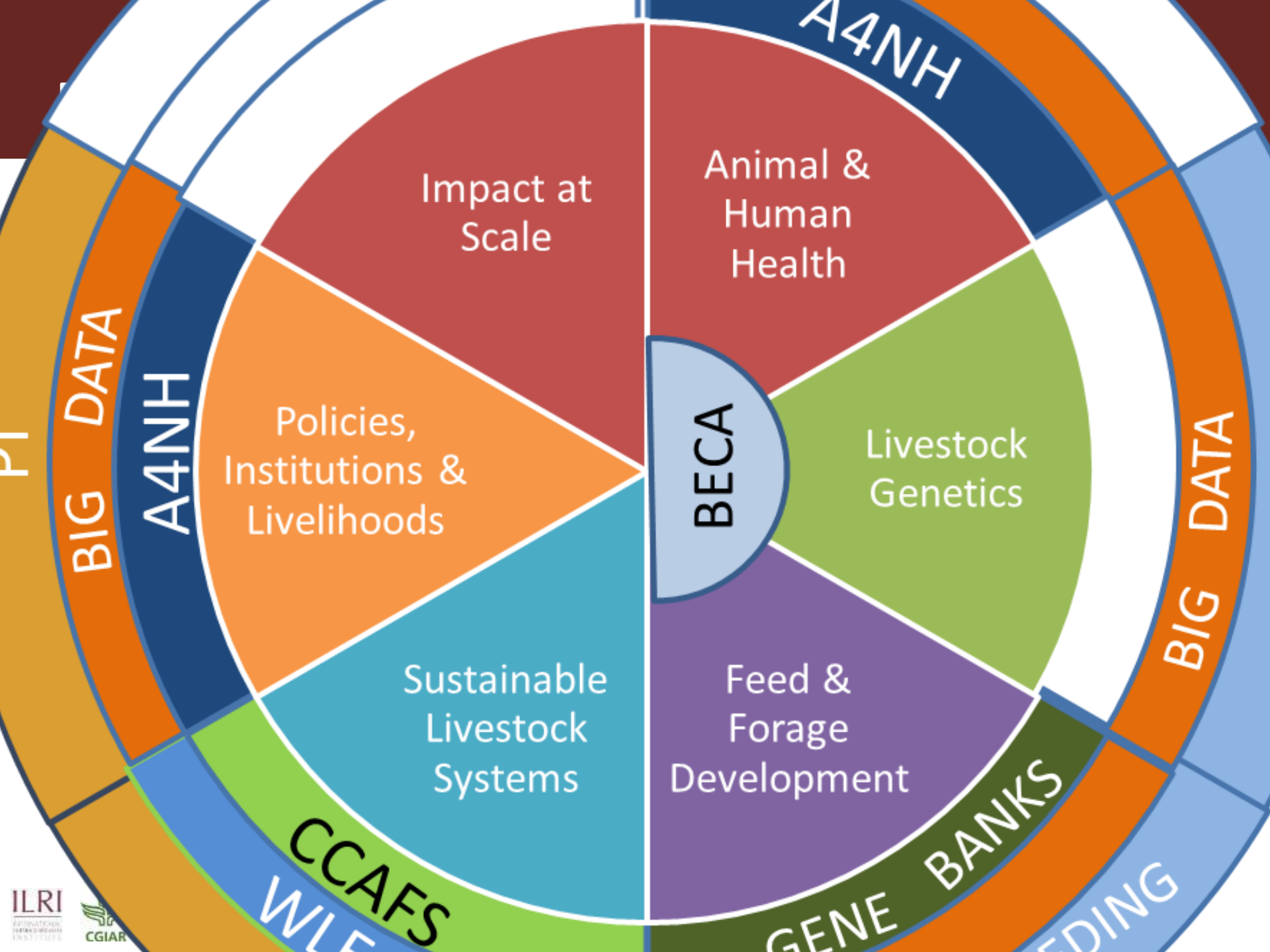
ILRI around the world


A4NH
Impact at Scale
Animal & Human Health
BIG DATA
A4NH
Policies, Institutions & Livelihoods
BECA
Livestock Genetics
BIG DATA
Sustainable Livestock Systems
Feed & Forage Development
CCAFS
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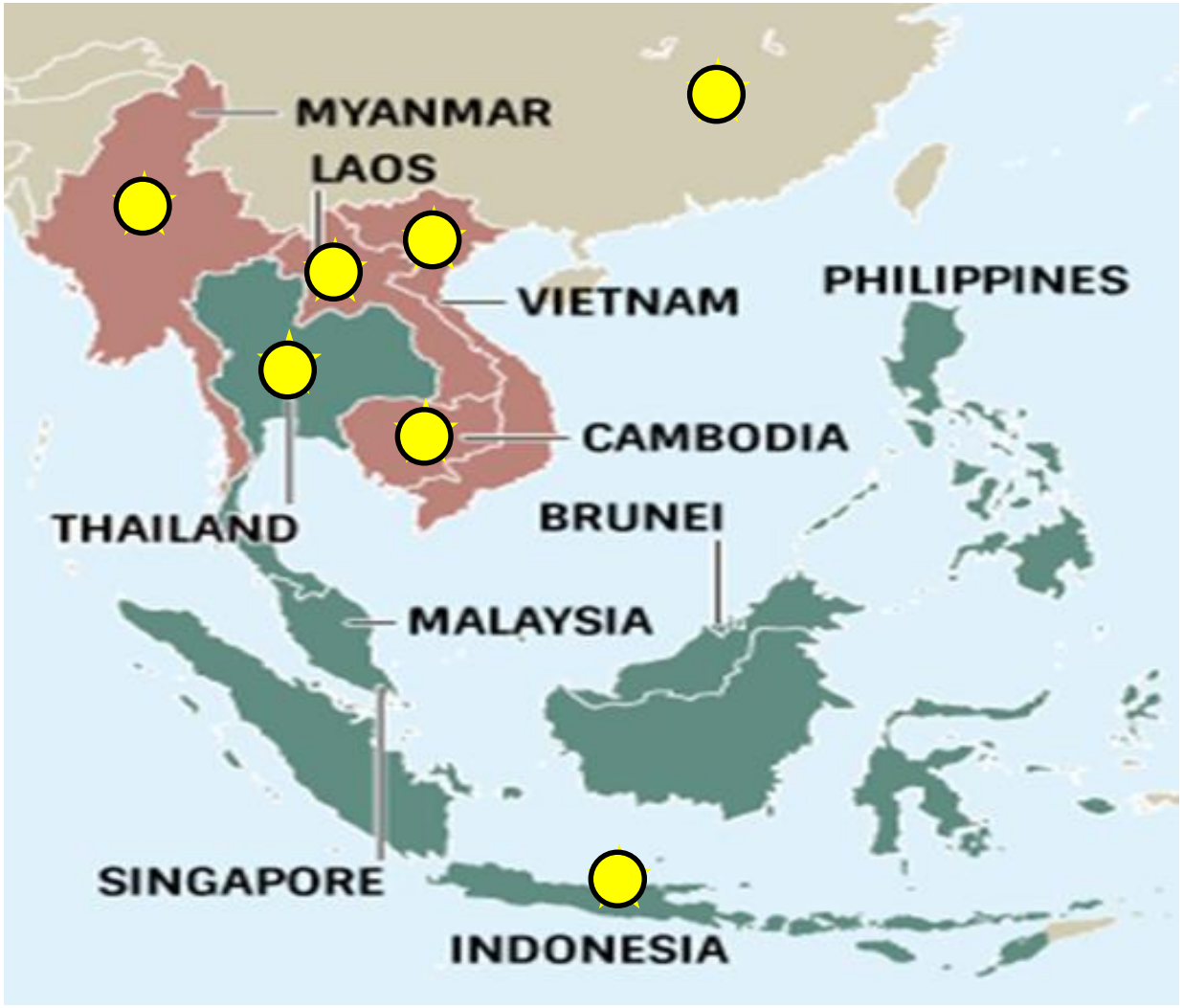
Where are we active in the region?

CRP
Livestock Agri-food system

CRP A4NH
Agriculture for Nutrition and Health

CRP CCAFS
Agriculture, Food Security and Climate Change



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Food Safety

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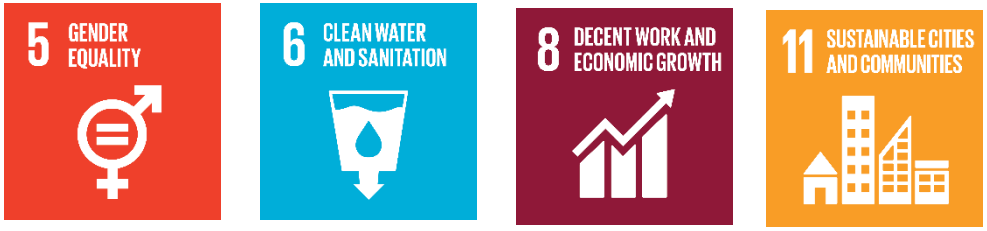
Food safety is integral to the SDGs

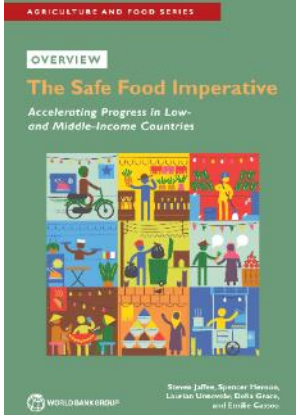
Traditional Image of Food Safety

Food Safety critical to ACHIEVING the SDGs

Food safety is integral to:

Food safety (practice) contributes to:





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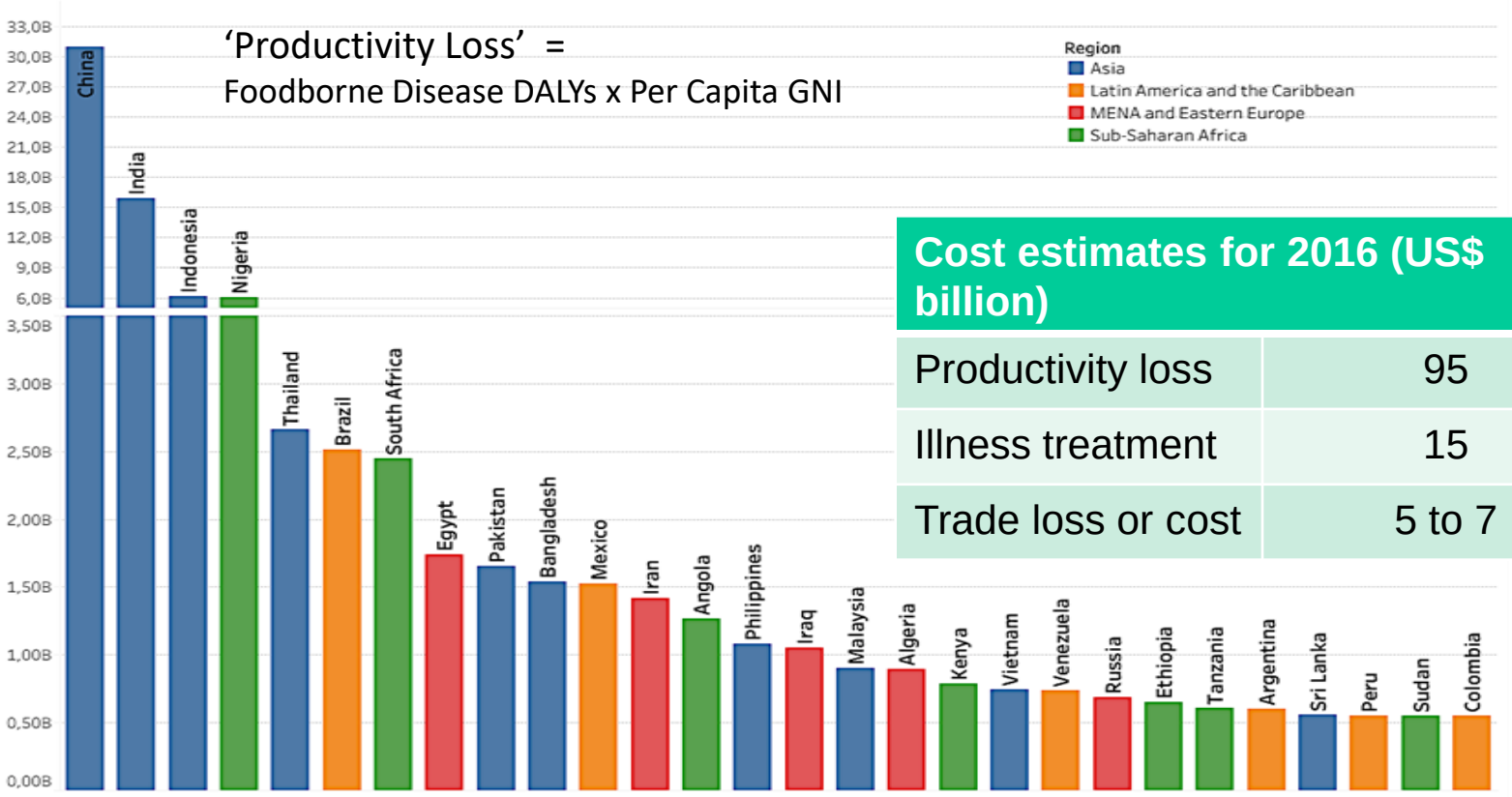
Domestic costs may be 20 times trade costs



Cost estimates for 2016 (US$ billion)	
Productivity loss	95
Illness treatment	15
Trade loss or cost	5 to 7

Illness treatment =
US$27 x # of Estimated foodborne illnesses

Trade loss or costs =
2% of developing country **high value** food exports

Based on WHO/FERG & WDI Indicators Database

Research approach: what do we do to understand and improve food safety?

- Situational analyses of food safety
- Capacity building on risk-based approaches
- Proof of concept: participatory risk assessment
- Pilot testing interventions

Approach: risk analysis or risk-based decision making
Hazards vs Risk

Hazard identification

Can it be present in food?
Can it cause harm?

What harm does it cause?
How does harm depend on dose?

Hazard characterization

How and to what extent does it get from source to victim?

Exposure assessment

What is the harm?
What is its likelihood?

Risk characterization

Participatory methods fit well

Risk communication

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Pork value chain and safety in Vietnam: from research to interventions

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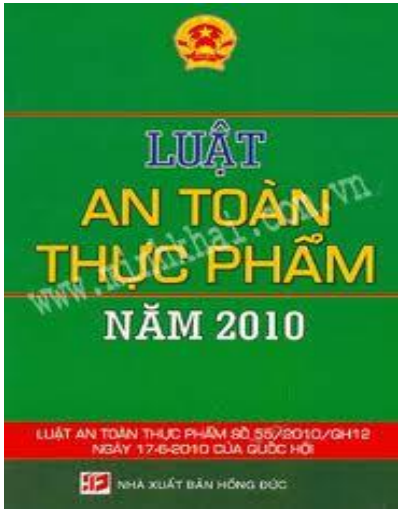
Issue of pork value chain and food safety in Vietnam

- **Large pig production** (30 million heads) mainly produced by 2.5 mio small scale farms (70%)
- **Pork is the main ASF (60%)** in Vietnamese diet **"fresh" pork** preferred
- Food safety among the **most pressing issues**, more important than education or health care
- Modern food safety legislation but **weak enforcement**
- Risk perception towards **chemical hazards** is important, issue of **risk communication**
- Food exports relatively well managed but **deficits in domestic markets.**

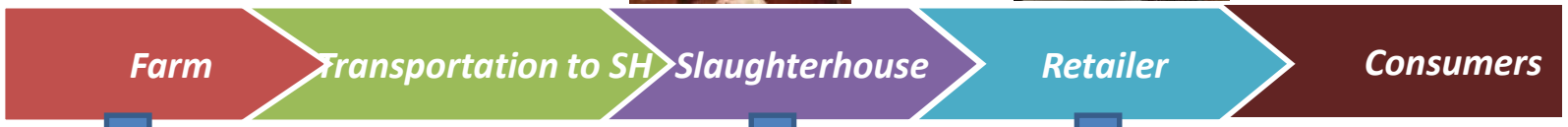


Nguyen-Viet et al, 2017

PigRISK project (2012-2017)
Food safety risk assessment along the pork value chain

Microbial and Chemical Risk Assessment

- *Salmonella* risk pathways developed for producers, slaughterhouse and consumers, quantitative microbial risk assessment (QMRA) risk for consumer
- Chemical risk assessment: antibiotic residues, banned chemicals, heavy metals



- Feed in bags, remaining feeds at the cages, environment
- Liver
- Kidney
- Pork
- Consumption survey

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Sinh Dang et al, 2017

Risk assessment

QMRA for salmonellosis

Age and gender groups	Estimated annual salmonellosis incidence rate (Mean (90% CI)) (%)
Children (under 5 years old)	11.18 (0 – 45.05)
Adult female (6-60 years old)	16.41 (0.01 – 53.86)
Adult male (6-60 years old)	19.29 (0.04 – 59.06)
Elder (over 60 years old)	20.41 (0.09 – 60.76)
Overall	**17.7 (0.89 – 45.96)**

The annual incidence of foodborne salmonellosis in the Asian region including Vietnam was 1% (range 0.2-7%) (Havelaar 2015)

Chemical risk assessment: minimal risks

Dang Xuan Sinh et al, 2017, Hanh Tran et al, 2017

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Economic impact of food borne diseases

ORIGINAL ARTICLE

JKMS

http://dx.doi.org/10.3346/jkms.2015.30.S2.S178 • J Korean Med Sci 2015; 30: S178-182

Cost of Hospitalization for Foodborne Diarrhea: A Case Study from Vietnam

Van Minh Hoang,[1] Tuan Anh Tran,[2] Anh Duc Ha,[3] and Viet Hung Nguyen[4]

Vietnam is undergoing a rapid social and economic developments resulting in speedy urbanization, changes in methods for animal production, food marketing systems, and food consumption habits. These changes will have major impacts on human exposures to

- Costs per treatment episode and per hospitalization day for foodborne diarrhea case were US$ 106.9 and US$ 33.6 respectively.
- 51.3%: Indirect cost (costs of times to patient, their relatives due to the patient's illness)
- 33.8%: Direct medical costs
- 14.9%: Direct non-medical costs (patient and their relatives)

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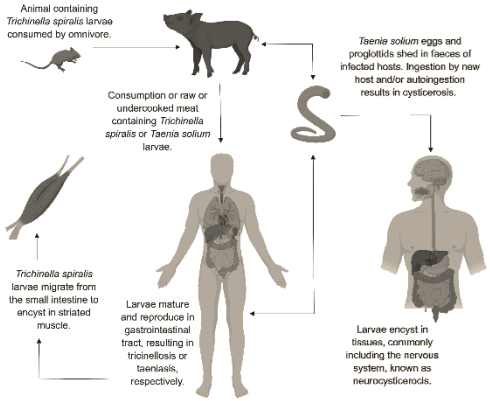
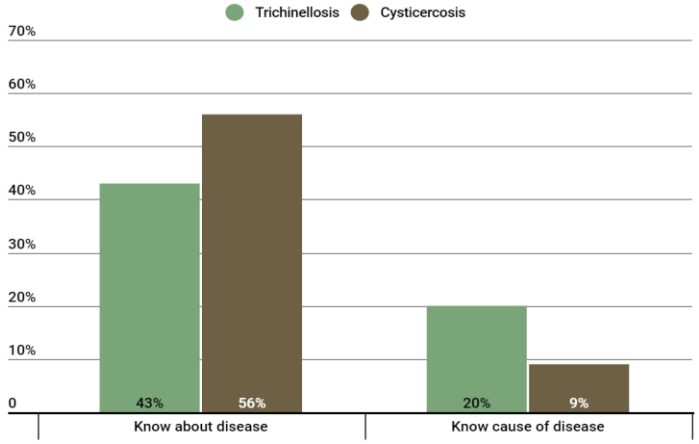
Hoang Van Minh et al, 2015, JKMS

Serological prevalence and factors associated with human trichinellosis and cysticercosis in Hoa Binh Province, Northwest Vietnam



- 300 participants with blood samples in Hoa Binh.
- ELISA for trichinellosis and cysticercosis (Demeditec® and apDia®).



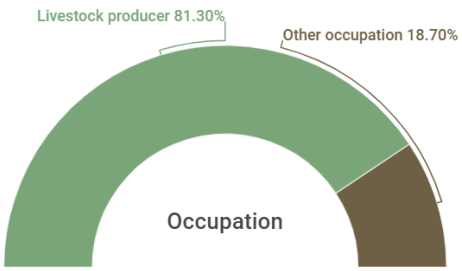
Knowledge of participants about diseases

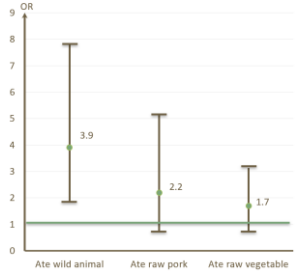
Trichinellosis

Cysticercosis

Positive case

Suspected case





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BMZ Federal Ministry for Economic Cooperation and Development

Investments in FS can save lives and $$$

- **94 million people**
- Cases of foodborne diseases by *Salmonella* in pork at 17%: **16 million get sick**
- Cost $ 107 to treat a case: if 1/3 looks for medical treatment, **$570 million (0.26% GDP)**
- Intervention to reduce 20% burden: **$ 340 million SAVED** from total population

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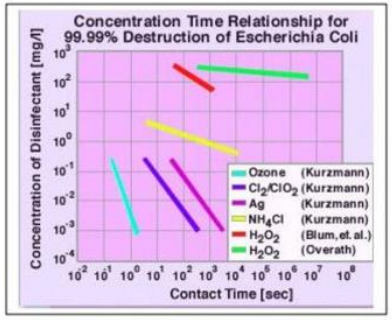
Interventions (Safepork project 2018-2022)

- Farm level: Simplified VietGAHP/GAP reduced AMU / AMR
- Slaughterhouse: ozone machine, no floor slaughter
- Markets: branding, better hygiene
- Consumer: reduced cross-contamination, hygiene
- Nudges



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Safe Food Fair Food for Cambodia

Project objectives

1. Actionable evidence on FBD burden associated with animal source foods (ASF)
2. Pilot incentive-based approach to improving food safety among ASF traders
3. Cambodian-led Theory of Change for improving food safety
4. Gender and equity research
5. Building capacity in food safety risk assessment, management, communication

Gender

TOC

Impact

Nutrition

1. Risk profiling

1. Scoping visits
2. Systematic literature review
3. Risk profiles
4. Training in risk ranking
5. Stakeholder prioritisation

Markets

QMRA

Household

2. Generate evidence on FBD
Five Urban Survey Study

Cost of Illness

Nutrition

3. Develop & test solutions for wet markets
RCT intervention

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CelAgrid

Taskforce

Generate Evidence on FBD

Risk profiling

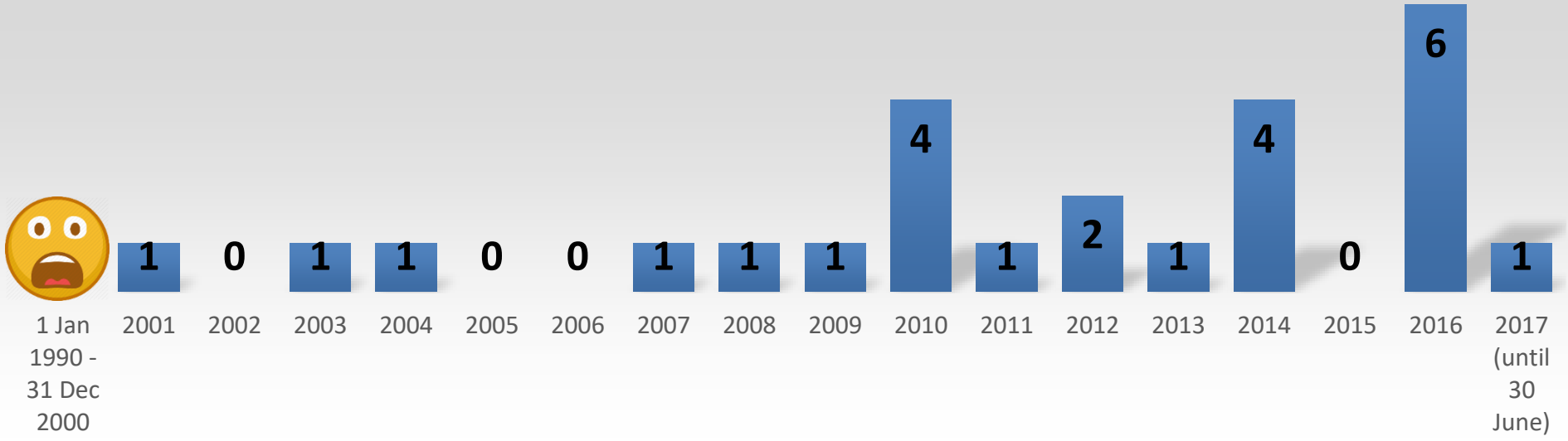
1. Scoping visits
2. Systematic literature review
3. Risk profiles
4. Training in risk ranking
5. Stakeholder prioritisation

Five Survey Study

1. National traders hazard survey
2. Urban household consumption
3. Urban household nutrition
4. Urban hospital COI
5. Quantitative RISK Assessment

International, peer-reviewed journal publications between 1990 and June 2017

n=25



APPROACH : SYSTEMATIC LITERATURE REVIEW (SLR) AND GREY LITTERATURE REVIEW

which foods???

- Foods associated with FBD: noodles, rice, seafood, dog meat, water spinach, rice wine, raw game meat
- Foods associated with chemicals: sausage, dry fish, seafood, noodles and meat balls produced from beef and pork;
- Catering foods at big events

which hazards???

- Vibrio spp., Salmonella spp., Staphyloccus aureus, Bacillus cereus
- borax, formalin

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Animal sourced food

Pork

In traditional Market

Chicken

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UF IFAS UNIVERSITY of FLORIDA

Multi-pathogen survey in Cambodian traditional market

- Pork and poultry
- *Salmonella & Staphylococcus aureus*
- Traditional markets in 25 provinces of Cambodia 12.2018 -3.2019
- Urban focus: Phnom Penh municipal and Siem Reap province, Sihanoukville, Battambang (repeated survey) 7 - 8.2019

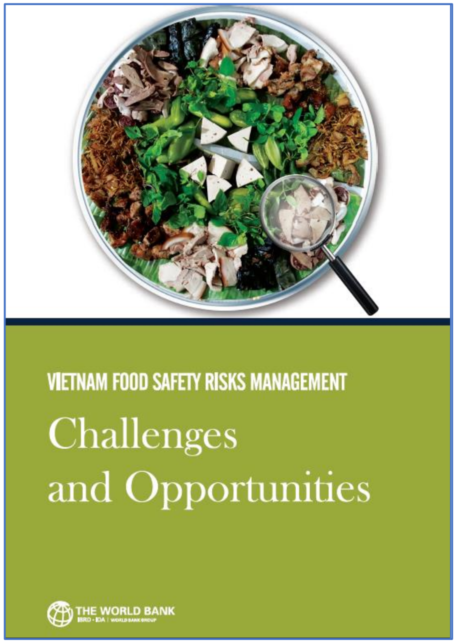
RESULTS

- All samples of the first round was collected for the multi-pathogen survey in **Cambodian markets in 25 provinces. In total 416 samples** (pork = 156, pork cutting board swabs=52) chicken (chicken meat = 156, cutting board swabs = 52) were collected. 312 shop owners were interviewed during the sampling.
- **In total of 184 samples positive to *Salmonella* (36%) and 133 to *S. aureus* (32%).**
- Isolates are being kept for further analysis on **antimicrobial resistance.**

Cost of per episode of hospitalization of FBD by group of health facilities

Cost	National Hospital (n=44)	Referral Hospital (n=60)	Regional Hosp. (n=100)	Community Clinic (n=62)	Overall (n=266)
Direct medical cost					
• **Amount [usd]**	125.77	9.42	27.85	4.19	34.38
Direct non-medical cost					
• **Amount [usd]**	40.64	8.36	26.33	0.30	18.58
Indirect cost					
• **Amount [usd]**	21.43	6.38	10.89	3.08	9.80
Total cost [usd]	**185.88**	**24.16**	**65.07**	**7.57**	**62.76**

Capacity building and policy translation



Global Food Security 19 (2018) 24–30

Contents lists available at ScienceDirect

Global Food Security

journal homepage: www.elsevier.com/locate/gfs

Research and training partnership to assist policy and capacity building in improving food safety in Vietnam

Hung Nguyen-Viet[a,b,*], Delia Grace[g], Phuc Pham-Duc[b], Sinh Dang-Xuan[b], Toan Luu-Quoc[b], Fred Unger[a,g], Seth de Vlieger[a,g], Ngoc Pham-Thi[c], Nhiem Duong-Van[d], Long Nguyen-Hung[e], Luan Tran-Dinh[f], Tran Thi Tuyet-Hanh[b]

[a] International Livestock Research Institute, Hanoi, Vietnam
[b] Center for Public Health and Ecosystem Research, Hanoi University of Public Health, Hanoi, Vietnam
[c] National Institute of Veterinary Research, Hanoi, Vietnam
[d] Faculty of Veterinary Medicine, Vietnam National University of Agriculture, Hanoi, Vietnam
[e] Vietnam Food Administration, Ministry of Health, Hanoi, Vietnam
[f] Directorates of Fisheries, Ministry of Agriculture and Rural Development, Hanoi, Vietnam
[g] International Livestock Research Institute, Nairobi, Kenya

A B S T R A C T

This paper evaluated the implementation of an initiative for promoting risk-based approaches to improve food safety management in Vietnam. A Taskforce of Risk Assessment for Food Safety (Taskforce) was formed and consisted of researchers working on risk assessment and food safety, and representatives of the related ministries of Health and of Agriculture. We used the OECD Development Assistance Committee Evaluation Criteria as a framework for assessing the impact of the Taskforce with five evaluation areas – relevance, effectiveness, effi-

Taskforce of Risk assessment for food safety in Vietnam

- Linking research to policy
- Taskforce: composed by experts from universities, research institutes, policy makers from the ministries (health, agriculture)
- Risk analysis capacity development for researchers and policy makers
- Taskforce now institutionalized and sustainable

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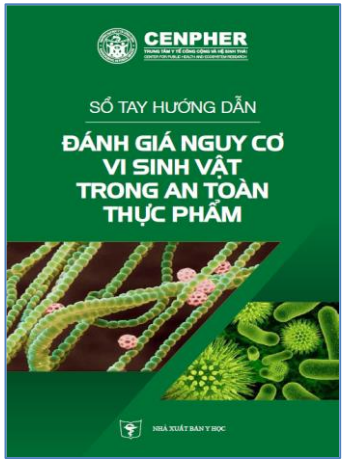
Capacity building impact: curriculum development & trainings

- Guidelines on FS risk assessment: more accessible and understandable in use in 17 universities, 7 cities
- Curriculum developed to teach 200 students per year: majority of future food safety human resources
- Trainings for veterinary and public health staff at ministry level
- Hand-on training on risk assessment for researchers, students



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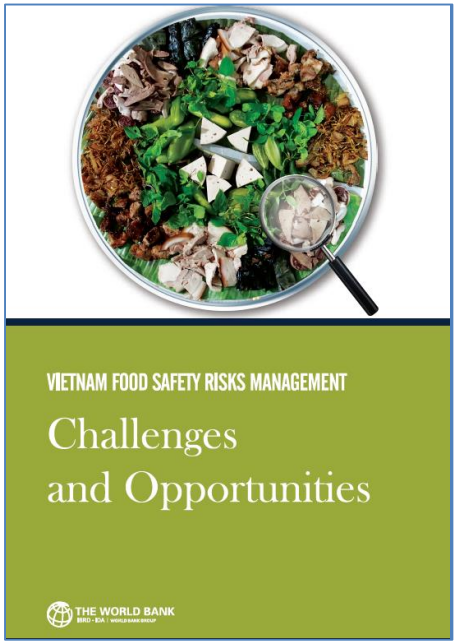
Policy impact: translational research for interventions in modernizing food system

- CGIAR/ILRI niche - risk assessment and policy / regulatory analysis for fresh foods in domestic markets
- World Bank convenes overall support to government: ILRI led technical works
- Upcoming projects based on WB report we led will improve food safety for 20 million people in major cities of Vietnam



WORLD BANK GROUP

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- **Stakeholder consultation**
- **Risk assessment training**

Savanakhet, Laos
Foodborne parasitic disease research 10. 2017

Decision makers

Public health (MD, army health)

Scientists

Vets

Bangladesh: capacity building on risk-based approaches

Risk assessment workshop in Dhaka 22-24 October 2018: 33 participants

Research into use: Risk communication and management

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SOCIETY

Last update 15:08 | 18/03/2019

VN police investigate mass infection of children with cysticercosis

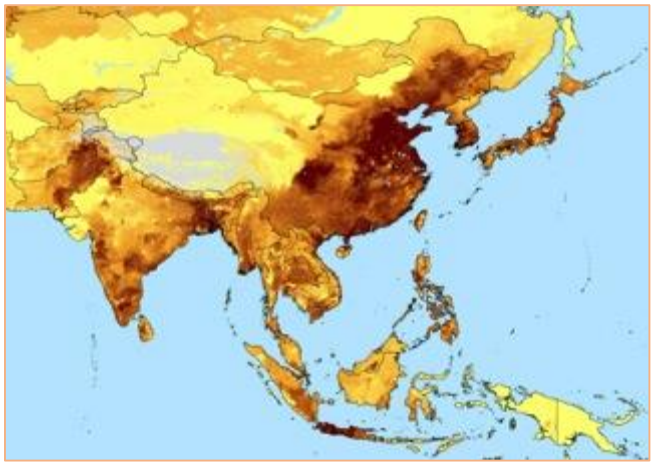
The police are investigating the alleged use of meat from sick pigs at several schools in Bac Ninh Province as the number of children tested positive for cysticercosis has climbed to 209.

Thousands of parents in Bac Ninh Province bring children to hospitals to test for cysticercosis on March 17

The police in Bac Ninh Province said on March 18 that they would cooperate with the police in Thuan Thanh District to

- Risk communication and management problem
- Cysticercosis in schools in Bac Ninh
- African swine fever and food safety

Antimicrobial use (AMU)
Antimicrobial resistance (AMR)



Global trends in antimicrobial use in food animals

Thomas P. Van Boeckel[a,1], Charles Brower[b], Marius Gilbert[c,d], Bryan T. Grenfell[a,e,f], Simon A. Levin[a,g,h,1], Timothy P. Robinson[i], Aude Teillant[a,e], and Ramanan Laxminarayan[b,e,j,1]

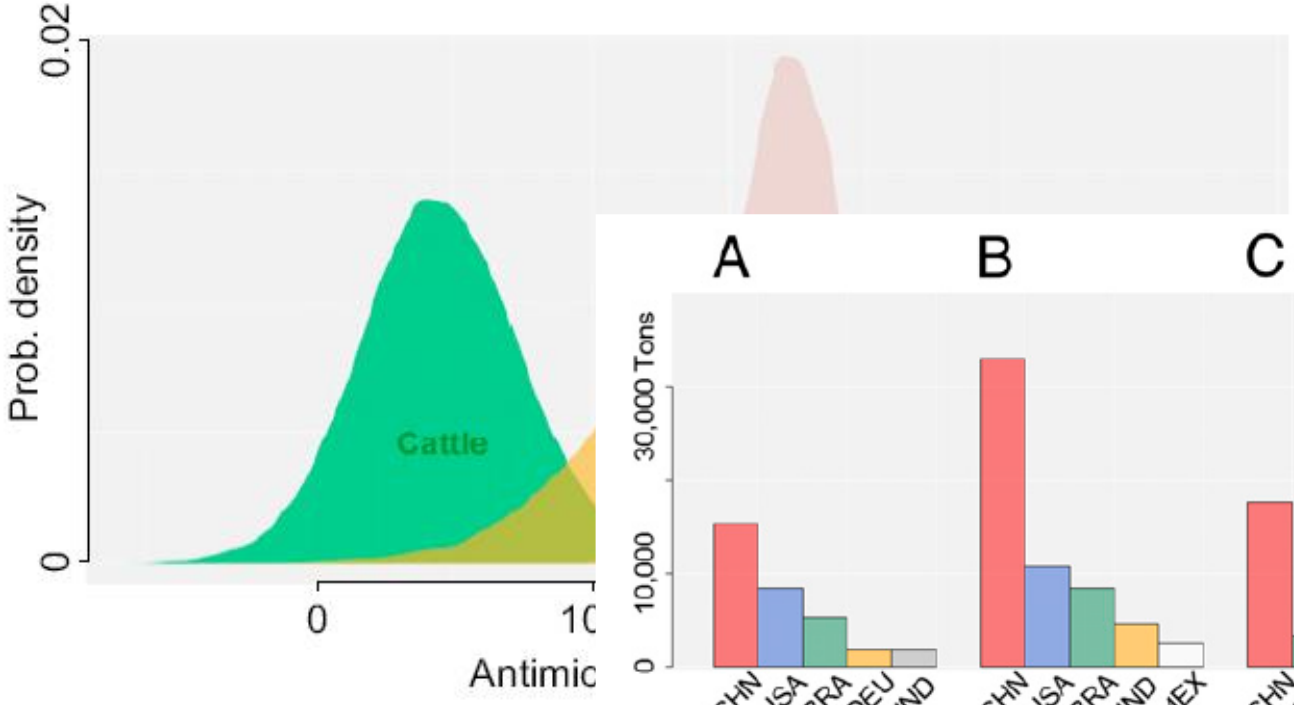


Fig. 2. Posterior distributions for e
cattle, chickens, and pigs in OECD

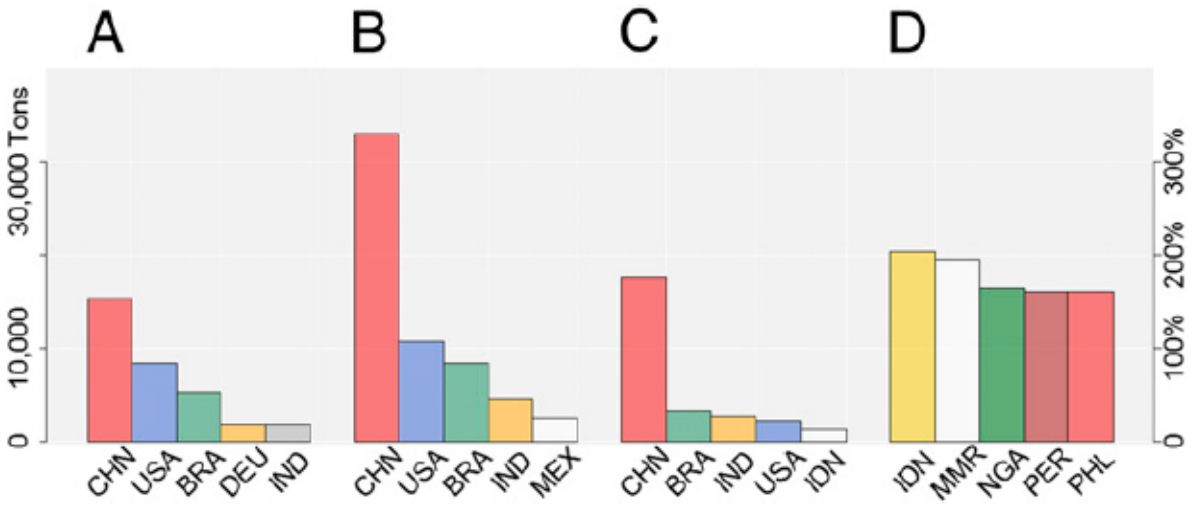


Fig. 1. (*A*) Largest five consumers of antimicrobials in livestock in 2010. (*B*) Largest five consumers of antimicrobials in livestock in 2030 (projected). (*C*) Largest Increase in antimicrobial consumption between 2010 and 2030. (*D*) Largest relative increase in antimicrobial consumption between 2010 and 2030. CHN, China; USA, United States; BRA, Brazil; DEU, Germany; IND, India; MEX, Mexico; IDN, Indonesia; MMR, Myanmar; NGA, Nigeria; PER, Peru; PHL, Philippines.

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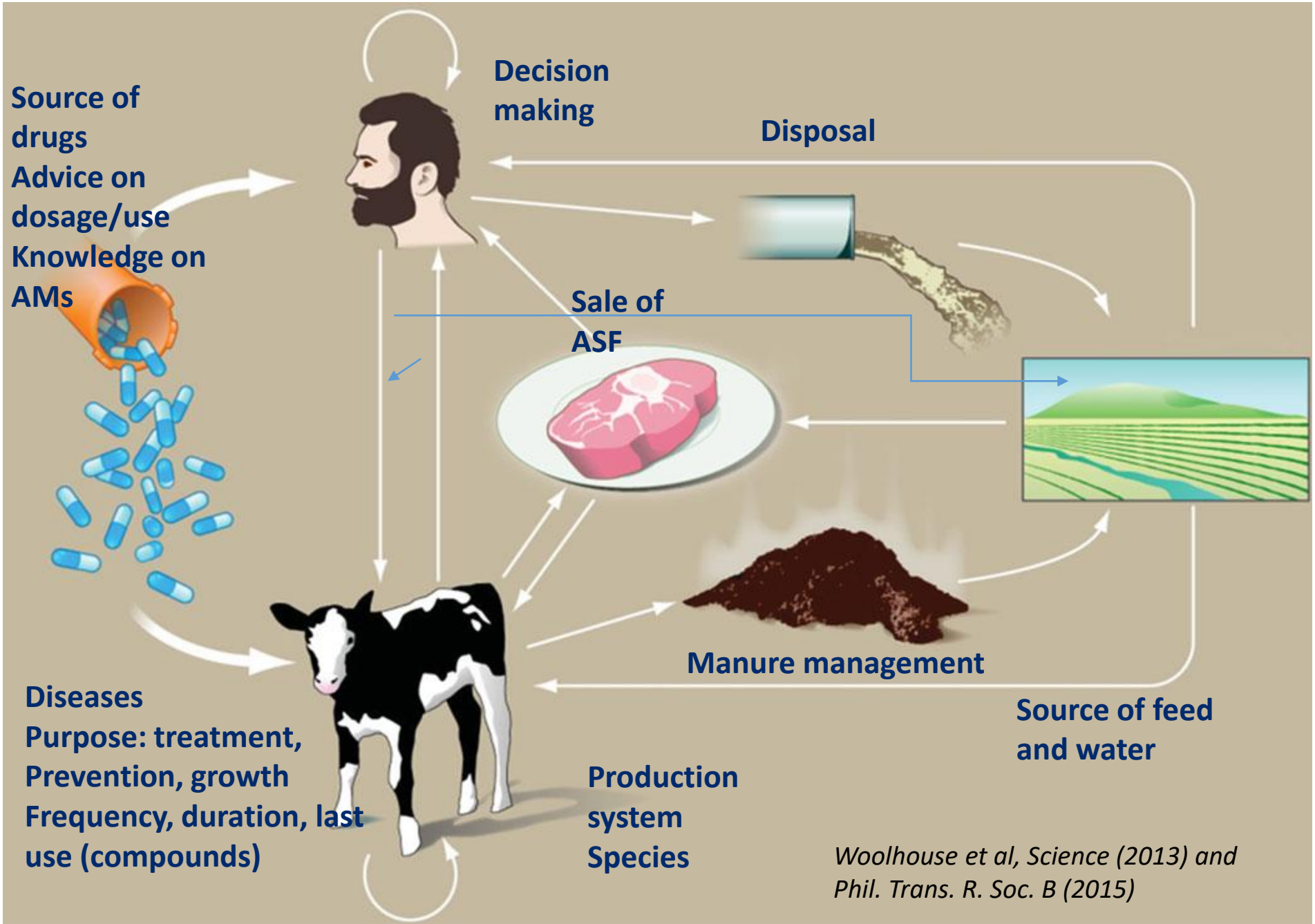
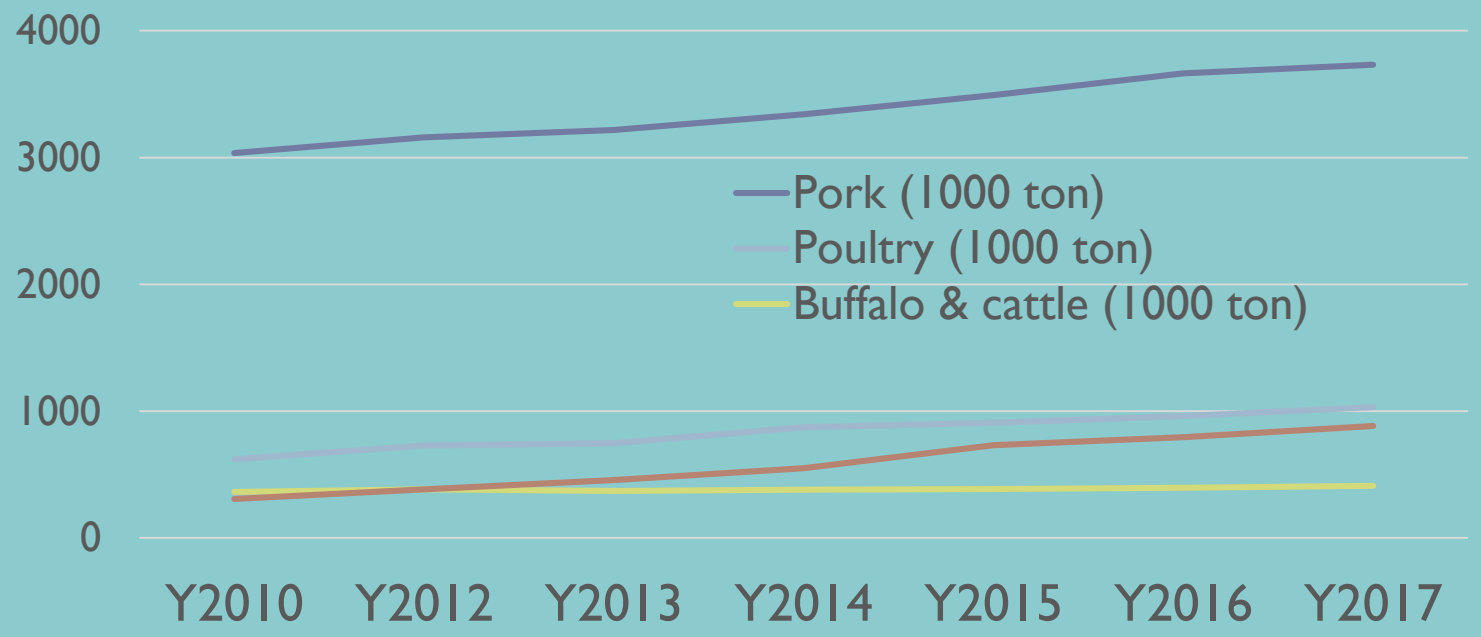
Van Boeckel et al. 2015. PNAS

AMR/AMU research in human and livestock



Woolhouse et al, Science (2013) and Phil. Trans. R. Soc. B (2015)

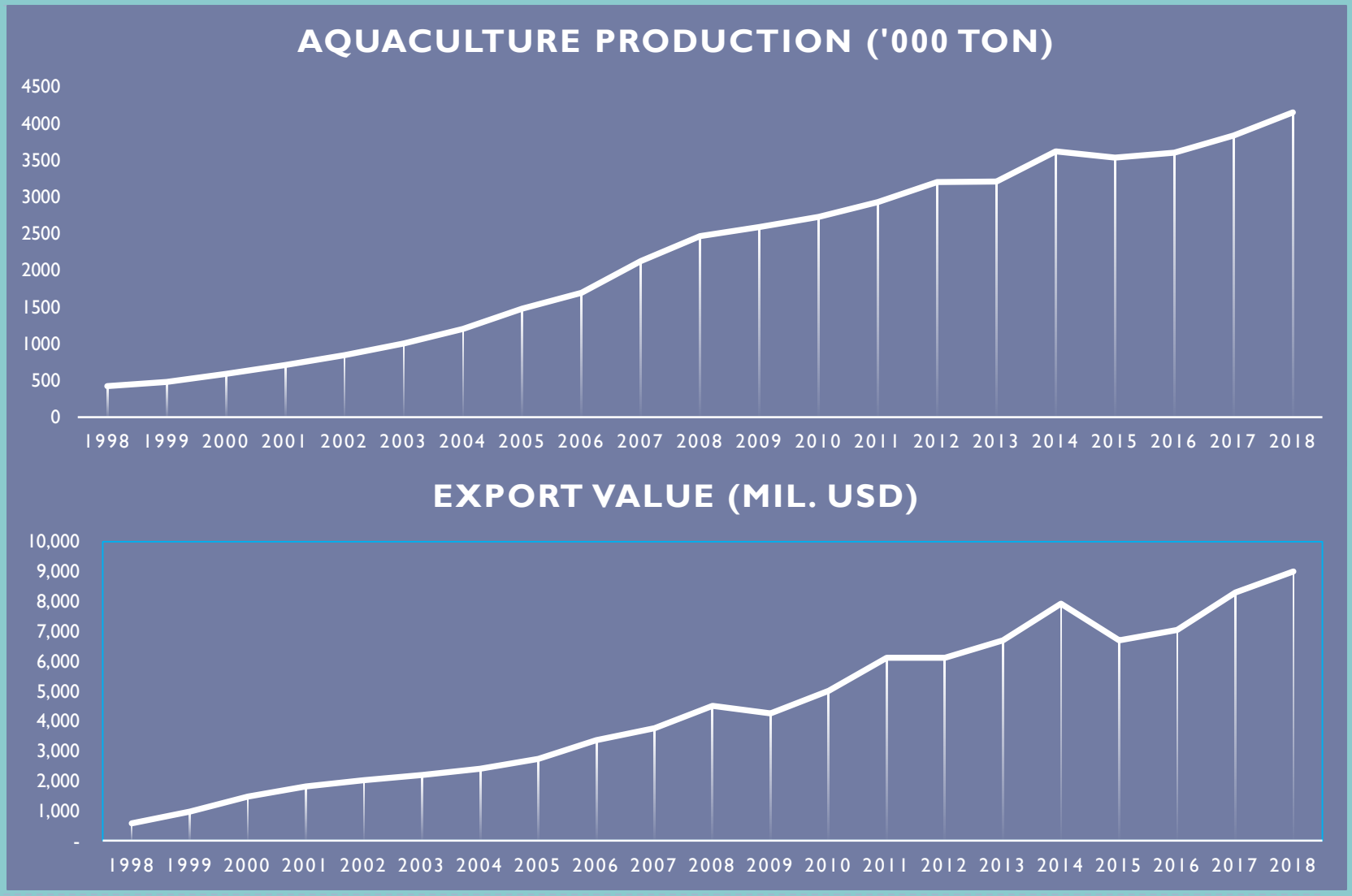
Livestock production in Vietnam (2010-2017)



- Annual growth 2010-2017: 5-6% per year
- Agriculture: 15% GDP
- Livestock: 20% of Agriculture GDP

DLP/ MARD (2018)

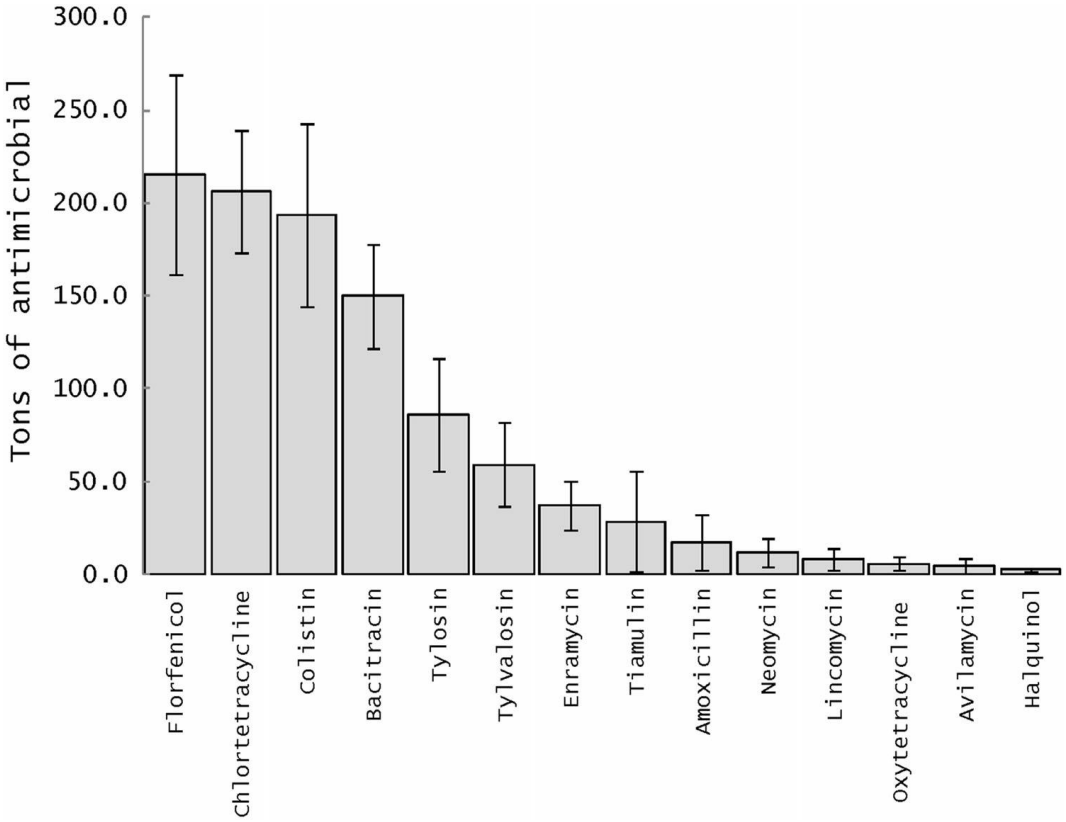
Aquaculture production and export of Vietnam (1998-2018)



Source: D-Fish

AMU consumption for chicken and pig medicated feeds

- **77.4 mg and 286.6 mg** of in-feed antimicrobials were used to raise 1 kg of live chicken and pig, respectively.
- **1023.5 tons, and 42.2 and 981.3 tons** for Vietnamese chicken and pig production, respectively.



Nguyen Van Cuong et al. 2016. EcoHealth

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Veterinary pharmacy, Northern Vietnam

Nga et al. BMC Pharmacology and Toxicology 2014, 15:6
http://www.biomedcentral.com/2050-6511/15/1/6

BMC Pharmacology & Toxicology

RESEARCH ARTICLE Open Access

Antibiotic sales in rural and urban pharmacies in northern Vietnam: an observational study

Do Thi Thuy Nga[1*], Nguyen Thi Kim Chuc[2], Nguyen Phuong Hoa[2], Nguyen Quynh Hoa[3], Nguyen Thi Thuy Nguyen[2], Hoang Thi Loan[2], Tran Khanh Toan[2], Ho Dang Phuc[4], Peter Horby[1,5], Nguyen Van Yen[6], Nguyen Van Kinh[7] and Heiman FL Wertheim[1,5]

- 90% AB sold without prescription
- Dispensed by inexperienced staff
- 25% of sales is AB sales
- More rural domestic drug sales

- High demand from buyer -> public awareness campaigns
- Strong incentive for AB dispensing -> room for intervention

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Key Milestones of AMR battle in Viet Nam

- **2013:** National Action Plan on Antibiotic Resistance 2013-2020
- **2013:** National Steering Committee on AMR
- **2014:** Establishment of Sub-Committees on AMR for the period 2013-2020
- **2015:** Aide-Memoire on Multi-sectoral Action to Combat AMR in Viet Nam
- **2015:** Start of Antibiotic Awareness Week
- **2017:** National Action Plan for the reduction of antimicrobial use and management of antibiotic use and control of antibiotic resistance in livestock production and aquaculture (2017 – 2020)

Signing ceremony-
Multi-sector Agreement on AMR prevention and combating in Vietnam (2015)

Events on AMR in 2016

Source: MoH, 2017

National action plan for AMU and AMR in livestock production and aquaculture

KẾ HOẠCH HÀNH ĐỘNG QUỐC GIA

VỀ QUẢN LÝ SỬ DỤNG KHÁNG SINH
VÀ PHÒNG CHỐNG KHÁNG KHÁNG SINH
TRONG CHĂN NUÔI VÀ NUÔI TRỒNG THỦY SẢN

(Ban hành theo Quyết định số 2625 /QĐ-BNN-TY ngày 21/6/2017
của Bộ trưởng Bộ Nông nghiệp và Phát triển nông thôn)

Hà Nội, tháng 6/2017

- Strengthen governance of AMR and AMU management
- Improve legal basis for AMR and AMU management
- Enforce the legislation in place
- Increase awareness of AMU and risk of AMR
- Implement good treatment and husbandry practices
- Monitor AMR, AMU and antibiotic residue
- Strengthen inter-sectoral collaboration in AMR management

VIDA-PIG PROJECT

Health and Antibiotics in Vietnamese Pig Production

UNIVERSITY OF COPENHAGEN

DANIDA
Danish International Development Agency

One Heath

1

Pig health and health management practices

2

Veterinary drug use among pig farmers

3

Antibiotic resistance in pigs and antibiotic residues in pork products

4

Effective interventions for improving pig health management

Rational use of AM, reduced AMR, safer food

Improve understanding of drug use and strengthen capacity in AMR /AMU surveillance

Pig farms, feed mills, abattoirs, veterinarians, etc.

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CGIAR

Hung Nguyen et al. 2018

Antimicrobial Resistance Hub

www.amr.cgiar.org

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INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

IFPRI INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

WorldFish

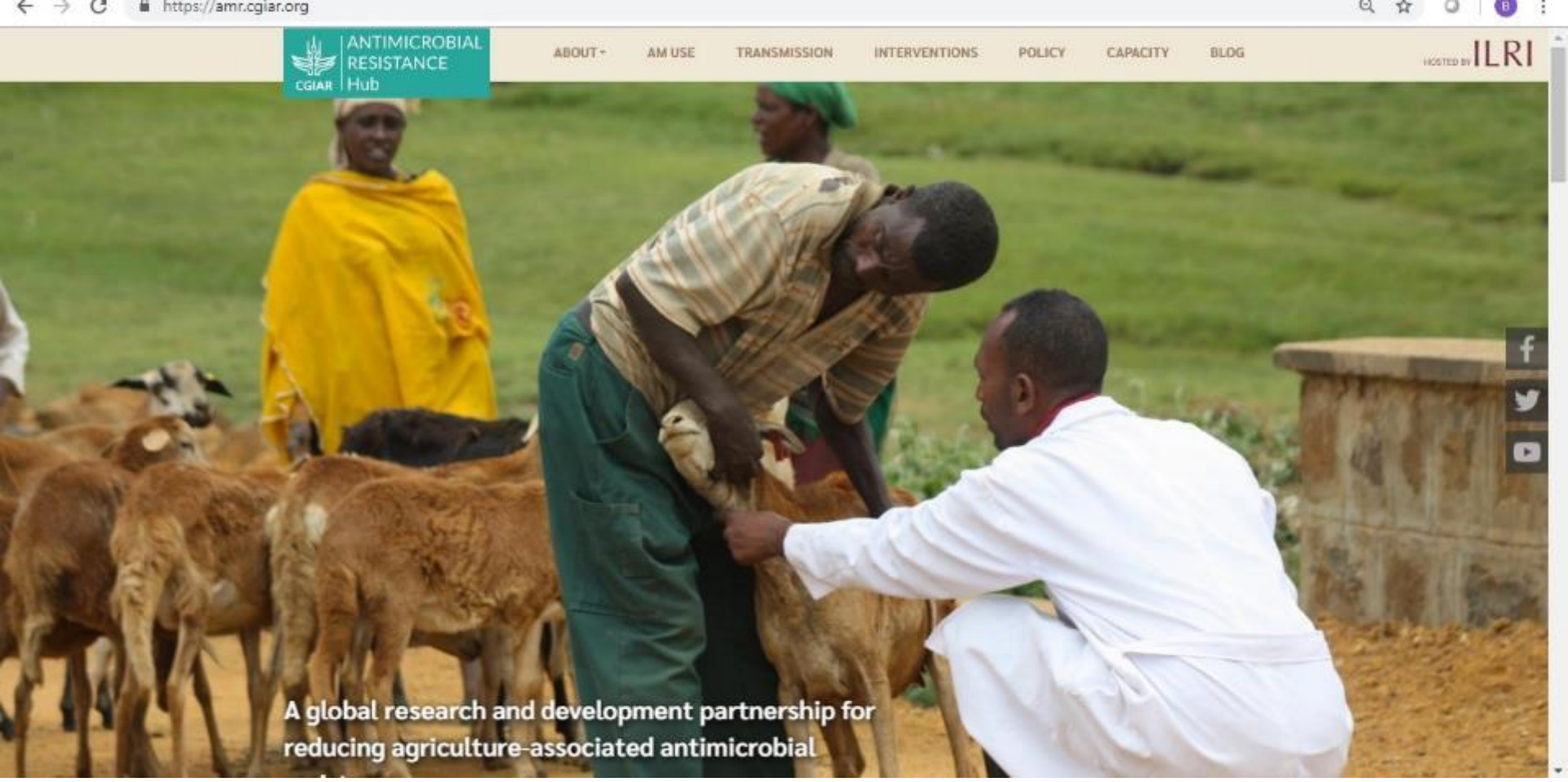
IWMI International Water Management Institute

CGIAR RESEARCH PROGRAM ON Agriculture for Nutrition and Health

CGIAR RESEARCH PROGRAM ON Livestock

CGIAR RESEARCH PROGRAM ON Fish

CGIAR Antimicrobial Resistance Hub launch meeting, Nairobi 21-22 February 2019



For more information:
www.amr.cgiar.org

AMR in the CGIAR: Activity focus

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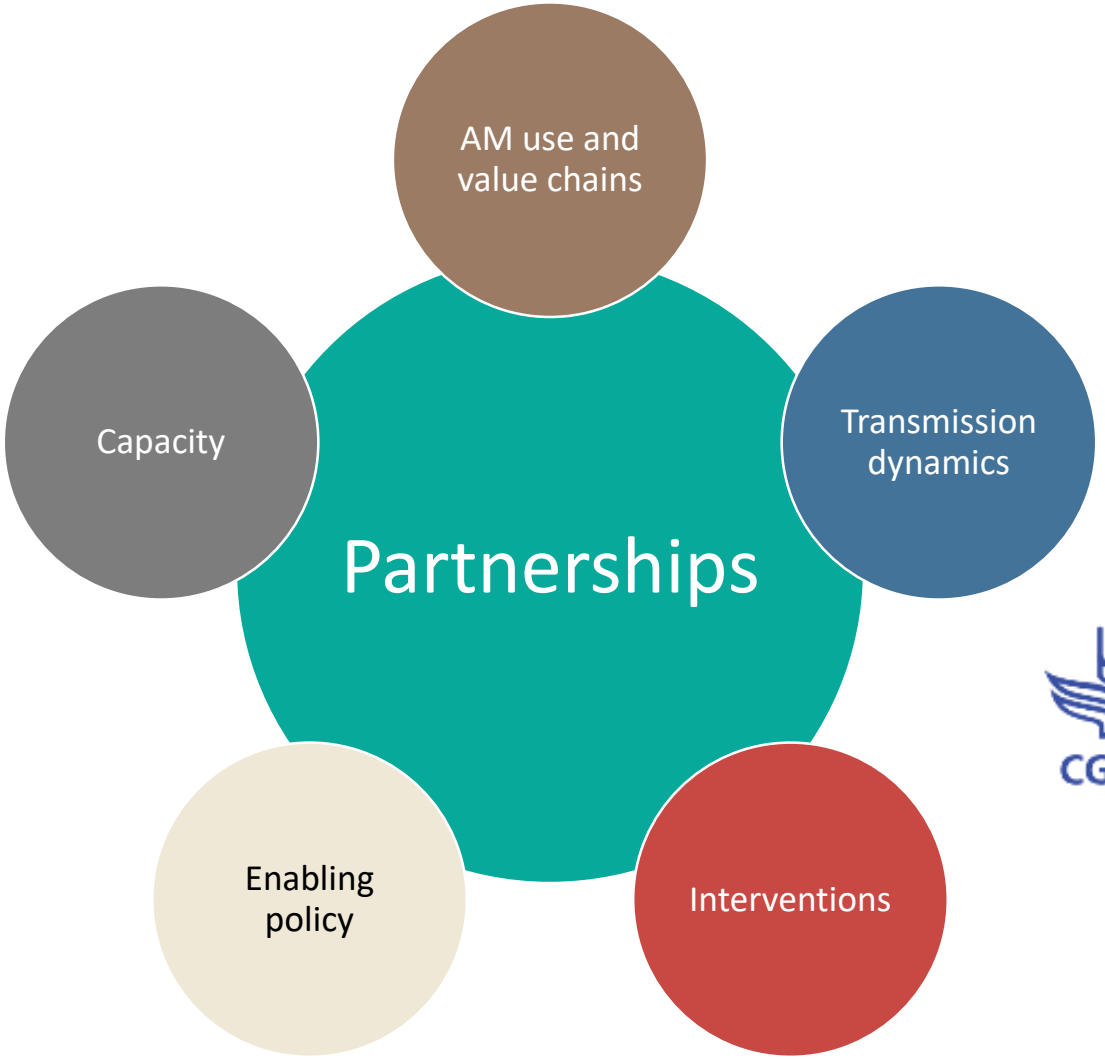

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EcoHealth prudent use of antimicrobial in SEA

APEIR
Asia Partnership on Emerging Infectious Diseases Research

IDRC CRDI
Canada

Intervention for AMR in Vietnam

Alternatives to AM: nano-silver in Vinh Phuc/probiotics

Treatment

- Feed without AM
- Nano silver 0.3%/kg

30 piglets for 4 months in 6 farms

Control

- Business as usual
- Medicated feed with Amoxicillin, 300 ppm

30 piglets for 4 months in 6 farms

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- Baseline: weight, AMR (*E. coli* in faeces)
- Monthly weight measurement
- Mortality, morbidity
- AMR: 4 months in faeces.
- AM residue in feeds (baseline, 3 months, pool sample), and pork

ASF situation in Vietnam

Acknowledgments

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- Dr. Pawin and Dr. Ken Inui (FAO Vietnam)
- Dr. Edward (ILRI Kennya)

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Food and Agriculture Organization of the United Nations

ASF situation update
FAO Animal Health Service

ASF situation in Asia update

25 July 2019, 09.00 hours; Rome

Information provided herein is current as of the date of issue. Information added since the last ASF China situation update appears in **red**. For cases with unknown onset date, reporting date was used instead. FAO compiles information drawn from multiple national (Ministries of Agriculture or Livestock, Local governments and international sources (World Organisation for Animal Health [OIE]), as well as peer-reviewed scientific articles. FAO makes every effort to ensure, but does not guarantee, accuracy, completeness or authenticity of the information. The designation employed and the presentation of material on the map do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal or constitutional status of any country, territory or sea area, or concerning the delimitation of frontiers.

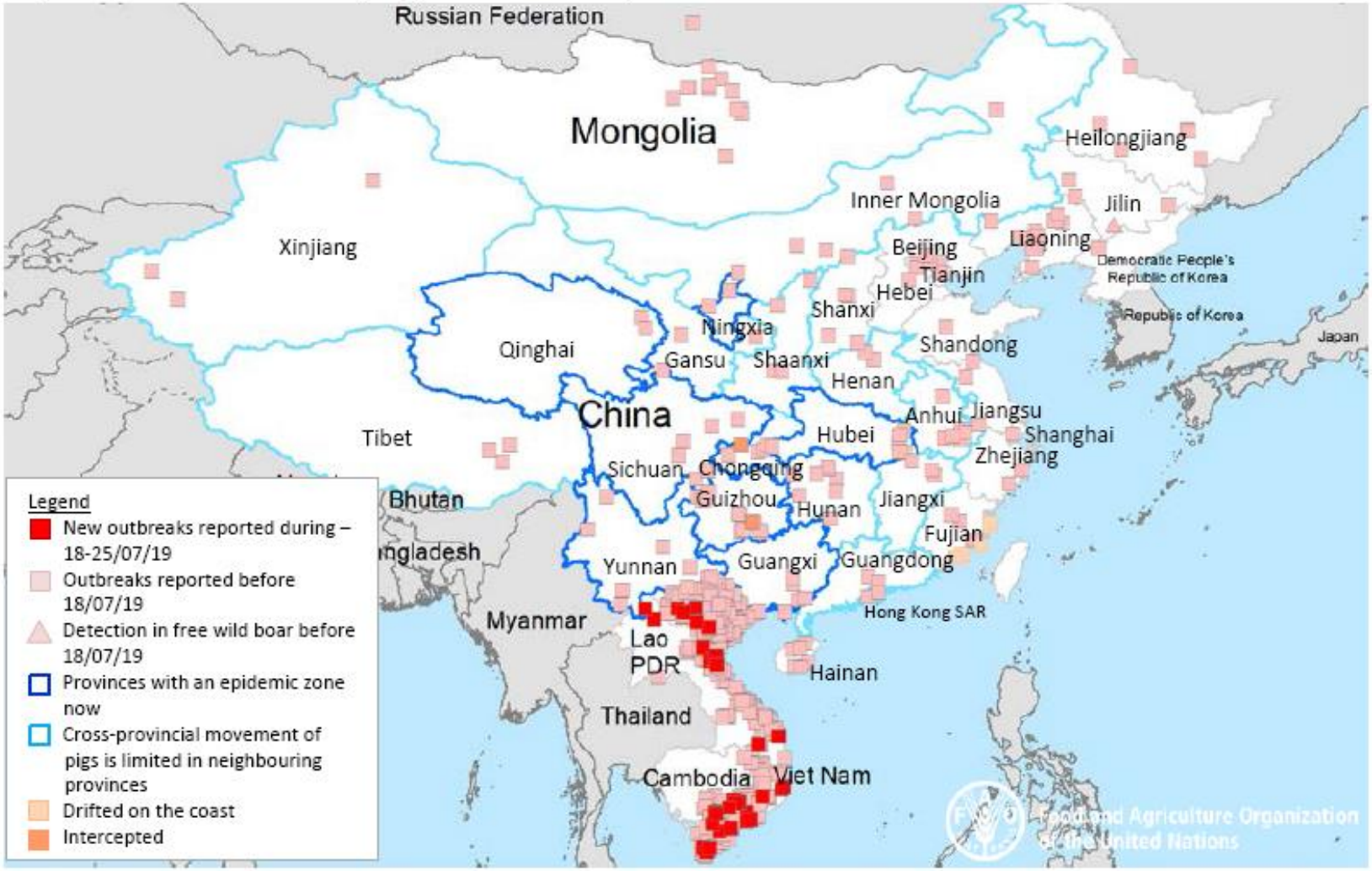
Overview

Hazard: African swine fever (ASF) is a viral disease affecting pigs and wild boar with up to 100% case fatality rate.
Affected Provinces:
China: Anhui, Heilongjiang, Henan, Jilin, Liaoning, Jiangsu, Zhejiang, Shanxi, Yunnan, Hunan and Guizhou, Hubei, Jiangxi, Fujian, Sichuan, Shaanxi, Qinghai, Guangdong, Gansu, Shandong and Hainan Provinces, Tianjin, Chongqing, Shanghai and Beijing Municipalities, Inner Mongolia, Ningxia Hui, Guangxi Zhuang, Xinjiang Uygur and Tibet (Xizang) Autonomous Regions and Hong Kong Special Administrative Region.
Mongolia: Bulgan, Darkhan-Uul, Dundgovi, Orkhon, Selenge, Töv Provinces and Ulaanbaatar
Viet Nam: Hung Yen, Thai Binh, Thanh Hoa, Ha Nam, Hai Duong, Dien Bien, Hoa Binh, Thai Nguyen, Quang Ninh, Ninh Binh, Nam Dinh, Bac Kan, Lang Son, Nghe An, Son La, Bac Ninh, Thua Thien-Hue, Bac Giang, Lai Chau, Quang Tri, Vinh Phuc, Cao Bang, Khanh Hoa, Hau Giang, Vinh Long, Dong Nai, Phu Thọ, Yen Bai, Binh Phuoc, Lao Cai, An Giang, Ha Tinh, Quang Nam, Dak Nong, Kien Giang, Soc Trang, Dong Thap, Gia Lai, Ha Giang, Tuyen Quang, Binh Duong, Ca Mau, Quang Ngai, Dak Lak, Tien Giang, Kon Tum, Bac Lieu, Bình Định, Tra Vinh, Binh Thuan, Quang Binh, Long An, Phu Yen, Ba Ria - Vung Tau, Lam Dong, Ben Tre, Tay Ninh Provinces, Hai Phong, Ha Noi, Can Tho, Da Nang and Ho Chi Minh Cities (†: *Source: media information)*
Cambodia: Ratanakiri, Tboung Khmum, Svay Rieng, Takeo and Kandal Provinces
Democratic People's Republic of Korea: Chagang-Do
Lao People's Democratic Republic: Salavan, Savannakhet, Phongsaly Provinces, and Vientiane Capital

Viet Nam: Since the Ministry of Agriculture and Rural Development (MARD) confirmed its first ASF outbreak on 19 February 2019, a total of 62 provinces/cities reported outbreaks, about 3,700,000 pigs have been culled.

ASF outbreaks

Map 1. *ASF situation in Asia (August 2018 to date)*



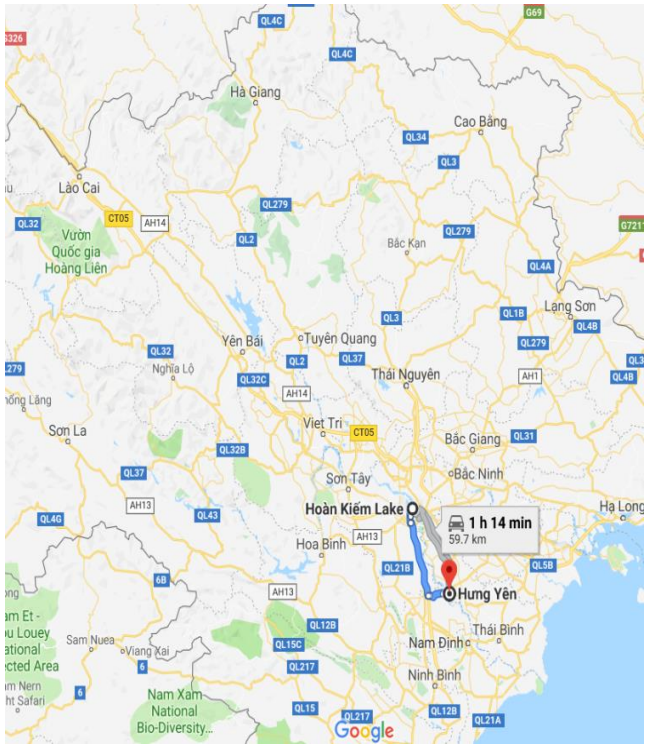
Source: China: MARA, Viet Nam: WAHIS & media information, Cambodia: MAFF, Lao PDR: DLF/MAF, Other: WAHIS

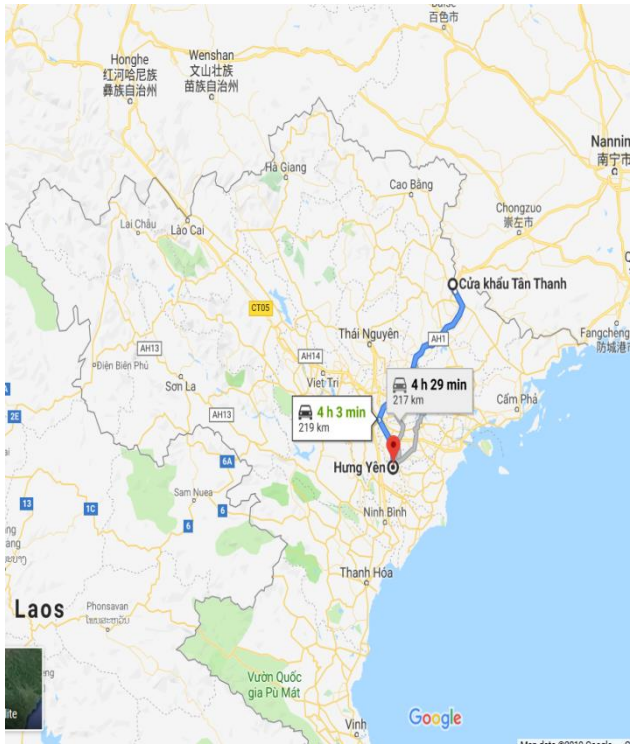
Introduction (continued)

- 1921: First discovered in Kenya
- 1957: First occurrence outside Africa
  - Portugal
- 2007: Republic of Georgia
  - Spread in Caucasus Region (Eurasia), including Russia Federation
- 2018 Outbreaks
  - China, Belgium (Wild boars), Hungary, Estonia, Latvia, Lithuania, Russia, Poland, Ukraine, Bulgaria, Romania
- 2019 Outbreaks
  - Mongolia, Vietnam, Cambodia, Laos

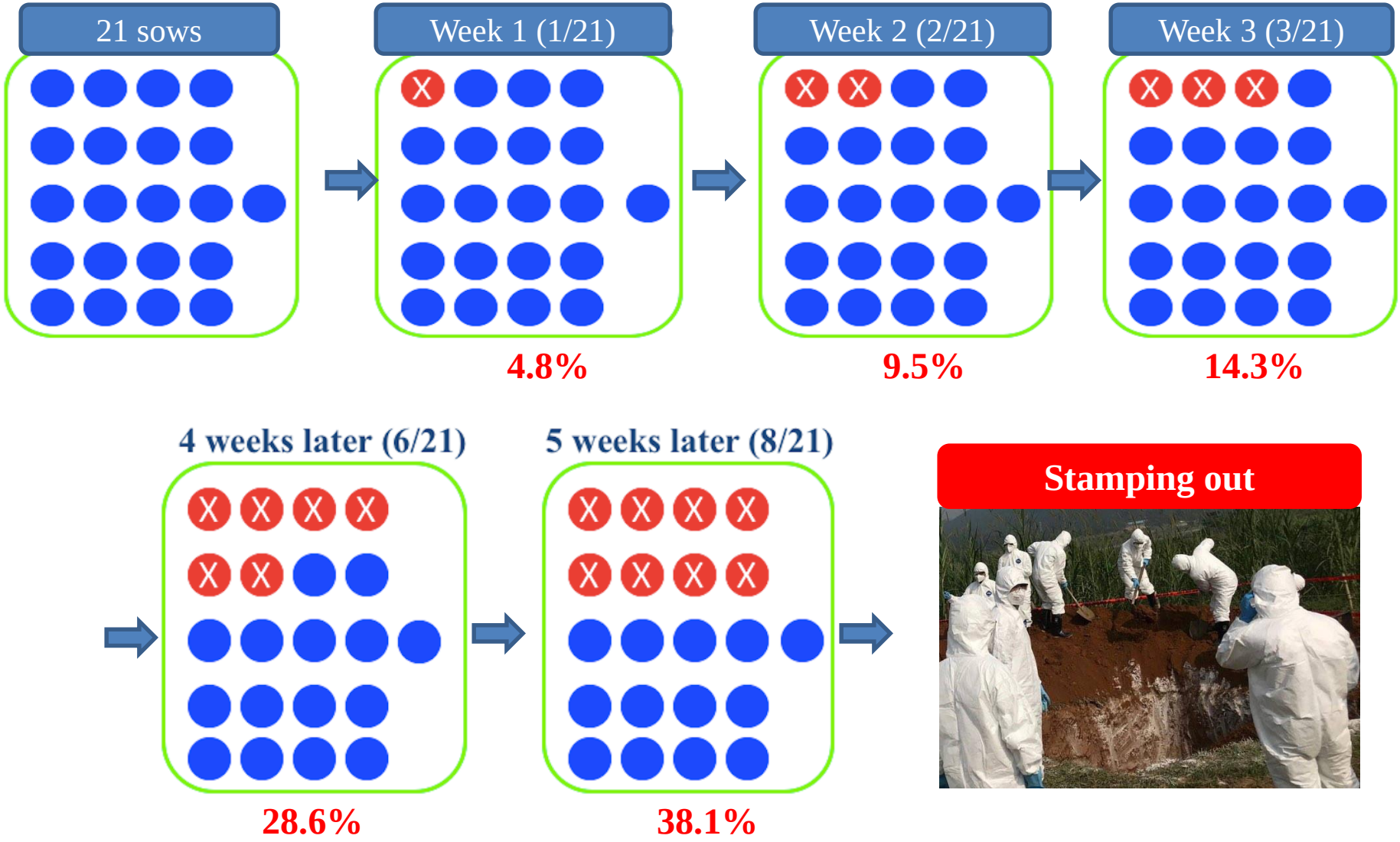
First detection of ASF outbreak

- On 01 Feb 2019, a household in Hung Yen province reported sick pigs with high fever and death pigs
- Hung Yen province: About **60km** from Hanoi and about **217km** from Tan Thanh border gate to China





First detection of ASF outbreak



Farm conditions of the first ASF

Publication for ASF outbreak in Vietnam

Outbreak of African swine fever, Vietnam, 2019

Van Phan Le[1*!], Dae Gwin Jeong[2!], Sun-Woo Yoon[2], Hye-Min Kwon[2], Thi Bich Ngoc Trinh[1], Thi Lan nguyen[1], Thi To Nga Bui[1], Jinsik Oh[3], Joon Bae Kim[3], Kwang Myun Cheong[3], Nguyen Van Tuyen[4], Eunhye Bae[6], Thi Thu Hang Vu[6], Minjoo Yeom[6], Woonsung Na[5], Daesub Song[6*]

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2. Infectious Disease Research Center, Korea Research Institute of Bioscience and Biotechnology, Daejeon, Korea
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5. College of Veterinary Medicine, Chonnam National University, Gwangju, Korea
6. College of Pharmacy, Korea University, Sejong, Korea

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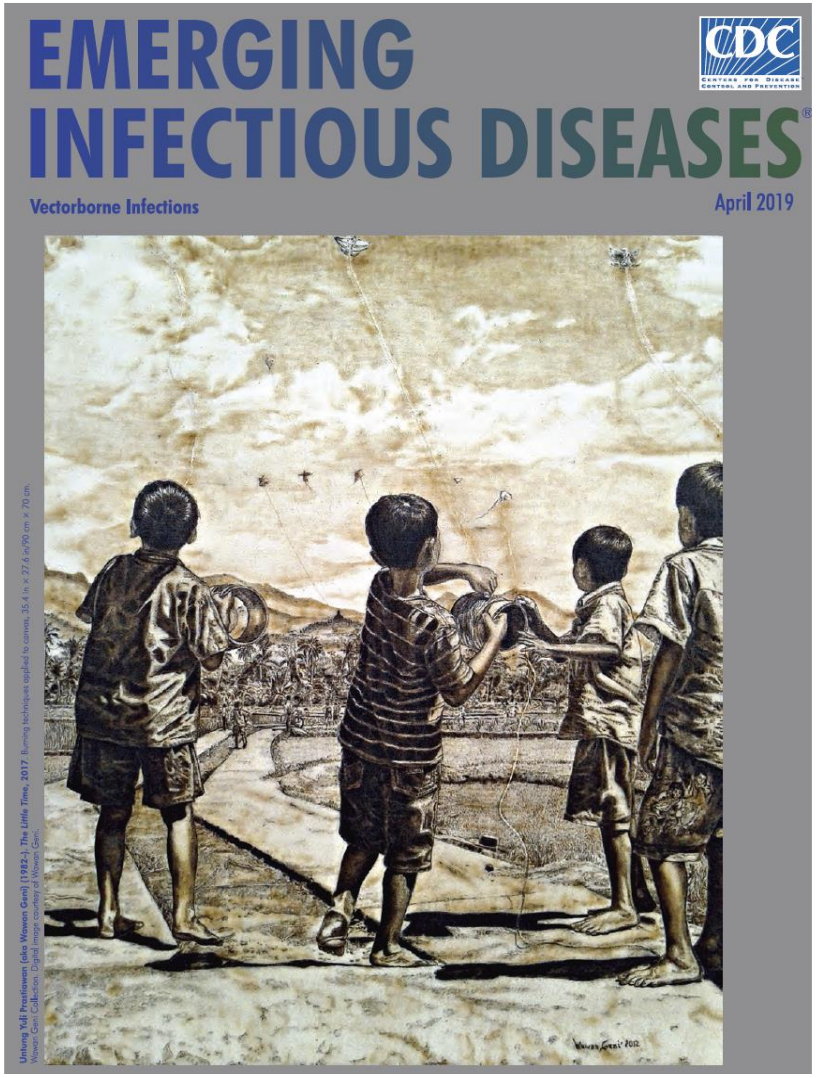
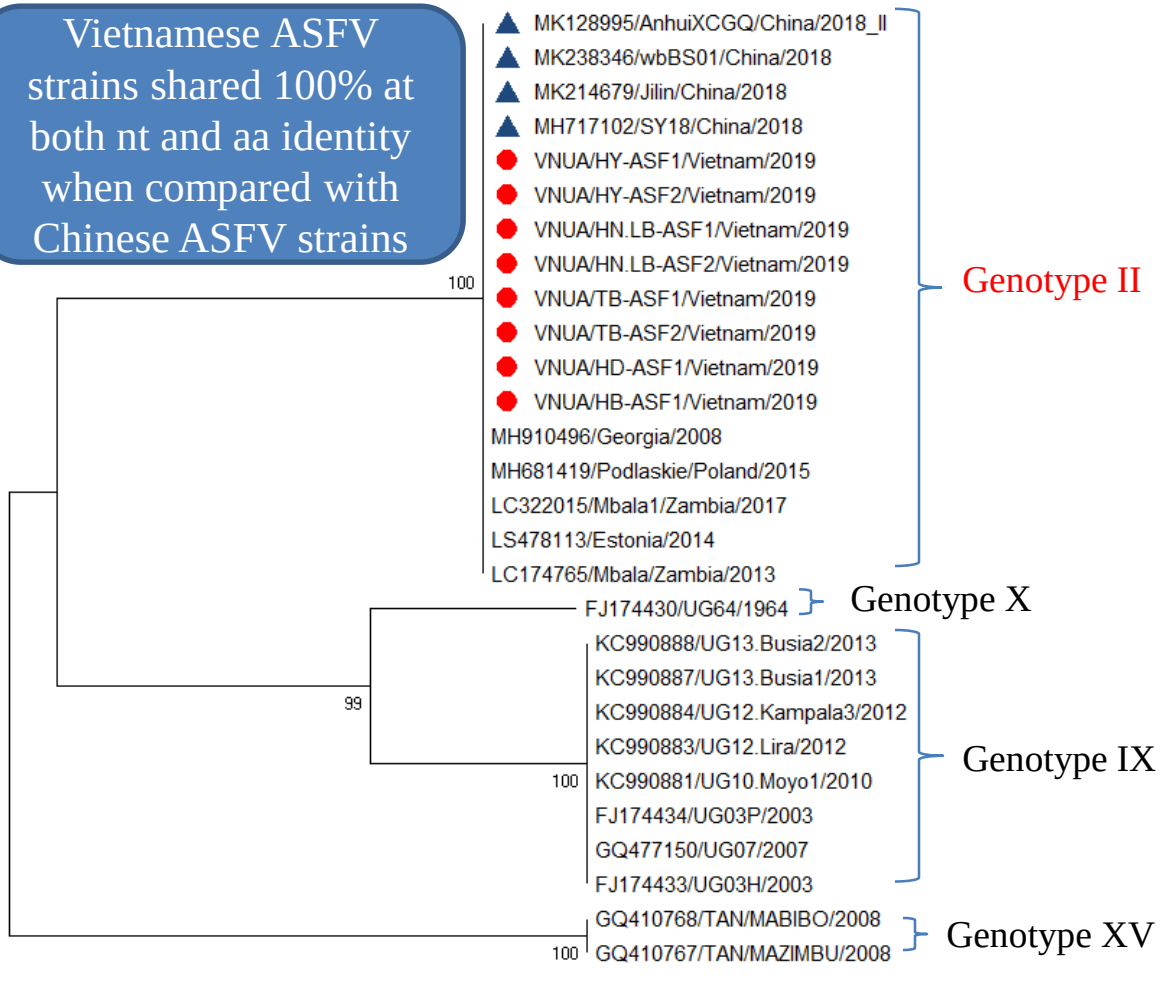
! These authors contributed equally

Biography: Le Van Phan is D.V.M. and associate professor of Vietnam National University of Agriculture. The research area is mainly virology including swine and avian viruses.



Genetic characterization of ASF viruses circulating in Vietnam

Vietnamese ASFV strains shared 100% at both nt and aa identity when compared with Chinese ASFV strains



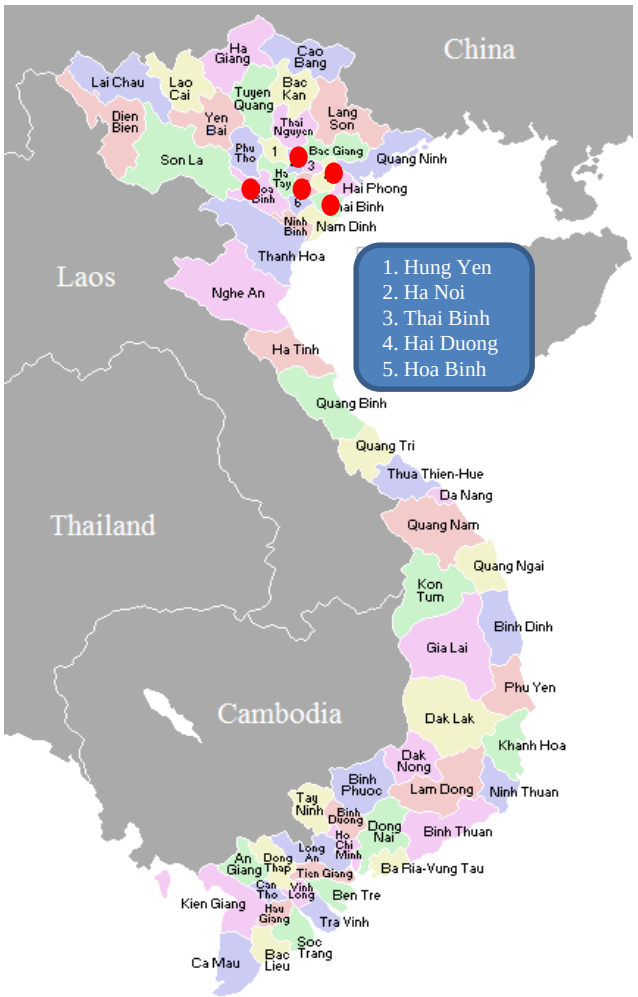


Fig. 1. Phylogenetic tree based on P54 gene of ASF.

Vietnamese ASFV strains; Chinese ASFV strains

Potential risk factors for ASF in Vietnam

- Long borders with many thousand people and vehicles cross over the borders daily. Vietnam detected ASF virus in illegal pork products
- International travels to Vietnam with million people who could carry meats and food products etc.
- low biosecurity; no outbreaks occurred in commercial farms
- None-zoonotic disease so that farmers could did panic selling, especially during the Tet and festival events
- Insect vectors ? (tick, lice, flies etc)

Current control measures

- **Movement control**
  - Pigs and pig products are not allowed to move out the infected areas
  - Established more animal quarantine stations on the roads from the North to the Sought for strict movement control of pigs and pigs products
- **Biosecurity application**
  - Requested all big farms have to apply strict biosecurity measures and frequently cleaning and disinfection of all risk factors
  - Re-stock only after the outbreaks is resolved for at least 30 days
- **Risk communication and public awareness**
- **Compensation scheme**

Conclusions (food safety)

1. Huge health and economic burden of foodborne diseases in LMIC
2. Capacity to develop food safety research in LMIC is important, risk communication need
3. Research translation to actions and policy: timely and opportunistic
4. Previous investments not in line with modern understanding, interventions successful in short term, long term, wide-reaching impacts likely require:
   - Training & technology
   - Incentives
   - Enabling environment

Conclusions (AMR and EIDs)

1. Animal agriculture uses more AM than human health does and is rapidly trending up
2. Dual challenge: access as well as excess
3. Alternative to antimicrobials is needed, prudent use, incentive
4. Risk communication

One Health use for these issues

International Journal of Public Health
https://doi.org/10.1007/s00038-018-1156-9

EDITORIAL

Integrated approaches to tackling health issues-related to agri-food systems

Hung Nguyen-Viet[1,3] · Delia Grace[2] · John McDermott[4]

- How is it used to address food safety and AMR issues?
- OH = approach for solving cross-sectoral challenges

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- BMZ project team
- Vietnam Food Safety report team
- ComAcross project in Laos: Vannaphone Phouthana
- Funding: ACIAR, CGIAR A4NH, World Bank, BMZ, USAID through




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Animal scientist, Nobel Prize Laureate for Physiology or Medicine–1996

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