Building Bridges, Supporting Livelihoods

# Livestock Production, Antimicrobial Use, and AMR: Situations and Solutions (?)

**M.J. Otte, FAO-RAP, Bangkok**

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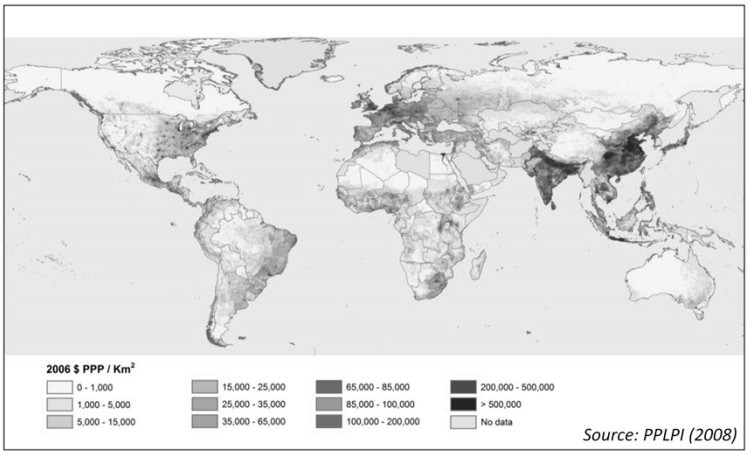
FAO Regional Office for Asia and the Pacific

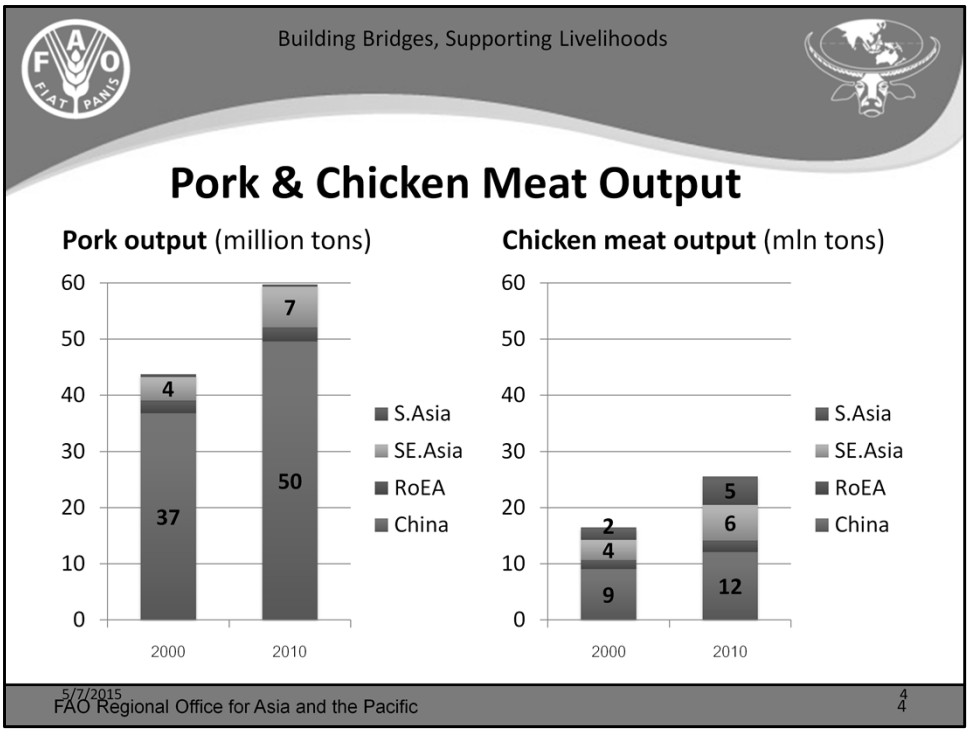
# Outline

- Livestock sector trends
- AMU in the livestock sector – what do we know?
- Consequences and solutions (?)

# Food Expenditure Density



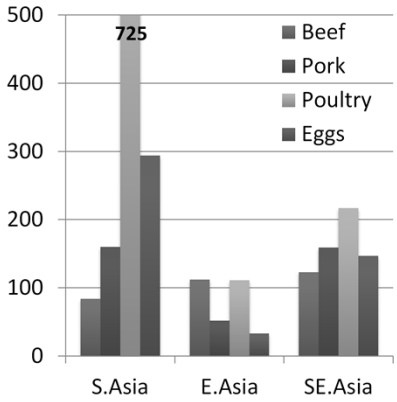

*Source: PPLPI (2008)*



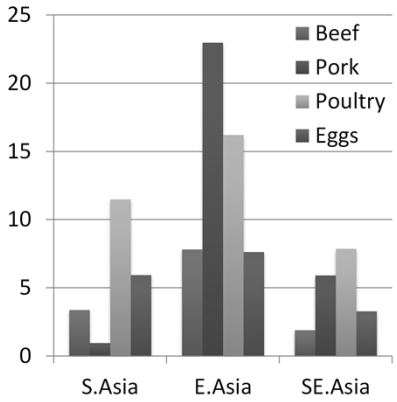

1 ton = app 13 pigs slaughtered, i.e. 60 million tons = 750 to 780 million pigs slaughtered.

# Demand Growth: 2000 - 2030

**Relative growth** (%)




**Absolute growth** (million tons)

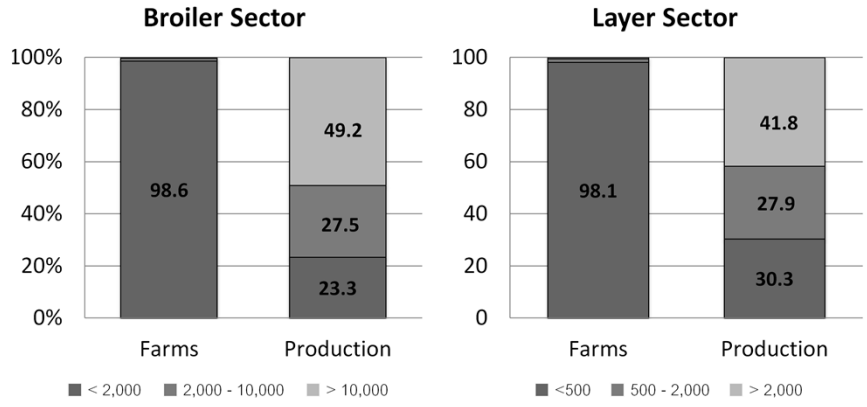



*Source: FAO Projections*

# Livestock Sector Development

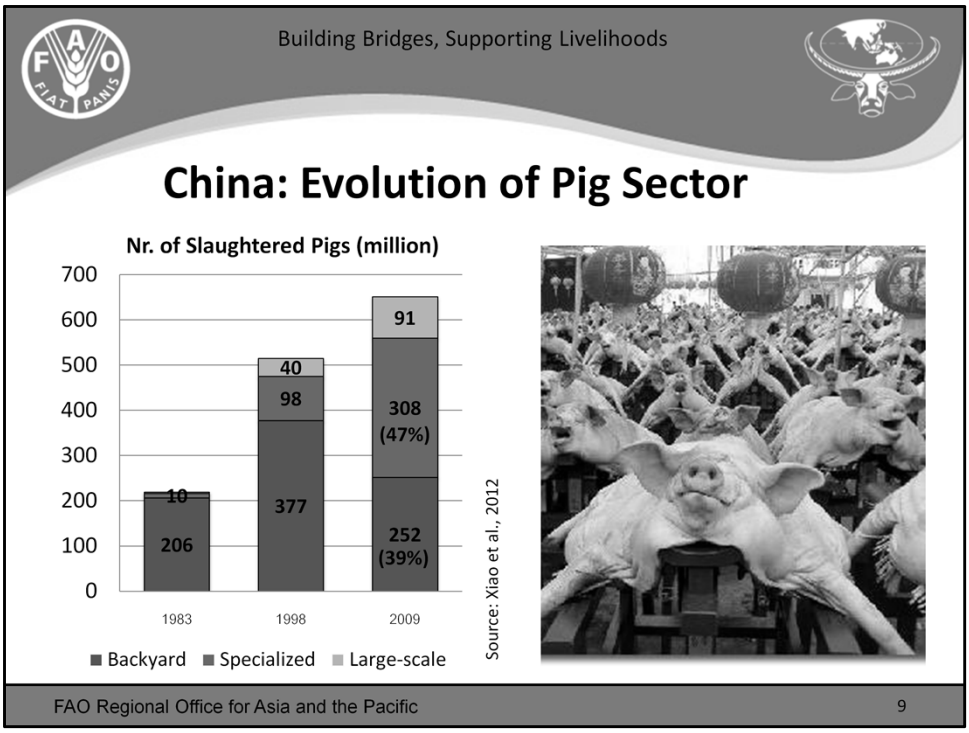
- Growth in total number of livestock
- Relative growth in importance of poultry and pigs vs ruminants
- Faster turnover / increased throughput (**intensification**)
- **Larger farming units** and concentration of units
- Corporate vs family farms
- Stratification of sector and vertical integration / contract farming
- Longer, cross-border supply chains

# China: Structure of Poultry Sectors

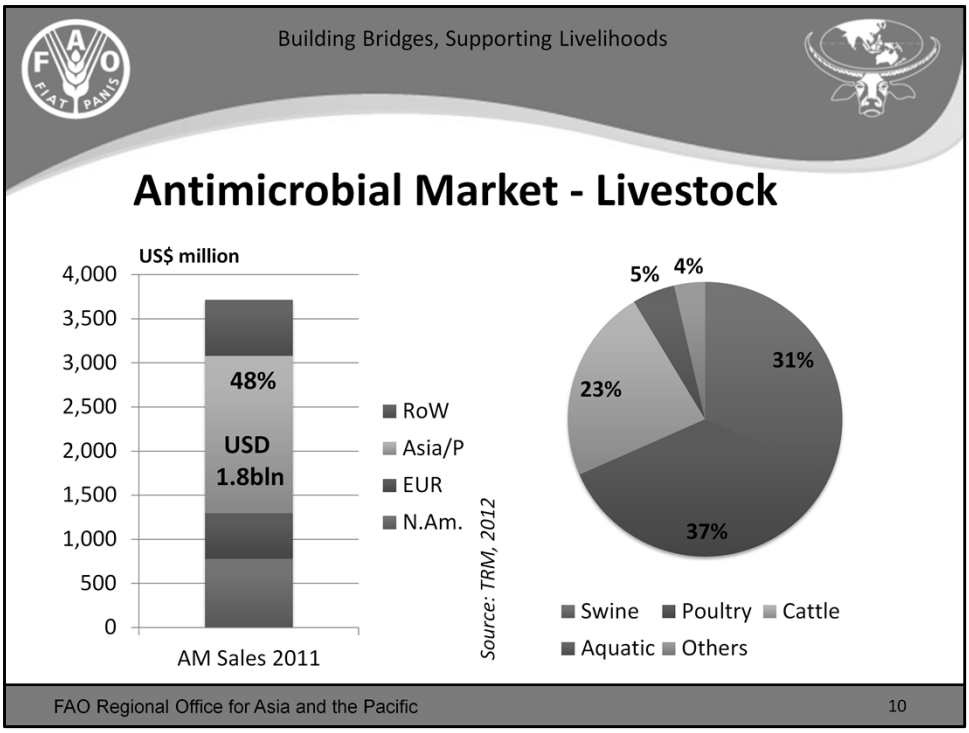



*Source: Bingsheng & Yijun (2007)*

# Industrial Poultry Production




In 2008: 80 million backyard farms = 97% of all farms



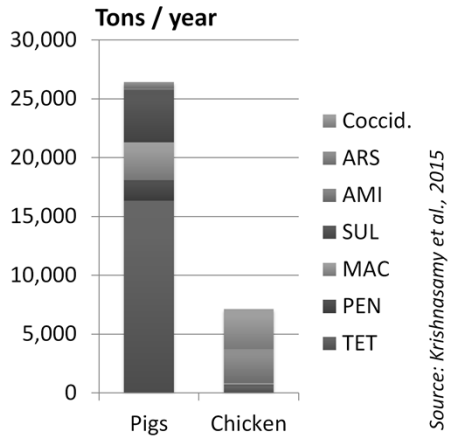

In value terms, nearly half of global AM use in food animals occurs in Asia

# Antimicrobial Uses in Lstk

- **Treatment**
  - Individual, therapeutic dose, 'short' duration
- **Prophylactic**
  - 'At risk' group, therapeutic dose, variable duration
- **Growth promotion**
  - Group, sub-therapeutic dose, 'long' duration, usually in-feed application

# In-feed Antibiotics


# Estimate of AMU in PR China

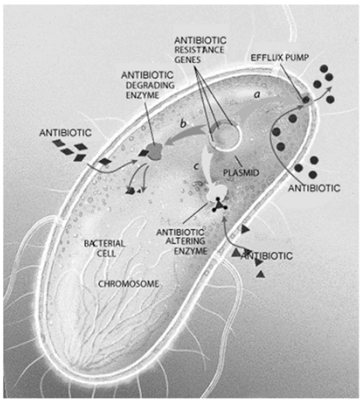



*Source: Krishnasamy et al., 2015*

# AMR in Asia

Literature review:

- > 200 studies (from 2008 onwards)
- Salmonella, *E. coli*, Campylobacter spp, Enterococcus spp.
- Study methodologies poorly documented and heterogeneous



| | | Salmonella | | | *E. coli* | | |
|---|---|---|---|---|---|---|---|
| Class | Compound | Poultry | Pigs | Rum | Poultry | Pigs | Rum |
| AMI | Gentamicin | 17 | 24 | 3 | 21 | 24 | 7 |
| | Kanamycin | 28 | 24 | 35 | 29 | 36 | 9 |
| | Streptomycin | 62 | 58 | 65 | 34 | 66 | 27 |
| CEP | Cephalothin | 29 | 7 | 7 | 34 | 18 | 4 |
| MAC | Erythromycin | 86 | | 28 | 86 | 71 | 57 |
| PEN | Amoxicillin | 36 | 22 | 80 | 59 | 57 | 81 |
| | Ampicillin | 25 | 60 | 77 | 67 | 57 | 26 |
| PHE | Chloramph. | 23 | 47 | 56 | 41 | 47 | 10 |
| | Florfenicol | 26 | 12 | | 27 | 36 | 17 |
| POL | Colistin | 12 | 6 | 0 | 1 | 5 | 3 |
| QUI | Ciprofloxacin | 10 | 11 | 3 | 51 | 31 | 15 |
| | Nalidixic acid | 44 | 40 | 5 | 53 | 36 | 13 |
| SUL | Sulfamethox. | 77 | 85 | | 40 | 60 | 19 |
| TET | Oxytetracyc. | 82 | 83 | 72 | 61 | 70 | 36 |
| | Tetracycline | 48 | 83 | 76 | 84 | 87 | 38 |
| TRI | Trimethoprim | 59 | 38 | 0 | 24 | 26 | 6 |
| | Trim-Sulfa | 39 | 44 | 7 | 75 | 61 | 3 |
| OTH | Imipenem | 0 | 0 | 0 | 0 | | |
| | Meropenam | 0 | | | 0 | | |

| Low: ≤10% | Mod.: >10% to 20% | High: >20% to 50% | V. High: >50% to 70% | Ex. high: >70% |
|---|---|---|---|---|

**AMR (%) in Salmonella and *E. coli* isolates from farm animals in Asia** (www.APHCA.org)

# AMR in *E. coli* from Pigs

| Class | Compound | AS | AU[1] | NZ[2] | US[3] | DK[4] | NL[5] | FI[6] | SW[7] |
|---|---|---|---|---|---|---|---|---|---|
| AMI | Gentamicin | 24 | 3 | 0 | 1 | 1 | 2 | 0 | 1 |
| | Kanamycin | 36 | | | 1 | | 1 | 0 | 1 |
| | Streptomycin | 66 | | 32 | 15 | 42 | 60 | 15 | 16 |
| CEP | Ceftiofur | <1 | 0 | 0 | | 1 | | 0 | |
| | Cephalothin | 18 | | 2 | | | | | |
| PEN | Amoxicillin | 57 | | 9 | 0 | | | | |
| | Ampicillin | 57 | 35 | | 13 | 29 | 25 | 7 | 13 |
| PHE | Chloramph. | 47 | 44 | 10 | 3 | 3 | 12 | 0 | 4 |
| | Florfenicol | 36 | 34 | | | 1 | 1 | 1 | 0 |
| POL | Colistin | 5 | | | | 0 | | | 0 |
| QUI | Ciprofloxacin | 31 | 0 | | 0 | 1 | 1 | 1 | 2 |
| | Nalidixic acid | 36 | 5 | 1 | 0 | 1 | 1 | 1 | 2 |
| SUL | Sulfamethox. | 60 | | 33 | | | 45 | 12 | |
| TET | Oxytetracycline | 70 | 76 | | | | | | |
| | Tetracycline | 87 | | 49 | 47 | 36 | 56 | 18 | 8 |
| TRI | Trimethoprim | 26 | | 8 | | 22 | 37 | 12 | 11 |
| | Trim-Sulfa | 76 | 33 | | | | | | |

Low: ≤10% | Mod.: >10% to 20% | High: >20% to 50% | V. High: >50% to 70% | Ex. high: >70%

[1] AU: DAFF 2007; [2] NZ: MAF 2011; [3] US: NARMS 2011 (pork); [4] DK: DANMAP 2012; [5] NL: MARAN 2013; [6] FI: FINRES-VET 2007-2009; [7] SW: SVARM 2011

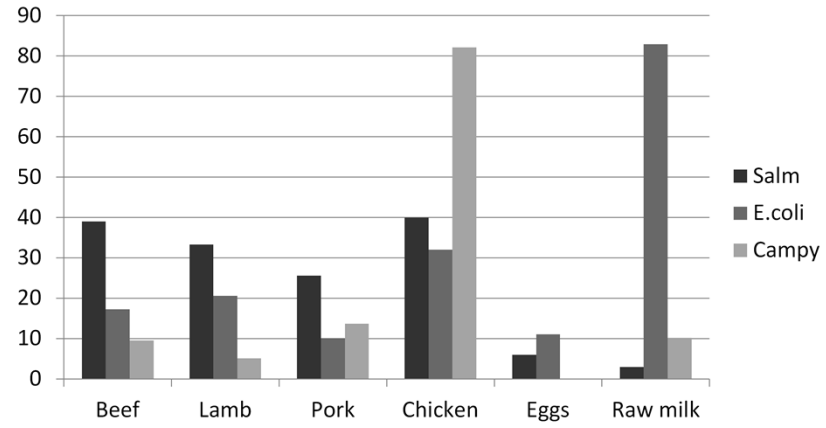
# AMR in *E. coli* from Poultry

| Class | Compound | AS | AU[1] | NZ[2] | US[3] | DK[4] | NL[5] | FI[6] |
|---|---|---|---|---|---|---|---|---|
| AMI | Gentamicin | 21 | 0 | 0 | 43 | 0 | 9 | 0 |
| | Kanamycin | 29 | | | 6 | | 9 | 3 |
| | Streptomycin | 34 | | 10 | 49 | 11 | 58 | 14 |
| CEP | Ceftiofur | 8 | 0 | 0 | 10 | 2 | | 1 |
| | Cephalothin | 34 | | 2 | | | | |
| PEN | Amoxicillin | 59 | | 5 | 12 | | | |
| | Ampicillin | 67 | 33 | | 22 | 20 | 70 | 6 |
| PHE | Chloramph. | 41 | 2 | 1 | 1 | 0 | 16 | 0 |
| | Florfenicol | 27 | 3 | | | 0 | 1 | 0 |
| POL | Colistin | 1 | | | | 0 | | |
| QUI | Ciprofloxacin | 51 | 0 | | <0.5 | 8 | 50 | 2 |
| | Nalidixic acid | 53 | 2 | 6 | 3 | 8 | 50 | 2 |
| SUL | Sulfamethox. | 40 | | 31 | | | 61 | 8 |
| TET | Oxytetracycline | 70 | 44 | | | | | |
| | Tetracycline | 61 | | 12 | 43 | 8 | 51 | 7 |
| TRI | Trimethoprim | 24 | | 7 | | 10 | 51 | 2 |
| | Trim-Sulfa | 75 | 27 | | 6 | | | |

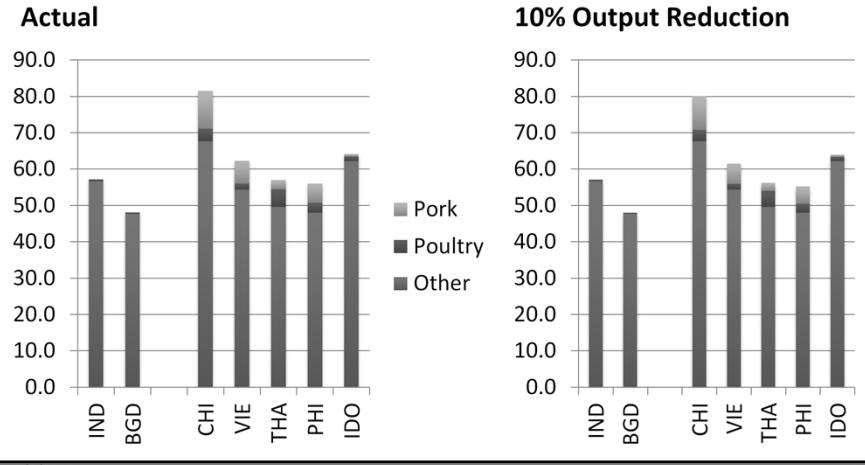
| Low: ≤10% | Mod.: >10% to 20% | High: >20% to 50% | V. High: >50% to 70% | Ex. high: >70% |
|---|---|---|---|---|

[1] AU: DAFF 2007; [2] NZ: MAF 2011; [3] US: NARMS 2010; [4] DK: DANMAP 2012; [5] NL: MARAN 2013; [6] FI: FINRES-VET 2007-2009

# Microbial Contamination of ASF

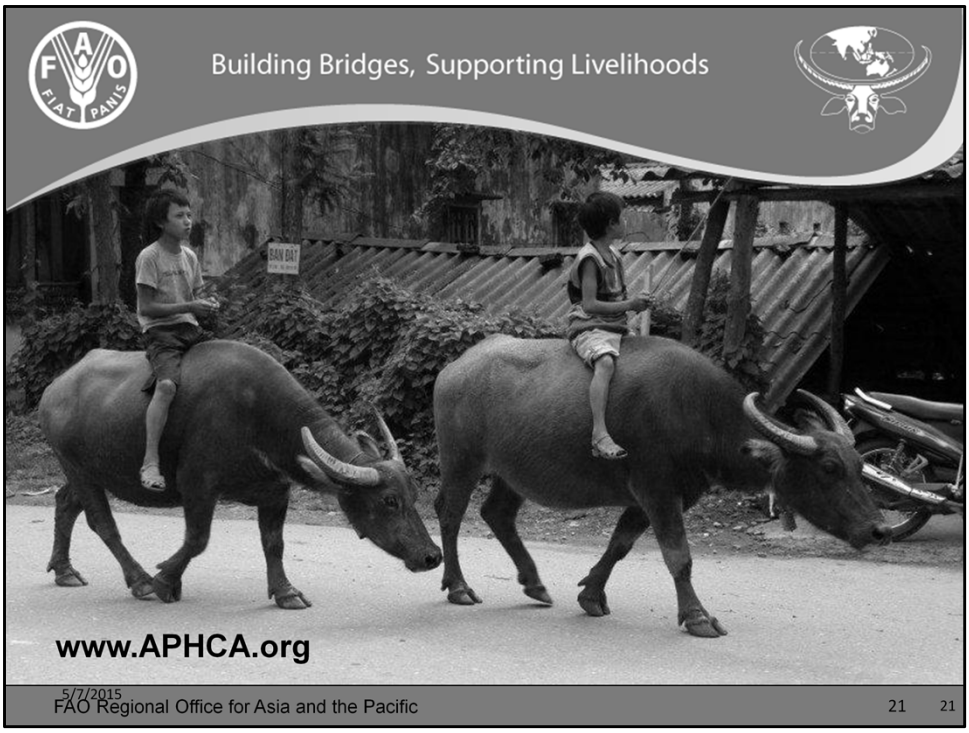


# Protein Supply (g/person/day)



# Conclusions

- Information on **AMU**: scarce, but studies of AMs in feed, feces, & environment suggest it is high.
- Information on **AMR**: no systematic monitoring, but levels in indicator organisms are alarming!
- Information on food animal associated **AMR impact**: absent, but human exposure likely to be high.
- **AMU for growth promotion**: Public Health risks likely to outweigh Food Security benefits (by far).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