Protecting people and animals from disease threats
Country Case Studies in Characterizing AMU at Farm Level
Background

• Very little data on AMU at the farm level as well as AMR surveillance data compared to human health work on AMR/AMU
• Farm usage data could link with good production practices
• Tasks were:
  o to develop a framework to measure AMU,
  o describe the economics of AMU and
  o assess risks to human health from AMU along the food supply chain for food producing animal species

• Contracted University of Liverpool, NACA and IHPP of Thailand
Acknowledgement

• University of Liverpool
• NACA
• IHPP, Thailand
• FAO RAP
• FAO ECTAD Teams (Vietnam, Indonesia)
• Thailand: Chulalongkorn University, DLD, Private Sector
• USAID
Key questions

• What is the current data capture, collection and analysis processes for antimicrobial use, antimicrobial residues and antimicrobial resistance?

• Are there gaps in the process of monitoring the AMU/AMR complex in the livestock sector?

• How might the project work with the countries to help manage the gaps?

• What information on the AMU/AMR complex does the country need to make decisions?

• What value will these decisions have on:
  • farm-level actions
  • company standards
  • government policy with regards to national disease prevention, food supply, trade
Five step approach to develop the framework

• A detailed literature review was undertaken to describe the agricultural systems, production characteristics, endemic disease challenges, AMU and resistance in key livestock species in Vietnam, Thailand and Indonesia.

• In-country discussions were conducted with government agencies, research institutions, universities, private sector stakeholders and the FAO in order to determine existing knowledge and identify research on AMU, AMR and the economics of use in each country.

• Identified potential livestock sectors for undertaking a more detailed analysis of AMU through a case study.

• Construction of a detailed diagram of the food supply chain for these livestock systems.

• Case studies were undertaken through collaboration with local research institutes, government research departments, universities and the FAO in Thailand, Vietnam and Indonesia.
Case Studies
Thailand

• Thailand: antimicrobial supply chain in the poultry sector and specific aquaculture specie (shrimp)

• Poultry and Shrimp: This highlighted a possible area for more detailed data collection as there is a distinct lack of useful information in this area, a predicted large human population exposed to antimicrobials along the broiler/shrimp supply chain and the importance of these industries in Thailand.
Vietnam

• The antimicrobial supply chain in the pig sector and aquaculture species (Pangas catfish) in Vietnam.

• The review highlighted the large amount of pig meat consumed in the country and the importance of small scale farming systems providing products through local markets.

• The pig industry was highlighted as a potential sector for more detailed analysis as existing studies have identified the potential over use of antimicrobials, large human population at risk along the pork supply chain and the poor adherence to regulations.

• Pangas catfish (Pangasius hypophthalmus) is cultured intensively in 10 provinces in the Mekong River Delta. Production increased from 46,000 tons (2001) to 1,027,000 tons (2015) with an export value increasing from USD 6 million to USD 1.5 billion, respectively.
Only the poultry and aquaculture species grouper were considered for conducting a more detailed case study on AMU and the economics of use. Both sectors are important in providing a protein source for domestic consumption with aquaculture also having a significant export market.

Grouper farming is an interesting alternative to subsistence fishing in Indonesia because large marine areas could potentially support this form of mariculture. Grouper has been marketed live mainly to Singapore, Hong Kong, the mainland China and Taiwan.
The movement of feed, chickens and broilers in the chicken supply chain in Thailand
High risk population for antimicrobial resistance in the chicken supply chain in Thailand
The pork supply chain in Vietnam and the potential risk to human health from antimicrobial use in pigs

Cultural, traditional enforcement
Predicted higher risk to human health from antimicrobial use

Formal rules, enforcement?
Predicted lower risk to human health from antimicrobial use
High risk population for AM resistance in the broiler supply chain in Indonesia.
Production chain for Pangas Catfish

Broodstock/Hatchery (24 hours) → Nursery (Average culture period: 70 days) → Grow-out (Average culture period: 245 days) → Processors

Veterinary Stores (antimicrobials, supplements and other chemicals) → Contract Grow-out (Average culture period: 245 days) → Export Market

Commercial companies/Processors

Feed Millers/Manufacturers/Suppliers → Without prescription AMU → Nursery

With prescription AMU → Grow-out

Processors → Export Market
Production Chain for prawns

- Broodstock/Hatchery (PLs)
- Feed Co.
- Pharmaceutical Co.
- Grow Out
- Broker
- Farmers' Group Cooperative
- Private Processors
- Shrimp Associations
- International Brokers (e.g. China)
- Local Market
- Neighboring Country (Local Market)
- Regional/International Markets

AMU
Production chain of cultured groupers in Indonesia.
Refining the Usage methodology

• Bin collection method as a way of capturing total AMU over the 6 week period.

• Provide the farmer with a physical container as a bin rather than a refuse bag with clear labelling of ‘AM products’. Request farmer to collect AM bottles used, any packaging for AMs in an in-feed or in-water formulation and feed labels from medicated feed used during this period.

• Provide a checklist which showed common trade names for AM products available in the country

• Conduct a more detailed explanation of the aims of the bin collection methodology on the first farm visit. Supplement with administering a questionnaire.

• Provide farmers with support and close guidance through regular visits of extension/field staff to complete the weekly productivity questionnaire data.

• Results in successfully collecting quantitative AMU data through the bin collection method.
The process of developing the framework and conducting case studies highlighted areas which should be considered a priority in the development of AMU and AMR policy.

These areas were both shown through the results from the case studies but also from the practical application of the methods for collecting data.
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<tr>
<th>Priority Area</th>
<th>Practical suggestions for policy development and implementation</th>
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| Pig production is still conducted mainly on small and medium size units.     | • It is essential that the government ensures that there is sufficient communication of AMU policies through provincial and district veterinary offices  
• The government needs to engage with key stakeholders.                        |
| Livestock production is not economically stable and declines in prices paid to farmers for livestock can effect farm profitability. | • The financial pressure on livestock producers to maximise productivity needs to be considered in AMU policy development to **ensure that farms are supported in the transition to reducing AMU.**  
• **Measures required to reduce the reliance on routine AMs** such as improved biosecurity, superior management practices and targeted vaccination programs need to be supported by the government and key livestock stakeholders and be economically viable for producers. |
| There may be national and regional differences in livestock production.        | • Approaches to AMU policy need to be feasible for the particular country and need to consider local customs.  
• Geographically differences within country need to be considered with regards to AMU policy. [For example, in Vietnam pig production is more intensive in the southern provinces when compared with the northern provinces and therefore AMU policy may require a different approach in the different regions.] |
<table>
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<th>Approaches to AMU policy and enforcement of policy needs to be appropriate for the farm size and business structure.</th>
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<td>• The communication routes needs to be identified for different types of farm such as contract farms for livestock companies versus independent farms. For example, to engage with contract farmers on responsible AMU it may be more practical to engage with the larger production company to disseminate information to their contract farmers. Whereas, the local government veterinary offices may be better placed to focus on communicating knowledge with independent commercial farmers and smallholders.</td>
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<th>In-feed AMU</th>
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<td>• There is a need for better legislation and enforcement of regulations for feed mills adding AM additives.</td>
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<td>• There is a need for stricter policy and enforcement relating to the labelling of animal feed. Feed labels need to include:</td>
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<td>  o Raw material ingredients of the animal feed</td>
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<td>  o Any vitamin, mineral or probiotic additives</td>
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<td>  o Any AM added and the associated doses</td>
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<td>• Encourage farmers to purchase pre-mixed AM feed if in-feed AMs are required and to discourage farmers from self-mixing AM active ingredients into feed on the farm.</td>
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Availability of AMs. At present AMs do not require a veterinary prescription and can be purchased directly from pharmacies and drug sellers or medicated feed can be bought directly from commercial feed companies.

- Whilst the ultimate goal may be to restrict AM availability to veterinary prescription only this is likely to be a much longer term goal.
- In the interim there needs to be harmonised guidance on responsible AMU given by pharmacists, drug sellers, veterinarians and community animal health workers.
- A requirement to register all pharmacies, feed companies and drug sellers which sell AMs could be undertaken to control and regulate distribution networks.
- Specific training for pharmacists, feed company representatives and drug sellers to ensure they are advising AMU which conforms to the summary of product characteristics for the particular AM and is in harmony with international guidelines on responsible AMU.
- Further resources and financial support are required to properly enforce AGP bans and there is a need for greater knowledge transfer with farmers and key stakeholders on the legislation.
| There is poor farmer awareness of what behaviours constitute responsible AMU. | • There needs for there to be harmonised advice on the responsible use of AMs given to livestock producers.  
| | • There is a need to ensure that there is sufficient knowledge transfer on the definition of preventative AMU, growth promoter use and alternative methods of preventing disease to AMs. |
| Alternative methods of preventing disease to antimicrobial use | • There is a need for further research into economically viable methods of preventing disease to the use of antimicrobials.  
<p>| | • There is a need to review the availability and costs of vaccinations available in country. |</p>
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<th>Disease surveillance</th>
<th>• A syndromic surveillance system would improve knowledge of the national disease burden of key livestock species and allow more targeted vaccination, disease eradication and other measures to prevent and control disease.</th>
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| AMU surveillance     | • It is suspected that inaccurate feed labels may result in an underestimation of in-feed AMU at a farm level. Therefore, it may be beneficial to collect data on the quantities of AMs premixed into feeds directly from feed manufacturing sites and feed companies.  
|                      | • It is likely that, at present, any plans to collect AMU at a farm level will have to rely on an external individual conducting and auditing medicines on farm and completing a questionnaire with the farmer as farmer awareness of what defines an AM was poor. Therefore, any surveillance which relied on farmer reporting would most likely be inefficient and inaccurate. |
| AMR surveillance     | • As in many countries in the world there is a need for an efficient and well established AMR monitoring system for both human and animal isolates. This will improve the understanding of the relationship between AMU in livestock and AMR in humans and will identify any potential areas of particular concern with regards to AMU in livestock.  
|                      | •                                                                                                           |
| Ability to locate and access farms | • It is not always possible to locate farms in rural Vietnam which makes it difficult to conduct cohort studies which require multiple visits to the same farm. Therefore, it would be beneficial to ensure that a number of easily traceable identifiers are used to locate a farm such as map coordinates, village name, farmer surname and any address details and that a researcher with local knowledge is included in the research team. |
Capacity requirements to implement effective AMU and AMR surveillance/diagnosis in the aquaculture sector.

- Strengthening awareness of farmers on AMU and AMR
- Regular monitoring of stocks for early detection of disease outbreak,
- Develop and produce alternatives to antimicrobials
- Promote simple biosecurity measures that are applicable at the farm-level;
- Promote ecological measures for disease prevention (e.g. tilapia cum shrimp aquaculture, “green-water” culture);
- Active and regular monitoring of antimicrobial use at the farm level;
Capacity requirements to implement effective AMU and AMR surveillance/diagnosis in the aquaculture sector

- Drug companies/distributors: government should work with the private companies on registration of antimicrobial drugs and on how to regulate distribution and selling of antimicrobial products;
- Veterinary prescription: develop a proper mechanism on how to properly prescribe approved drugs for use in aquaculture wherein non-vet fish health professionals should be given authority to recommend if not prescribe drugs;
- Encourage feed distributors and farmers to strictly observe and follow prescribed withdrawal period for any antimicrobials used in aquaculture.
- Develop and implement capacity building programs for local/provincial officers on AMU/AMR awareness;
- Encourage formation of aquaculture associations/federations and promote stronger linkages which can actively extend support to farmers especially on the prudent use of antimicrobials in major aquaculture operation.
Global health security is a shared responsibility.
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