Integrating food safety and nutrition assessments in livestock and fish value chains

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Introduction

- Livestock and fish sector in low and middle-income countries rapidly growing
- Opportunities for poverty alleviation and amelioration of ill health and nutrition
- Intensification may lead to increase in risk of foodborne disease
- Close link between disease and malnutrition, but assessments of food safety and nutrition often disaggregated
Why worry about zoonotic and foodborne disease in relation to nutrition?

**Food Scares**
- Consumption decreases

**Disease Control**
- Culling of animals, production losses

**Threatened Livelihoods**
- Reduced income

**Production Losses/Inefficient Production**
- Decrease in production

**Food Safety Measures**
- Impact on nutrient availability

**Human Mortality and Morbidity**
- Malnutrition, decrease in production
Example Salmonella

> Estimated 93,757,000 cases of gastroenteritis due to non-typhoidal *Salmonella* per year\(^1\)

> Estimated 155,000 human deaths due to non-typhoidal *Salmonella* per year\(^1\)

> Estimated 86% of the cases are foodborne\(^1\)

> Worldwide mass production and distribution of food disseminates pathogens rapidly

> EU Salmonella control programme: ... Poultry slaughtered from ... To....

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Aim and objectives

International Livestock Research Institute required a tool for the rapid integrated assessment of food safety and nutrition to make recommendations for pro-poor research priorities in livestock and fish value chains.

Objectives

1. Develop integrated approaches for assessing livestock and fish value chains in relation to nutrition and health.
2. Apply the approaches to value chains with high potential for pro-poor transformation.
REGULATORY AND INSTITUTIONAL FRAMEWORK: public and private rules and regulations, enforcement, etc.

ENVIRONMENT: Change in land use, climate, loss of biodiversity, CO₂, production green house gases, nitrous oxides, waste, use of water, fertiliser, pesticides, fossil fuels, etc.

Crops

Move

Grow

Move

Harvest

Move

Process

Move

Process

Move

Eat

ANIMAL WELFARE

Signals

Land & water

Move

Move

Move

Move

Retail

Move

FOODBORNE HAZARDS

Probability of food being contaminated

CONSUMERS
• Choices
• Behaviours
• Circumstances

HUMAN HEALTH & WELL BEING

NUTRIENT CONTENT

Probability of nutrient loss (quantity and quality)

ECONOMIC VALUE
FOODBORNE HAZARDS

Contamination of feed and water
Disease emergence, introduction, spread. Veterinary biologicals, farm chemicals
Mixing, partitioning, removal, cross-contamination
Growth & inactivation
Chemicals

Probability of food being contaminated

CONSUMERS
Mixing, partitioning, cross-contamination, growth and inactivation

Risk assessment following Codex Alimentarius Commission
1) hazard identification, 2) hazard characterisation, 3) exposure assessment, 4) risk characterisation
→ risk management

“no harm”, ideally promote

Data collection to assess food safety risks, factors influencing availability, access and utilisation, and management opportunities
• Literature review
• Questionnaire survey for all steps of the livestock/fish value chain
• Biological sampling along the chain up to retail level
• Participatory rural assessments for producers and consumers
• Focus group discussions with women and children
## Study sites and sampling

### Tilapia value chain in Egypt
- **Species:** Tilapia – most commonly farmed fish
- **Professional** - Kafrelsheikh is main fish producing governate in Egypt (55% of fish output)
- **Three case study areas,** rural fish producing, rural non-fish producing, peri-urban
- **Survey, PRA, FGD, SSI**
- **Biological samples:** pesticide residues, heavy metals, aerobic plate count, 5 specific microbiological pathogens

### Dairy value chain in Tanzania
- **Species:** Dairy cattle – indigenous and commercial
- **Dominance of small-scale production,** has potential for growth
- **Five case study areas in two districts with different production systems**
- **Survey, PRA, FGD, SSI**
- **Biological samples:** coliform count, total plate count, PCR for *Escherichia coli* and *Brucella abortus*

### Pork value chain in Vietnam
- **Species:** Pork – most often consumed livestock product
- **Dominance of small to medium scale semi-intensive system**
- **Three communes each in two districts with different economic status**
- **PRA, FGD, SSI**
- **Questionnaire based surveys and biological sampling taking and analysis in next phase of the project**
Egypt – fish consumption

- Large differences in availability of fish depending on geographic location (fish producing area, non-fish producing area, peri-urban area)
- Strong seasonal patterns in availability (summer – winter)
- Consumers reported smell, colour of fish and gills, firmness and degree of detached scales as the main attributes for fish quality
- Consumers are not buying fish with changes in these attributes even if there are no other choices
- Fish is usually bought either from retailers in the village market (during the market day), fish shops in the village or in the nearby city
  - Most consumers ask the seller to clean, and eviscerate fish to take it home ready for preparation
  - Also common to ask seller to cook fry or grill fish to take it home ready for consumption
Tanzania – milk consumption a risk?

- Various contamination pathways and critical control points identified along the dairy value chain
- Only livestock product that is consumed several times a week by the majority of households
- Milk commonly bought fresh/raw in the morning, then filtered and boiled for 5 to 30 minutes – most frequently consumed boiled
- Raw milk consumption reported for the respondent, children, pregnant and the elderly
- Common for adults, children, elderly, pregnant women to drink fermented milk
- Raw milk often used as “detoxifying agent” and “to clean the system”
- Strong seasonal fluctuations in availability and access
- Multiple quality attributes reported, but consumers often buy milk even if they think it is not safe
Discussion and outlook

- Indications of multiple trade-offs between food safety and nutrition
- Potential for increasing food safety in the chains and improving food security
- Analysis of data to answer specified set of questions
- Provide recommendations for research priorities to funding body
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Thank you for your attention!