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# **Final report**

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## Contents

1	Acknowledgments3
2	Executive summary4
3	Background4
4	Objectives8
5	Methodology8
6	Achievements against activities and outputs/milestones9
7	Key results and discussion16
8	Impacts
8.1	Scientific impacts – now and in 5 years
8.2	Capacity impacts – now and in 5 years
8.3	Community impacts – now and in 5 years
8.4	Communication and dissemination activities
9	Conclusions and recommendations49
9.1	Conclusions
9.2	Recommendations
10	References54
10.1	References cited in report
10.2	List of publications produced by project
11	Appendixes60
11.1	Appendix 1:

## **1** Acknowledgments

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## 2 Executive summary

This project used social science methods (semi-structured interviews, rapid ethnography and media and document analysis) to understand biosecurity reform efforts during the COVID-19 pandemic at wet markets in Kenya, the Philippines and Vietnam. The project was conducted between June to December 2021 by an expert team of social scientists from RMIT with expert partners from the Planetary and Global Health Program at St. Luke's Medical Center College in the Philippines; the Institute for Anthropology, Gender and African Studies at the University of Nairobi, Kenya; and the Vietnam Academy of Social Sciences.

We identified seven stakeholder groups with different interests and perspectives on wet market biosecurity reform: government, market managers, international agencies, scientists, vendors and workers, civil society groups and politicians.

Our findings are divided into two sub-sections.

## <u>1. Three social narratives influence stakeholder responses to wet market biosecurity</u> reform in Vietnam, Kenya, and the Philippines

We identified three main narratives that framed the problem of biosecurity and preferences for solutions and change in the three case study countries.

- The first, a 'human health' narrative, questioned global narratives about pandemic risks, framed markets as a source of food security rather than biosecurity risk, and emphasized the need to strengthen veterinary public health policy for endemic diseases. The only COVID-19 pandemic policies that influenced wet markets were those related to infection control. Health risks at markets were predominately viewed through the concept of 'freshness' rather than strict biomedical categories.
- A second 'modernization' narrative viewed biosecurity as part of a broader process of socio-economic development. This viewpoint emphasized infrastructural gaps, spatial arrangements and the conflict between reform and business interests and constraints. Cleanliness and organization of the market environment was analogue to biosecurity.
- A third and final narrative centered on local livelihoods and the conflict between market vendors and sellers and efforts to reform biosecurity and modernize market infrastructure. This narrative called into question the appropriateness of certain regulations and policies, including bans and closures, the importance of cultural heritage and the ways that local stakeholders organized for collective political action.

Our research found that wet market biosecurity strategies occur in the context of three contrasting narratives that emphasize different aspects of health and risk, reflective of different worldviews and interests of the social groups that are dependent on, regulate and supervise market activities.

Policy reform efforts should take these different narratives into account in order to avoid negatively impacting local livelihoods, culture and food security.

## 2. The effect of COVID-19 pandemic lockdowns on wet markets and food systems in Kenya, Philippines and Vietnam

Contrary to the initial expectations of the project, we did not find any policy reforms at wet markets implemented to address potential pandemic spillover risks. Rather, the only pandemic policies that influenced wet markets were those related to infection control.

- We found that COVID-19 lockdowns and other mitigation measures caused a ripple effect across the food supply chain in all three countries, with a combination of reduced supplies and demand driving increases in the price of animal-sourced foods. This was more severe in Vietnam (due to stricter lockdowns) compared to the Philippines and Kenya, where markets were deemed an "essential service" early on.
- Transport restrictions were highlighted as one major policy challenge, preventing goods from moving to market.
- While some market stakeholders expressed concerns about COVID-19, the economic consequences of restrictions were viewed as a far greater threat to them than the virus itself.
- These were believed to have had substantially negative effects on market vendors and sellers as well as transporters, traders, butchers, day laborers, and farmers.
- Negative effects found in our research included: reduced production and labour needs, spoilage, lost income, debt, psychosocial stress and lost customer networks
- Changing consumer behavior during the pandemic was believed to have been shaped by socio-economic status, with many reportedly reducing their intake of animal protein while middle and higher-income groups depending more on supermarkets and online vendors.

Our study found that lockdowns and other pandemic restrictions negatively impacted the availability and affordability of animal-sourced food products in Kenya, the Philippines and Vietnam while also having harmful consequences for those dependent on the market value chain for their livelihoods.

Future health crisis management needs to consider the impact of lockdown policies on food systems, agricultural producers, market vendors and customers, especially those working in the informal sector.

## 3 Background

The COVID-19 pandemic is the most significant shock to global and local food systems since the financial crisis of 2008 (Clapp and Moseley, 2020). As responses to the pandemic developed from 2020-22, they revealed deep vulnerabilities in food systems at local, national and regional levels (Robins et al. 2020) including with access to animal source foods. Identifying and examining the nature of these vulnerabilities will provide direction to help mitigate future disruptions to food systems. In the livestock sector, lockdowns and movement restrictions significantly impacted animal trade, abattoirs, and consumer markets. This is suspected to have significantly impacted smallholder farmers, particularly women, who rely on the sale of livestock products at informal markets for their livelihood.

The pandemic also once again raised concerns about the potential role of wet markets in amplifying novel disease spillover. Wet markets in Asia were singled out in 2020 as an alleged source of global pandemic risk with calls to close, ban, regulate, and reform them (Aguirre et al. 2020; Petrikova et al. 2020; Lynteris and Fearnley, 2020). The concerns about wet markets centred heavily on wild animals in so-called 'wildlife wet markets.' This led to high-level political pressure for veterinary public health and biosecurity reforms; for example, by the Australian Minister of Agriculture at a G20 meeting in April 2020. In these narratives, pandemic risks are frequently linked to wider concerns about biological and ecological conservation, the (illegal) global wildlife trade, animal welfare and animal rights (D'Cruze et al. 2020; Saravanamutta et al. 2020; World Animal Protection, 2020).

However many wet markets do not sell wildlife or bushmeat; in fact, wildlife represent only a small fraction of the animals sold at wet markets in Asia and Africa (which we define broadly to mean any fresh-food market where live animals (poultry, ruminants, seafood and wildlife) are kept, slaughtered and sold to consumers alongside fruits, vegetables and/or grains). Hence there are a diverse range of "wet markets" that need to be distinguished by their scale, produce and type of animals, among other factors. In this sense, many "wet markets" are synonymous with "traditional" or "fresh-food" markets (Roesel and Grace, 2014; Zhong et al. 2019). While emerging diseases with pandemic potential represent low probability but high impact events, the risk of endemic food-borne and zoonotic diseases transmission at wet markets (Salmonella, Campylobacter, E. coli, etc.) contribute to more frequent and significant local disease outbreaks (Grace et al. 2012; Grace, 2015; Roesel and Grace, 2014). Furthermore, the framing of wet markets as sources of disease and threats to biological diversity may generate simplistic and narrow policies that ignore positive contributions to local nutrition, livelihoods, and sociocultural wellbeing (Eskew and Carlson, 2020; Zhong et al. 2020). Draconian governance and management reforms aimed solely at reducing zoonotic infection risks may have unintended negative socioeconomic, health and wellbeing consequences for communities and the resilience of food systems.

This project explored how the COVID-19 pandemic impacted wet markets using three case study countries: Vietnam, Kenya and the Philippines. These countries have been selected in consultation with ACIAR staff and considering existing country partnerships. All three countries have implemented various types of COVID-19 lockdowns and restrictions that impacted wet markets and the livestock sector in 2020; as of early 2021, all three countries have also reported relatively low COVID-19 cases and deaths. These countries represent a range of wet market systems and government responses to COVID-19. For example, Vietnam has enacted a national directive banning the sale of wildlife and has pro-actively cracked down on live wildlife markets and online sales since the pandemic began. This builds on a range of wet market reforms since Avian Influenza, SARS and food-borne disease outbreaks that have generated significant media attention

in Vietnam. In the Philippines, the government response appears to have been less proactive in regards to wet markets (despite a similarly large illegal wildlife trade and concerns about emerging infectious diseases) although the pandemic has led to the strengthening of the Philippine Inter-Agency Committee on Zoonoses (PhiICZ). In contrast to Vietnam and the Philippines, live wildlife are rarely stored and slaughtered at markets in Kenya, where the primary concern of authorities relate to bushmeat sold informally through house-to-house visits by middlemen and 'hidden' as goat or beef at wet markets.

## **4** Objectives

The goal of this rapid assessment project was to understand how the COVID-19 pandemic impacted wet markets in Vietnam, Kenya and the Philippines, specifically in relation to biosecurity reforms and policies. To do this, we will:

- 1. Develop a framework to understand change at wet markets that will include policy, legal, biosecurity, infrastructural, socio-cultural, and management dimensions;
- 2. Map the policy and social networks that influence the functioning and reform of wet markets, including different narratives, interests, values, power dynamics, and contextual forces.
- 3. Understand how markets were impacted by and responded to COVID-19 restrictions and how the pandemic has influenced the perception and framing of wet markets as foci for disease risk;
- 4. Generate lessons and evidence on the impact of the COVID-19 pandemic on wet market reforms, including on system vulnerabilities and resilience, that could inform future ACIAR investments in the area of food safety and One Health.

## 5 Methodology

The project was conducted from June 2021 to December 2021 and was divided into three phases: 1) policy document and media analysis, 2) key informant interviews, and 3) rapid ethnographic methods. Detailed guidance documents were produced to standardize the methodology in each phase, with the goal of generating meaningful comparisons between Kenya, the Philippines and Vietnam.

Ethical clearance was obtained from RMIT University (2021-24245-15509) (Australia), St. Luke's Medical Center College of Medicine (Philippines) and the Kenyatta National Hospital/University of Nairobi Ethical Review Committee (KNH-ERC/A/322) (Kenya). The research was deemed exempt in Vietnam.

#### 1. Policy document and media analysis

In each country, we collected relevant national policy documents and mainstream online news stories related to wet markets using a search term rubric. Policy documents were collected by searching government websites and in discussion with key policymakers in each country. We found and reviewed 29 policy documents in the Philippines, 9 in Vietnam and 18 in Kenya. We simultaneously searched major national online newspaper articles that discussed wet markets and zoonotic disease risk over the last five years. We reviewed 38 media articles in the Philippines, 6 online newspapers with 126 relevant articles in Vietnam and 5 media articles in Kenya. The policy documents and media articles were catalogued and analyzed thematically in Microsoft Excel. We synthesized key insights from these sources into country reports, which also included relevant academic sources, and used this to informed subsequent phases of the project.

#### 2. Key informant interviews

We created a list of key stakeholders identified through the media and document review as well as by searching websites and asking for endorsements from colleagues in each country. We aimed to interview a representative sample of the different stakeholder groups linked to wet markets including in the food, public health, biodiversity, economic, and local government sectors. Each country team generated a preliminary list of potential key informants and, using the information gathered at this point, produced a stakeholder map identifying clusters of stakeholders. From this phase of the project, we identified 7 main stakeholder groups that influence wet market biosecurity efforts – as shown in **Figure 1**. This helped guide subsequent phases of the research. Categories were similar in each of the three countries, although specific organizations were different (see *Stakeholder Maps* for each country in **Appendix 1**).



#### Figure 1: Stakeholder Map

Stakeholder maps were discussed by the project team and used as the basis for narrowing down the final selection of key informants in each country to 20 individuals to ensure a balanced representation between the different sectors. Where certain informants were not available, substitutes were found, as is consistent with a purposive sampling approach. Market vendors and workers as well as politicians were not included in the key informant interviews but were part of the subsequent rapid ethnographic fieldwork. Interviews lasted roughly 1 hour each and were conducted either in-person and remotely depending on the pandemic restrictions in place at the time and the comfort of the participant. Interviews were both audio-recorded and summarized (Philippines) and documented through hand-notes (Kenya, Vietnam).

	Kenya	Philippines	Vietnam
Government	8	11	5
Scientist	6	2	3
International agency	5	4	3
Private sector	1	1	5
Civil society	0	2	4
	20	20	20

Table 1. Ocicelea key informants per country	Table 1	: Selected	key	informants	per	country
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#### 3. Rapid ethnography at wet markets

The final phase of the project (October-December 2021) involved visiting a purposive sample of markets in each country for 1-2 days per market and using rapid ethnographic methods (observations, informal group interviews, informal interviews) to understand the opinions and experiences of market workers, vendors, managers and customers. Ethnographic research involved 1-3 social scientists visiting the market for the duration of the day. Observational notes and photographs were taken on the physical condition of the market, infrastructure, trading and transportation, hygiene, inspections and biosecurity practices. At each market, key individuals with an important role related to the operation of the market (for example, market management board members, traders, transporters, slaughterhouse workers, veterinarians, cleaners) as well as customers were selected for interviews and group discussions. Question templates were created prior to fieldwork to guide these conversations. Data collection consisted of hand-written notes and photographs; audio recording was not considered appropriate for informal interviews. Permission for the research was obtained from the appropriate government and/or private sector authority before fieldwork began at each market site.

	Kenya	Philippines	Vietnam
Urban	1. Nairobi Meat Market 2. Local Terminal Market 1- Nairobi	1. Arranque Market, Manila	<ol> <li>Long Bien</li> <li>Ha Vy</li> <li>Hai Boi</li> <li>Den Lu</li> <li>Ha Dong</li> <li>Dong Xuan</li> <li>Nghia Tan</li> <li>Bo Song</li> <li>(All in greater Hanoi)</li> </ol>
Rural	3. Local Terminal Market 1 – Busia 4. Fish Market – Busia	2. Rio Tuba Market, Palawan Island	
	5. Rural Local Terminal Market 2- Busia		

#### Table 2: Wet markets included in the study

\* Fieldwork in Kenya also included visits to a rural pig slaughterhouse and 3 different rural butcheries in Busia County.

To select these markets sites, we first aimed to understand the diversity of wet markets in each country. We developed a characteristics rubric adapted from Lin et al.'s (2021) classification of wet markets based on potential disease risk and included whether the market sold dead/live animals, wild/domesticated animals, and/or perishable/non-perishable goods. We also accounted for the type and age of the market, geography

(urban/rural, coastal/inland), ethno-linguistic and socioeconomic groups that are known to frequent the market as well as historical knowledge and local reputation (cleanest wet market, central hub for wildlife trade, etc.). Using this rubric, each country generated a list of 10 markets with diverse characteristics, with the initial goal of selecting 2-3 per country.

In total, the research team visited 15 markets over 1-2 days each in Kenya (5) and the Philippines (2) and 3-5 days each in Vietnam (8) – see **Table 2**. Unless stated otherwise below, each market sold live/dead animals and animal parts, conducted some animal slaughter, and sold an assortment of fresh hot food, vegetables, fruits, grains and various consumer goods.

#### Site selection in Kenya

In Kenya, all markets were privately owned and run, although government veterinarians were attached to each for inspections and oversight. We selected two markets in Nairobi: one of which has a slaughterhouse for cattle, sheep and goats and is one of the main suppliers of meat to both high and low end butcheries. The second (only selling already slaughtered domesticated animals) supplies 2/3 of the beef supply to wholesalers and retailers throughout Nairobi and is rumoured to also sell bush meat on the black market. Three rural markets were also selected in Busia County, a cross-border area on the Kenyan-Ugandan border, which allowed us to explore the impact of the pandemic on cross-border trade, food systems and biosecurity reforms. We selected the two main markets in Busia, situated 30 km apart from each other where both live and slaughtered domesticated animals (cattle, sheep and goats) were sold. We also selected the main fish market in Busia town (considered one of the largest fish markets in Kenya) to explore the dynamics of different animal value chains. Finally, we also visited a rural pig slaughterhouse in Malaba town and, to get further information from retails vendors, three small rural butcheries.

#### Site selection in Vietnam

COVID-19 pandemic lockdowns occurred in many parts of Vietnam during the second half of 2021, which restricted the research team to the Hanoi area. Nonetheless, eight wet markets were selected and visited in greater Hanoi, representing a range of wholesale, retailer and temporary markets. This included 4 large modern wholesale markets with hundreds of stalls each (Long Bien, Ha Vy, Den Lu), including one exclusively focused on poultry (Hai Boi). Three of the largest traditional wet markets in the Hanoi area were included in the study (Ha Dong, Dong Xuan, Nghia Tan), located in dense residential areas. Finally, one temporary market (Bo Song), which meets in different locations, was selected.

#### Site selection in the Philippines

We intentionally chose one urban and one rural wet market that are well known to actively sell both wild and domesticated live animals. Arranque Wet Market is busy urban market located in Binondo, Manila City (capital of the Philippines), and is a notable source of Chinese medicine and exotic food products such as eels, black chickens, frogs, etc. Meanwhile, the Rio Tuba Public Market is located in a *barangay* (village) south of Palawan Island, considered a remote part of the country. Palawan is recognized as a biodiversity hotspot and an epicenter for illegal wildlife trade, and the market is also known to be an important cross-border trading post with other Southeast Asian countries, especially Malaysia.

#### 4. Data analysis

Each country team conducted thematic analysis on the key informant interview and rapid ethnographic data they collected. This analysis was collated into a country report. Prior to drafting this report, biweekly online group meetings allowed the teams to present preliminary data and high-level findings. Project members agreed to a generic thematic structure to the country reports to assist with the comparative analysis of the case studies. We identified 10 main themes to guide the final analysis of fieldwork data: disease risk perceptions, political responses, animal biosecurity conditions, biosecurity reform efforts, the consequences of biosecurity reforms, the role of wet markets in food systems, the impact of the pandemic on food systems, the impact of the pandemic on wet markets, the influence of the pandemic on consumer behavior, and drivers of policy change. In general, these emerged from parts of the question guides that helped guide field research. Country reports included detailed analysis from each of these overarching themes, including photographs and observational descriptions. The country reports were collated and analyzed comparatively, with multiple requests for each country team to review draft analysis and provide additional data and clarifications.

#### 5. Study limitations

There are several limitations to our exploratory study. The first involves the short period of time spent at wet markets (1-2 days per site during one visit in Kenya and the Phillipines), which limited the depth of some of our data collection including with certain sensitive topic (e.g. illegal wildlife trading and non-compliance with biosecurity practices) and the ability to validate preliminary findings. Markets are busy places and many of our informal interviews and discussions conducted during market hours as vendors and managers went about their work. To limit interruptions, we tended to explore one different theme with each participant. Taking notes verbatim without a recorder was also a challenge for some of the field researchers. Many of the key informant interviews were conducted online and not in-person, and it was felt that this limited the ability for national stakeholders, especially government officials, to be candid and for researchers to develop sufficient rapport during the interview. Pandemic restrictions also presented numerous difficulties in arranging interviews and travelling to markets for the rapid ethnography, which had to be delayed in Vietnam and the Philippines.

There are some remaining questions about the degree of theoretical saturation. The project covered a large number of different topics across three different countries and many different types of markets. The media and policy analysis provided initial insights that we used to guide subsequent data collection and analysis. We standardized the key informant interview and rapid ethnography guides to help ensure comparability and used the same types of questions in both methods. While the general conclusion was that theoretical saturation had been achieved with the core, main themes, there were a few areas where additional time and research would have increased the depth of our analyses. This includes: greater detail about how the pandemic affected different types of market stakeholders (women, farmers, the poor, supermarkets, smallholder farmers, slaughterhouse workers); the ways in which market stakeholders sell and use different animal parts and how these are traded in the value chain; how markets are governed and managed differently depending on whether they are rural or urban and formal or informal; the opinions and experiences of customers (which was limited in our fieldwork); and the general perception of government pandemic policies. There were also specific policy points that were raised by only one informant and which we did not have sufficient time to clarify (e.g. details of previous biosecurity policies and the nature of the wildlife trade). Additional time for member-checking of key findings would have been useful. In spite of

these limitations, the research team felt that this exploratory study captured sufficient robust data for the overall objectives and that supported the themes and sub-themes identified.

# 6 Achievements against activities and outputs/milestones

Objective 1: To develop a framework to understand change at wet markets that will include policy, legal, biosecurity, infrastructural, socio-cultural, and management dimensions;

no.	activity	outputs/ milestones	completi on date	comments
1	Reviewing the academic literature and policy/media documents and triangulating this with interview and ethnographic data collection	"Three social narratives" framework	June 2022	The conceptual framework is shown in Figure 2 and described in section 1 of the results section.

## Objective 2: To map the policy and social networks that influence the functioning and reform of wet markets, including different narratives, interests, values, power dynamics, and contextual forces.

no.	activity	outputs/ milestones	completion date	comments
2	Each country team conducted a stakeholder mapping activity. This was used to guide the selection of key informants. Interviews explored the policy environment.	Country reports Stakeholder maps Papers in preparation	October 2021 Ongoing	Stakeholder maps are available for each country in the Appendix The 2 papers in preparation (see results section) present the insights generated from this objective.

## Objective 3: To understand how markets were impacted by and responded to COVID-19 restrictions and how the pandemic has influenced the perception and framing of wet markets as foci for disease risk;

no.	activity	outputs/ milestones	completion date	comments
3	Interviews and rapid ethnography	Country reports and final report	June 2022	Section 1 and 2 of the report presents our analysis of this objective

Objective 4: To generate lessons and evidence on the impact of the COVID-19 pandemic on wet market reforms, including on system vulnerabilities and resilience, that could inform future ACIAR investments in the area of food safety and One Health.

no.	activity	outputs/ milestones	completion date	comments
4	Interviews and rapid ethnography	Country reports and final report	June 2022	Section 1 and 2 of the report presents our analysis of this objective, and key implications are discussed in the final section of the final report.

## 7 Key results and discussion

### **SECTION 1**

# Wet markets and biosecurity reform: Three social narratives influence stakeholder responses to policy in Vietnam, Kenya, and the Philippines

Our analysis identified three main narratives about wet markets that shaped the ways in which different stakeholders perceived and engaged with biosecurity reforms (see **Figure 1**). These narratives are explored below and include: health, modernization and local livelihoods. These narratives were emphasized and conceptualized differently by different stakeholder groups. Each stakeholder group represented a dominant set of interests that shaped the ways in which they perceived and approached their activities at wet markets (**Table 1**). These are discussed more below.



Figure 1: Conceptual framework

Stakeholder	Dominant interest
Government	Policy, regulations and coordination
Market managers	Business and administration
International agencies	Project priorities
Scientists	Disease surveillance
Market vendors and workers	Livelihoods
Civil society	Advocacy
Politicians	Political strategy

 Table 1: Wet market stakeholders and their dominant interests

#### 1. Health risk, biosecurity and food safety

Key informants questioned global narratives around pandemic risks and emphasized the need to strengthen understanding and policy related to endemic disease risks. We found that food safety at wet markets was mainly understood in reference to notions of "freshness" rather than strict biomedical categories.

#### 1.1. Wet markets, COVID-19 and pandemic spillover

We found no evidence that the global rhetoric to ban wet markets and to restrict wildlife sales that emerged during the early months of the pandemic influenced any specific market reform in the three case study countries in 2020-21. Rather, policy attention on wet markets was quickly subsumed by rising infections and the challenges of lockdown and other NPIs. This meant that the only COVID-19 pandemic policies that influenced wet markets were those related to infection control. We also found that, in general, wet markets were not perceived as important sources of emerging disease risk. Rather, markets were overwhelmingly viewed as essential means of providing food security and livelihoods – of *improving* health – rather than 'risky' or unhealthy places. Despite the alleged market origin of COVID-19 that dominated the media in 2020-21, there seemed to be no change in the perception of wet markets as a possible source of human health risk. There was concern expressed about the representation of wet markets as "petri dishes" for novel diseases by international media. The lack of concern about pandemic emergence at wet markets was furthered by the general perception that wild exotic

animals were rarely sold at format markets and that live animals were overwhelmingly domesticated livestock, fish and poultry.

The COVID-19 pandemic led to a range of biosecurity measures at wet markets that were not aimed at preventing novel pathogen spillover from animals but in containing SARS-CoV-2. These are summarized in **Table 2**. There were a few unexpected improvements in biosecurity; for example, in Kenya, water was made more readily available, which was believed to have improved sanitation and allowed vendors to better wash their meat, while a mandate to open markets only during the day led to better supervision as government officials were present at that time. In Vietnam, we observed some markets with new washbasins and hand sanitizer at the market gates during peak times of COVID-19 transmission; however after cases came down we observed that hand washing and hand sanitizing became less of a concern. Overall, the dominant perception was that once restrictions were removed, things would revert to 'normal' and therefore there have been no significant biosecurity changes in wet markets as a result of the COVID-19 pandemic.

Type of pandemic restriction	Interventions*
Behavioural	Mandatory face masks, face shields, and gloves; washing and disinfecting requirements; mandatory vaccination; no hand shaking; disinfecting sales areas; requiring customers to wash hands; no spitting; more frequent garbage collection.
Movement	Social distancing; curfews; transport restrictions; shopping voucher systems during lockdowns; greater spacing between market stalls; seat arrangements; limit visiting time; avoiding the area if sick; body temperature checks; testing requirements; designated entry and exit points.
Closure	Lockdowns; closures if COVID-19 cases are reported; closures if the market does not abide by the pandemic restriction rules.

Table 2: Pandemic restrictions at wet markets, identified in the 3 case study countries

\* This table summarizes all of the various types of interventions used in the three case study countries.

We observed and heard of an active trade in wildlife and wild meats (see **Table 3**). However, we found that wildlife rarely ends up at the formal wet markets we visited, although clandestine sale occurs in 'black market' or 'shadow selling.' We found that wild meat is believed to be concentrated in the informal settlements in Kenya, rural, hard-toreach wet markets in the Philippines, and unofficial mobile bird markets in Vietnam, where wild birds are often hidden in discreet places between domesticated species such as

chickens, ducks, swans, or pigeons. We found that policy debates about wildlife meat was not driven by concerns related to pandemic risk but rather to ecological conservation and biological diversity. In Vietnam, there are 360 animals on the 'red book' of endangered species issued by the Vietnam Environment Administration and laws banning such sale were strengthened in mid-2020. A report by the NGO PanNature in 2021 found no change in wildlife markets due to the pandemic and noted a lack of data on wildlife farms and breeding facilities for exotic animals, which have limited veterinary oversight and hygiene (https://www.nature.org.vn/en/wp-content/uploads/2022/01/In-the-Maze-13Jan22-EN.pdf). In the Philippines, the enforcement of the Wildlife Resources Conservation and Protection Act (Wildlife Act), that prohibits the unlawful trade of wild animals and wildlife by-products, has been strenghten in recent years including at our Manila market site during the pandemic. Wild animal farming, however, falls outside the Act and may serve as a cover for wildlife laundering (Mayuga, 2021). Among the wild animals permitted by the Biodiversity Management Bureau to be farmed are parrots, lovebirds, macaws, snakes, turtles, and crocodiles. A technical working group had been organized prior to the pandemic to revisit the Wildlife Act, aiming to increase penalties, law enforcement on cracking down personalities behind the illegal trade as well as "wildlife laundering," among others. Such efforts have generated awareness among consumers in all three countries that the indiscriminate trading of wild animals and wildlife is prohibited, although the growing practice of wildlife farming was acknowledged to be growing, fudging boundaries in current laws and oversight.

	Kenya	Vietnam	Philippines
Directly observed	None	Snakes, turtles, rats, birds, rabbits, cats	Birds (lovebirds, parakeets)
Mentioned by informants	Zebra, Impala, buffalo	Snakes, turtles, rats, birds, rabbits, cats, pangolin	Live wild animals: Exotic reptiles (pythons, turtles, monitor lizards, iguanas, geckos, chameleons) and exotic birds (Myna birds, cockatoos)
			Wildlife products: wild boar meat, turtle meat, pangolin meat

Table 3: Wildlife traded and sold at the selected research mar
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We found that government informants and scientists believed that the media and international organizations have been over-prioritizing novel pandemic risks at wet markets over the more systemic risks of endemic diseases. Food-borne diseases, epizootics such as African Swine Fever (ASF) and Highly Pathogenic Avian Influenza (HPAI), and endemic zoonotic diseases from domestic livestock were considered to be a much greater concern than novel viruses from wildlife (see **Table 4**). In the Philippines, both ASF and HPAI had swept through the country months before the COVID-19 pandemic, precipitating the culling of affected animals, bans and regulations on interprovincial trade, increased inspections, and the disinfection and quarantine of farms. In Kenya, one slaughterhouse in Busia County had been temporarily closed in 2014 and again in 2017 due to an outbreak of anthrax and foot-and-mouth-disease (FMD).

Table 4: Past disease outbreak believed to have been associated with wet markets

Kenya	Philippines	Vietnam
Avian Influenza, Rift Valley	Highly Pathogenic Avian Influenza	H5N1, African Swine
Fever, TB, brucellosis,	(H5N6, H5N1), Foot-and-Mouth	Fever, MERS-CoV,
measles, salmonella, E coli,	Disease (FMD), African Swine Fever	measles, salmonella,
cholera, typhoid, AMR.	(ASF), anthrax, canine parvovirus	E coli, AMR.
	(CPV), salmonella, amoebiasis, cholera	

\* This list included disease outbreaks reported by key informants in our interviews. In general, we found that market staff and vendors had a lack of awareness regarding these previous disease outbreaks and could not name specific diseases.

#### 1.2. Meat safety – freshness, disease & veterinary inspections

In general, human health risks from wet markets were viewed through the lens of meat safety, especially the concept of "freshness." In urban markets, the fact that meat came from official slaughterhouses, with quality certification and a timestamp, was invoked to explain this. In rural markets, freshness was related to on-site slaughter and the fact that animals were often reared locally and by the vendors themselves. The visual color and texture of meat helped explain freshness; meat is frequently touched by customers and sellers to explain and assess the freshness of meat. Freshness was often explained with reference to the fact that customers never got sick. In some markets, incandescent bulbs have been replaced by LED because the yellow hues give the illusion that fish and meat are fresher. In general, frozen foods were viewed as "unfresh", of lesser quality and safety. Proximity to the source of the animal, trust between stakeholders in the value chain, and visual freshness were major themes in the ways local market sellers explained meat safety.

"Due to our culture, we have concentrated on fresh produce and we don't like packaged and processed food. We are averse to labelled standardised foods, many consumers thus believe in these informal markets; they want meat from butcheries and to be able to point and say "give me that cut of meat!". Male Key informant, Veterinary officer, Kenya

"There's trust for both suki—for the buyer and the seller. [...] There's that trust that what you are buying is not double-dead, hot meat, rancid, spoiled, putrid." Male Key Informant, Labor Group Representative, Philippines

"I want to buy food in wet markets because the price is cheaper than in supermarkets. Buying food in wet market, I can choose 'The fish is swimming, the chicken is crowing' to make sure it fresh. The sellers also help me to to scale fish and pluck chicken feathers. Furthermore, the frozen food is not tasty." Female customer, Vietnam.

We observed many different conditions that are, according to biomedical standards, typically classified as unhygienic or risky: vendors touching and prodding meat with bare hands; adjusting masks or handling money after touching meat without washing their hands; cooked meat stalls situated side by side with raw meat; raw meat stored directly on the ground without containers; raw blood retrieved from drainage to cook into sausages; and use of stored (stagnant) water for washing; animal caretakers and slaughterers without personal protective gear. We also found that some meats were displayed in "open" areas of the market, where the sunshine increases the likelihood of cross-contamination from food contaminated with bacteria. Vendors did not think that diseases could be transferred by touching and interacting with the meat products on display at their stalls, although they did generally think that washing the meat could remove any possible risk of transmission to customers.

We found that veterinary market inspections are influenced by existing regulations, protocols and veterinary capacity. Each country has regulations for pre-slaughter and post-slaughter inspections that include animal clinical examination, meat inspection, worker biosecurity protections, waste management and disinfection. Meat cannot leave a slaughterhouse before inspection and the meat inspector can condemn risky meat, to be disposed in the condemnation pit.

"So, let's say [...], before the pigs or the animals [...] enter the slaughterhouse, they are supposed to be inspected from the point of origin. The farm. And then, next inspection [...] would be before the live animals disembark going into the holding pens. So, once they reach the holding pen and once they are slaughtered, it is presumed that the animal is apparently healthy." Female Key Informant, Veterinary Office, Philippines.

"Once there is good sanitation, meat is free from diseases. There is good inspection and once the carcass is said to have diseases we are not allowed to touch. It is condemned". Informal group discussion, market workers, Kenya.

Food hygiene has socio-economic dimensions. In general, informal markets, which include street vendors and rural weekly markets, have inadequate infrastructure, oversight, and biosecurity practices. Formal markets, especially those with links to food processing companies, supermarkets, and export markets, have much more stringent laws and incentives. But the divide between the formal and informal sector can be difficult to determine; for example, in Hanoi (10 million people) there are 749 registered slaughterhouses (poultry n=456, pig n=220, cow/buffalo n=61)<sup>1</sup> but many are organized on the pavement, are seasonal (especially for poultry), operate during the night (from 11pm-6am) and are technically illegal since poultry are banned from the inner city of Hanoi. Even in larger markets, some traders actively slaughter on site, making food safety work challenging for veterinary inspectors. Market stakeholders were well aware of the gap between formal regulations and local conditions – see **Text Box 1**.

#### Text Box 1: Reluctance for photographs in markets, Kenya

There was a lot of hesitancy in our taking photographs in Kenyan wet markets, especially in the slaughterhouses, perhaps because the meat inspectors and market managers were already aware of the poor conditions of the markets and negative publicity that has been portrayed in the media. These leaders noted that they were doing their best given the limited funds and weak infrastructure and they were afraid of the pictures being used in the media which would hurt their business.

Health risks were also predominately believed to be driven by the unscrupulous business practices of certain traders and sellers in the absence of meat inspection. In the Philippines, there are instances where protocol violators tamper documents to allow the smooth, unchecked interprovincial transport of live animals and even the sale of frozen meat which is traditionally prohibited in wet markets. In Kenya, this included the sale of chickens that died unexpectedly or from diseases, the use of cat meat in "*samosas*" (a kind of stuffed pastry) and the clandestine sale of wildlife meat, mostly sold in informal settlements. Some markets were known as "dumping grounds" for poor quality meat, often focused on the urban poor and lower socio-economic groups.

"There have been cases of game meat sold in Nairobi and this often happens in the informal settlements where this meat is sold from the back of vehicles and is uninspected. Some unscrupulous business men have also been going around chicken farms and buying dead chickens which they slaughter and sell to poor consumers for Ksh 100 when chicken costs Ksh 500". Male Key Informant, Veterinarian, Kenya.

<sup>&</sup>lt;sup>1</sup> Statistics of the Hanoi Department of Agriculture and Rural Development

"Because in the cities, in bigger areas, there is an NMIS inspector. The inspectors are trained, if not they're veterinarians who actually say this is good for human consumption. But they don't reach the hinterlands [...] in Northern Palawan, they sell wild pig along the road. Like whatever they killed for instance that evening, they will sell it. So, there's no control there." Female KII, Researcher, Philippines

"Near industrial parks, there are often temporary markets on the roadway. Workers like to buy goods on the roadside quick and cheap, but are less concerned about food quality and safety. Many sellers pluck chicken and duck feathers right on the roadside, then pour wastewater and waste on the roadway, clogging drains with unbearable stench." Health official, Hanoi, Vietnam.

#### 1.3. One Health and policy fragmentation

We found that perceptions from government officials and scientists about biosecurity reform centered heavily on the need to address the fragmentation and coordination of policy and regulations, which they highlighted as a major barrier to wet market biosecurity improvements. Coordination challenges between different tiers of government in newly decentralized systems were repeatedly highlighted. In Kenya, the food safety control system has 22 legislations (Kang'ethe et al. 2020)<sup>2</sup> and is implemented by 12 different government bodies and entities (for slaughterhouses, milk, meat, pesticides, etc), which confuses operators due to the overlaps across the regulatory agencies, duplication of efforts and conflicting information to traders and consumers.

"In the livestock industry there are more than 20 policies and now we are consolidating them into four policies. The first is the livestock bill, the animal health bill, the veterinary public health bill then the animal welfare and protection bill and they are in the process of becoming bills of parliament". KII, Male, Veterinary officer, Nairobi

*"In the whole country, there are 434 large slaughterhouses with veterinary control; 25,000 small slaughterhouses, of which only 30% have business licenses, 70% do not have licenses."* Government veterinarian, Vietnam

"Although, even if we have national laws, the problem is the implementation downstream. We have good policies. The basis of our policies are good but when they're already downstream, the difference in implementation, perception, as well as understanding of the policies... And somehow, as an LGU, because of their autonomy, [...] they can follow or not that national laws." KII, Male, Official, Department of Health, Philippines

Scientists called for improvements in "science-based" policies and regulation, and the need to better implement a One Health approach, although they also stressed the significant shortages in funding and the difficulties in translating research into improved

<sup>&</sup>lt;sup>2</sup> Kang'ethe E, Mutua F, Roesel, Kristina and Delia Grace. National food safety architecture in Kenya. International Livestock Research Institute (ILRI); 2020.

policy. One Health national units have been established, such as The Philippine Committee on Zoonosis (PhilCZ) and Kenyan Zoonotic Disease Unit (ZDU), as well as national policy frameworks such as Vietnam's One Health Partnership for Zoonoses (OHP). However key informants called for more *"authentic collaboration"*, and maintained that collaborations come with *"turfing,"* lacks funding for collaborative work, and that there continues to be a neglect of wildlife and environment approaches in health research and policy. They also noted the need for greater local ownership of the policy process.

"So, the committee on zoonosis that we attend to, together with the Department of Health, is a big step for recognizing [...] whatever threat that is zoonotic in nature. Unfortunately, of course, [...] with the multitude of diseases, we are not always given enough funds to do either surveillance, testing or something." KII, Male, Official, Department of Agriculture, Philippines

"The agenda in wet markets is mainly guided by external forces such as the WHO but we need to find a voice for ourselves. A lot of research has been done by international groups but because these diseases are endemic with us, we need to make these diseases a priority. Food safety is not even addressed in our curriculum...We don't know what our food safety problems are and food safety issues need to be prioritized and we should identify which value chains are at risk. We lack the capacity, lab, surveillance, policies, legislation and traceability systems". KII, Male, Researcher, Kenya

"Currently, in Vietnam, food is managed according to the Law on Food Safety, Article 61 stipulates "Responsibility for state management of food safety", in which, the Ministry of Health has the main responsibility, other Ministries, organizations and local authorities must cooperate with the Ministry of Health. However, some regulations are still unclear, lack of specificity on the assignment of responsibilities among ministries, organizations and local authorities." Health official, Vietnam

#### 2. Economic interests and the drive towards modernization

We found that efforts to enhance biosecurity were situated within a much wider, complex discussion about infrastructural reform and economic development. Wet markets were viewed as physical sites that represented the socio-economic conditions of an area, and efforts to reform biosecurity were framed as part of a broader process of modernization. This was discussed not in the language of health but rather by reference to infrastructural improvement, cleanliness, and the negotiation between formal and informal sectors.

#### 2.1. Infrastructural improvements

Gaps in biosecurity were most often explained by reference to the lack of physical infrastructure at wet markets (See **Figure 2**). Market vendors, workers and managers emphasized many recent improvements in infrastructure and key informants believed that market infrastructure has generally improved over the last few decades. This was

explained in reference to better water and sanitation facilities and hygienic conditions, such as the slaughter, transport and waste collection – see **Text Box 2**.

#### Text Box 2: Infrastructure improvements in the Philippines

In the past, the slaughter of livestock was conducted in unsanitary conditions. In slaughterhouses, livestock such as pigs would be tied up on the solid floor, pierced, and then drained of its blood. After which, the carcass would be cleaned, removing the hair and entrails—all done on the floor of the slaughterhouse. It would then be placed in a large sink to be hosed down prior to its delivery to the wet market. The transportation of the animal to the market was similarly unhygienic, usually loaded by *kargadors* or laborers on the floors of tricycles without protective gear or even clothing. It would then be carried again by these laborers unto the counter of the meat stall for butchering.

Presently, slaughterhouses make use of slaughtering hooks to ensure that meat is properly elevated throughout the process, The meat is also now wrapped in plastic during transport to the market. The National Meat Inspection Service (NMIS) currently accredits slaughterhouses according to their compliance to national standards, although not all municipal slaughterhouses are accredited by the regulating body. Furthermore markets have been renovated in recent years, from establishments with earthen floors to cement or tile. Some markets have also been elevated to protect against flooding, and drainage within the area has been improved. Chapter IV - "Markets and Abattoirs" of the Code on Sanitation of the Philippines provides the prescribed structure, sanitary facilities, and sanitary requirements of markets. Moreover, the proper disposal of waste at both poultry and hog farms has also been strictly imposed, whereas before, dead hogs would be found floating in the river of urban centers.



Figure 2: Slaughter practice photos at wet markets in the Philippines (A and B), Vietnam (C and D) and Kenya (E and F)

Many infrastructure gaps still exist. At our market sites, we observed unhygienic conditions in slaughterhouses; the unfiltered discharging of wastewater into sewers and rivers; the crowded conditions of animal cages; a lack of availability of water and garbage disposal; and inadequate disinfection and cleaning. In Vietnam, we often observed no area to safely dispose of animal parts, especially on-site slaughter for poultry and animals with signs of disease. In meat markets in Nairobi, we observed workers cleaning the floors every twenty minutes, wearing preventive gear and with functional handwashing stations but we also noticed clogged drains, meat on the floor and disposal of animal waste on the open ground. In rural markets in Busia, Kenya, we found waste disposal pits were not

covered, one had collapsed, and none constructed as a replacement and some of the waste was stored in a shed. In an urban market in Manila, Philippines, we found only three water faucets available at the meat section for usage; previously, each stall had its own faucet, but most were removed to cut down on water expenses at the market. Meanwhile, in places where no faucet was observed at the market, vendors had to bring their own water pails for their activities.

#### 2.2. Business interests and management

A major reason why infrastructure and biosecurity measures have been poorly enforced was explained by reference to economic pressures and forces. This was especially the case in Kenya. For private sector actors and workers at the Kenyan slaughterhouses, biosecurity was seen to impinge on their time and reduce their profits. However, wet markets are a major source of income not only for sellers but also for the local and national governments that collect revenue from them. While legal requirements demand that the owners of slaughterhouses and markets meet biosecurity standards to some extent, the large capital investment needed to establish and run a market minimizes the incentive to impose consequences for non-compliance with biosecurity policies. Market managers acknowledged that implementation and compliance with government policies was expensive and time consuming.

"These is very little goodwill to address these issues because people perceive it will take away profits but people need to know once we have biosecurity in place it governs everything in the chain. People need a better understanding on why these issues are important. In our setting there is emphasis on the economic importance of wet markets but bio security should be at the forefront too, biosecurity should be number one and everything else follows". KII, Male, Biomedical researcher, Kenya.

"We are struggling with waste management but we will get there soon, managing waste is our biggest challenge as it is very expensive. Getting the license to allow us to direct our liquid waste to the sewer line from NEMA costs 100,000ksh per year and the officers must come to confirm the viability of the place". Informal interview, Male, Market Manager, Nairobi, Kenya.

"Street vendors and sellers at temporary markets do not have to pay taxes and official fees, their goods are not of quality and clear origin, so they sell cheaply. The local authorities do not want to close these temporary markets because it is a source of pocket income for them" Female seller at Nghia Tan market, Hanoi, Vietnam.

Infrastructure reform was seen to be one of the most expensive and challenging aspects of improving wet market biosecurity. Such costs were not the only concern for market management boards; instead, the business practices of managing their contracts and relationships with traders, market regulations, infrastructure maintenance and instillation, and interactions with the Ministry of Trade took precedence. Food safety was viewed as part of the infrastructure and procedural management needs, largely within environmental sanitation and alongside the responsibilities of fire prevention and security. The management style of a market also has an influence on the enforcement of rules and regulations, as does the threat of consequences if biosecurity measures and infrastructure do not pass specific standards; however, there was a sense that government support was infrequent and lacking.

"Liquid waste disposal is a big challenge but we are trying to ensure that we reach the standards that are set. A government minister once closed all the slaughter houses here for almost a year because of poor liquid waste management. Pretreatment is very expensive and meeting the standards that were put in place is very hard. The construction of a pretreatment firm requires a large space and modern technology. The government has not helped us". Slaughterhouse manager Male, Nairobi, Kenya.

"In 1993, there was a devolution, so most of our functions were devolved to LGUs. [...] Since at that time, the LGUs were overwhelmed, until now the support towards the agriculture side is very weak... well, not all. [But] a lot of provinces still do not have a provincial veterinarian." KII, Male, Official, Department of Agriculture, Philippines

"Ha Vy is the largest wholesale poultry market in the North, built in 1993, nearly 30 years now. The market facilities have deteriorated. The water supply and sewage systems have deteriorated. The stores are too narrow. We have proposed to invest in upgrading, renovating, and expanding the market, but so far there have been no plans." KII, Market manager, Vietnam.

These challenges were also applicable to markets run by the public sector, where funds for reforms had to be obtained through centralized government expenditure that were difficult to obtain.

Infrastructure reform was different for the informal sector, whose legal status varied by country. In Vietnam, informal markets were usually temporary, small markets and corner markets under the management of the communal authorities and sometimes without operating licenses, although vendors are allowed to trade in these markets and have to pay market fees daily. Like Vietnam, satellite markets or *talipapas* and ambulant vendors in the Philippines are temporary and they do operate without official licenses. However, as they trade only within the vicinity of the market and do not directly occupy market stalls, they are not subject to pay any market fees. In Kenya, informal markets are operated by private stakeholders but biosecurity measures are overseen by the government.

#### 3.3. Space and cleanliness

The modernization narrative also emphasized a different set of primary concerns about risk related to security and economy compared to the framing of risk in biological and health terms. Market hygiene was conceptualized through notions of cleanliness and

space (See **Figure 3**), both of which were linked to the geographical location of a market. Remote, rural markets in the political periphery were much less a target for modernization policies – infrastructural reforms and biosecurity improvements - than urban centers.



## Figure 3: Photos of wet markets vendors and animal storage: Kenya (A and B), the Philippines (C and D) and Vietnam (E and F).

The last few decades have seen many improvements to the cleanliness of markets. This was frequently discussed in reference to spatial and building renovations; for example, spacing between stalls, cemented floors, pulley systems for slaughterhouses, slaughterhouse refrigeration and better security to prevent theft. Improvements in the

physical aesthetics of a market was believed to precipitate a culture of cleanliness with regular routines for sweeping, garbage disposal, and, in urban markets, disinfection (spraying chemicals, soaping and scrubbing). Changes in management as well as the relocation of a market away from traditional urban locations - which were often more crowded – was viewed as a straightforward way to transform a market. When asked what improvements they would prioritize, most local market stakeholders emphasized building and spatial reorganizations as the main priority. In our urban market site in Manila, Philippines, these improvements were initiated after the market was privatized and key informants believed that building renovations, new management, security guards and closed-circuit cameras, and increased rental fees had improved inspection and food safety rules. In Vietnam, new markets were planned with new hygiene rules that spaced stalls and reorganized the market according to regulations that separated the aquatic zone, poultry slaughtering area, fresh meat area, vegetable and tuber and fruit area. In Busia, Kenya, building markets away from residential areas, fencing markets to keep out dogs and ensuring that all the workers wore full protective clothing were the main biosecurity improvements cited by market stakeholders, while the main priority for the market vendors was to improve sanitation and construct new stalls due to an increase in population.

#### 3. Local livelihoods, restrictions and politics

A third and final narrative centered on how local livelihoods and socio-economic practices conflicted with the goals of biosecurity and modernization. This called into question the appropriateness of biosecurity measures, including punitive bans and policies, the importance of cultural heritage and the ways in which local politicians could be mobilized to support market stakeholders against veterinary public health advice as a mode of redress.

#### 3.1. The appropriateness of biosecurity measures

Certain biosecurity laws and measures were considered to be inappropriate given local socio-economic conditions. A list of policies mentioned by key informants is provided in **Table 6**. Many country policy frameworks were revised after the Avian Influenza outbreaks in the mid-2000s in all three countries, reflecting the tendency for countries to adopt idealized global standards and norms. Market workers viewed many as a hindrance and annoyance, while veterinary inspectors acknowledged that some were not

implementable due to gaps in infrastructure. According to government informants, lack of funding and the fragmentation in coordination mechanisms between local departments, agencies and organizations was the main problem. For example, on-site slaughter is widely practiced in all countries despite it being officially banned in Kenya and Vietnam, creating a legal grey zone. Slaughter practices often prioritize speed over protective wear, partially due to the fact that such material is not available but also because the act of slaughtering and processing meat is done in the heat. In the Philippines, we observed many workers without T-shirts, wearing jewelry such as metal bracelets and rings, and vendors moving freely between exchanging money and handling fresh meat displayed at their stalls with bare hands despite policies mandating workers in wet markets to observe good personal hygiene and the use of personal protective equipment like gloves. In Nairobi, workers did not like to wear gloves: "We don't like using gloves as they are not good to handle meat, they are slippery and cause one to work at a slow pace" (Informal interview, male slaughterhouse workers Local Terminal market 1, Busia). It is difficult to enforce constant hand washing at the markets, in the bustle of the market where perceptions are orientated by notions of freshness and natural social exchanges.

Kenya	Vietnam	Philippines
Commercial chicken farming must have at least five acres of land All livestock (including chickens) should be killed in a slaughterhouse	Veterinary laws ban the sale of live animals at wet markets and require all livestock to be killed at slaughterhouses.	The Local Government Code devolved the regulatory functions of national agencies to the LGU Lower tariffs on imported pork products

Table 6: Policies believed to be inappropriate and/or harmful by key informants\*

\* This is not an exhaustive list of examples.

Workers also regularly circumvent rules and regulations as part of their business practices.

"Frozen meat, ideally, is prohibited from the wet market. If the [...] vendor is insistent on selling frozen meat, one of the requirements is to have a freezer. [...] because there are times that when you buy frozen meat, it's boxed but frozen. Then you will just see the box is just under the table, not in the freezer. Because when that thaws out, you would recognize that the consistency of the meat is different. You wouldn't know that when it was slaughtered, it had bacteria and when it was frozen, the bacteria were also frozen [...] It's still one of our problems. Controlling it." KII, Female, Veterinarian, Provincial Veterinary Office, Philippines

"Blood that comes directly from the veins of animals is used for making "mutura", The rest of the blood is directed to blood tanks. We do not recommend people to take blood out of the slaughter house. It can be contaminated and cause some

*diseases. People who take blood do so without the meat inspectors consent "* KII, Male, Meat Inspector, Nairobi, Kenya.

"After the chickens and ducks are slaughtered, I will sell offal to the catfish farmers in the village. Everyday, my slaughterhouse has about 20-30kg of offal. Chicken and duck feathers are sold to collectors for processing. Wastewater and the rest are poured down the drain, from this drain will lead directly to the irrigation ditch in the field." Market vendor, Vietnam

Parts from slaughtered animals are used for different purposes, such as the bile, hooves, omasum, horns, tails, bones, discarded meat and blood. In the Philippines, pig's blood is often used for a notable Filipino dish called *"dinuguan."* In one of the slaughterhouses in Kenya, we observed bile being drained into a container and someone collecting the discarded blood for later use. In Kenya, several products such as bile, omasum, and gall bladder stones are sourced by the Chinese for export in other markets for medicinal as well as aphrodisiac purposes.

"There were some waste materials which were initially not being utilized but now they are sold e.g., eye balls, penises and small pieces of meat that fall on the ground and there are traders who are buying them. There seems to be markets outside the country. We regard them as inedible but we don't know what they are using them for. The ones collecting the small pieces of meat that fall on the ground say that they need them for dogs and pigs but we are not sure and they might end up being consumed by people". KII, Female, Veterinary Officer, Kenya

In Vietnam, veterinary laws require all poultry to be killed at slaughterhouses and not at wet markets. Vendors at temporary and roadside markets, outside the reach of veterinary inspectors, regularly carry out public slaughter. A poultry seller in Nghia Tan market, Vietnam, complained:

"Since it was forbidden to slaughter livestock and poultry at the market, the number of customers has decreased markedly. Meanwhile, the slaughter of poultry at temporary markets is common. Poultry vendors at the temporary or roadside markets do not have to pay taxes and fees for market management. The sanitary conditions when slaughtering are very simple and unsecured, but they still do it without any competent management." Informal interview, female poultry seller, Vietnam

To ensure that meat is freshly slaughtered and to avoid the high costs of formal slaughterhouses, makeshift slaughterhouses are arranged near market premises, usually small shacks with simple feather pluckers and pots of water to wash the poultry after slaughter. Here, poultry are slaughtered directly on the floor and by-products after slaughter are put in open containers and sold to fish farmers. Wastewater in the slaughtering process without any treatment step is discharged directly into temporary ditches to irrigate adjacent agricultural fields.

#### 3.2. Punitive and harmful consequences of market rules

The discrepancies between policies on the books and real-world conditions were believed to create ambiguities in policy implementation that contribute to enforcement of punitive bans and excessive punishments implemented inconsistently. These are ultimately viewed as harmful especially for smallholder farmers and the informal food sector. In Kenya, this meant that many vendors are not supportive of government policies, and this distrust and conflict was believed to have negative effects on food safety. While some civil society groups (e.g., World Animal Protection) do conduct some consumer education about food safety, there was believed to be very little if any education and facilitation and engagement with market stakeholders. Kenyan stakeholders believed that this reduced compliance and drove clandestine activities in the livestock value chain.

"Unfortunately, some of the strategies that come out are "lets ban what the vendors are doing" without providing practical alternatives. The private actors claim that if there are no incentives, they are not willing to innovate and adopt. This is the mindset we need to change so that we don't focus only on the law but on incentives. e.g. the poultry farmers slaughter at night when there are no inspectors and then they transport the meat at 3am to the markets. So we will continue to play that hide and seek game". KII, Male, International Organization, Kenya

"People know that is it prohibited to trade threatened species. [...] Heightened enforcement will only serve to bring it underground. True, it's already underground now anyway in major areas." KII, Male, Policy Specialist, International Organization, Philippines

This also extends to the clandestine sale of wildlife on the 'black market' or "shadow selling." This was widely acknowledged in Kenya, where the clandestine sale of wildlife meat (Zebra and impala in Nairobi) mostly sold in informal settlements and related to poverty. In the Philippines, the wildlife trade at Rio Tuba is similarly conducted in "the shadows", and vendors resorted to hiding the wild boar meat sold at their stalls among the beef at their stalls, which is comparably reddish in color, in order to disguise its presence from regulating authorities. Poachers receive orders from their "*parokyano*" (loyal customers) or consortia by middlemen, and are also reportedly using social media including Facebook marketplace according to a wildlife law enforcer with the Department of Environment and Natural Resources Philippine Operations Group on Ivory and Illegal Wildlife Trade (Enano, 2019). Wildlife rarely ends up at wet markets since there is a general awareness among the Filipino population that the indiscriminate trading of wild animals and wildlife is prohibited.

*"Although you don't see it in the wet markets of Palawan, it is happening. It is happening by text, by cellphone, by word of mouth within the province."* KII, Male, Official, Council for Sustainable Development, Philippines.

"Wet markets are not places to sell wildlife meat [but] people still purchase it because it is cheaper. This value chain was affected [by the lockdowns] but as

long as the demand is there people will find a way to sell their wild meat. People will communicate and do it in the black market. Health risks are even increased when people go underground". KII, Female, Researcher International Institution, Kenya.

#### 3.3. Threats to market culture and competition

The building renovations that helped improve market cleanliness and biosecurity were viewed, by some market sellers and workers, as "both a blessing and a curse." They precipitated anxieties, fears and uncertainty about the future since they came alongside new malls and supermarkets that have emerged in the urban landscape and compete with the traditional market economy and was seen as a threat to markets as embodied manifestations of cultural heritage. In many local contexts, markets have a unique role in social life where culture (recipes, health advice, religious practice) is preserved and preformed; they are sites for jobs, the exchange of money and friendships often located at the historic center of a town, city or village. These sentiments were invoked to explain the threat of modernization, which drew customers away and threatened the traditional social bonds that linked vendors to their clients and supply chains. There were fears about nepotism and monopolies through market relocations and renovations, especially in stall allocations for new markets. New technologies, such as automated systems and digital payments, were also discussed as offering new opportunities to reduce contact between carcasses, customers and workers in biosecurity terms but there was also an acknowledgement that technology could exclude some market stakeholders and impose greater barriers for the informal sector to earn a living by occupying boundary areas outside current surveillance and monitoring.

#### 3.4. Local collective action and political forces

The interests of market vendors were a continuous negotiation at the local level to protect their interests through collective action. For example, a popular policy in Batangas City, Philippines, prohibited the sale of stalls to individuals with the intention of renting them out to other vendors, preventing middlemen from dominating stall rental opportunities. In response to fears that their market could be closed down by authorities, traders in Kenya organized themselves to address market cleanliness and hygiene and noted that this was done because the county governments did such a poor job in garbage collection. Markets also have internal issues to address. For example, in Vietnam we found conflicts between market vendors and informal vendors who sell their goods at the front gate of a market. The latter often attract many customers but do not pay fees and present a challenging situation for management boards. In the context of decentralization reforms in all three

countries, local government plays a pivotal role in market management and regulation for services and facilities. In the Philippines, they are the main regulatory body of wet markets while national agencies will only serve to support and provide technical assistance towards becoming "*self-sufficient and self-reliant*." Interestingly, it was stated that the vendors are unaware of specific policies and instead, have a market master who explains the local ordinances, who in turn, receives memos from city hall. In addition, decentralization of agricultural policy to the local level resulted in the LGU being "overwhelmed" and overly influenced by local "*political considerations*," (instances where agricultural positions are not filled up for "*savings*"). In Kenya, key informants also stressed that market reforms frequently did not adequately consult experts and communities.

"There is funding for the construction of new markets but we were not consulted when they were designed so the design of the markets was not optimal. The departments do not know their roles and because they are many and we don't have a platform for sharing what we do it is hard to solve issues and work well together.." Male KII, Public Health, Busia, Kenya.

*"In terms of infrastructure, the new market that is under construction is small. The new market can only be good for retailers and not wholesalers because there is no parking place for vehicles."* Informal interview with fish traders, fish market, Busia, Kenya.

Wet market reforms also intersected with local political interests. Because people, especially ordinary citizens, congregate in wet markets on a regular basis, politicians vying for positions of power and leadership, whether at national or local levels, make sure to visit the wet markets to woo potential voters. Politicians often control the budget allocations and use issues related to wet markets for political mileage. New mayors were mentioned as turning points in the cleanliness of a market. Local politicians can also interfere with efforts to close an unhygienic market to gain support from the public. In Nairobi, for example, there have been plans to build a modern poultry slaughterhouse since 2015 and this has not happened due to bureaucracy, funds mismanagement and a lack of proper coordination across sectors. The constant changes occasioned by political interference of county officials in Nairobi also contributed to these delays as every officer wants to start his or her own project for political mileage.

"For example, in 2015 we lobbied for the construction of a modern hygienic slaughter house for chicken, land was allocated but we have never been showed the land. We don't know if the land was grabbed or if it is still available. We even had proposed a public private partnership for the construction and management of the slaughterhouse but this has never moved forward due to administrative challenges". Male KII, Public Official, Nairobi County, Kenya.

Politicians also have an interest in maintaining the status quo in order to avoid destabilizing market vendor interests, which often involves opposing market closures directed by veterinary disease policy and regulations. In some counties in Kenya, veterinarians have ordered the closure of slaughterhouses due to a disease outbreak only to have county elected officials reopen them to gain political clout and addressing popular anger and concern about livelihood and food security concerns.

"Conflicts between stakeholders are always political e.g., the county director of veterinary services is the one supposed to institute a ban or declare an outbreak and close a wet market but when he does it as per the law the political class who are his seniors try to overturn the decision or want to close the market themselves for clout so we are always balancing the politics and the profession. Going against the politicians can even lead to loss of employment and transfer from one station to another and in some cases redesignation or indictment. When markets are closed due to disease threats vendors will hold demonstrations and often the political class will listen to them so such tensions do exist". KII, Male, Veterinary officer, Busia, Kenya.

## SECTION 2 The effect of COVID-19 pandemic lockdowns on wet markets and food systems in Kenya, Philippines and Vietnam

A second component of the project was to explore the impact of COVID-19 pandemic policies on wet markets. This second section of the report presents our data on this topic in four sections. The first describes the various restrictions that were imposed on wet markets during the first two-years of the pandemic (2020-2021) while the latter three sections discuss the effect of these restrictions on: food supply and prices; consumer behavior; and market livelihoods. **Figure 1** provides a graphic representation of the interrelationships between pandemic restrictions, food supply, demand, prices and the health of the wet market economy. We discuss these issues with a particular focus on animal sourced foods.



Figure 1 Interrelationships between restrictions, effects on market economics and livelihoods

#### 1. COVID-19 pandemic restrictions at wet markets

We found that restrictions at wet markets were generally divided into three types: 1) behavioral restrictions, 2) movement restrictions and 3) quarantines and closures (Table 1). Below we summarize the movement and closure restrictions; we focus on the latter two categories since these were the most important in influencing the socio-economic impact of the pandemic on market sellers and customers.

Table	1:	Pandemic	restrictions	at	wet	markets,	identified	in	the	3	case	study
count	ries	;										

Type of pandemic	Interventions*
restriction	
Behavioural	Mandatory face masks, face shields, and gloves; washing and disinfecting requirements; mandatory vaccination; no hand shaking; disinfecting sales areas; requiring customers to wash hands; no spitting; more frequent garbage collection.
Movement	Social distancing; curfews; transport restrictions; shopping voucher systems during lockdowns; greater spacing between market stalls; seat arrangements; limit visiting time; avoiding the area if sick; body temperature checks; testing requirements; designated entry and exit points; medical declaration forms.
Closure	Lockdowns; closures if COVID-19 cases are reported; closures if the market does not abide by the pandemic restriction rules.

\* This table summarizes all of the various types of interventions used in the 3 case study countries.

#### 1.1. Restricted access to markets

Restrictions from 2020-21 placed barriers on people's access to markets. In both Vietnam and the Philippines, this included a "one-entry, one-exit policy" as well as coding schemes, using odd-even numbers or surname letters, to allow residents and vendors of specific neighbourhoods to visit a wet market only on assigned days (1-2 times per week) for a limited amount of time. This lasted for more than a year in many places, with some restrictions gradually eased and removed over time. In some urban areas in Vietnam, food could only be ordered by phone or internet during the lockdown period in 2020 and again in 2021. No restrictions were implemented in Kenya on market access. The ways in which transport restrictions affected supply and demand are discussed below.

#### 1.2. Closure of markets

In all countries, markets were closed during lockdowns, more common in Vietnam and the Philippines. In Kenya, a 2-month lockdown occurred from March 25<sup>th</sup> to July 7<sup>th</sup> 2020 and a second 1-month lockdown from 26<sup>th</sup> March to May 1<sup>st</sup> 2021. In both cases, markets reopened with minimal restrictions in the formal sector. In Vietnam, an initial lockdown in the whole country occurred from 1-30 April 2020, followed by four waves of regional lockdowns according to the pandemic situation. All markets were closed in Ho Chi Minh

City and most of the Southern provinces during the most severe lockdown from May-Sept 2021, which corresponded with our fieldwork. At this time, Hanoi was divided into 4 different risk zones with shifting levels of restrictions depending on local epidemiological data. In the Philippines, after roughly one month of lockdown wet markets were excluded from the complete shutdown regulations starting in April 2020, which ran for more than a year, and a skeleton workforce was allowed in wet markets as long as they adhered to behavioral restrictions. Unlike in Kenya and the Philippines, staff in Vietnam had to be present at the market 24 hours a day during the time of lockdowns.

# "During the time of social distancing, our staffs must bring their stuff to stay at the management board's headquarters. We have to split up to guard the market 24/7." Market manager, Vietnam.

In both Vietnam and the Philippines, market closures continued in 2021-22 depending on epidemiological factors such as community transmission thresholds and positive cases identified at the market. Detailed COVID-19 prevention plans were put into place and the police and army were used to inspect, supervise and sanction violations of pandemic prevention measures at markets. In Vietnam, an outbreak color map determined the level of restrictions imposed on a community based on risk profiles. A nation-wide Alert System for community quarantine was also implemented in the Philippines in late 2021.

Informal markets and sellers in all three countries faced additional difficulties. In Vietnam, temporary markets and sidewalk markets and vendors were forced to close during social distancing periods. Informal vendors were initially prohibited to operate in the Philippines during the early phases of the pandemic but rolling carts and satellite markets were later welcomed as a way to decongest wet markets. In Kenya, most informal markets were not closed or targeted because of food security concerns, especially for the urban poor, although some livestock trading markets were closed because they failed to meet social distancing standards and the police were used to enforce COVID-19 regulations in the formal sector including butcheries.

#### 1.3. Perceptions of pandemic restrictions

While some vendors expressed concerns about COVID-19, the economic consequences of restrictions were seen as a far greater danger than the virus itself. We found different levels of scepticism and criticism about pandemic restriction policies, with stakeholders from Kenya (with the lowest case and mortality rates) and the Philippines more vocally critical of government policies compared to Vietnam. Criticisms in the Philippines varied depending on epidemiological situation and location of the market. In general, some believed the markets were a COVID-19 risk because of the large crowds, while others stressed that the open air as well as the various anti-epidemic measures undertaken made markets a low-risk place. Compared to Kenya and the Phillipines, wet markets continued to be viewed as a high-risk area for COVID-19 transmission throughout 2020 and 2021 in Vietnam. This epidemiological classification meant that lockdowns, closures and social distancing policies were more strictly enforced by local leaders and market managers, who aimed to control the number of infections in the market and surrounding area. Interestingly, we found that market staff in Vietnam believed that markets that remained open were considered to be a "lucky blessing" and not a result of anti-epidemic efforts per say - chance and randomness were invoked to explain how the virus spread and why some markets were closed and others open.

Many argued that the policy response at wet markets was very sudden and decisions made in a top-down manner, often by the Ministry of Health, with very little involvement from other sectors and market stakeholders. In the Philippines, the initial implementation of the restrictions was largely viewed as inconsiderate to the food system and agriculture situation in the country. A key informant in the Philippines, referred to the beginning of the pandemic as: the *"wild, wild west…Monday, there would be a wild restriction… Tuesday, suddenly [stores] were allowed to open."* We found relatively little media debate about calls to ban live animal markets, relative to concerns regarding the alleged source of the virus from a live-animal market in Wuhan, China; most media coverage focused on the effect of market closures on food security and local livelihoods. Although transactions across the value chain, from farm to fork, eventually eased as restrictions were relaxed, stakeholders felt that many of these initial challenges and errors could have been avoided with greater communication between national agencies, local governments, and wet market stakeholders. Similar criticisms were found in Kenya.

"The closure of livestock markets was mainly for disease control. We need to think about how all our actions are going to affect wet markets holistically so that we don't focus on one thing at the expense of another." KII, Female, Researcher International Institution, Kenya.

#### 2. Supply chains, transport and prices

Lockdowns caused a ripple effect across the food supply chain. This was more severe in Vietnam compared to the Philippines and Kenya. In Vietnam, many suppliers and slaughterhouses had to suspend production or apply the "3-on-site" model (eating, sleeping and producing at the market) which created major challenges for drivers to transport their goods. Goods had to be guarantined and disinfected before entering the market and many traders withdrew due to difficulties in moving between provinces, something that was compounded by labour shortages as workers returned to their rural hometowns. In an effort to address this, the "green channel" system was established in July 2021 for inter-provincial and inter-regional transport in Vietnam; although there remained ambiguity about what was and was not "essential goods", leading businesses to be confused about licensing conditions. The Hanoi Department of Transport rejected 78% of applications (of 24,572), with 8,579 still pending (in late 2021), causing a shortage of essential goods, especially food. In addition, some localities applied a mandatory 14-day medical isolation period for people returning from epidemic areas, leading to a shortage of truck drivers. Transport chains were also impeded by traffic checkpoints and changing local regulations. For example in Can Tho province, there were cumbersome testing requirements that demanded that transporters change drivers or unload goods to another vehicle with a license to circulate in the city, despite negative test results, causing traffic jams and congestion of goods transported in and out of the city.

Disruptions to the food system still occurred in the Philippines but were not, on the whole, as severe. The early community quarantine guidelines explicitly stated that the movement of delivery trucks "shall be unhampered," and was supported by a simultaneous Department of Agriculture memorandum that established the "Foodlane" system—a system that ensured the seamless movement of agri-fishery products through truck ban exemptions, ease of passage at checkpoints, foodlane routes, and assistance during product delivery. Transport restrictions were much less strict in Kenya, although curfews and movement rules disrupted the ability of some animal traders to transport animals for

slaughter in early 2020 and again during the second lockdown in mid-2021.

## Text Box 1: Food supplies and the closure of Long Bien wholesale market, Hanoi, Vietnam

Long Bien market is the largest market in Vietnam, functioning as a wholesale and transshipment market to other retailers in Hanoi and the neighboring provinces. It is home to about 1,108 business premises with thousands of products, mainly agricultural products (vegetables, fruits, seafood and dried agricultural products). It normally operates 24/7 hours and is a located at the gateway of the Centre of Hanoi City, the Capital of Vietnam. The Long Bien market was closed for nearly two months in 2021 because of two cases of Covid-19 infection identified at the market. The market management board, under the direction of the People's Committee of Ba Dinh district and the professional advice of CDC Hanoi, assisted traders to move their goods out of the locked market. All people, vehicles and goods entering and leaving the market were sprayed with disinfectant. The market management board also issued referrals to traders so that they could switch to other markets to do business while the Long Bien market was closed. However because the closure of the market occurred very suddenly, vendors were forced to sell their products cheaply, sometimes at the roadways and sidewalks in residential areas.

Transport issues were widely considered to have been the primary reason in all three countries why producers faced production losses; there were reports that animals grew too old to sell and vegetables rotted at the farms due to the prevention of delivery trucks bringing products to market. In Dong Nai and Binh Duong provinces in Vietnam, there were 500,000 surplus quail eggs every day during lockdown as well as millions of poultry eggs. A workshop we attended, organized by *The Labour* newspaper on 14 September 2021, found that: *"In Dong Nai province, for livestock, the total number of chickens is 20 million and currently there is a backlog of 200,000 white broiler chickens, 80,000 ducks, 6,000 goats."* During the 2021 lockdown in Vietnam, market stakeholders reported to us that the price of fresh food items such as meat and fish, and also green vegetables, increased by 2-3 times in many places.

Similar challenges occurred in the Philippines; as mentioned by a labor group representative: "There were LGUs [Local Government Units] that [...]permitted [the farmers to sell their products] but most of the people were confused and there was nothing else they could do, so a lot of the crops died." Rules at the beginning stages of the pandemic in the Philippines stated that only a single member of a family could leave the household at any given time; however, this created difficulties for farmers and sellers. Local hog raisers were unable to transport their livestock to the market alone, particularly women, and were either forced to sell their animals at lower prices, as they could no longer afford the overhead expenses incurred from keeping the animals at their farms for longer periods of time, or donate them as part of the relief goods to be distributed to the community. Data from the National Economic and Development Authority (NEDA) showed that 94.3 million pesos (~\$1.9 million USD) were lost from the agriculture sector from unsold produce in the Philippines during the first Enhanced Community Quarantine (ECQ) from mid-March to end of May 2020 alone. Food prices, however, were not only affected by transport and supply challenges but also the increase in commodity prices such as oil and feed and the overall reduction in demand. In the Philippines they were also influenced

by a devastating, concurrent epidemic of African Swine Fever (See Text Box 2).

Text Box 2: African Swine Fever and the impact of lockdowns on the pork sector in the Philippines

In the Philippines, COVID-19 lockdowns were implemented concurrently with animal lockdowns, specifically piggeries, to address the African Swine Fever (ASF) epidemic that had started in September of 2019, six months prior to the declaration of the pandemic. This devastated large and smallholder farmers alike, and was believed to be the most influential factor in the rising prices of animal protein. The rise in price of pork, the most commonly consumed protein in Filipino households, as well as the rise in prices of oil and feed, caused a chain reaction which led to the subsequent increase in the price of chicken and fish. The spread of ASF encouraged the government to "dump" imported frozen meats into wet markets and food retailers across the country in order to compensate for the lessened production of livestock, which was opposed by the representative organizations of producers, such as the Samahang Industriya ng Agrikultura (SINAG) (Rivas, 2021). The lockdowns added challenges to the recovery of the pork sector. In June 2020, Iloilo City in the Western Visayas region of the Philippines was only able to ship around 1,000 heads of live hogs to the island of Luzon but by November, they were already able to ship around 16,000 heads (Sornito, 2020). The impacts of the ASF epidemic and supply consequences brought by the pandemic restrictions were still felt in 2021, with pork and chicken prices rising. However, in January 2022, the country's food prices remained steady despite the spike in oil prices and weather disturbances.

In Kenya, transport challenges, movement restrictions and closure of schools, hotels and bars impacted on food trade in both informal and formal markets during both the 2020 and 2021 lockdown. The sale of meat takes place in the evenings in bars and restaurants as well as for home use. Traders reported to us that excess stock either went to waste or was sold at a very reduced price. Thus, when curfews were in place many traders were not able to sell as people stayed at home. In spite of these difficulties, the traders were hesitant to increase the prices because of low demand. In some cases the prices even went down from Ksh 350/kg to Ksh 280/kg in Nairobi due to very low consumer demand. Availability of new livestock stock was also affected:

"Farmers at some point could not access day old chicks and with that, farmers were not able to restock their farms. Hotels were not operating so farmers lost market for their poultry. It became a challenge all around for the farmers and all were affected." Key Informant, Male, International Organization, Kenya.

Our research suggested that pandemic lockdowns may have had effects on the supply and transport of wildlife and wild meats in the Philippines, but not in Vietnam and Kenya. A report by PanNature (2021) found no change in wildlife trading and selling in Vietnam during the pandemic, which was similarly echoed in our fieldwork. However in the Philippines, vendors in remote Palawan Island noted that the tighter restrictions at the market had led to a decrease in the sale of wildlife, also due to recent changes in city administration and a stronger national government push against wildlife trading. According to staff and vendors at Arranque in Manila, the current mayor had imposed stricter punishments for those caught engaging in the sale or trade of wildlife. This was welldocumented in media reports: Hallare (2020) reported that two stalls were caught selling endangered myna birds at the Arranque Market were closed down, and the helper involved in the sale was charged with a fine of 10,500 pesos – a hefty price for a market seller. However, we also heard rumors that the financial strain brought by lockdowns had led some locals whose livelihoods depended on tourism to have resorted to poaching and illegal selling of *'tamaraw'* or the Mindoro dwarf buffalo meat in the province of Mindoro Oriental, outside our local locations.

#### 3. Demand and consumer behavior

The pandemic changed consumer behavior by limiting access to wet markets, especially the cumbersome system of entering markets in Vietnam and in the Philippines. Signing a medical declaration, taking temperature readings, and disinfecting hands meant that many people were afraid or reluctant to go into formal wet markets and would rather stop at roadside stores, satellite markets, or supermarkets. Erratic opening times also contributed to this, with many markets in Vietnam only open for 2 hours in the early morning or evening. In many markets, this reduction in demand was still emphasized in our visits to markets at the end of 2021 and also influenced the way people shopped, considering the ongoing restrictions.

*"I still go to the market to buy food every day, but only at the stores near my house. I just buy foods I need and come back home quickly, not spend time talking to other people when buying like before."* Female shopper, Hanoi, Vietnam.

*"The people who patronize our wet market are now very limited, because they put up fences around the wet market".* KII, Female, vendor, Philippines

Customer behavior was shaped by the nature of pandemic restrictions and whether or not wet markets were deemed to be an "essential service." In the Philippines, markets were intentionally kept open by local government when supermarket chains and malls were closed. The Omnibus Guideline on the Implementation of the Community Quarantine by the IATF indicated wet markets as "essential retail trade and service establishments." which were thus allowed to operate even during the enhanced community guarantine (ECQ) - the strictest classification of community guarantine. In Vietnam, this situation was reversed and supermarkets were kept open while wet markets were closed. In Kenya both supermarkets and informal markets were kept open with the only restrictions limited to hygiene and social distancing measures. Hence in the Philippines, wet markets attracted a larger share of the food purchases, although this was tempered by an overall reduction in overall meat purchasing due to the economic impacts of the pandemic: "Instead of buying one kilo of fresh meat, they just buy half a kilo, but still, fresh meat." (KII, male, labor group representative, Philippines). In Vietnam, many people were not allowed to leave their homes during the various regional lockdowns and had no income, with lasted 2 months during the harsher lockdowns in Hanoi and Ho Ming Minh in late 2021. Markets that reopened after lockdowns lost a large number of traders and customers, as some big businesses refused to come back to trade at the Long Bien market, which affected the market's revenue.

Normally, wet markets in all three countries were believed to cater to all socio-economic groups but are especially important for those of lower socioeconomic status. Consumers prefer wet markets because they value fresh products (especially meat), the ability to choose specific products (e.g., a specific cut of meat at "pocket friendly prices"), and

because they are places where social networks intersect with livelihoods and business (See **Text Box 3** for an example of the *suki* system in the Philippines). Changing consumer behaviors during the pandemic were shaped by socio-economic status, with middle and wealthier classes moving towards more dried and frozen products in supermarkets, reducing consumption of fresh products. This occurred in all countries, and was facilitated by a shift on online shopping through large establishments like supermarkets but also, in some cases, through social media.

"Everything is online now. When you buy online, you just click, order, then they deliver directly to your house. This is what I've also been doing for the past year." KII, Female, vendor, Philippines

"Online shopping was enhanced and people were selling, buying and delivering animal sourced foods..." non-contact market" through sending "boda boda" (motorbike) riders. They would advertise on online platforms and sell it there to their friends and neighbors." KII, Male, International organization, Kenya

"Some of the customers did not want to get into the market. They call us or order goods via the Zalo app. We deliver to them either at home or the market's gate" Interview, market vendor, Vietnam

Most small-scale producers and market vendors, however, lacked the capacity and access to digital infrastructure and, hence, were not able to adapt to online sales and e-commerce. Large producers were believed to have had more means to weather through the pandemic, having the capacity to adapt to new methods. Key informants believed the pattern of online shopping was likely to continue even after the pandemic in all three countries. Many informants felt that these online services were not direct competitors to wet markets since online services are usually for ready-to-eat, finished food products from restaurants, rather than for fresh, raw ingredients.

## Text Box 3: Cultural norms and economic practices at wet markets in the Philippines

The purchasing of fresh meat at wet markets is considered a "daily routine" for many Filipinos, especially lower-income households. Wet markets are viewed as a "pillar of the local community" (on par with churches, schools, and recreational areas), the geographical embodiment of cultural identities, and a place where social relationships, unique to informal food retail and built on trust through personal ties, are enacted. One such relationship that is prevalent in the Philippines is the "suki system," a concept referring to the loyal relationship between the vendor and customer, the vendor and the supplier, or between two vendors who exchange products within the wet market. The suki system is advantageous for customers as they can easily bargain for better prices, and they can be assured that the products are high-guality and safe for consumption. As mentioned by an informant: "There's that trust that what you are buying is not doubledead, hot meat, rancid, spoiled, putrid." However, the one-entry, one-exit policy and the odd-even scheme created challenges with customers, customers who otherwise had no means of communication with vendors chose to purchase from other vendors on the days they were allowed to visit the market, especially if their needs were urgent. This meant that some vendors have lost their suki or regular customers or have had challenges retaining them.

#### 4. Impact on livelihoods and psychosocial wellbeing

Our research found that pandemic mitigation efforts had substantially negative effects on the livelihoods and psychosocial wellbeing of market vendors and sellers as well as transporters, traders, butchers, day laborers, and the farmers who depended on them. Many people were deprived of their main or only source of income for many months, lost their savings and business assets, were laid off their causal jobs and suffered stress from the uncertainty that surrounded when businesses would be allowed to reopen. In Vietnam, most of traders we interviewed in late 2021 said that the amount of goods they sold had decreased by 40%-50% compared to the time before COVID-19. For example, the owner of a cow slaughterhouse in Dong Anh in Vietnam emphasized that before the pandemic, his slaughterhouse sold out an average of 20-25 cows/day, however, in late 2021, his slaughterhouse only sold out 5-7 cows/day. In Busia, Kenya, one butchery owner explained that before COVID-19, he could sell over 40 kgs of meat at his butchery, however, during the second lockdown periods in 2020 and 2021 he sold less than 15 kg a day. Some of the meat ended up going bad due to the reduced sales, and his business was affected negatively.

#### Text Box 4: The effect of movement restrictions on livestock traders in Kenya

In Kenya, livestock trade encompasses a lot of people from all socio-economic classes such as animal producers, animal traders, vendors, transporters, butchers, flayers and cleaners in the slaughter houses. Animals for slaughter are purchased and moved across the entire country and often at night. During the COVID-19 pandemic movement restrictions including curfews and lockdowns were instituted (First lockdown 25th March -7th July 2020) and (Second Lockdown, 26th March - 1st May 2021) which affected the sale and production of animals and meat all over the country. Animal traders were unable to transport animals for slaughter and this caused many to close their businesses and jobs were lost. Animal traders are often middle class while others like flayers (those who strip off the skin of animals), off-loaders (workers who load animals from vehicles), and cleaners are in the lower social economic class and were also severely affected. Many traders sold animal products to large establishments including bars, schools and hotels and they lost business as a result of pandemic restrictions. Since there was no prior warning that these measures (movement restrictions among others) would be instituted, traders were caught unaware and were unable to service loans and had to lay off their staff. The haphazard and unpredictable nature of these restrictions (movement restrictions among others) meant that all the actors were impacted continually over an extended period of time and it would take them a long time to recover. These impacts were felt in both the formal and informal sectors since the suppliers are the same to both informal markets and the supermarkets. With all these challenges the traders could not increase the price of meat, as demand was also low. All were affected including meat inspectors who got paid depending on the number of animals slaughtered.

We found that pandemic restrictions impacted people differently depending on socioeconomic status. The informal sector, which makes up the vast majority of the agricultural sector in all three countries, was often targeted with immediate closures, and was less likely to seek exemptions to allow their businesses to remain open. This included street and transient flea market-style vendors that congregated around formal markets to sell food or put their wares on wooden pallets on the ground. It also included small-time fishermen who were banned from fishing and selling. Backyard raisers who butcher their animals and sold the meat for profit to earn back the expenses spent on raising animals were disadvantaged in comparison to larger businesses who had access to industrial refrigerators and therefore were able to stock up and acquire enough supplies to continue selling during the pandemic. Many day laborers, including staff at slaughterhouses, were laid off due to reduced demand and economic activity. The effects of the pandemic on restaurants and hotels, many of which purchased products from wet markets, was viewed as particularly important for some market stakeholders. The pandemic also affected the animal trade network (see **Text Box 4** for a discussion of the impact in Kenya). In the Philippines, an informant from a private wet market chain surmised that sales from businesses such as restaurants comprised around 50% of the earnings of vendors at their markets, prior to the pandemic. A meat vendor in Nairobi, who specialized in selling a kind of sausage called "*mutura*" mainly sold to bar patrons, emphasized how he lost his clientele once bars were closed and his daily sales reduced to 5 kgs from 20kgs. Another trader stated:

"COVID-19 has affected our operations deeply. Our main customers are hotels and restaurants, their closure meant that we lost a lot of customers and businesses went down. Given that there were restrictions on livestock movement, it was hard for me because I get sheep from Narok county. However, we never stopped coming to the slaughterhouse, it is our source of income. When I slaughter sheep and I don't sell on that day, it losses weight and quality when I sell it the next day. That is a big challenge we face as meat suppliers. Some people even closed business during the pandemic." Informal interview, female, meat trader, Kenya

Local government and market vendors sought to adapt rigid lockdown restrictions in some circumstances to minimize the harm of restrictions on food security and local livelihoods. In the Philippines, they established "*mobile palengkes*" (rolling stores) and temporary satellite markets (*talipapa*) particularly in densely populated centers. In Arranque Market, vendors were allowed to display the cages of their animals for sale along the sidewalks of Manila, attracting attention from passers-by in an attempt to increase business for the market. A small number of market traders also benefited from pandemic restrictions due to the new market conditions, others were able to compensate for her financial losses by setting up a stall in front of their house and others actively broke laws and rules out of desperation – travelling through checkpoints at night, for example.

"There are a lot of people opening up their own stalls. [...] our highways are full of these newly opened stalls [...] it's just like a satellite market. And it's complete. There's pork, chicken, fish, beef."] KII, female, vendor, Philippines

"During social distancing, only people in Ha Vi village can sell poultry at the Ha Vi poultry market. Traders from other communes could not come there to trade. Many families have an income of 4-500 million VND per month. They not only sell at the market but also deliver poultry at the highway to their familiar customers who cannot have adequate required papers to enter the market." Interview, vendor, Vietnam

"People who were well known and connected benefited from this crisis. They would take many orders and supply meat to many butcheries and enjoyed the power of monopoly. Some people bought about 50 carcasses that weren't sold the previous day and and sold them at high prices in butcheries and thus obtained good profits". Informal interview, Male, Meat Inspector, Kenya. While some vendors expressed concern about Covid-19, the economic consequences of restrictions were seen as a far greater danger than the virus itself. In general, the difficulties in procuring supplies, combined with the lessened sales, resulted in huge financial blows to vendors at wet markets. Vendors at Arranque Market expressed the difficulties they faced due to the lessened volume of traffic at the market, with some unable to make a single sale on certain days. During our fieldwork in late 2021, vendors remained stressed about whether they would be able to recover the number of customers and we observed few customers on the day visits were conducted in late 2021. In Kenya, we heard reports of traders closing their businesses and some falling into mentally illness or hiding due to the loans they were unable to repay. One animal trader said that:

"There was a woman here who we know well and used to be a butcher. She owed people a lot of money because when COVID-19 hit she was not paid by the supermarkets she used to supply meat to. This money was in millions of Kenya shillings. She became mentally sick and the last I heard her husband told people that she had relocated to their rural home." Informal interview, Male, Animal trader, Meat market, Nairobi

A vendors' association representative in the Philippines was brought to tears while describing the difficulties vendors went through during the pandemic and expressed her thankfulness that she was able to save money before the pandemic hit. Others emphasized that they had barely earned enough to get by at the height of the pandemic restrictions. Most market stakeholders felt that the recovery from the pandemic had not yet occurred and that customers had still not recovered – see **Text Box 5**. They worried about the future of their livelihood and business.

"I tried to get the customers back, inform the regular customers that I have came back. During the COVID-19 outbreaks, goods are sluggish, but the fees are still the same, so our Trader Union are applying for support from the Government to reduce tax and rental fee. If you don't sit, you will lose capital, it's too hard." Interview, Seafood trader, Long Biên market, Vietnam.

#### Text Box 5: The perspective of market vendors at Arranque Market, Philippines

Registered and informal vendors both lamented the effects of the pandemic restrictions on the wet market in the Philippines. *Herlan* (a pet shop trader) stressed that sales remained slow in late 2021 compared to pre-pandemic levels. There are even days when he is unable to make a single sale. "*Malaki ang pinagkaiba*" (there is a huge difference) *Herlan* stated, with sadness, "*dati, siksikan ditto*" (it was so crowded here before). Another trader, *Nanay*, expressed similar sentiments, stating that vendors at the meat section lost out on a lot of sales due to the pandemic. In the midst of the exchange, an individual clad in a blue uniform approached *Nanay*, who promptly handed over a crisp hundred-peso bill from her box of earnings. The individual explained that she was a representative from one of the vendors' cooperatives at Arranque market; as a member, *Nanay* deposits her extra earnings from her stall in a savings fund collected by representatives of the cooperative. At the height of the pandemic, however, she recalled being unable to set aside any savings as she made just enough for her living expenses and nothing more. For stallholders such as *Nanay* and Herlan, whose families often depend solely on their earning at the market, the pandemic was a huge financial blow.

## 8 Impacts

#### 8.1 Scientific impacts – now and in 5 years

The project's anticipated scientific impact is two-fold: 1) It provides compelling evidence of the negative consequences of lockdown policies on wet markets during the pandemic. Once published in a scientific journal, this will form part of the broader debate about the costs and benefits of pandemic mitigation strategies and how such policies affect different segments of society. 2) It provides a unique analysis of how different wet market stakeholders understand and engage with biosecurity reform (three social narratives). Once published in a scientific journal, this framework may be used as a guide for future research and as a heuristic for scientific researchers and policymakers to account for the different social interests and perspectives of wet market stakeholders.

#### 8.2 Capacity impacts – now and in 5 years

The project involved the online training of two female research assistants in the Philippines who conducted the interviews and ethnographic research. It also included mentorship support between country PIs and a team of 7 university-affiliated social science researchers across different disciplinary specialities and across the 3 countries. All of our country research collaborators continue to work in the area of One Health, zoonoses and wet markets and we anticipate that the learning generated through this project will have benefits for future, ongoing work in this area.

#### 8.3 Community impacts – now and in 5 years

Our project may have substantial community impacts if the insights generated are used to guide policy and practice at wet markets in countries around the globe.

#### 8.3.1 Economic impacts

Our research findings on the negative effects of pandemic lockdowns on wet markets may help to shape future pandemic policies to ensure that disruption to food systems, agricultural producers and consumers is minimized. We expect that this would have substantially positive economic impacts especially for more vulnerable communities and women.

#### 8.3.2 Social impacts

Our research on the different narratives that shape biosecurity reform may assist researchers and policymakers better design, implement and evaluation future policies in wet markets in ways that limit or minimize negative effects especially to market vendors and agricultural producers. Our research helps to provide a voice to those involved in the wet market system in this policy debate.

#### 8.3.3 Environmental impacts

n/a

#### 8.4 Communication and dissemination activities

Two academic papers are currently in preparation and will soon by submitted to scientific journals. We presented the final results of the project at the Global Health Security Conference 2022 in Singapore (June 28-July 1, 2022).

## **9** Conclusions and recommendations

We have divided our conclusion into two sections, based on the two sets of results described above.

#### 9.1 Conclusions and recommendations

#### **SECTION 1 – Three social narratives influence stakeholder responses**

We found that three competing social narratives shape biosecurity reforms at wet markets in Kenya, the Philippines and Vietnam: health risks, modernization and local livelihoods. Appreciating the different reasons that stakeholder groups hold and experience these narratives may have important implications for the future of biosecurity investments and policy.

This project was developed to respond to global policy rhetoric in early 2020 that called for the banning and rapid reform of wet markets, together with greater restrictions in the wildlife trade. Many scientists, international agencies and governments framed this as an urgent priority to "prevent pandemics" (Aguirre et al. 2020; Lynteris and Fearnley, 2020; World Animal Protection 2020). And yet we found no evidence that these calls had any impact in our three case study countries. On the one hand, this is not surprising since policy concerns focused on rising COVID-19 cases. Many governments (e.g. Vietnam and the Philippines) continued to maintain strict non-pharmaceutical interventions and focused on scaling-up large vaccination programs starting in mid-2021. However there are other reasons. Our key informant interviews and rapid ethnographic fieldwork found strong discordance between the bio-securitized framing of wet markets as 'petri dishes' of novel viruses in need of urgent sanitization reform, even bans and closures, and the everyday lived experience and cultural meaning associated with wet markets. This fits with the work of other scholars, who argue that universal calls to eliminate wet markets homogenize what are diverse socio-economic systems used by billions of people around the world while also distracting from real solutions to multifaceted problems in the agricultural sector (Barnett and Fournie, 2021; Chuvileva et al. 2020). Wet markets are overwhelmingly viewed not as risky places that may cause a 'global' pandemic but as sources of local health, food, livelihood and social connection. Health concerns were expressed in terms of meat safety and food-borne disease, and related mostly to gaps in basic infrastructure that prevent sanitized slaughter and food hygiene. As found with other studies (Bukachi et al. 2021; Zhong et al. 2020), health risks were evaluated based on notions of freshness and related to inspection timestamps, on-site slaughter, local production, color and texture, and past food consumption experience.

Rather than viewing markets as site of novel pathogen emergence, government officials and national scientists were more concerned about local endemic food-borne diseases and trans-boundary animal diseases such as African swine fever and Avian influenza. This echoes findings from Scoones (2010), Hinchliffe et al. (2021), Bardosh (2016), Mwacalimba and Green (2015) and others who have argued that international agencies may over-emphasize pandemic concerns at the expense of other endemic health priorities, hiding the lived reality of small-scale producers and the informal sector. At a country level, national media also appear to over-emphasize the fear of global health crises whereas local health issues appear to receive less attention. Policies and capacity to improve local disease priorities in the animal sector was believed to be stymied by fragmentation and lack of funds but also confusion about specific priorities and the role of different agencies. Similar findings have emerged from other policy analysis studies (Okello et al. 2015; McPake et al. 2022; Lee and Brumme, 2013). Key informants called for 'more One Health' to address this but it was not always clear what this meant in practical terms.

Of course, those advocating for wet market bans and reforms as a means of pandemic risk mitigation do articulate specific risk practices that should be targeted – related to animal species, hygiene conditions, length of the value chain, etc (Grange et al. 2021; Lin et al. 2021; Wegner et al. 2022). The term 'wet market', originally linked to the melting ice used to preserve and wash floors from slaughter is a heterogeneous category (Lin et al. 2021); diversity is found within and between different markets, areas of a single market and different stakeholders across the formal and informal value chain.

There continues to be debate about the need, feasibility and consequences of wildlife trade bans for conservation and pandemic prevention (D'Cruze et al. 2020; Eskew and Carlson, 2020; Thuy et al. 2022; Wegner et al. 2022). Our research was exploratory and had only a limited focus on the wildlife trade; however our data suggests that reform efforts to limit exotic animals at formal markets have taken place over the last few decades and consumers are also more aware of existing wildlife laws. This suggests that the global rhetoric about the dangers of the wildlife trade and the need for blanket policies for pandemic risk may be overstated. From a novel pathogen standpoint, there is a need to better define 'high-risk activities', anticipate the unintended consequences of stricter biosecurity reforms and consider what type of risk mitigation is really possible given the inherent uncertainty in predicting disease dynamics for a low probability 'pandemic' event.

Interestingly, we found that wildlife rarely ends up being openly sold at many wet markets. Some of our study locations were well-known nodes in the sale of live wildlife but we observed very few wild animals available for sale. That said, clandestine sales are reported to still occur and we sampled a small number of markets. Additionally, it was clear that a transition is occurring from catching wildlife in the wild to the growing intensive animal farming of exotic animals. Intensive animal farming of exotic animals is an emerging industry, especially in Vietnam but also in the Philippines, with limited controls and law and veterinary oversight (Thuy et al. 2022).

While freshness was the dominant conceptual lens by which market stakeholders viewed and interpreted health, *cleanliness* was the dominant lens used to understand infrastructural improvement. In this sense, *cleanliness* helped ensure *freshness*. Markets reflected a local process of historical and socio-economic modernization and we found that most markets had undergone recent improvements in slaughter, transport and waste collection. The framing of markets as sites of *modernization* emphasized a different set of primary concerns about risk related to security and economy compared to risk in biological and health terms. Market hygiene was conceptualized through notions of cleanliness and space, both of which were linked to the geographical location and physical characteristics of a market (Bardosh et al. 2016). We found that costs and business forces were used to explain infrastructure gaps since large capital investments were required. Improving biosecurity was inseparable from general infrastructure and management improvements, viewed as part of environmental sanitation and alongside responsibilities of fire prevention and security.

When asked what improvements they would prioritize, most local market stakeholders emphasized building and spatial reorganizations as the main priority. This finding fits within some specific recommendations made by organizations calling for the separation of wildlife and livestock as part of a pandemic prevention strategy (Lin et al. 2021). However the history of past market reforms, which occur in ways that are not always favourable to market stakeholders, should provide a degree of caution less rapidly organized interventions cause negative consequences and are not sustainable. Many past reforms involve moving markets out of crowded traditional areas and come with fences, security, new stalls and cement – all of which make traditional markets look and feel more like a supermarket. Our study showed how modernization – viewed as "both a blessing and a curse" – was also associated with the consolidation of economic power and deterioration in cultural heritage and social bonds. Market vendors and sellers expressed anxieties about an uncertain future as new shopping malls and supermarkets continue to expand in the urban landscape, competing with traditional market economies. Although open-air markets are predicted to continue to be a main source of food, including in urban Africa (Hannah et al. 2022), this conflict will accelerate in the coming years (Figuie and Moustier, 2009).

Markets are sites of conflict between the interests of local market sellers and traders and the goals of biosecurity and economic modernization. One important issue we found involved laws and regulations banning animal slaughter at wet markets in Vietnam and Kenya that were strengthened due to biosecurity concerns about Avian Influenza that emerged in the mid-2000s (Nguyen et al. 2017; Connan et al. 2012). The discrepancy between such policy and real-world conditions (e.g. the lack of infrastructure for slaughter and the basic nature of the market chain) create policy ambiguities that were believed to contribute to punitive bans and excessive punishments implemented inconsistently at the local level. A large literature has explored the unintended consequences of biosecurity laws and enforcement on the livestock sector, questioning this type of heavy-handed approach (Miewald et al. 2015; Nguyen et al. 2017). And yet there is often a minimization of the biosecurity risks associated with modernized and sanitized market actors as well as an under-appreciation of how local practices in smaller-scale systems may reduce risk (Miewald et al. 2013; Stuart and Worosz, 2012; Nguyen et al. 2017). One result of this is an increase in animosity and distrust between vendors (concerned with securing their livelihoods) and veterinary and market authorities concerned with increasing biosecurity. There is some evidence this may be counter-productive as it reduces support for government policies and may drive clandestine activities in the livestock value chain.

Finally, we found that these social conflicts at markets do illicit forms of popular political action – whether in efforts at self-organization (e.g. to clean markets and maintain payment fees) or to solicit politicians to interfere in specific policies (e.g. animal movement bans and closures). In the context of decentralization reforms present in all three case study countries, local government plays an increasingly pivotal role in market management and regulation for services and facilities. In this regard, ensuring the *health* of local food systems, of which wet markets play a central role, is part of a broader struggle between policy ideologies in food systems (e.g. local vs. the global, the small-scale vs. the corporate, the fresh vs. the packaged) and is manifested in struggles between grassroots activism, government regulations and the economic centralization of power (Chuengsatiansup, 2008; Laforge et al. 2017).

In conclusion, our research found that wet market biosecurity strategies occur in the context of three contrasting narratives that emphasize different aspects of health and risk, reflective of different worldviews and interests of the social groups that are dependent on, regulate and supervise market activities. Policy reform efforts should take these different narratives into account in order to avoid negatively impacting local livelihoods, culture and food security.

#### Recommendations:

- Greater research on specific pathogen spillover risk at wet markets and the wildlife value chain are needed to better understand what specific biosecurity measures could feasibly prevent zoonotic spillovers
- This type of research should weigh the benefits of interventions with the the costs of greater biosecurity reform for local livelihoods and the agricultural system in the short and long term.
- Longer-term participatory research is needed to understand specific policy pathways that balance biosecurity with livelihoods and how these can be linked to national and local disease priorities for food-borne diseases and trans-boundary animal diseases.

- Larger, more focused studies are needed to understand the emergence of intensive animal farming of exotic animals and the health and biosecurity implications of this.
- Further research should explore the policy process of 'modernizing' wet markets and the specific costs associated with infrastructural improvements. From a health perspective, ranking priorities with the least cost and the most benefit would be helpful.
- The modernization of wet markets, in some instances, is associated with the consolidation of economic power and deterioration in cultural heritage and social bonds, including competition from new shopping malls and supermarkets. Efforts should be made to ensure the cultural preservation of traditional wet markets.
- Greater research is needed on how to improve or tailor specific policies (e.g bans on animal slaughter at wet markets in Vietnam and Kenya) that are widely viewed as unreasonable and contribute to punitive bans, such that what are seen as excessive punishments result in distrust between market stakeholders and veterinary and market authorities.
- There is a need to better understand the ways in which local government, within the context of decentralization reforms, can strengthen market management and biosecurity in ways that enhance the agency of market stakeholders and strengthen local livelihoods and food security.

#### SECTION 2– Effect of pandemic lockdowns on wet markets & food systems

Our research found that pandemic lockdowns and restrictions aimed at infection control had substantial impacts on wet markets and food systems. Our analysis of these unintended consequences was divided into three categories: 1) supply chains, transport and prices; 2) demand and consumer behavior; and 3) the impact on livelihoods and psychosocial wellbeing.

We found that, in general, the social and economic consequences of restrictions were perceived to be a far greater danger than the virus itself. This fits with a large body of survey-based data showing substantial, negative impacts from restrictions on household food security and food system actors in low- and middle-income countries (Bundervoet et al. 2022; Hammond et al. 2022; Egger et al. 2021; Maredia et al. 2022; Stephens et al. 2022; Picchioni et al. 2021). Stakeholders from Kenya (with the lowest case and mortality rate) and the Philippines were more vocally critical of their governments' policies, especially in the early days of the 2020 lockdowns, compared to Vietnam. Many argued that the policy response at wet markets was sudden and decisions made in a top-down manner, often by the Ministry of Health, with very little involvement from other sectors and market stakeholders. Studies of government advisory groups corroborate these findings, showing the limitations of expert groups that do not include social, economic and policy experts from non-biomedical backgrounds (Rajan et al. 2020). Although transactions across the value chain, from farm to fork, eventually eased as restrictions were relaxed, stakeholders felt that many of these initial challenges and errors could have been avoided with greater communication between national agencies, local governments, and wet market stakeholders.

Pandemic restrictions in 2020 and 2021 influenced market chains for more than one-year in areas of Vietnam and the Philippines while lasting only a few months in Kenya in 2020 and again in 2021. A media analysis by Birner et al. (2021) found that widespread concern in Africa (including Kenya) about the negative impacts of lockdown on food security played a major role in public policy debates that infuenced stringency and policy. Despite the Phillipines having endured one of the longest and most strict national pandemic lockdowns (Hapal, 2021; Lavado et al. 2022), by recognizing wet markets as "essential services" early-on in 2020 the country appears to have limited direct disruptions to food systems. While the Philippines kept wet markets open when supermarkets and shopping malls were closed, the opposite occurred in Vietnam. Transportation was a major bottleneck in Vietnam, something that was avoided to some degree by the foodlane system in the Philippines, which exempted trucks from onerous movement restrictions. Local government and market vendors also sought to adapt to lockdowns and restrictions in some circumstances to minimize harms on food security and local livelihoods. In the Philippines, they established "mobile palengkes" (rolling stores) and temporary satellite markets (talipapa) particularly in densely populated centers, and vendors also began selling from their homes. Others actively circumvented restrictions in order to maintain their incomes. In this regard, and as reported by Picchioni et al. (2021), traditional agricultural stakeholders reliant on shorter value chains may have been more resilient to pandemic disruptions. This was echoed in a review by Dixon et al. (2021) of Asian farming systems which found that hill-mixed systems were much more resilient during the pandemic compared to irrigated wheat-based systems due to diversification and shorter market chains. Emergency planning should consider food transportation systems more carefully and also ensure equal status of wet markets with supermarkets. There also appears to be a greater need for decentralized planning and local adaptation to allow local government to address specific complaints raised by market stakeholders and the agricultural sector.

Compared to Kenya and the Philippines, the classification of wet markets as a high-risk area for COVID-19 transmission in Vietnam meant that closures and social distancing policies continued to be strictly enforced by local leaders and market managers in late 2021. Anti-epidemic measures aimed to control the number of infections in the market and surrounding area. This classification does not appear to be strongly associated with the epidemiological data on COVID-19; for example, data suggests that outdoor transmission is neglible to overall community spread (Bulfone et al. 2021).

Unsurprisingly, we found that lockdowns had ripple effects across food supply chains that increased prices and led to food spoilage, especially with eggs. The nature of lockdowns and their socioeconomic effects meant that demand for animal products from wet markets (e.g. meat, eggs and milk) were negatively affected with many market stakeholders emphasizing that demand still remained below pre-pandemic levels during our rapid ethnographic fieldwork at the end of 2021. Going to a wet market was often difficult, with consumers in Vietnam and the Philippines required to obtain tickets or vouchers that were only good for a few hours on certain days of the week and restricted to one person per family. The same types of restrictions were implemented in supermarkets during general lockdowns.

Wet markets in all three countries were believed to cater to all socio-economic groups but are especially important for those of lower socioeconomic status. A general trend was reported in our research: during the pandemic, middle and high-income groups moved towards more dried and frozen products bought at supermarkets and ready-to-eat, finished food products from restaurants purchased online. These findings fit with the results of a recent systematic review which found that eating behaviours during the pandemic were modified towards a preference for ultra-processed food with decreasing consumption of fruits, vegetables and fresh food (Gonzalez-Monroy et al. 2021). A second review found that women, individuals with a low socio-economic status, informal workers and young adults that rely on daily wage were significantly more likely to suffer from reduced diet quality, nutrition and food security during the pandemic (Picchioni et al. 2021). Key informants in our study believed the pattern of online shopping was likely to continue even after the pandemic in all three countries. In their global review, Bene et al. (2021) also noted that many formal groceries, retails and supermarkets benefited from pandemic restrictions in 2020, as did e-commerce platforms, whereas small-scale and informal stakeholders in food systems reported much greater financial losses and were not, in many countries, able to access social or financial supports. As we found in our comparison between Vietnam vs. Kenya and the Philippines, the declaration of food system actors as 'essential services' was a critical component to mediate inequities in the economic consequences between food system stakeholders.

This study adds to the evidence-base showing that pandemic restrictions had negative impacts on socio-economic development, specifically for those in the informal economy and agricultural sector in low- and middle-income countries (Hammond et al. 2022; Egger et al. 2021; Maredia et al. 2022; Stephens et al. 2022; Picchioni et al. 2021). A survey study with smallholder farmers from seven LMIC countries found that COVID-19 containment measures were believed to be severe and widespread, impacting food purchase, sale of farm produce, off-farm income, and crop input access (Hammond et al. 2022). Roughly half to three-quarters of respondents reported farm sale losses, which were more severe in locations with greater restrictions. Bene et al. (2021) found that accessibility and affordability of food were severely impacted in LMICs due to a combination of loss of jobs/decreases in household income together with changes in the food system due to disruptions caused by lockdowns and social distancing policies. We found that pandemic control measures impacted the livelihoods and psychosocial wellbeing of market vendors, sellers, transporters, traders, butchers, day labourers, and the farmers who depended on them. Other studies have found similar trends in the livestock sector (Abu Hatab et al. 2021), with small-scale farmers (Hammond et al. 2022), the urban poor (Onyango et al. 2021), and with pastoralists (Griffith et al. 2021; Ilukor et al. 2022). Individuals were deprived of their main or only source of income for many months, lost their savings and business assets, took out large loans, were laid off their causal jobs and suffered stress and depression due to the uncertainty that surrounded when businesses would be allowed to reopen or when demand for products were return to pre-pandemic levels. These impacts were multifaceted, and impacted people differently depending on their social capital and socio-economic status (Bundervoet et al. 2022). In general, we found that impacts were believed to be greater for those working in the informal sector; e.g. street vendors, small-scale fishermen, backvard farmers, and smallscale butchers.

It was difficult to disentangle rising prices from the simultaneous increase in commodity prices (gas/oil and feed) and the reduction in demand brought about during the pandemic. This was especially the case in the Philippines, where African Swine Fever (ASF) had already started to devastate the pork market even before the pandemic started (Cooper et al. 2021). This highlights the challenges of untangling the multiple effects of different kinds of shock to food systems. Our research also suggested that pandemic lockdowns might have had both positive and negative effects on wildlife trading and hunting, although this should be taken as preliminary data. As found by Thuy et al. (2022) in Vietnam, pandemic policies may have helped strengthen some wildlife laws and reduce wildlife farming but also provided incentives for increases in poaching where the local tourism economy had collapsed.

In conclusion, our study found that lockdowns and other pandemic restrictions negatively impacted the availability and affordability of animal-sourced food products in Kenya, the Philippines and Vietnam while also having harmful consequences for those dependent on the market value chain for their livelihoods. Future health crisis management needs to consider the impact of lockdown policies on food systems, agricultural producers, market vendors and customers, especially those working in the informal sector.

#### Recommendations:

- Greater representation from non-biomedical experts (social, economic and policy domains) in government advisory groups is needed during health emergencies and disasters to ensure that wet markets and other parts of the food system are deemed to be "essential services."
- The classification of wet markets as high-risk places for COVID-19 transmission should be revisited in Vietnam since this classification has consequences for the

level of social distancing and closure policies at the local level.

- Emergency planning should consider food transportation systems more carefully and also ensure equal status of wet markets with supermarkets.
- There is a need to enhance decentralized planning and local adaptive capacity to help local government address specific complaints raised by market stakeholders and the agricultural sector during crises, rather than rely solely on top-down regulations and restrictions.
- Our study suggests that consumer behavior has changed due to the pandemic, with reduced demand for products from wet markets (especially in Vietnam and the Philippines) and a shift in consumer behavior in middle and higher-income groups preferring more shopping at supermarkets and online platforms. These qualitative findings should be followed-up in more long-term research to evaluate if they represent a durable change.
- Pandemic lockdowns and restrictions have negative impacts on the informal economy and agricultural sector in low- and middle-income countries and these costs should be carefully considered by policymakers as they weigh the costs and benefits of large-scale, disruptive non-pharmaceutical interventions.
- Further, longitudinal research on the impacts of pandemic restrictions on the food system are needed, as are social policies to mitigate them and address social harms in business closures and the accumulation of debt.
- It is unclear how the pandemic has affected wildlife trading and hunting and further research is needed to understand how the collapse of tourism has impacted animal conservation efforts and poaching.
- There is a need for participatory after-action reviews to systematically evaluate the impact of the pandemic on food systems by directly engaging a wide variety of experts and stakeholders through dialogue and debate. This exploratory study can serve as a point of departure for greater policy-orientated reflection and analysis by country stakeholders.

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## **10.2 List of publications produced by project**

In preparation:

- 1. Wet markets and biosecurity reform: Three social narratives influence stakeholder responses to policy in Vietnam, Kenya, and the Philippines
- 2. The effect of COVID-19 pandemic lockdowns on wet markets and food systems in Kenya, Philippines and Vietnam

## 11 Appendixes

## 11.1 Appendix 1:



Figure 1: Philippines stakeholder map



Figure 2: Vietnam stakeholder map



Figure 3: Kenya stakeholder map