STOP Spillover

Behavioral Risk Assessment Along Wildlife Value Chains in Dong Nai Province:

Detailed Report

Activity 1.2.6.1 | March 2023

CONTENTS

ACRONYMS

DARD   Department of Agriculture and Rural Development

DoH   Department of Health

FGD   Focus Group Discussion

FPD   Forest Protection Department

KII   Key Informant Interview

NGO   Non-Governmental Organization

OH-DReaM   One Health Design Research and Mentoring

OH-DWG   One Health Design Research and Mentoring Working Group

PPC   Provincial Peoples' Council

PPE   Personal Protective Equipment

QA/QC   Quality Assessment/Quality Control

Univ   University

WLF   Wildlife farmer

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SECTION I: INTRODUCTION

Viet Nam has a high population density and some of the highest livestock densities in Southeast Asia (Rabaa et al. 2015). Approximately 50 percent of the Viet Namese population resides in rural areas and participates in small-scale animal production, with agriculture representing 40 percent of total employment in 2017 (World Bank 2016). Pigs, poultry, and cattle are the main livestock produced at small-scale livestock farms, and biosecurity is low (Cao Ba et al. 2020). Bat guano is a commonly harvested fertilizer, and several aspects of collection and transportation present a risk for spillover (Huong et al. 2020). Wildlife farming has grown as a means of poverty reduction and livelihood diversification (Huong et al. 2020). Rising incomes have contributed to growing demand for wildlife products, particularly exotic meats for consumption, and these have supported the legal wildlife industry in Viet Nam (McElwee 2012).

Wildlife farms raise wild (and domestic) animals primarily with the intent to sell the meat and body parts for human consumption or medicine. The wildlife trade is believed to have contributed to both SARS outbreaks and the COVID-19 pandemic (Huong et al. 2020). The Viet Nam Initiative on Zoonotic Infections has been conducting research on emerging pathogens within the country. Their publication states that they "aim to investigate the socio-cultural context of wildlife consumption and farming" (Rabaa et al. 2015). However, their report did not include a gender analysis of any aspect of wildlife farming or any sex and age disaggregation of their data, making it very difficult to better understand the zoonotic risk and appropriate, targeted interventions/responses.

A study conducted in 2019 in the Thai Nguyen Province in northeastern Viet Nam, where livestock and farming (of pigs, poultry, and cattle) are the main occupation, determined the health literacy of livestock farmers toward biosecurity to prevent zoonotic diseases. Participants' understanding of influenza A (H1N1) was limited (Cao Ba et al. 2020). Many risk behaviors were observed from this study, including a lack of protective equipment, improper disinfection practices, inadequate vaccination, improper antibiotics usage, and inappropriate waste management. Some of the reasons given for not using protective equipment was the feeling that it is not worth paying for in small-scale farming and discomfort while wearing the equipment. Only 23 percent of participants said that they had heard about zoonotic diseases from animal health or public health personnel (Cao Ba et al. 2020). To reduce high-risk behaviors among livestock farming communities, it will be important to engage both animal health and public health workers who serve as frequent and trusted channels of communication.
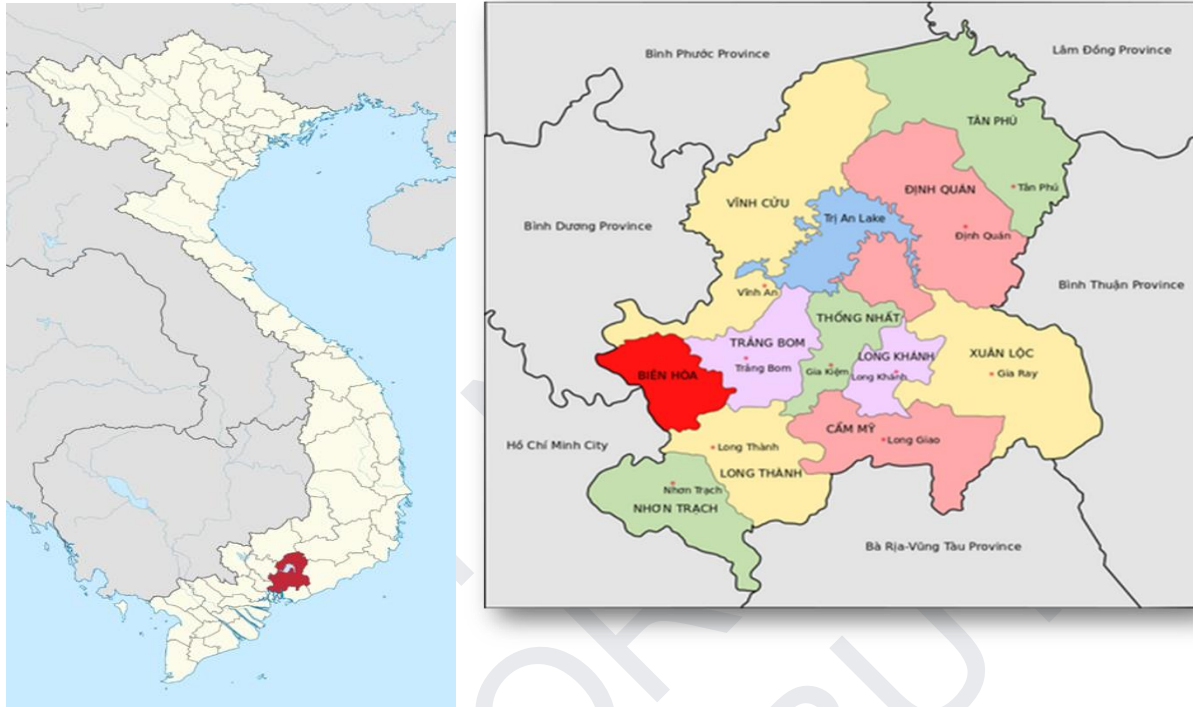
Figure 1: The wildlife farms were mainly located in 4 districts: Tan Phu, Vinh Cuu, Thong Nhat, and Dinh Quan districts.

They keep spotted deer, sambar deers, civets, pythons, snakes, bamboo rats, crocodiles, weasels, wild boars, rats, pangolins, porcupines, silver-backed chevrotain and/or Viet Nam mouse-deer (Tragulus versicolor).

Images: https://en.wikipedia.org/wiki/%C4%90%E1%BB%93ng_Nai_province

Dong Nai province (see Figure 1) hosts more than 800 wildlife farms. Some species are sourced from the wild and legally or illegally enter the value chain through wildlife farms (Dong Nai Forest Protection Department 2022).

USAID PREDICT surveillance reports showed that some coronaviruses existed in wildlife and livestock farms in this region (PREDICT 2019, 2020). For example, the work revealed the presence of murine coronavirus in the black giant squirrel and Malayan porcupine, Longquan Aa mouse coronavirus in the Hoary bamboo rat, and Alphacoronavirus and Betacoronavirus 1 in the domestic pig. Although coronaviruses were not detected in humans, individuals did test positive for influenza A and B (PREDICT 2020). In 2020, a qualitative survey was conducted that focused on wildlife farmers in Dong Nai. Wildlife production practices such as hand washing facilities; protective clothing and footwear for personnel and other visitors; washing and disinfecting crates or other equipment, etc. were discussed but no biosecurity production practices were identified (PREDICT-USAID 2019).

The wildlife farming community in Viet Nam is exposed to multiple species of animals, both wild and domestic, through co-housing and feeding practices. The limited biosecurity practices in backyard farming operations and on wildlife farms, as well as limited awareness of zoonotic diseases, indicate that pathogen emergence on wildlife farms is unlikely to be contained effectively. Wildlife farming in this context represents a risk for individual farmers as well as for traders and other actors along the wildlife value chain, which subsequently presents a higher risk of pathogen transmission with consequences for national and global health security (PREDICT-USAID 2019).

To address knowledge gaps, a behavioral risk assessment study was conducted in 2022 and was aimed to unpack the social and behavioral risk factors of those involved in wildlife value chains in Dong Nai province. The overall goal was to determine the ways in which the behaviors of different actors along value chains can facilitate the potential spread of coronaviruses (i.e. SARS-CoV-2), the types and frequency of human-wildlife exposure, and how the various animals and animal products are used.

Specific objectives included:

1. Identify actors who are involved in the wildlife value chain (both individual and household level) including farmers, breeders, traders, restaurant workers, and transporters.

2. Identify social, economic, gender, cultural, environmental, and other risk factors that drive zoonotic spillover risk.

3. Identify the level of knowledge of biosecurity and behavior risk factors of wildlife farmers that can spread viral pathogens (e.g. SARS-CoV-2, other coronaviruses).

4. Observe behaviors along the wildlife value chain.

SECTION II: METHODS

This report focused on legal wildlife farm production and selected aspects of value chains with species traded from captive wildlife facilities that farmed wild bamboo rats, porcupines, civets, and sambar deer. The assessment did not go into depth on risks that may arise from sourcing of inputs and services, such as health services and disease prevention and control services. Two districts considered to be high-risk interfaces were selected based on the following criteria: farm size distribution, avoided duplication of previous research conducted by PREDICT, and input from Dong Nai key stakeholders and NGOs.

The Behavioral Risk Assessment Report was developed using inputs from four days of interface outcome mapping stakeholder engagement series and country-level insight and information obtained from the Viet Nam OH-DReaM teams during two days of in-person meetings and a site activation visit.

As part of the primary data collection and analysis, the OH-DReaM team trained enumerators, organized data collection in the two high-risk districts, developed the initial report, conducted the validation workshop, and finalized the final assessment report.

2.1 Risk Framework

This study applied risk frameworks (Figure 2 and 3) aligned with the Joint Risk Assessment Operational Tool (JRA OT), a multisectoral, One Health-based approach developed by Food and Agriculture Organization of the United Nations, World Organization for Animal Health and World Health Organization (WHO et al. 2020). This approach used problem formulation to frame activities across wildlife farms and actors, applied hazard identification and exposure assessment based both on previous research and findings by PREDICT, priority pathogens identified by STOP Spillover, and likelihood of hazardous conditions arising across wildlife farming activities. Risk characterization was used to categorize risk factors and inform targeted interventions. Results are presented by risk factor and actor followed by integrated risk matrix-based assessments.

Interface outcome mapping stakeholder engagement and early hazard identification activities allowed the Country and OH-DReaM teams to identify actors and risk factors. The actors identified included household members that were engaged in legal wildlife farming activities, the traders that were involved in the value chain that facilitated the circulation of wildlife products between the farmers, and the consumers and neighbors that lived near the wildlife farms.

EXAMPLE RISK-FRAMING EXERCISE: CORONAVIRUS INFECTION IN WILD ANIMAL RESERVOIRS AT FARMS IN DONG NAI PROVINCE AT FARMS IN DONG NAI PROVINCE

Risk Factors	Exposure	Actors at Risk of Exposure	Interventions
Production of wild animals under poor biosecurity conditions	Exposure during animal handling	Breeding suppliers	Targeted interventions are designed to reduce risk along transmission pathways at farms
Transportation of wild animals across the community	Exposure during transportation	Farm owners, managers, workers	
Cross-Cutting Risk Factors	Exposure during processing	(Informal) traders, restaurants, worker	
Seasonality	Exposure during slaughtering	Family members, neighbors, visitors in close contact with wildlife on farms	
Gender	Exposure during animal husbandry (breeding)	Veterinarians, animal health workers	
Socioeconomic	Exposure from animal waste	Human health service providers	
Animal health service and human health surveillance for farmed wildlife	Exposure to contaminated equipment	(Informal)actors in wildlife food and product supply chain	
Food safety in WL value chain		Cleaners	

*Data input to be informed by the questionnaires and focus group discussions for Activity 1

Figure 2: Risk framework of coronavirus infection at wildlife farms

ACTORS ALONG WILDLIFE VALUE CHAIN IN DONG NAI
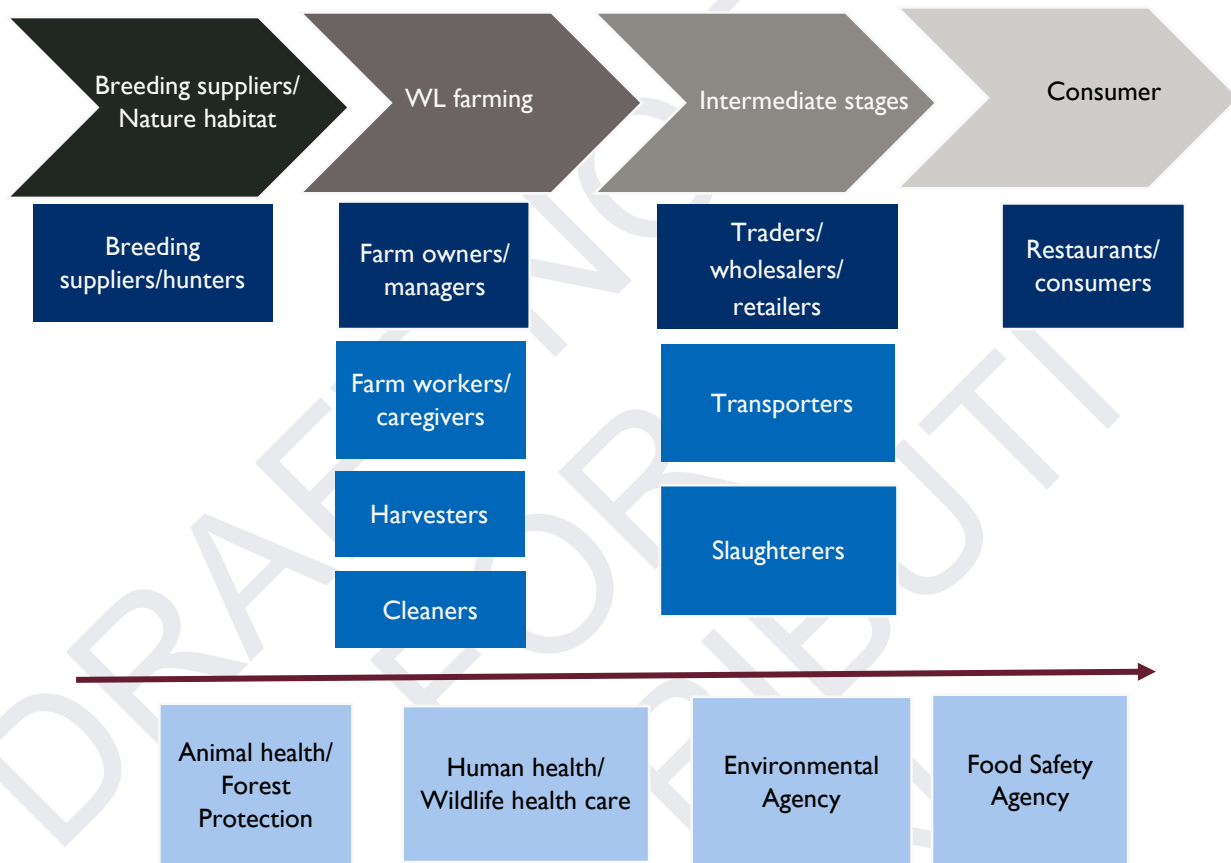
Figure 3: Risk framework of coronavirus infection at wildlife farms

2.2   Hazard Identification

In addition to SARS-CoV-2 being a priority virus for STOP Spillover, studies conducted in Viet Nam have detected coronaviruses in most wildlife farms (60.7%), including farmed Malayan porcupines (6.0%), and bamboo rats (6.3%), and researchers have expressed concern over this hazard accumulating throughout the wildlife value chain process (Huong et al. 2020). Studies show that the combination of increased coronavirus prevalence in traded wildlife and greater opportunity for human-wildlife contact as well as intra- and inter-species contact in trade systems is likely to increase the risk of zoonotic transmission of coronaviruses in wildlife markets, restaurants, and other trade interfaces (PREDICT-USAID 2019). Based on this information the Risk Assessment focused on coronavirus virus Spillover in general.

2.3   Data Collection Tools

Table 1 provides an example of the risk questions and the context for the "risk problem" that each activity was designed to address. The survey tools that were developed included questions that allowed for the collection of detailed information on the demographics of the farming community, gender information, and specific activities of farm members. These observations were then evaluated for dependency on age and gender. Biosafety and biosecurity practices were also evaluated in the wildlife farmers. Details on the specific activities undertaken by these actors provided pathway-based exposure assessment information and this allowed the assessment of gender and age-related differences. Perceptions of the farmers and other actors towards the benefits and risks associated with wildlife farming were included and allowed the researchers to better understand key factors that affected their behavior and motivations for engaging in these legal agricultural practices. Observational checklists allowed for farm visitors to view the application or lack of application of described risk modifying activities. These methods informed the risk assessment report and provided the basis for suggested social and behavior change (SBC) needs and intervention options.

The research team used both quantitative and qualitative tools for data collection. Details are presented below:

Table 1: Actors and tools used to support hazard identification activities

#	Method	Respondents	Risk Informing Questions/Context
1	Interviews	1. Wildlife farm households including farmer owners, workers, breeding suppliers, family members of wildlife households: 267 people 2. Wildlife traders, wholesalers/retailers/Restaurants: 43 people 3. Wildlife farm neighbors nearby the farm, consumers: 103 people	Where are the wildlife farms located? What activities take place on wildlife farms and in the wildlife trade? Who are the actors? What is their knowledge of and adherence to biosecurity practices? What motivation and other behavioral drivers impact risk of coronaviruses spilling over along the wildlife value chain?

#	Method	Respondents	Risk Informing Questions/Context
2	KIIs	1. Key staff members of DOH and DARD: 5 people. 2. Representative leaders and staff of animal health station; forest protection division; district health center; environmental division; sub-DARD division; representatives of livestock cooperatives (in Vinh Cuu district): 11 people	Where are the wildlife farms located in relation to other facilities (health clinics, livestock cooperatives, etc.)? What are the motivations and challenges for different actors along the wildlife value chain (i.e., socioeconomic, gender, cultural, & environmental factors)? What biosecurity practices are in place? What medical care and treatment services are available near wildlife farms?
3	FGDs	4 FGD sessions organized in 4 targeted communes for wildlife farmers: 10 people/session, 2 sessions in each district (Tan Phu and Vinh Cuu)	What are the benefits, challenges, and alternatives to wildlife farming and breeding? What are the benefits, challenges, and alternatives to wildlife trading? Which biosecurity measures and other safety practices would actors in the wildlife value chain be interested in adopting to reduce the risk of spillover?
4	Observation	20 observed sessions	Do observed behaviors at wildlife farms align with responses from surveys and FGDs?

A questionnaire (Appendix B) was developed to assess various risk factors including: the location of wildlife farms, wildlife value chain actors, their adherence to biosecurity, and other behavioral drivers that can impact risk. In addition, key informant interviews (Appendix C) and focus group discussions (FGDs) (Appendix D) with several value chain actors were conducted to complement and enrich the questionnaire. Points along the value chain for consideration included 1) wildlife farms (on farms and households near farms), 2) traders and restaurants, 3) neighbors and consumers and 4) One Health related agencies.

2.4   Quality Assurance & Quality Control Process

Quality assurance was conducted throughout the development, design, and implementation of this activity (See Appendix F). A risk framework was created based on local input and guidance from the Risk Analysis and Communication Hub (RAC) to identify the important actors and factors contributing to risk. Based on this framework, multiple data collection tools were created (questionnaires, FGD and KII guides, and observation checklists), allowing the team to cross-reference and verify responses. These tools were reviewed and edited by members of the country team as well as experts from the consortium to ensure consensus on their applicability. To achieve quality and validity of data collection, two days of training were provided to the risk assessment team, including implementers and OH-DWG members, to

unify the process. Survey tools were tested prior to conducting surveys at the sites to ensure appropriate answers were received. All participants were interviewed separately to ensure privacy and confidentiality.

After the data collection process had been completed, the RAC Hub members alongside lead members of the country team conducted the quality control process. A Data Dictionary (See Appendix E) was generated from the SPSS data file and used to check that the data entries correspond directly to the translated questionnaire. Unique identifiers were added for each respondent linking the data file to the respondents' questionnaires. This allowed the team to quickly check for entry errors and facilitated communication about entries in the data file. Clarification was needed regarding changes in the expected versus actual number of respondents, incomplete responses and/or data entries, ambiguous value labels in the data dictionary, and some modifications that had been made to the questionnaire after translation (e.g. choices offered and question order). The quality control process allowed us to resolve these minor inconsistencies and improve confidence during data analysis and interpretation.

SECTION III: RESULTS BY RISK FACTORS

3.1   Gender and Age

3.1.1 Wildlife Farmers

Farmers are the central actor in the wildlife value chain, from breeding supply and production to slaughtering and processing. A total of 267 respondents were farmers, in which Tan Phu district had 110 people in 14 communes (Phu An, Phu Binh, Phu Loc, Tan Phu, Thanh Son, Nam Cat Tien, Phu Xuan, Phu Trung, Phu Lap, Phu Son, Phu Lam, Nui Tuong, Tra Co, Ta Lai), and Vinh Cuu district had 157 people in 3 communes (Hieu Liem, Vinh An town, Phu Ly), of which men accounted for 55.4% and women accounted for 44.6%. A breakdown by commune is shown in Figure 5. Almost all (91.8%) of the study participants were married, 6.7% were single, 2 were divorced and 2 were widows. Most (71.5%) have a family of 3-5 people, 23.2% have a family of 6-9 people.

The mean age was 48.7 years, median age was 48 years, the youngest respondent was 18 years old, the oldest respondent was 88 years old, mode age = 59, and most respondents were 26-59 years old. 23.5% of respondents were over 60 years old. which might be considered a vulnerable population on wildlife farms. The average age and 95% confidence limits are shown for each commune in Figure 4.

Average Age for Respondents Working on Wildlife Farms in Each Commune
(mean and 95% confidence limit)
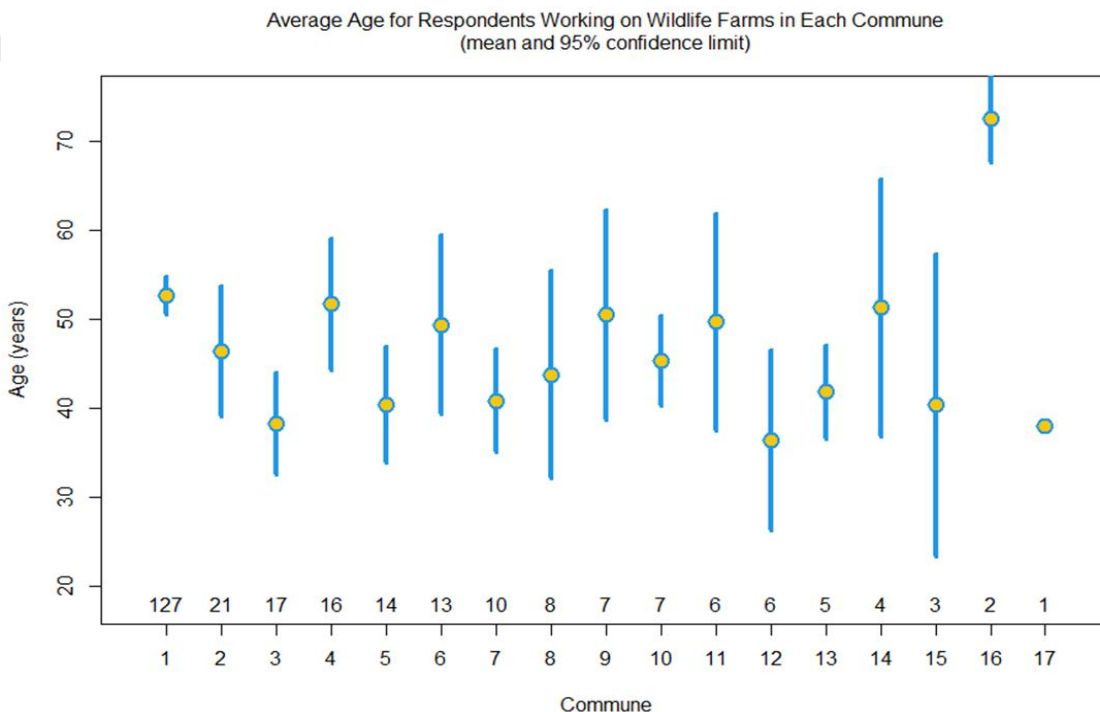
Figure 4: Average Age by Commune

Figure 4 shows the average age by commune with 95% confidence intervals. The number of respondents in each commune is shown above each commune. Data is from the survey. Commune names: 1 Hieu Liem, 2 Nam Cat Tien, 3 Phu Binh, 4 Phu Ly, 5 Vinh An town, 6 Phu Loc, 7 Tra Co, 8 Phu An, 9 Phu Trung, 10 Phu Lam, 11 Tan Phu town, 12 Phu Lap, 13 Thanh Son, 14 Nui Tuong, 15 Ta Lai, 16 Phu Son, 17 Phu Xuan

At most wildlife farms, family members were involved in wildlife production. Men participated in wildlife production activities more than women. Families with 3-5 members accounted for the majority (71.5%), families with 1-2 members accounted for 5.2%; the remaining 23.2% of respondents had families of 6-9 members. Among them, the rate of participation in the care and rearing of wildlife is distributed as follows: 24% were sole operators, 64.4% both husband and wife participate; 28.1% have other adult family members participating and 7.1% include support from other people such as grandparents, other adults, and relatives. No children under the age of 13 were reported to be involved in wildlife farming operations but 2 children 13-18 years old had been involved in taking care of wildlife at farms. This is consistent with the tradition of raising livestock and poultry in rural Viet Nam, where children often help in household chores.

Age and Wildlife Farming Experiance
(line shows smoothed trend of incresing experience)
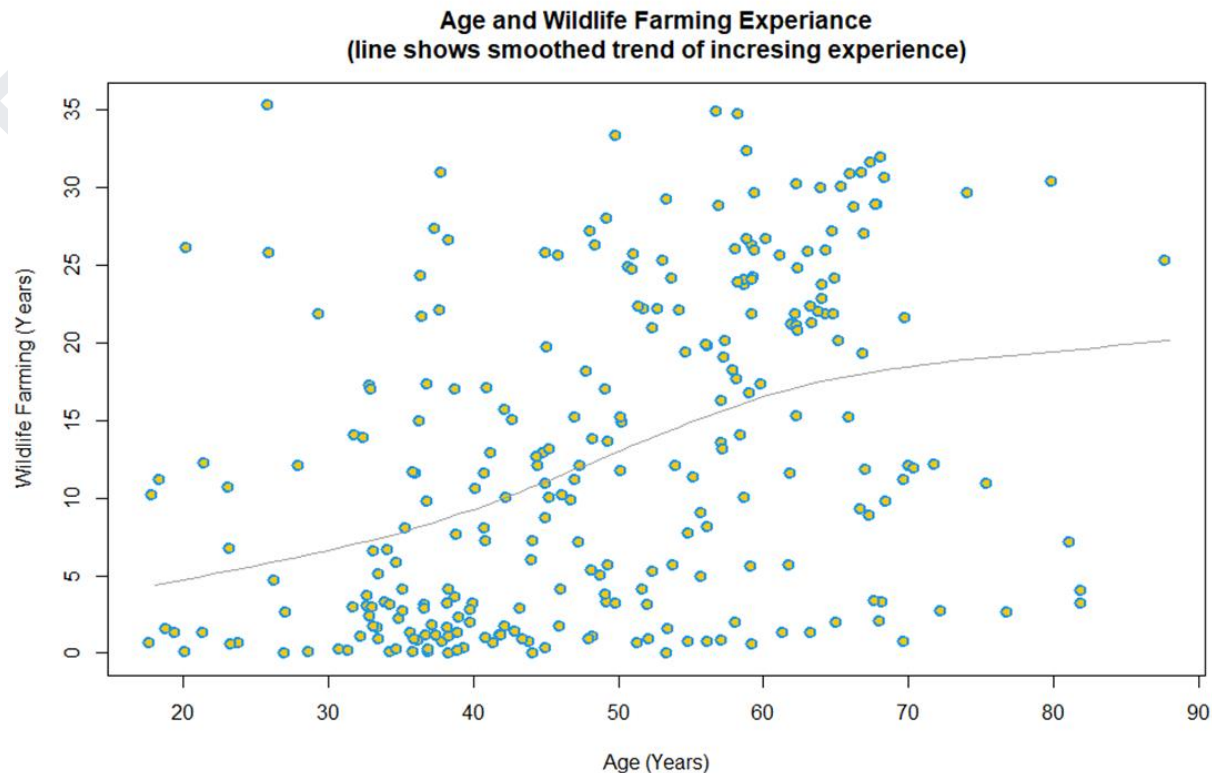
Figure 5: Plot of number of years' experience in wildlife farming as a function of the age of the respondent. The line shows the smoothed trend of increasing experience with age. The smoother used to produce the line was a penalized likelihood cubic spline in the R package. Data is from the survey.

> "Usually, secondary or high school students can help their parents with light chores such as feeding animals, grass cutting, or cleaning, while young children cannot" *(KII, Vinh Cuu District Forest Protection Officer).*

The number of years involved in wildlife farming varied from a few months to 35 years and showed a wide range of values across all ages of participants as shown in Figure 5. Experience did show an increasing trend with age as shown by the smoothed trend.

The most common tasks participated in by the majority of respondents included animal care (80.9%), feeding (77.5%) barn cleaning (76%), and farm ownership/management (61.4%). The only activity that showed a significant gender disparity was farm ownership/management, with roughly twice the proportion of men participating in this activity as women (χ^2 test p<0.0001; Table 3). Other activities did not display a significant gender disparity based on a chi-square test for binomial data, though there was a noted trend toward greater participation of men in removal of sick and dead animals (p=0.05). As wild animals are powerful species, men tend to be more involved than women in wildlife production while women tend to raise livestock and poultry.

Table 2: Labor allocation on wildlife farms, based on survey results.

Activity	Male		Female		Total	Chi-square test
	n	*%*	*n*	*%*		*p*
Management	112	**68.3**	52	31.7	164	**<0.0001**
Breeding	121	56.0	95	44.0	216	0.69
Slaughter	3	50.0	3	50.0	6	0.79
Feeding	112	54.1	95	45.9	207	0.42
Cleaning	112	55.2	91	44.8	203	0.88
Dead animals	41	**71.9**	16	28.1	57	**0.05**
Living at farm	10	55.6	8	44.4	18	0.85
Other (admin)	1	25.0	3	75.0	4	0.33

3.2 Socio-Economics

3.2.1 Wildlife Farmers
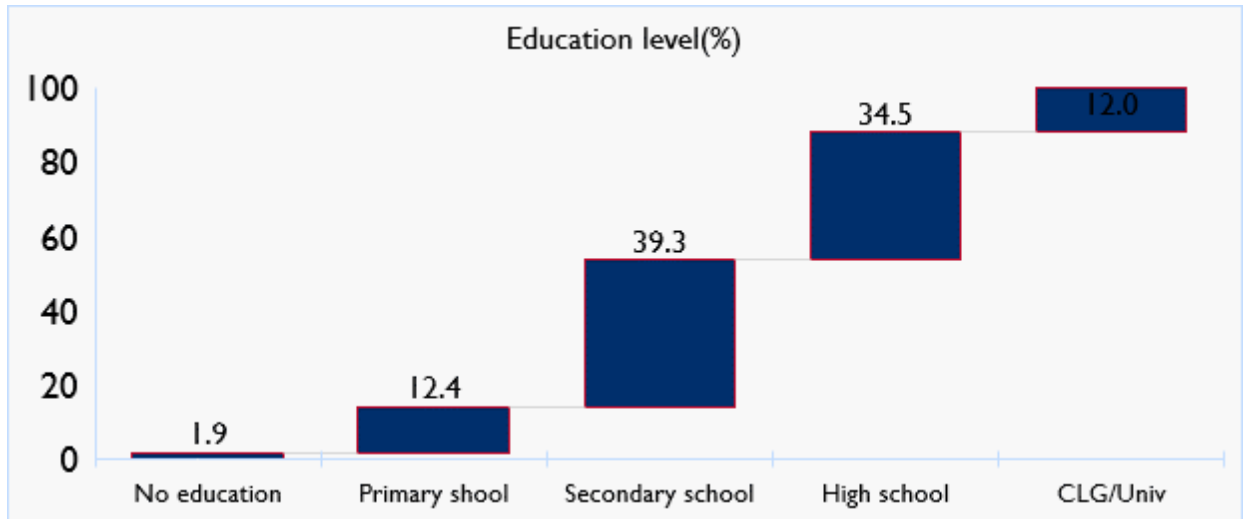
Figure 6: Educational level of respondents. Data is from the survey.

A majority (53.6%) of respondents had, at most, lower secondary education (Grade 9). Approximately a third had finished high school and 12% had college/university education (CLG/Univ). Fewer than 2% reported no formal education.

Of the 267 study participants, 77.5% listed wildlife farming as one of their primary sources of income (>20% of income in Figure 8). This subset of respondents spent an average of 40% of their working time on wildlife farming. Crop production was a primary source of income for 62.2% of respondents. Seventy-nine respondents answered that their primary income is from other jobs such as workers, government employees or retired, accounting for 29.6% of total respondents. These other occupations contributed between 60 and 100% of household income.

Household Income from Wildlife Farming (%)

Legend: ■ <20%   ■ 20-50%   ■ >50   ■ Not yet

Slices: 9.4%, 64.8%, 12.7%, 13.1%
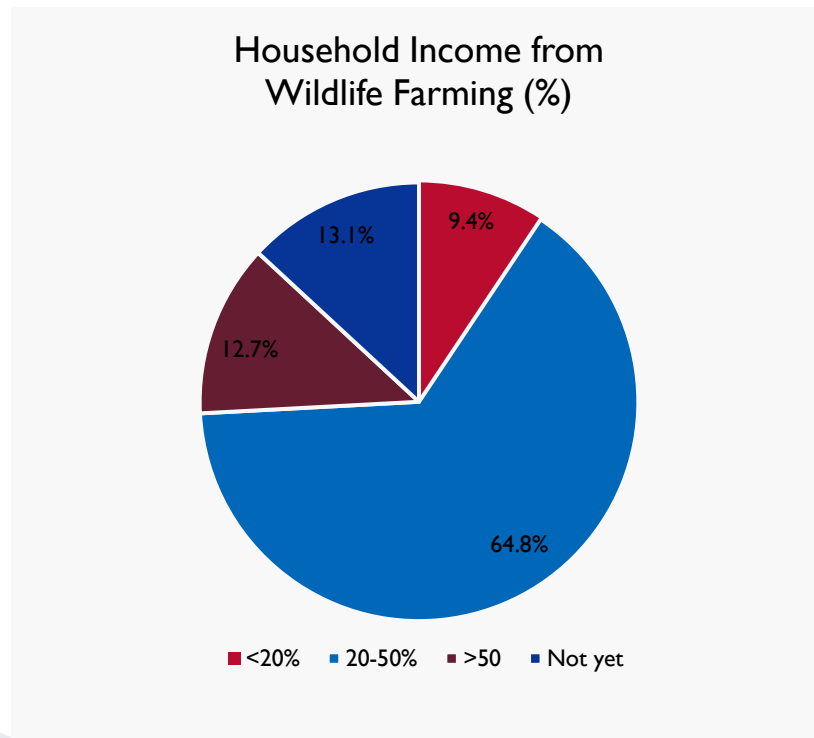
Figure 7: Percentage of household income from wildlife farming. Data is from the survey

The most commonly reported reasons that households raise wildlife were:

- To earn extra income - wildlife farming is highly profitable compared to other species
- Because it has become common in their village
- To take advantage of available labor sources from family members
- Because it is a continuation of a family tradition
- Some breeders came to wildlife farming accidentally by being given wild-sourced animals as gifts, or began raising the animals as pets because their children like them

Most farmers responded that these wildlife species (Sambar deer, porcupine, bamboo rat and civet) are easy to raise, food is readily available at family farms, and the feed for wildlife is cheaper than for poultry or livestock (those species reportedly need more processed feeds). Others said the animals are clean, odorless, have few diseases, and reproduce more.

The economic contribution of wildlife farming to household budgets is highly variable. Approximately 10% of households in our survey largely keep wild animals as pets, and their experimental ventures into wildlife farming have not yet brought economic value. Among the 230 respondents who said wildlife breeding/farming activities contribute to their family income, the contribution ranges from 5% to 100 % with most households (64.8%) deriving between 20 and 50% of household income from wildlife farming (Figure 7). This economic contribution has been fairly stable over time – 31.5% of respondents reported that wildlife farming accounts for a greater percentage of household income than it did five years ago, while 13.1% said it is less important to their household budget. The majority (55.4%), however, reported no change.

Based upon the survey, prices are generally higher for wildlife products than most other livestock products. The average selling price for porcupines was 350,000-400,000VND/kg (US$15.2-17.4/kg) with an average weight of 8-10kg/individual. Young breeding porcupines sell for about 2.0 million VND/pair ($86.9/pair). Bamboo rat sells for approximately about 800,000VND/kg ($34.8/kg) for meat at a weight of 1-1.2 kg/individual, and a breeding pair sells for approximately 1.5 million VND ($65.2/pair-breeding). With civets, the average selling price is 1.2 – 1.5 million VND/kg ($52.1-65.2/kg) with an average weight of 2.-2.5kg/individual, around 10 individuals are sold per month, the price of breeding animals is about 5.0 million VND/pair ($217.4/pair). Porcupines can contribute approximately 3.6 million VND/individual ($156.5/individual) to household income. For farms raised 3-4 individuals, the volume of deer velvet harvested and sold on average 0.7-0.8kg/month, price is 5.0 – 7.0 million VND/kg ($217-216/kg). Many households are in the process of breeding with only 1-2 years' experience, so the volume of product sold is very small. Examples of monthly income are around 12-15 million VND ($512-652) from civets; 3-4 million VND ($130-174) from bamboo rats; or 3.5-5.6 million VND ($152-244) from Sambar deer.

Among respondents who reported an increase in household income from wildlife farming over the past 3 years, the average increase was 25.5% (range 10-100%, median 20%). For those who reported a reduction in the contribution of wildlife farming to household income, the reduction was on average 35.2% (range 10-90%, median 20%).

When asked about their plans for the next two years, 61.4% said they intend to increase herd size, 6% plan to reduce the herd, 27% intend to keep herd size about the same, and 5.6% were unsure (usually due to uncertainty about future market conditions). The main reasons for scaling up wildlife farming were that these animals are easy to raise, are more profitable than livestock and poultry, are easy to breed, reproduce readily, and participants felt that the cost of raising wildlife was low. Some older farmers plan to reduce their activities due to their advancing age.

3.3   Behavior

3.3.1   Risk Perception - Wildlife Farmers

Regarding farmers' knowledge and practices regarding biosecurity and zoonotic diseases, most farmers have not observed transmissible diseases in their captive wildlife, but are concerned about the risk of disease transmission from their holdings.

Despite the expressed observation that captive wildlife does not show diseases, 46.4% of respondents are concerned about the possibility of disease transmission affecting human health (Figure 8). Among those respondents who are worried about diseases, 82 people (33.6%) are concerned about diseases in animals only; 31 people (12.7%) are concerned about both human and animal diseases and 13 (5.3%) do not know. There were no respondents who only worried about human disease. There were 244 respondents in total.
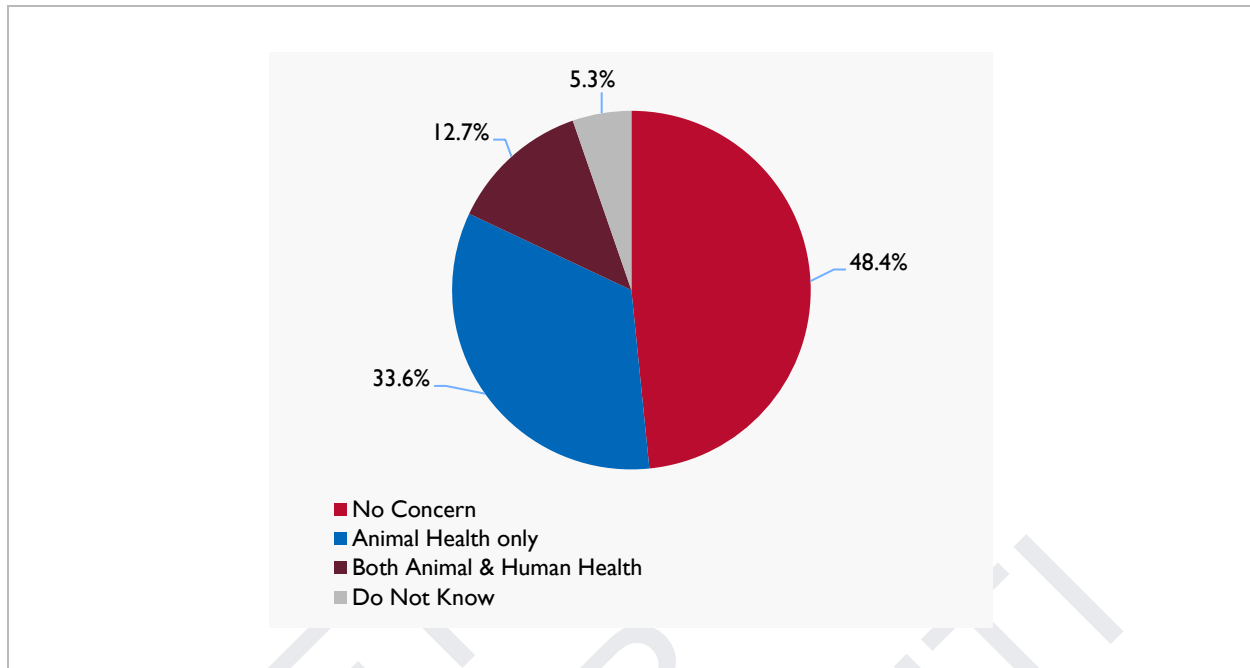
Figure 8: Concern of respondents in survey about disease on wildlife farms. Data is from the survey. There were no respondents who only had concern about human disease. There were 244 respondents in total.

A number of other concerns were raised by respondents such as bad smells, the poor viability and deaths of young stock, digestive disorders associated with food, foot-and-mouth disease (in Sambar deer) or unexplained skin ulcers. Many farmers answered that they had never seen any disease in farmed wild animals and were not concerned about this issue. Farmers did not report that they had any medical records, health checks, or disease surveillance for wildlife farmers. Based on household observations, interviews and checking of medical records, some people had symptoms of respiratory disease at the bamboo rat farm. However, they did not believe there was a link between the illness in humans and disease in animals.

The survey respondents were asked if a wildlife animal died what were the ways dead animals were disposed of on the farms where they worked. They were to indicate all of the ways from the following list:

1. Used the animal for eating or sharing

2. Buried

3. Took it to the landfill, pond, or river

5. Disinfected and buried

6. Reported to veterinarian or forest protection officer

There were 89 respondents (33.3% of 267 respondents) that indicated they had used one of the combinations listed below of the five choices. The most common response, 61

respondents, was that they had buried the dead wildlife and 19 respondents indicated they had disinfected the animal before burying it. Of particular concern there were 21 respondents (7.9% of 267) who indicated they used the dead wildlife for eating themselves or sharing as food with others, and 11 (4.1% of the 267) indicated that this was the only method they had used.

> "*Have colds, gastrointestinal diseases, joint pain not related to deer*"
> *- FGD*
> "*Self-treatment with mid disease, serious illness go to hospital if serious*

There were only 19 (7.1% of 267) who indicated they had disinfected the animal before burying it and 4 (1.5% of 267) had reported the death to a veterinarian or forest protection officer.

Table 3: Combinations of dead wildlife disposal methods that respondents indicated were used on the wildlife farms where they worked.

Respondents	Disposal of Dead Animals					Respondents	
	1	2	3	4	5	Number	Percent
	X	X		X	X	1	0.4
	X	X		X		2	0.7
	X	X			X	1	0.4
	X	X				5	1.9
	X		X			1	0.4
	X					11	4.1
		X		X		1	0.4
		X				51	19.1
				X	X	1	0.4
				X		14	5.2
					X	1	0.4
Number	21	61	1	19	4		
Percent	7.9	22.8	0.4	7.1	1.5		

There were 267 respondents of which 89 indicated (33.3% of 267 respondents) they had disposed of dead wildlife on the farms where they worked. Data is from the survey. Disposal methods were 1. Ate the animal or shared with others for consumption 2. Buried 3. Took it to the landfill, pond, or river 4. Disinfected and buried 5. Reported to veterinarian or forest protection.

Most reported that when animals are sick or dead, the main cause of concern economically was lost revenue and the cost of treatment and monitoring. However, many people were also worried about spreading the infection from dead individuals to healthy wildlife or spreading the disease to owners and families.

The farmers raise wildlife based on their experience in livestock husbandry. Selection of breeding stock, farming techniques and attempts to cure sick animals were learned from peers who are successful in raising the species in question. The strong wildlife producer peer networks in place are a positive opportunity for communication, surveillance, and training. Farmers generally treat sick animals using cattle or poultry drugs, estimating doses by weight. There are no medical records kept for wildlife or wildlife farmers. Most wildlife farmers have not been trained on biosecurity needs and risks or have not encountered communication campaigns related to zoonotic diseases.

Most farmers observed that there are no diseases on their farms or in their captive wildlife and that they are not infected from wildlife. They rely upon their experience in livestock husbandry and on advice or information from other farmers who are successful in wildlife production. Wildlife farmers in our survey displayed a low level of awareness of biosecurity principles and perception of risks from zoonotic disease. The majority of farmers reported little or no PPE use for several activities on the farm. Biosecurity and zoonotic disease communication material were generally not available for farmed wildlife in Viet Nam, and farmers report that no communication campaign for zoonotic disease prevention in the wildlife value chain has been done in Dong Nai province.

Farmers generally reported buying breeding stock based on peer suggestions. Most respondents believe that captive wildlife have very few diseases due to the closed breeding system. Farmers generally described diseases based solely on the observed symptoms, and generally had not had any form of veterinary examination conducted on their farms.

3.3.2 PPE Use and Availability on Wildlife Farms

Respondents reported that shoes or boots were commonly used when feeding (55%), cleaning cages (65%), and catching/touching animals directly (36%). Gloves were reportedly often used when cleaning the barn (66.7%) and catching/handling animals directly (42.7%). Masks were frequently used during feeding (70%), cleaning of cages (71.9%) and velveting (39.7%). Protective clothes/gowns/aprons were rarely used (used by less than 20% of participants) in most animal care and handling operations. There are still a number of farmers who do not use any PPE in livestock production activities (accounting for 11-28%).

The survey asked respondents about the types of PPE that were used on the farms for the activities of cleaning, feeding, catching, harvesting, and slaughtering/butchering. Figure 9 shows the percentage of respondents who indicated use for each type of PPE—masks, gloves, shoes,

and clothing. Clothing was the least likely item to be used by the respondents, and PPE of any type was least likely to be used during slaughtering and butchering.
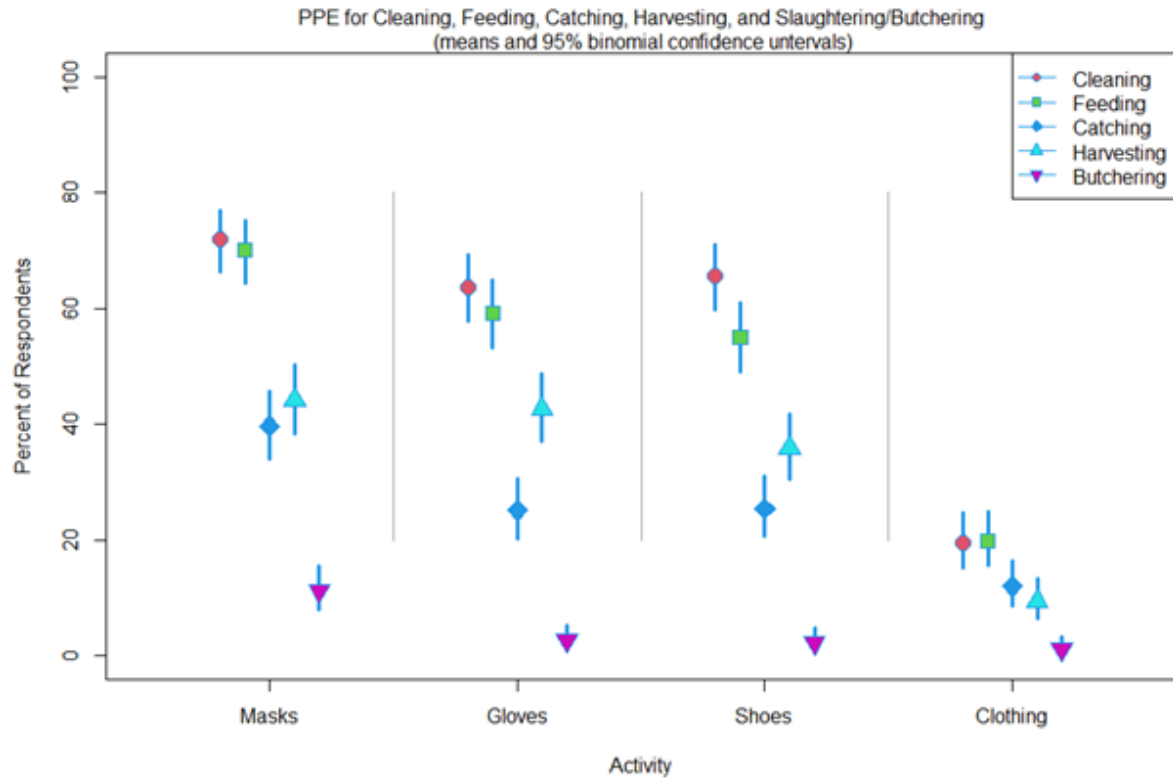
Figure 9: Types of PPE used for cleaning, feeding, catching, harvesting, and slaughtering/butchering as reported by the respondents on the wildlife farms where they worked. Data is from the survey, there were 267 respondents.

Very few people mentioned management of visitors. However, most households raising porcupines and civets were cautious about allowing guests to enter, especially during breeding periods because disturbances scare the animals and may result in injuries to their newborn.
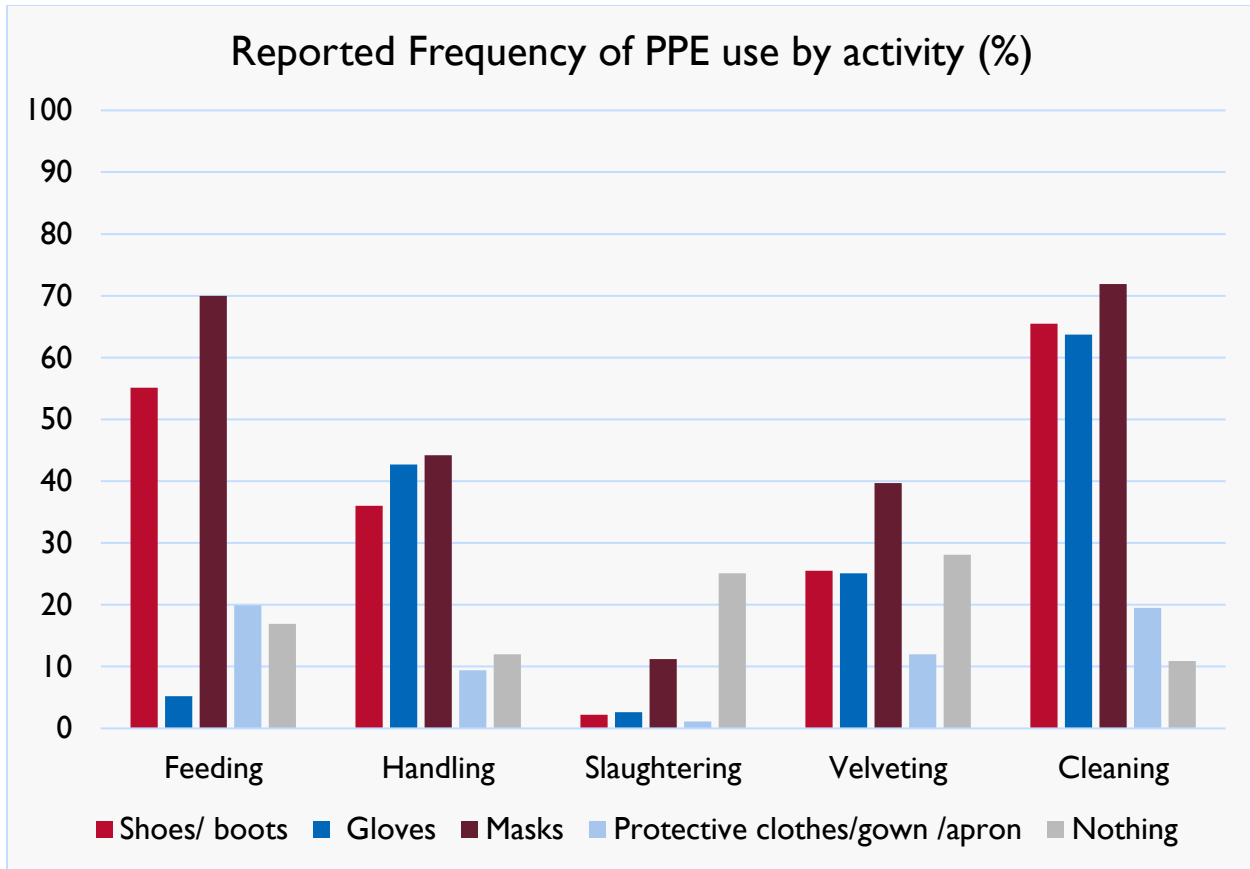
Figure 10: Bar graph of PPE use. Data is from the survey, there were 267 respondents.

During 20 visits to wildlife farms, a number of gaps in hygiene and biosecurity practices were observed. Most farmers used limited or moderate PPE and barn conditions were frequently unhygienic with poor management of wastewater and manure. Livestock and poultry were frequently allowed to enter wildlife raising areas. As in most food animal settings throughout the world, self-administering antibiotics to treat animal diseases was common. The absence of a wildlife aware health service for consultation may contribute to antimicrobial resistance.

Figure SEQ Figure * ARABIC 121.Figure SEQ Figure * ARABIC Observation visit to wildlife farm. 112: Observation visit to wildlife

There was a lack of extension/educational materials relating to biosecurity and zoonotic disease control in wildlife farming and there was no evidence of education or communications campaigns for wildlife farmers.

A wide range of levels of standards in hygiene, biosafety and biosecurity practices was observed and this suggests that positive deviance approaches may be effective. Barns where wildlife were raised were often small and damp, although they were generally cleaned daily. There is a wide range of standards in physical facilities in wildlife farming operations. Many respondents reported that they take advantage of pre-existing livestock/poultry barns. Other households have constructed purpose-built barns out of bricks or wood that are usually 5-20m away from the family residence. Some farmers cleaned the barn daily and sprayed insecticide once a month.

Figure SEQ Figure * ARABIC 13: Observation visit to wildlife

3.4 Wildlife Farm Infrastructure

3.4.1 Water Sources

Among 267 respondents, the majority of households used water from covered boreholes (56.2%), tap water (53.6%), and filtered water (15.7%) for household use. The water sources used for farmed wildlife were very similar (Figures 14 and 15). The respondents indicated that multiple water sources were used on many farms. This will be analyzed further in the Integrated Analysis section.
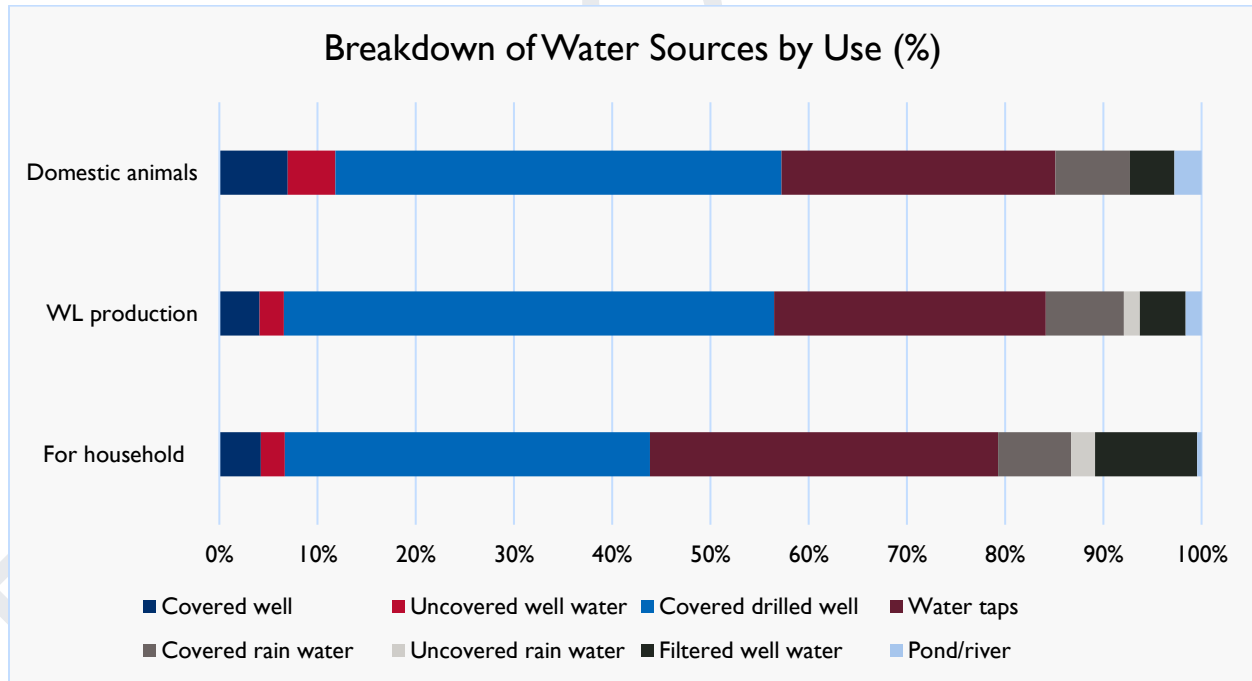
Figure 14: Water sources for wildlife farms for 3 types of use. Data is from the survey, there were 267 respondents.
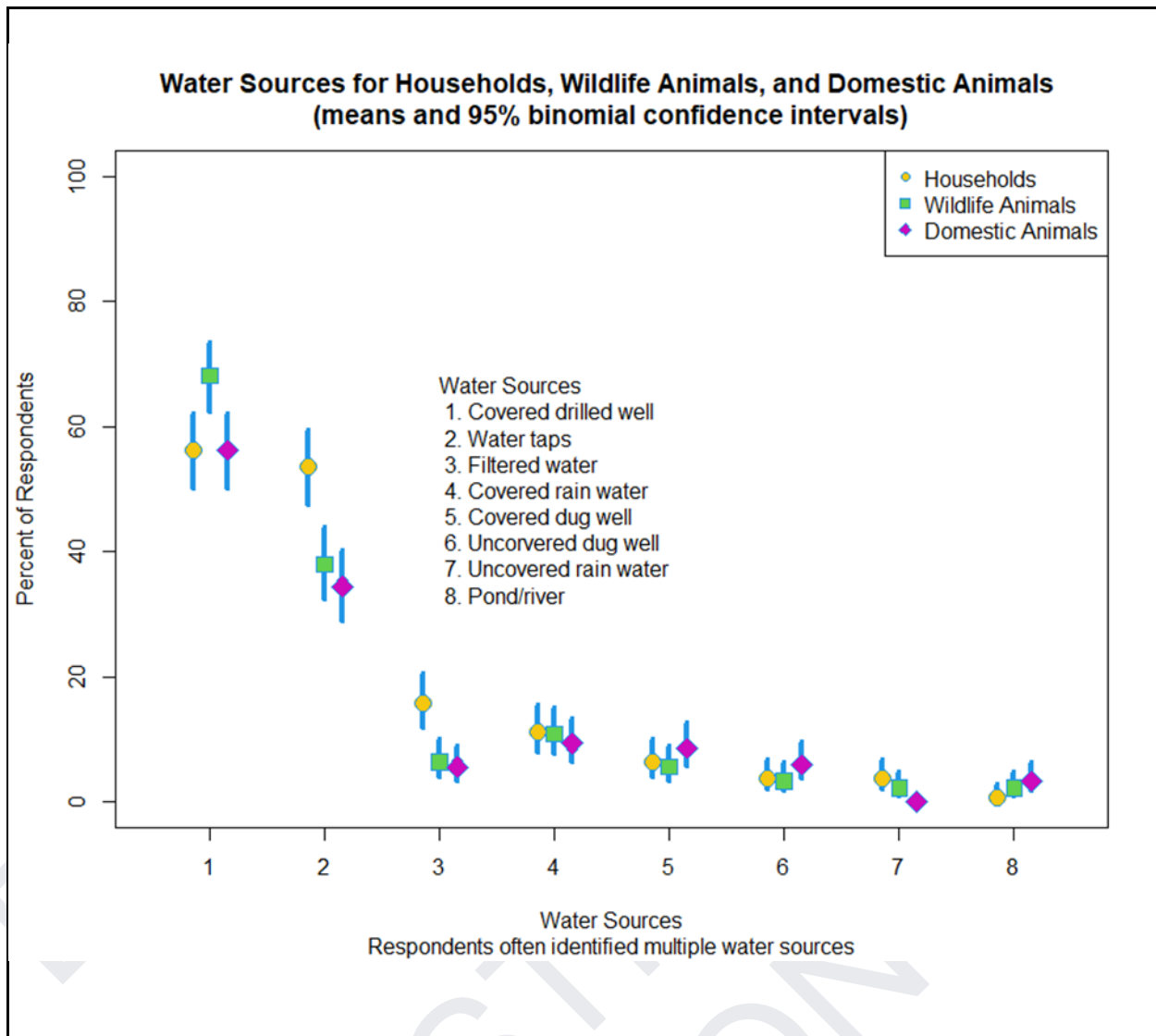
Figure 15: Wildlife farm sources of water for household, wildlife, and domestic species. Data is from the survey for 267 respondents working on wildlife farms.

3.4.2 Waste Management Infrastructure

Wastewater and excrement generally was washed into a covered manure cellar or cesspit. Manure may be applied to crops or fish ponds and in some cases, biogas is harvested from anaerobic decomposition of manure. Moderate levels of use of personal protective equipment (PPE) were reported. To deal with wastewater and excrement from wildlife production, farmers use covered manure cellars and may make use of the manure as plant fertilizer, for biogas production, or apply it to crops and fishponds.

The respondents on the survey were asked "Where does animal waste from slaughter/butcher and animal excrement on the farm go?". The open-ended responses were put into one or more of the following 7 categories and are shown in Figure 16.

1. Manure composting

2. Manure and excrement are treated with probiotics

3. Use biogas technology

4. Manure and excrement are collected into a bag or cesspit to fertilize plants

5. Excrement and wastewater flow into a cesspit with no composting used to fertilize plants

7. Wastewater and manure are applied directly to fertilize garden with no treatment

8. Feed fish

This question will be further analyzed in the Integrated Analysis section.

Animal Waste Methods
(means and 95% binomial confidence intervals)

Animal Waste Methods
Respondents usually identified multiple animal waste methods
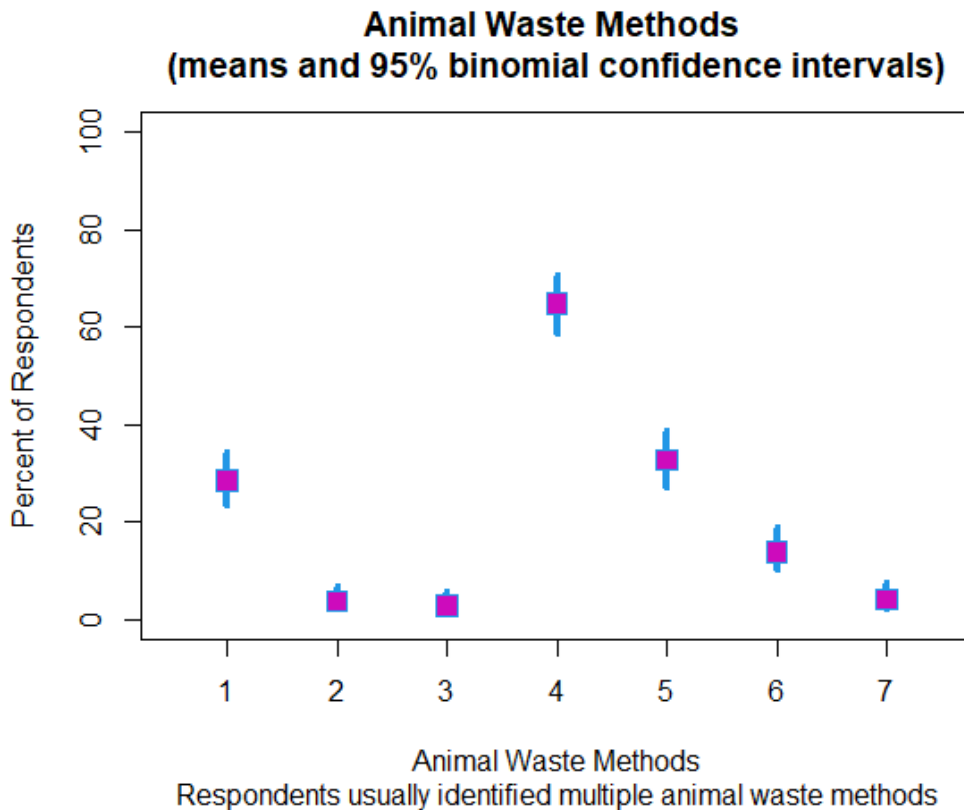
Figure 16: Methods for treating animal wastes on wildlife farms where Respondents to the survey worked. There were 245 respondents with open ended responses which were then classified into 7 different categories shown above. Most responses were classified into multiple categories.

3.4.3 Species on Farms
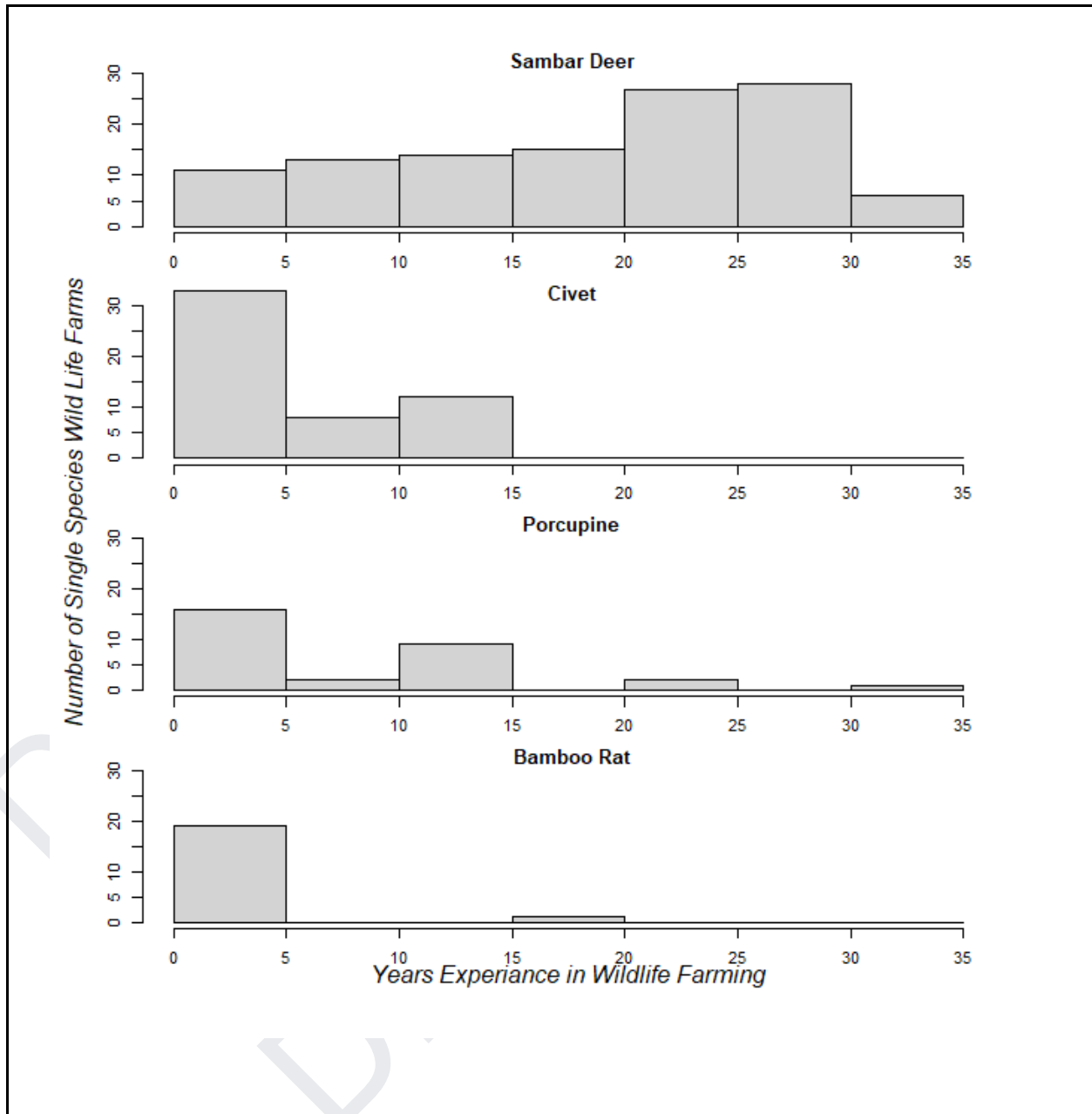
Figure 17: Histograms of years of experience of farming 4 wildlife species. Data are from survey for 267 respondents working on wildlife farms.

Overall, survey respondents had an average of 12.5 years of experience (ranging from a few months to 35 years) in wildlife farming, with sambar deer farmers being the most experienced (mean = 19.5 years), while civet, bamboo rat and porcupine producers generally had many fewer years of experience in the sector: civet and bamboo rat 3.2 years, porcupine 6.8 years on average (Figure 17).
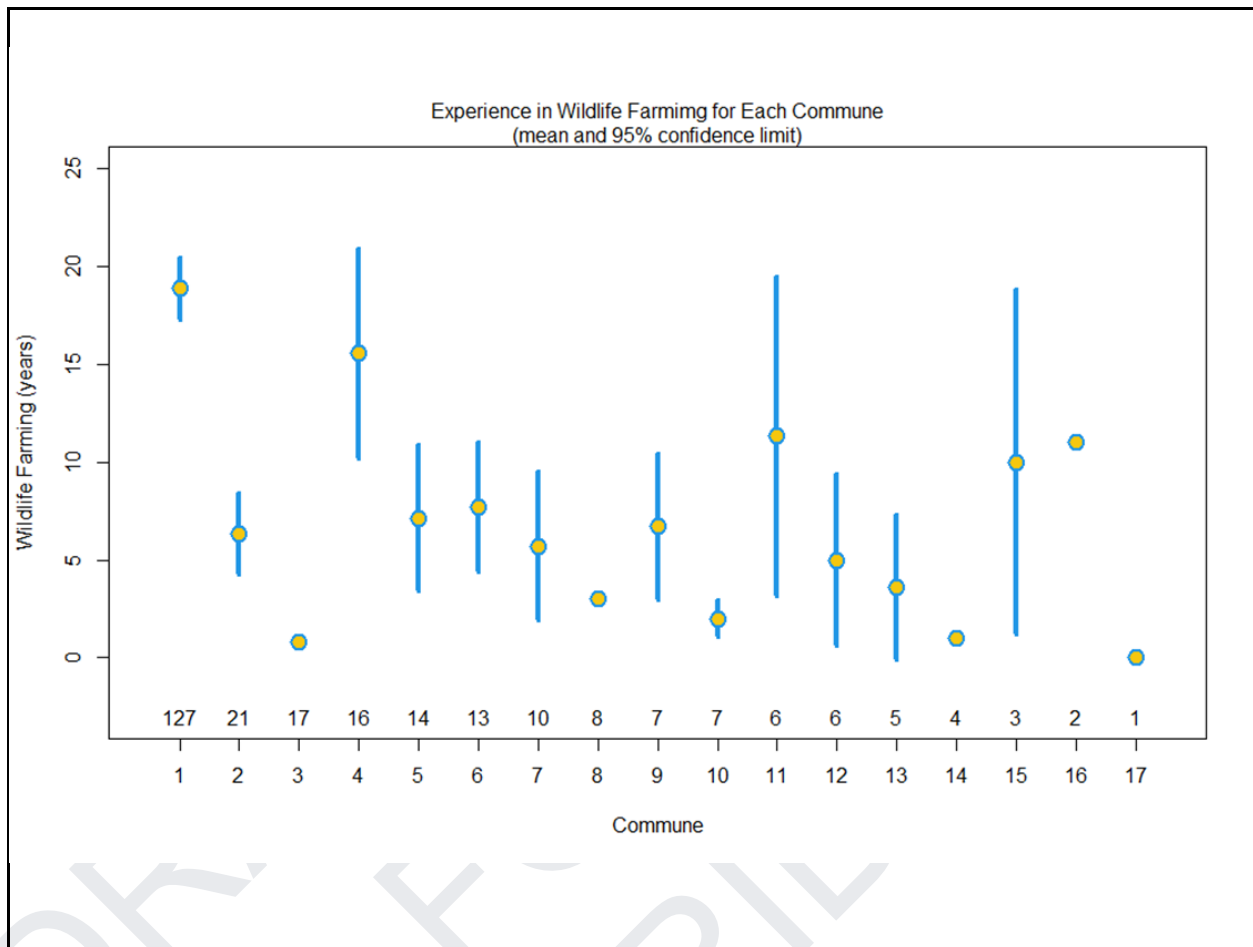
Figure 18: Mean number of years of wildlife farming and 95% confidence interval for each commune. Number of respondents is shown above the commune number. Data are from the survey of 267 respondents working on wildlife farms. Commune names: 1 Hieu Liem, 2 Nam Cat Tien, 3 Phu Binh, 4 Phu Ly, 5 Vinh An town, 6 Phu Loc, 7 Tra Co, 8 Phu An, 9 Phu Trung, 10 Phu Lam, 11 Tan Phu town, 12 Phu Lap, 13 Thanh Son, 14 Nui Tuong, 15 Ta Lai, 16 Phu Son, 17 Phu Xuan.

In Figure 18, the years of experience in wildlife farming for the 17 communes showed considerable variation among communes. Notably, commune 1 had the longest experience and commune 3 farmers had all begun wildlife farming within the last year.

At FGD sessions, most farmers considered that Sambar deer, porcupine, bamboo rat and civet, are easy to raise and that the food is readily available at family farms and cheaper than for poultry or livestock (those species reportedly need more processed feeds). Others said wildlife are clean and odorless, have few diseases, and reproduce more than domestic animals.

Survey respondents were most likely to work on Sambar deer farms and workers on Sambar deer farms reported greater years of experience than workers from other farms. Deer farmers

were markedly more experienced (average 19.5 years' experience) compared to other types of wildlife farmers, including porcupines, rats, and civets (all < 7 years).

The vast majority of respondents (83.5%) reported raising at least one of the targeted wildlife species (porcupines, civets, bamboo rat, or deer). Only 44 of the 267 respondents (16.5%) raised 2 or more wildlife species, however, only 22 of the 267 respondents (8.2%) raised 2 or more of the targeted species of wildlife. The other respondents raised wildlife species such as wild boar, bird's nest, or wild chicken. Only 3 respondents in the survey raised 3 or more of the targeted species of wildlife (see Table HS_1_C).

Farms raised civets, bamboo rats, and porcupines for the purpose of selling meat, for breeding, or both. 75% of farmers raise civets for sale as breeding stock, and only 35.3% sell civets for meat. Deer are mainly raised for antlers (for use in medicine), though 49% raise and sell breeding stock. Very few respondents said that they sell deer meat. Porcupine farmers raised animals for meat (63.4%) and to sell breeding stock (56%). Bamboo rats are raised for sale as breeding stock (88% of respondents) and meat (54.4%). Many farmers would like to sell more breeding stock due to the perception that this is a more lucrative endeavor. Wildlife was sold directly to consumers (41.8%), traders (33.6%) and farmers (19.2%), but the main buyers varied substantially by species (Figure 19).
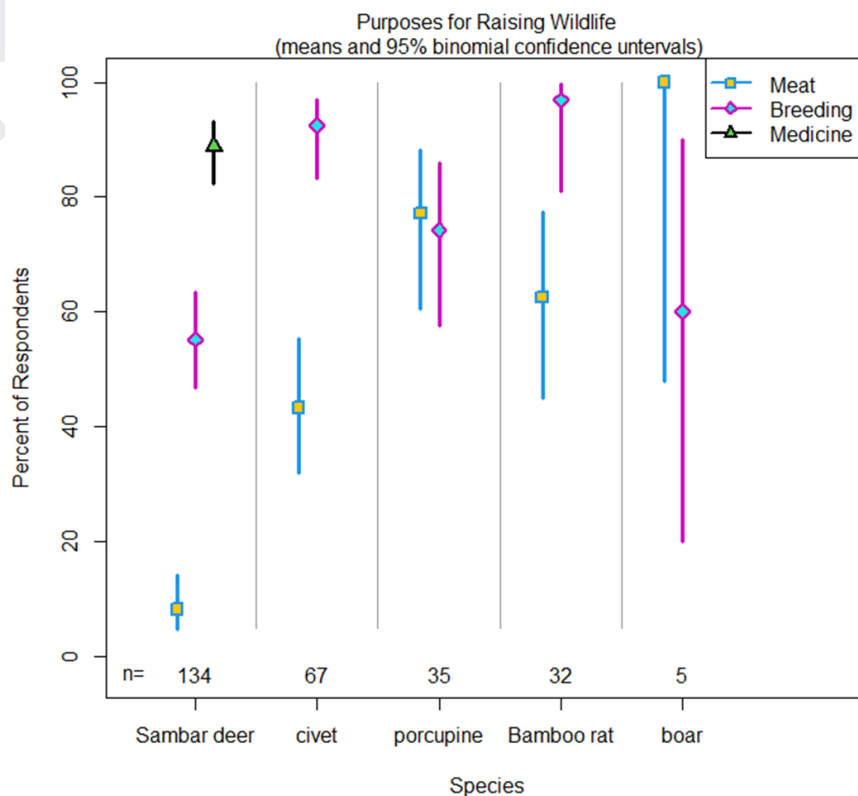
Figure 19: Purpose for raising wildlife. Percent of respondents and 95% binomial confidence intervals. Number of respondents raising each wildlife species is shown at the bottom of the plot. Data is from a survey for 267 respondents working on wildlife farms.

3.4.4 Future Aspirations of Wildlife Farmers

Many farmers expressed ideas for improving treatment of wastewater and wildlife waste. They expressed interest in suitable probiotics (microbial additives) to treat manure, wastewater, and wildlife waste to limit odor and prevent environmental contamination. Some indicated that they are considering building a gutter to drain wastewater from barns to manure cellars or build biogas harvesting systems.

Some farmers expressed a desire to apply cooling measures for farmed animals and to receive instruction in reproductive techniques. There are no records of disease management, quarantine, and disease testing on animals and farmers are interested in improving this situation. Some farmers expressed an interest to be provided with suitable disinfectants to disinfect their farms.

Respondents expressed their hopes of being trained on disease prevention, safe and hygienic captive breeding techniques, and being guided by veterinary authorities on professional sanitation techniques. Some households want to be supported with labor protection equipment, disinfectants, and instructions on disease management standards.

The majority (87.3%) of respondents did not intend to give up wildlife farming. Thirty-four people (12.7%) reported an intent to stop raising wildlife. Commonly reported reasons for planning to give up wildlife farming were decreases in selling prices (8 people); belief that there is a disease related to wildlife occurring near the farm (4); unfavorable law changes increasing levels of fines when violation is detected by Forest Ranger (3); and belief that they or a family member are sick (3); or that the family opposes wildlife farming (2). Nineteen people gave other reasons such as old age, weakness, and no time to raise. Of 13 young people aged <25, 23.2% want to train for another job and 46.2% want to switch to livestock production.

Motivations to trade in wildlife include the need to earn a living and perceived market demand for wildlife products, especially wildlife meat. Due to more strict regulations and increasing penalties for violations, 72.1% of respondents want to stop trading wildlife.

There were 10 people who did not intend to stop selling (23.3%), but 72.1% intend to stop trading for various reasons, such as strict legal regulations and strict enforcement (44.2% of respondents) and a decrease in selling price (41.9% of respondents). Over 20% of interviewed staff would like to train for other jobs for free, 9.3% want to switch to livestock production, and 25.6%want to be supported by a peer group.

3.4.5 Wildlife Traders

Among the 43 wildlife traders, most were retailers. Out of a total of 43 traders, men accounted for 60.5% and women accounted for 39.5%. Participants ranged in age from 25 to 64, with a mean of 43.4 years. The vast majority (97.7%) of interviewees were married, with just 1 person divorced. Traders were somewhat more highly educated than farmers - 7% have primary education (grades 1-5), 32.6% lower secondary education qualifications (grades 6-9), 55.8% have high school qualifications (grades 10-12) and a small minority (4.6%) had intermediate or college/university level education.

Wildlife trading was reported as a major source of income by 58.1% of respondents, but they spent only 26.8% of their time on this job. Wildlife trading is mainly a part time retail activity, and many wildlife traders have other jobs or trades.

Economic factors are the primary motivation for participation in wildlife trade – the trade contributed 32.9% to household income on average. Although an important source of income, the volume of activity is variable and the level of income fluctuates. A majority (72.1%) of respondents believe that the percentage contribution of wildlife trade to their household income has decreased in the past 3 years, with the average decrease estimated at 13.1%. Respondents attributed this decline principally to demand reduction during the COVID-19 pandemic. There were 2 people who thought that the contribution of wildlife farming to their household income had increased - estimated at 30%. The remaining 23.3% of households believed that income remains constant from wildlife trading.
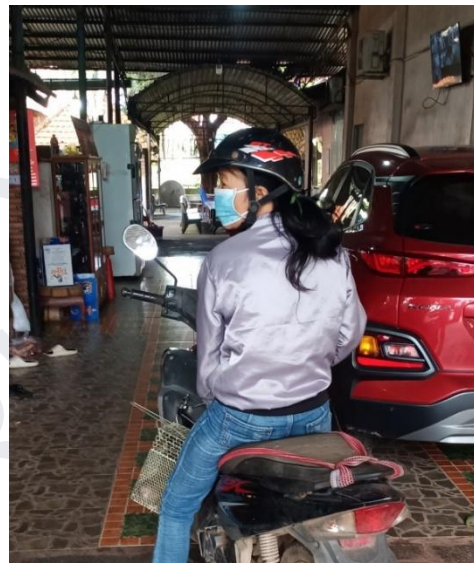
Figure SEQ Figure | ARABIC 20: Wildlife being transported my*

Most wildlife traders purchase meat for consumption and animals for breeding purposes.

Table 4: Purposes of trading by species

	Bamboo rat (n=15)		Civet (n=19)		Porcupine (n=14)		Samba Deer (n=9)		Snake (n=10)		Other * (n=4)	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Meat	0	15	1	18	2	11	0	9	0	10	0	4
Breeding	8	7	12	7	7	7	7	2	4	6	4	0

	Bamboo rat (n=15)		Civet (n=19)		Porcupine (n=14)		Samba Deer (n=9)		Snake (n=10)		Other * (n=4)	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Medicine	0	0	19	0	14	0	8	1	9	1	4	0
Tourism	0	0	19	0	14	0	9	0	10	0	4	0
Other	0	0	19	0	12	2**	9	0	10	0	4	0

** I am a shipper (n=2)

Average monthly selling volume is equivalent to buying volumes.

Deer antler velvet was purchased on an average of 20-30 kg per month and a minimum of 3 kg/month. The antler velvet price was around 4,000,000-6,000,000 VND/kg. The average selling price is from 7,000,000-8,000,000VND/kg.

Bamboo rats were purchased on an average of 10-20 individuals/month and a minimum of 4-6 per month. The purchase price ranges from: 350,000-500,000 VND/breeding stock, 550,000 to 700,000VND/kg (for meat). The average selling price is from 700,000 -1,100,000 VND/kg depending on purchase price.

Civet was purchased on an average of 10 - 50 animals per month and generally at least 4-5 individuals/month (average weight of 3-5 kg/individual). The average purchasing price ranges from 800,000 -1,200,000 VND/kg for meat depending on social demand and market price fluctuations, while breeding stock price is about 800,000-1,000,000 VND/individual. The average monthly selling volume was approximately equal to the purchase volume. The selling price ranged from 800,000 VND/kg to 1,600,000 VND/kg for meat (equal to 2,000,000-2,500,000VND/individual) and 1,200,000 -1,500,000VND/individual for breeding stock.

Porcupines were purchased on an average of 10-25 individuals /month and a minimum of 3-4/month. The average purchase price ranged from 1,200,000-3,500,000VND/individual. The selling price of breeding stock was 1,200,000 VND/individual while it was around 2,500,000-4,000,000 VND/individual for meat.
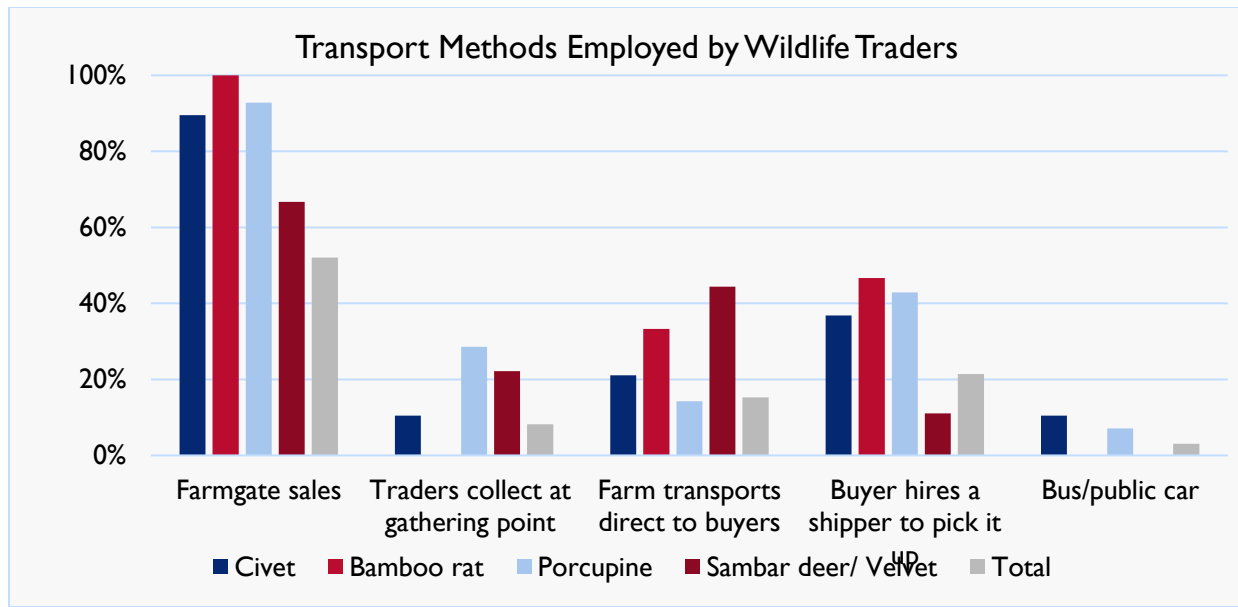
Figure 21: Transport methods employed by wildlife traders. Data is from survey results. 19 respondents handled civets, 15 respondents handled bamboo rats, 14 respondents handled porcupines, and 9 respondents handled sambar deer.

There are many options for transporting wildlife (Figure 20) when traders purchase wildlife at the farm. Transport by bus/public car was used less often than other modes, due to concerns about heat stress in luggage areas. Personal cars and motorbikes were used more often for live animal transport.

Handling of multiple species by traders may pose a risk of disease spillover among species. Only 9 respondents (21%) reported working with wildlife with a single species, 13 respondents (30%) reported working with 2 species, and 21 (49%) reported working with 3 or more species. 26 traders (60.5%) reported selling both wildlife and domestic animals (Table 5).

Table 5: Number of wildlife and Domestic Species that traders reported handling

Number of Wildlife Species	Number of Domestic Species					Total
	0	1	2	3	4	
1	9	6	6	1	0	22
2	7	4	2	0	0	13
3	1	5	1	0	0	7
4	0	1	0	0	0	1

Number of Wildlife Species	Number of Domestic Species					Total
	0	1	2	3	4	
Total	17	16	9	1	0	43

Note: 3 respondents indicated they no longer work with wild animals and/or shifted their trade.

> *"My restaurant had stop selling wildlife from the end of 2021" (ID:3040)*
> *"Stopped wildlife trading" (ID:3042)*
> *"The wildlife price is high, so now we mainly sell chicken and fish" (ID:3043)*

Across species, wildlife was trader primarily for meat, followed by breeding. Samba deer and snake were the only species mentioned as being traded for medicinal purposes.

Across species, small farms seem to be the main source (100%) of animals for traders who handle bamboo rats and snakes. The great majority (89% or more) of traders work with civets and porcupines. Wildlife were mainly purchased from small farms (68.9%) and sold to other farmers (31.4%) and consumers (48.6%). As these were small to medium sized animals (e.g., bamboo rats), most buyers came directly to the farm to catch, handle, and transport wildlife. The multiple and diverse interactions by the traders across species and interfaces increased the probability of disease spillover. Traders represent an important potential control point for interventions.

Table 6: Sources of Wildlife by species from traders survey

	Bamboo rat (n=15)		Civet (n=19)		Porcupine (n=14)		Samba Deer (n=9)		Snake (n=10)		Other * (n=4)	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Small Farms	0	15	2	17	1	13	1	8	0	10	3	1
Large Farms	12	3	17	2	7	7	7	2	6	4	4	0
Breeding	13	2	17	2	14	0	7	2	7	3	4	0
Capture	0	0	19	0	14	0	9	0	10	0	4	0
Other	14	1*	14	5**	13	1***	9	0	9	1*	1	3*****

* WL hunter
** WL hunter (n=3), trader (n=2)
*** shipping for traders
***** farmer (n=2) / WL hunter(n=1)

Table 7: Buyers of Wildlife by species from traders survey

	Bamboo rat (n=15)		Civet (n=19)		Porcupine (n=14)		Samba Deer (n=9)		Snake (n=10)		Other * (n=4)	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Farmers	5	10	6	13	7	7	6	3	2	8	3	1
Consumers	0	15	3	16	1	13	3	6	2	8	2	2
Restaurant	14	1	13	6	9	5	3	6	3	7	3	1
Company	15	0	19	0	14	0	9	0	9	0	4	0
Other	15	0	17	2*	13	1**	8	1***	8	2**	4	0

* Food for family (n=1), Chinese trader (n=1)
** Trader

The types of domestic animals at traders' homes included poultry at 8 homes (19.5% of 41) and pigs at 7 homes (17.1% of 41).

Table 8: Types of domestic animals at traders' homes

	Poultry	Pig	Cow/Buffalo	Dog/Cat	Fish	Other
No	33	34	40	26	35	38
Yes	8	7	1	15	6	3
Missing	2	2	2	2	2	2
Total	43	43	43	43	43	43

3.4.6 Neighbors

A total of 103 neighbors and wildlife consumers responded to this survey (54.4% male and 45.6% female). The average age of interviewees was 44.4 years old. The youngest was 24, and the oldest was 72. 85.4% of respondents were married, 12.6% single, and 2 divorced. On average, there were 4.17 people in the family (2-8 people) with a median of 4. Families with 3-5 members made up the majority of 76.7%, families with 2 members made up 7.8%, and the remaining 15.5% of respondents had a family of 6-8 members.

Neighbor survey participants were more educated when compared to wildlife farmers and traders. 12.6% had primary education (grades 1-5), 31.1% had lower secondary education qualifications (grades 6-9), 33% had high school qualifications (grades 10-12) and 21.4% had an intermediate or college/university level education.

The majority (85.4%) of neighbors reported raising domestic animals at their home. Table 9 below shows the types of domestic animals neighbor survey participants had at their homes. The majority (72%) of neighbors reported they kept poultry and 24% kept pigs. Neighbors had higher rates of domestic livestock keeping compared to traders (Tables 8 and 9).

Table 9: Types of domestic animals at neighboring homes

	Poultry	Pig	Cow	Dog/Cat	Fish	Other
no	29	78	99	40	94	94
yes	74	25	4	63	9	9
Total	103	103	103	103	103	103

Water Source for households and domestic animals

Covered drilled wells were the most common water sources for both households and domestic animals (Tables 10 and 11), followed by water taps for the household and covered dug water wells for domestic animals.

Table 10: Water Source for Households from Neighbors Survey

	Covered dug water well	Uncovered dug well	Covered drilled well	Water tap	Covered rainwater	Uncovered rainwater	Filtered water	Pond /river	Other
No	85	98	41	63	99	101	86	101	101
Yes	16	3	60	38	2		15		
Missing	2	2	2	2	2	2	2	2	2
	103	103	103	103	103	103	103	103	103

Table 11: Water Source for Domestic Animals from Neighbors Survey

	Covered dug water well	Uncovered dug well	Covered drilled well	Water tap	Covered rainwater	Uncovered rainwater	Filtered water	Pond / river	Other
No	85	97	32	86	101	103	99	100	102
Yes	18	6	71	17	2		4	3	

Missing									1
	103	103	103	103	103	103	103	103	103

Many neighbors (40.8%) had no concerns about disease on farms. A further 9.7% indicated that they did not know. Among the respondents who have concerns about disease, 36.9% were concerned about disease in animals; 12.6% were concerned about diseases in humans and animals.

Regarding the zoonotic diseases of concern, 37.9% answered that they had concerns, 37.9% did not, and 7.8% indicated that they did not know.

From the point of view of the risk of disease if exposed to live or recently slaughtered wildlife while having an open wound, 21.4% answered "No risk" (21 of103), while 27.2% answered "Yes'' but were unsure of what the risk was.

Table 12: Concern about diseases on the farm (neighbors survey)

	Frequency	Percent
Yes, in animals	38	36.9%
Yes, in both animals and humans	13	12.6%
No	42	40.8%
I don't know	10	9.7%
	103	100.0%

3.5   One Health Agencies

The Forest Protection Department is the key agency in wildlife management in accordance with existing regulation from Provincial to commune level.

The veterinary service currently focuses on 5 common zoonotic diseases as in Circular 16/2013 (MARD & MOH, 2013). The role of veterinary agencies in supporting wildlife production is minimal. Veterinarians have limited capacity to treat and handle diseases in wildlife.

A limited role of human health or environmental agencies was reported by the other sectors, though it is possible the informants were unaware of such roles. No health checks or health

surveillance for farmers was in place and there was no food safety inspection of wildlife meat or meat products.

> *"Regarding the environment, there is no farm which carries out the procedures for approving wildlife production activities to meet environmental protection standards"*
>
> *- Environmental Official, KII)*
>
> *"Sub-DAH cooperates with other units to determine the cause of the disease when farmers report a case or death"*
>
> *- VET Official, KII*
>
> *"Regulations and personnel related to wildlife are not clear regarding VET. For example, only cases of common diseases for civets according to the specified list will result in a quarantine. If there is no required disease on the list, they will not proceed into*

3.6   *Integrative Analysis*

The qualitative behavioral risk assessment approach used in this document was informed by the JRA OT (Joint Risk Assessment Operational Tool (JRA OT), 2020). The basis of our risk assessment framing was presented in Figures 1 and 2 where actors, activities and specific risk factors were identified and then informed by directed data collection that included behavioral questionnaires across the wildlife farming value chain actors, Key Informant Interviews (KIIs), Focus Group Discussions (FGDs) and Observations (locational checklist). The data collection provided input on many risk factors including environmental, occupational, infrastructure, self-reported health, social, economic and risk perception insights. Table HS_1_A shows how risk factors were combined into a risk matrix and combinations of low, medium, and high likelihood of impact from each risk factor were used to classify the combinations into three ranked groups. Impacts referred to here are outcomes such as disease and zoonotic spillover of diseases among animals and humans.

> Table HS_1_ A: Comparison of two risk factors based upon data collection that included behavioral questionnaires across the wildlife farming value chain actors.
>
> Key Informant Interviews (KIIs), Focus Group Discussions (FGDs) and Observations (locational checklist). Risk Factors were categorized in terms of likelihood of impact of disease and spillover of zoonotic diseases. Green indicates that both risk factors represent a lower likelihood of impact, blue indicates one or the other risk factors are a medium likelihood of impact but neither is a high likelihood of impact, and yellow indicates one or the other risk factors are a higher likelihood of impact.

Risk Factor 1	Risk Factor 2		
	Low Likelihood of Impact	Medium Likelihood of Impact	High Likelihood of Impact
Low Likelihood of Impact			
Medium Likelihood of Impact			
High Likelihood of Impact			

Figure HS_1_A shows an example risk matrix. Risk matrices are tools that are frequently used by public and One Health assessors across activities and which provide a consistent platform for assessing the level of risk and thus can provide valuable input into risk management decision-making processes. A matrix can consider categories of probability or likelihood against categories of severity of the consequence. In our application we were able to construct multifactorial risk comparison contexts including qualitative information on the likelihood and impact of activities and infrastructure across the wildlife farming interface (JRA OT, 2020). We developed a series of integrative analyses using risk matrices for evaluating combinations of risk factors including number and diversity of species, infrastructure of water sources and animal waste management on wildlife farms. Also, in this integrative analysis section we identified differences between male and female use of PPE and whether there are differences in risk perception in terms of worry about human and animal disease on wildlife farms.

The Methods section presented an assessment of individual actors and statistical analysis. To integrate our single actor and single activity assessments we used a risk matrix approach similar to that described in the JRA OT. The purpose of our integrated analysis was to ultimately inform our interventions and interface identification in Viet Nam. These integrated analyses also provide evaluation milestones to more clearly illustrate risk reduction and co-solutions for lowering risk after targeted intervention strategies are implemented within the overall application of core interventions. As further described in the Results section, this information ranked activities (such as water and waste management infrastructure) by their potential to impact biosafety, biosecurity, and affect One Health consequences.

Our detailed integrated assessments of the diversity and scale of wildlife and domestic farming in Dong Nai province allowed us to look at a variety of complex situations in this farming area. This integration allowed for enhanced risk assessment evaluation and ultimately informed intervention interfaces.

3.6.1 Evaluating the combined likelihood of impact of number and diversity of species, water sources, and treatment of animal waste.

We used the results of the survey questions on the number and diversity of species, water sources, and treatment of animal waste to evaluate the combined likelihood of impact on disease and spillover of zoonotic disease among species of these three risk factors. We accomplished this in three stages by grouping the answers for a single question and ranking them for each factor into low, medium, and high likelihoods of impact. We used pairs of the factors—number and diversity of species, water sources, and animal waste treatment infrastructure—to form a 3 by 3 matrix crossing the low, medium, and higher likelihoods of impact from each factor. These matrices were then combined to provide an overall ranking for the farms where the respondents worked.

3.6.1.1 Number and Diversity of Species

Multiple species on a wildlife farm can pose a hazard due to the potential risk of disease spillover between species. Evaluating risk requires consideration of both the hazards and exposures. To facilitate assessment of our data we used a modification of the risk matrix approach to consider the potential (inherent hazard) of the activity or situation as well as infrastructure presence at the wildlife farming sites as an indication of potential to impact the spread of zoonotic disease. In general, we need to understand the likelihood of exposure as well as the presence of a hazard in order to calculate both the likelihood and the probability of the adverse health impact that could occur at that location. We collected general information which was mostly qualitative in nature across the farms by actor. This provided both the presence of certain hazardous situations as well as the frequency of such situations (potential for exposures). We were able to ascertain a list of risk factors and document those present on the wildlife farms and which could impact the overall ranking for the sites. This formed the basis of our qualitative hazard ranking within our modified risk matrix.

Table HS_1_B presents a tabulation between all species to show all pairs for wildlife and domestic species from the survey respondents. Porcupines (41 respondents 15.4% of 267) and bamboo rats (33 respondents 12.4% of 257) are shaded gray because they are known to carry coronavirus in Viet Nam (Predict 2019, 2020) and they occur with every other species except spotted deer. Studies have also identified coronaviruses in domestic pigs (32 respondents, 12.0% of 267) in these regions and therefore this has also been shaded in gray. Poultry (156 respondents, 58.4% of 267) are shaded in orange because of their potential to be infected with avian flu and they occur on some farms with all the species in the table. Table HS_1_C shows the relationship between the number of wildlife species and the number of domestic species on farms as reported by respondents in the survey. This table shows a total of 66 respondents (24.5% of total respondents) who reported they worked on a wildlife farm that has no domestic animal species and 62 respondents working on a farm with only one wildlife species. There were 201 respondents (75.5% of total) who reported working on a wildlife farm with one or

more domestic species. There were 59 different combinations of species (not shown) on the wildlife farms present in the data.

Table HS_1_ B: Cross tabulation of all species as reported by survey respondents for the wildlife farms

	Wildlife Species					Domestic Species					
	Sambar deer	civet	porcupine	rat	boar	poultry	Pet*	pig	spotted deer	cow	fish
Sambar deer	143	0	4	2	5	80	49	28	16	0	6
civet	0	68	2	10	0	40	47	14	0	9	4
porcupine	4	2	41	2	2	25	29	4	0	6	3
bamboo rat	2	10	2	33	1	19	22	9	0	3	3
boar	5	0	2	1	5	1	1	3	0	0	0
poultry	80	40	25	19	1	156	102	32	11	10	12
Pet*	49	47	29	22	1	102	135	31	6	10	11
pig	28	14	4	9	3	32	31	47	3	5	6
spotted deer	16	0	0	0	0	11	6	3	16	0	1
cow	0	9	6	3	0	10	10	5	0	15	1
fish	6	4	3	3	0	12	11	6	1	1	13

*Pet is dog/cat.

Cross tabulation of all species as reported by survey respondents for the wildlife farms where they worked. The intersection of gray and orange colors are for farms with species potentially carrying coronavirus and avian flu. There were 267 respondents.

Because of the many different possible combinations of species, it was decided to consolidate the results in Table HS_1_C into the total number of species on a farm by adding the number of wildlife and domestic animal species which is shown in Table HS_1_D.

Table HS_1_ C: Percent of respondents cross tabulated by the number of wildlife and domestic species on farms

Number of Wildlife Species	Percent of Respondents (Number of Respondents)					
	Number of Domestic Species					
	0	1	2	3	4	Total
1	23.2 (62)*	24.3 (65)	33.3 (89)	9.0 (24)	3.0 (8)	92.8 (248)
2	0.7 (2)	1.5 (4)	1.9 (5)	0.4 (1)	1.5 (4)	6.0 (16)
3	0.4 (1)			0.4 (1)		0.8 (2)
4	0.4 (1)					0.4 (1)
Total	24.5 (66)	25.8 (69)	35.4 (94)	9.8 (26)	4.5 (12)	100.0 (267)

* Sambar Deer is the only wildlife species to be on single species farms

This table shows the percent of respondents cross tabulated by the number of targeted wildlife species and domestic species on farms where they worked. Multiple species on a wildlife farm (including both wildlife and domestic) may pose a risk of disease overspillover among species.

Based upon the hazard of having multiple species on a wildlife farm contributing to spillover risks, we identified a low likelihood of impact as having a single species shown in green (62 respondents, 23.2% of 267), a medium likelihood of impact 2 species shown in blue (67 respondents, 25% of 267), and a higher likelihood of impact to have 3 or more species shown in yellow (138 respondents, 51.8% of 267).

Table HS_1_ D: Percent of respondents working on wildlife farms by the total number of wildlife and domestic species

Percent of Respondents (Number of Respondents)				
Total Number of Wildlife and Domestic Species				
1	2	3	4	5 or more
23.2 (62)*	25.0 (67)	35.2 (94)	11.3 (30)	5.3 (14)

* Sambar Deer is the only wildlife species to be on single species farms

This table shows the percent of respondents working on wildlife farms by the total number of wildlife and domestic species.

3.6.1.2   Water sources for household, wildlife animals, and domestic animals

Water sources for household, wildlife animals, and domestic animals were described as coming from covered drilled wells, water taps, filtered water, covered rainwater, covered dug wells, uncovered dug wells, uncovered rainwater, and ponds or rivers. Each respondent indicated all the sources of water for household, wildlife animals, and domestic animals on the wildlife farm where they worked. An overview of the results of the survey were presented in Figures 12 and 13 for each source and use. Table HS_I_E shows this information integrated by the sources of water grouped into 3 categories with sources in each category having a similar degree of safety and stability (these categories were done in consultation with the Viet Nam relevant stakeholders). These categories are:

A. Low likelihood of impact: Covered drilled well, Water taps, Filtered water

B. Medium likelihood of impact: Covered rainwater, Covered dug well

C. High likelihood of impact: Uncovered dug well, Uncovered rainwater, Ponds or rivers

There was a complex pattern of responses because some respondents indicated there were multiple sources that were used for household water, and then different combinations of sources for wildlife or domestic animals. This meant that for household water, there might be sources identified in category A (low likelihood of impact sources) and also categories B or C (medium and high likelihood of impact sources), similar to wildlife and domestic animal water sources. For this report it was decided to assign the category based on the source of greatest concern since that was a vulnerability for the spread of waterborne diseases, that is, if household water had sources in categories A (low likelihood of impact) and C (high likelihood of impact) it would be categorized as category C (high likelihood of impact) since that was the source of greatest concern. The same criteria were used for sources of wildlife water and domestic animal water. This allowed the report to focus on potential biosafety and biosecurity intervention targets.

The respondents indicated that 73-77% of the farms where they worked had water source infrastructure in category A (low likelihood of impact sources) depending on the use of the water, 15-17% in category B (medium likelihood of impact sources), and 8-10% had high likelihood of impact water sources in category C.

Table HS_I_ E: Comparison of water sources for household, wildlife animals, and domestic animals

	Percent of Respondents (Number of Respondents)		
	Household	Wildlife animals	Domestic animals
Respondents with complete data	264	256	240*

	Percent of Respondents (Number of Respondents)		
	Household	Wildlife animals	Domestic animals
Category			
A Low Likelihood of Impact: Covered drilled well, Water taps, Filtered water	77 (202)	77 (195)	73 (176)
B Medium Likelihood of Impact: Covered rainwater, Covered dug well	15 (40)	15 (39)	17 (40)
CHigh Likelihood of Impact: Uncovered dug well, Uncovered rainwater, Pond/river	8 (22)	8 (21)	10 (24)

Some wildlife farms did not have any domestic animals so there are fewer farms for which the source of water for domestic animals was applicable.

This table compares sources of water for household, wildlife animals, and domestic animals. Water sources were grouped into three categories with sources in each category having a similar degree of safety and stability (these categories were done in consultation with the Viet Nam relevant stakeholders). Sources in category A are likely to be the safest sources of water, sources in category B are less safe, and category C is likely to be the least safe sources.

For this report it was decided to consolidate in Table HS_I_F the three types of water source infrastructure categories for households, wildlife, and domestic animal species on wildlife farms into an overall ranking of the farms based on the category with the greatest vulnerability among the three uses. If a farm had household water in category A but domestic water in category C, then it would be placed in the third row of Table HS_I_F. Based on the consolidated rankings for water sources, 65% have all category A rankings, 18% have some Category B rankings but no Category C, and 17% have some Category C rankings.

Table HS_I_ F: Combined table for the A, B, C categories for sources of household, wildlife, and domestic animal water

Group (based on Categories in previous table for water sources)	Percent of Respondents (Number of Respondents)
All Category A for Household, Wildlife, Domestic Animals	65 (167)
At least 1 Category B and No Category C for Household, Wildlife, Domestic Animals	18 (45)
At least 1 Category C for Household, Wildlife, Domestic Animals	17 (43)

This table combines the A, B, C categories for sources of household, wildlife, and domestic animal water from Table HS_I_E. They were combined based on the least safe category for household, wildlife, and domestic animal water. The first row in this table is respondents who reported that the farm they worked on had water source infrastructure in category A for all three of household, wildlife, and domestic animals and this was identified as a relatively low likelihood of impact condition shaded in green. The second row is respondents who reported at least one source of water in category B but none in category C, with a medium likelihood of impact shaded in blue. The third row represents respondents who reported at least one source of water in category C, and this condition was identified as a higher likelihood of impact shaded in yellow. There were 98 farmers (38.4% of 255) ranked in more likelihood of impact category out of the 255 respondents with complete data.

3.6.1.3   Treatment of animal waste

The treatment of animal waste was shown in Figure 16 in the report for 7 methods of treatment. To gain further understanding of how to rank these 7 waste management infrastructure methods into low, medium, and high risks, the Viet Nam team provided the following observations on these methods:

1. Manure composting is a traditional manure treatment in rural areas. Excrement is collected in heaps or into the pit then mixed with some herbal/ vegetable matter, incubated for a while to rot without using any modern equipment to measure temperature, humidity. The farmers use their experience of composting livestock and poultry waste.

2. Manure and excrement are treated with probiotics to quickly decompose to fertilize plants. 3. Biogas technology is an additional method to make use of manure and waste from domestic animals. It is usually applied to farms raising livestock and poultry in large quantities and is mainly applied on Sambar deer farms.

4. Manure and excrement are collected into a bag or pit to fertilize plants after a few days. They are not composted or mixed with probiotic.

5. Excrement and wastewater flow to a pit with no composting. When the pit is full, farmers scoop out manure to fertilize the plants. This is the least hygienic waste treatment method.

6. Wastewater and manure are applied directly to fertilize crops with no treatment in an unsanitary manner.

7. Feeding directly to fish in an unsanitary manner.

The 7 methods were grouped into three categories based upon the safety and sustainability of the method and its likelihood of impact on disease and spillover of zoonotic disease among species:

Category A: Low likelihood of impact were responses 1, 2, and 3.

Category B: Medium likelihood of impact were responses 4 and 5.

Category C: High likelihood of impact were responses 6 and 7.

Because most of the responses indicated multiple methods were used on farms, the combinations of responses are shown in Table HS_G with the percent of respondents with that combination listed. The combinations of methods present on wildlife farms were then grouped by their potential for spread of disease such that the group with least potential only had Category A low hazard waste methods for waste disposal on the farm, the group with the highest potential had some Category C high risk methods, and the Category B had medium hazard methods but no Category C high hazard methods. There were 245 respondents who answered the question on waste methods and 22 who did not, and of the 245 respondents 35 mentioned a single method of treating waste and 210 mentioned multiple methods.

Although 79 farms (32.2% of 245 farms) had some Category A low likelihood of impact methods for handling waste, there were only 14 farms (5.7% of 245) that only used Category A low likelihood of impact methods, placing them into the low likelihood of impact group in the first column of Table HS_I_G. The other 65 farms (26.5% of 245) also had some Category B medium likelihood of impact and C high likelihood of impact methods for treating animal waste. The largest group of farms (188 farms, 76.8% of 245) were those with some category B medium likelihood of impact methods and no category C high likelihood of impact methods—this is the medium likelihood of impact group shown in the first column of Table HS_I_G. There were 43 farms with some Category C methods for treating animal waste (17.5% of 245 farms) which placed them into the high likelihood of impact group, shown in the first column of Table HS_I_G. Combining the medium and high likelihood of impact groups in the first column of Table HS_I_G, there were 231 farms (94.3% of 245) with high or medium likelihood of impact methods for treatment of animal waste.

Table HS_I_ G: Combinations of animal waste treatments that respondents indicated were used on the wildlife farms

Farm Category	Categories for Animal Waste Treatment Methods							Respondents		
	A 1	A 2	A 3	B 4	B 5	C 6	C 7	Number	Percent	Group Total %
Low likelihood of impact	X	X						2	0.8	5.7
	X							5	2.0	
			X					7	2.9	
Medium	X	X		X				1	0.4	76.8

Farm Category	Categories for Animal Waste Treatment Methods							Respondents		
	A1	A2	A3	B4	B5	C6	C7	Number	Percent	Group Total %
likelihood of impact	X			X				44	18.0	
	X				X			1	0.4	
	X			X	X			17	6.9	
		X		X				2	0.8	
				X				64	26.1	
				X	X			21	8.6	
					X			38	15.5	
High likelihood of impact		X				X		4	1.6	
				X		X		7	2.9	
				X		X	X	1	0.4	
				X			X	2	0.8	17.5
					X		X	3	1.2	
						X		22	9.0	
							X	4	1.6	
Number	70	9	7	159	80	34	10			
Percent	27.5	3.5	2.7	62.4	31.4	13.3	3.9			

Respondents indicated combinations of animal waste treatments used on the wildlife farms where they worked. The methods were put into three categories—A: low likelihood of impact and the safest and most sustainable methods; B: medium likelihood of impact methods; C: high likelihood of impact methods. The combinations of methods present on the farms were then grouped (shown in the first column). The low likelihood of impact group (green in first column for the farm category) only had Category A methods for waste disposal on the farm. The medium likelihood of impact group (blue in first column for farm category) had category B methods and possibly category A methods, but no Category C methods. The high likelihood of impact group had some Category C methods (yellow in first column for farm category). There

were 245 respondents who answered the question on waste methods and 22 who did not.

3.6.1.4 Combining Number and Diversity of Species and Water Infrastructure

The results for wildlife farms where respondents worked in Table HS_I_F and for water sources and total number of species in Table HS_I_D are combined in a risk matrix in Table HS_I_H. This provides a cross comparison for likelihood of impact for two risk factors and helps to characterize farms at a medium to higher likelihood of impact level. This combination of criteria shows that only 17% of the farms are at the lowest likelihood of impact (green in Table HS_I_H), whereas 65% were at the lowest likelihood of impact based only on water sources (all water sources category A in first row of Table HS_I_G) and 23.2% were at the lowest likelihood of impact based on number of species (green Table HS_I_D). The combination of criteria shows that 59% are at the highest likelihood of impact (yellow in Table HS_I_H), whereas 17.5% were at the highest likelihood of impact based only on water sources (at least one water source in category C yellow group of Table HS_I_G) and 51.8% were at the highest likelihood of impact based on number of species (yellow columns of Table HS_I_D). By integrating the information on water source infrastructures with diversity of species on wildlife farms, we were able to identify 83% of respondents working on farms with risk factors ranking in the medium to higher risk category.

Table HS_I_ H: Matrix comparing combined groups in Table HS_I_G for water sources to total number of species in Table HS_I_D for wildlife farms

	Percent of Respondents (Number of Respondents)		
Likelihood of Impact groups for water sources	Total Number of Wildlife and Domestic Species on Wildlife farms		
	1	2	3 or more
All Category A for Household, Wildlife, Domestic Animals	17 (43)	18 (45)	31 (79)
At least 1 Category B and No Category C for Household, Wildlife, Domestic Animals	3 (7)	4 (9)	11 (29)
At least 1 Category C for Household, Wildlife, Domestic Animals	4 (9)	5 (13)	8 (21)

Table HS_I_H is a matrix comparing combined groups in Table HS_I_G for water infrastructure to the total number of species from Table HS_I_D for wildlife farms where respondents worked. This matrix provides a way to identify types of wildlife farms that are of concern based upon two criteria rather than a single criterion. Yellow shading indicates wildlife farms with a high likelihood of impact, blue shading indicates farms with a medium likelihood of

impact, and green shading indicates farms with a lower likelihood of impact. There were 255 respondents with complete data.

3.6.1.5   Combining Number of Species and Treatment of Animal Waste

The results for wildlife farms where respondents worked is in Table HS_I_ G by methods of treating animal waste (infrastructure) and this is integrated with the total number of species from Table HS_I_D. These are combined in a matrix in Table HS_I_I. This provides a cross comparison for two risk factors (infrastructure and species diversity) and helps to characterize likelihoods of impact on farms. This combination of criteria shows that only 0.8% of the farms are at the low likelihood of impact (green in Table HS_I_I), whereas 5.7% were at a low likelihood of impact based only on methods of animal waste treatment infrastructure, and 23.2% were at a low likelihood of impact based only on number of species (one species in green column of Table HS_I_D). The combination of criteria shows that 59.6% are at the highest likelihood of impact level (yellow in Table HS_I_I) whereas 17.5% were at the highest likelihood of impact based only on animal waste methods, and 51.8% based on number of species (yellow columns of Table HS_I_D). There were 245 respondents with complete data. This illustrates the utility in identifying and integrating risk factors to target and ultimately evaluate intervention effectiveness. It is important to acknowledge in SBC studies that behaviors are rarely associated with a single risk factor, thus an integrated approach is needed.

Table HS_I_ I: Matrix comparing combined groups in Table HS_I_ G for methods of treating animal waste to total number of species in Table HS_I_D for wildlife farms

Waste Treatment Likelihood of Impact Level	Number of Species		
	I	2	3 or more
Low	0.8 (2)	I.2 (3)	3.7 (9)
Medium	17.6 (43)	20.8 (51)	38.4 (94)
High	3 .7 (9)	3 .7 (9)	10.2 (25)

Table HS_I_I is a matrix comparing combined groups in Table HS_I_G for methods of treating animal waste to the total number of species from Table HS_I_D for wildlife farms where respondents worked. This matrix provides a way to identify types of wildlife farms that are of concern based upon two criteria rather than a single criterion. Yellow shading indicates wildlife farms with a higher likelihood of impact, blue shading indicates farms with a medium likelihood of impact, and green shading indicates farms with a lower likelihood of impact. With this combined analysis we now see 99.2% of the farms with medium and high likelihood of impact. There were 245 respondents with complete data.

3.6.1.6   Combining Questions about Animal Waste Methods and Water Sources

The results for wildlife farms where respondents worked is in Table HS_I_ G for methods of treating animal waste and water sources in Table HS_I_F are combined in a matrix in Table HS_I_J. This provides a cross comparison for two criteria and helps to characterize likelihoods of impact of disease and spillover of zoonotic diseases among species on farms. This combination of criteria shows that only 3.0% of the farms have a low likelihood of impact (green in Table HS_I_J) whereas 5.7% had a low likelihood of impact based only on methods of animal waste treatment (Table HS_I_G) and for water sources 65% (Table HS_I_F). The combination of criteria shows that 30.3% have a high likelihood of impact (yellow in Table HS_I_J) whereas 17.5% were at a high likelihood of impact based on animal waste management infrastructure , and 17% based on water source management. There were 235 respondents with complete data.

Table HS_I_ J: Matrix comparing combined groups in Table HS_I_G for methods of treating animal waste and water sources in Table HS_I_F

	Percent of Respondents (Number of Respondents)		
Likelihood of Impact groups for water sources	**Treating Animal Waste**		
	Low Likelihood of Impact	**Medium Likelihood of Impact**	**High Likelihood of Impact**
All Category A for Household, Wildlife, Domestic Animals	3.0 (7)	47.2 (111)	13.2 (18)
At least 1 Category B and No Category C for Household, Wildlife, Domestic Animals	1.7 (4)	14.0 (33)	0.4 (1)
At least 1 Category C for Household, Wildlife, Domestic Animals	0.9 (2)	14.9 (35)	0.9 (2)

This table is an integrated matrix comparing combined groups in Table HS_I_G for methods of treating animal waste and water source infrastructure in Table HS_I_F. This matrix provides a way to identify types of wildlife farms that are of concern based upon two infrastructure criteria rather than an evaluation with a single risk factor. Yellow shading indicates wildlife farms with a high likelihood of impact, blue shading indicates farms with a medium likelihood of impact, and green shading indicates farms with a low likelihood of impact. Using this combined analysis, we now see 97% of wildlife farms with medium to high likelihood of impact categories. There were 235 respondents with complete data.

3.6.1.7 Combination of Questions on Number of Species, Animal Waste Disposal,

and Water Source Infrastructure

The rankings developed for the three risk factors of number of species, disposal of animal wastes, and water sources can be combined to better understand the overall conditions on farms and where improvements are most needed. The right three columns of Table HS_I_K are the colors of the low and medium likelihood of impact rankings from Tables HS_I_H, HS_I_I, and HS_I_J that combined two of the three criteria. The numbers in these columns come from the low and medium (green and blue) likelihood of impact rankings in Table HS_I_D for number of species, Table HS_I_F for water sources and Table HS_I_G for animal waste.

The three criteria are used in Table HS_I_K to group the farms depending on how many of the risk factors were ranked as a medium likelihood of impact. The row with 0 medium likelihood of impact criteria had only 2 respondents whose answers ranked the farms where they worked as having low likelihood of impact for all three criteria. The 3 rows with 1 medium likelihood of impact means that 28 respondents ranked the farms where they worked as having low likelihood of impact for 2 criteria and medium likelihood of impact for 1 criterion. Similarly, the 3 rows with 2 medium criteria means the farms were ranked as low likelihood of impact for 1 criterion and medium likelihood of impact for 2 criteria. And the row with 3 medium likelihood of impact criteria means all 3 criteria were ranked as a medium likelihood of impact. Totaling all the farms in Table HS_I_K, there were 76 respondents (32.3% of 235) that indicated the farms where they worked had no high likelihood of impact criteria. The other 159 respondents (67.7% of 235) indicated the farms where they worked had more serious concerns with at least one high likelihood of impact criteria.

Table HS_I_ K: Combined hazard rankings for the criteria of number of species, disposal of animal wastes, and water sources

		Criteria		
Number of Medium Hazard Criteria	**Number of Respondents**	**Number of Species**	**Animal Waste**	**Water Sources**
0	2	62	14	167
1	0	62	14	45
	27	62	188	167
	1	67	14	167
	5	62	188	45

		Criteria		
Number of Medium Hazard Criteria	Number of Respondents	Number of Species	Animal Waste	Water Sources
2	1	67	14	45
	33	67	188	167
3	7	67	188	45
Total	76			

Combined hazard rankings for the criteria of number of species, disposal of animal wastes, and water sources. The right three columns are the colors of the hazard rankings from pairs of criteria in Tables HS_I_H, HS_I_I, and HS_I_J. The numbers in these columns come from the low and medium hazards for the three criteria in Table HS_I_ D for number of species, Table HS_I_F for water sources and Table HS_I_G for animal waste. There were 235 respondents with complete data.

3.6.2 Integrated Analyses for differences between genders

3.6.2.1   Differences Between Genders in Availability of PPE

The use of PPE for farm activities was shown in Figures 9 and 10. An important concern is whether PPE is equally available to both males and females, which is evaluated in Table HS_I_L for each of the five wildlife farm activities—cleaning, feeding, catching, harvesting, and slaughtering/butchering. This was tested by analysis of variance (ANOVA) on the logistic scale for binomial data (chi-square tests). The hypothesis being tested was (% females) = (% males) for each activity. The p-values for these 5 tests were adjusted for multiple testing using the Benjamini and Hochberg (Benjamini and Hochberg 1995) method implemented in the R routine p.adjust. A significant difference, $p<0.001$, was found with females reporting higher availability of PPE for the activity of feeding. For feeding it was tested whether any of the types of PPE were different for males and females. It was found that females had significantly higher use than males for masks ($p=0.002$) and gloves ($p=0.007$).

Table HS_1_ L: Availability of 4 types of PPE reported by wildlife farmers when involved in 5 types of activities on the wildlife farms

Activities	Types of PPE				Adjusted P-value female=male
	Masks	**Gloves**	**Shoes**	**Clothing**	
Cleaning					
% females	79	69.7	69.7	20.2	0.078
% males	66.2	58.8	62.2	18.9	
Feeding					
% females	80.7*	68.9**	59.7	22.7	<0.001
% males	61.5	51.4	51.4	17.6	
Catching					
% females	38.7	26.1	26.1	13.6	0.96
% males	40.8	24.5	25.2	11	
Harvesting					
% females	46.2	41.2	34.5	10.1	0.96
% males	42.6	43.9	37.2	8.8	
Butchering					
% females	9.2	1.7	2.5	0.8	0.96
% males	12.9	3.4	2	1.4	

* p=0.002, ** p=0.007

Availability of 4 types of PPE as reported by respondents when involved in 5 types of activities on the wildlife farms where they are employed. Adjusted p-values are shown for each activity testing whether (% females) = (% males) across the four types of PPE (chi-square tests based on ANOVA on a logistic scale for binomial data). There were 267 respondents in the survey. Females significantly had a higher availability of PPE for the activity of feeding p<0.001.

3.6.2.2 Risk Perception: Does worry about disease differ between males and females?

The results of asking survey respondents about their concern about human and animal disease was shown in Figure 8. These results were further analyzed in Table HS_1_M to determine if answers differed between females and males. The table shows the percent of respondents by gender and their 95% confidence limits. It was found there was no significant difference, p=0.31

in their answers to the question.

Table HS_I_ M: Responses by gender to the question about whether the survey respondents were worried about disease. There were 267 respondents.

Worried about disease?	Respondents			Percent of Respondents	
	Number			Mean (95% Confidence Interval)	
	Total	Females	Males	Females	Males
Worried	135	58	77	43.0 (34.9,51.4)	57.0 (48.6,65.1)
Not Worried	118	52	66	44.1 (35.4,53.1)	55.9 (46.9,64.6)
Don't Know	14	9	5	64.3 (37.6, 84.3)	35.7 (15.7,62.4)

SECTION IV: CONCLUSIONS & RECOMMENDATIONS

Table 13: Summary Research Findings and Why They Matter

Actors/ Sectors	Activity	Gender AGE	PPE Risk Perception	Water/Waste Management Infrastructure	Value Chain	Health Care
WILDLIFE FARMERS (WLF)						
Wildlife Farmers **(WLF)** **Highlights**	Years involved in WLF (<1 to 35 years) 83.5% of respondents stated they raised at least one of the 4 high risk species targeted by the project (civets, bamboo rats, porcupine or sambar deer) 23.2 % of all respondents indicated that they raised only one of the 4 high risk species. Of the 16.5% of respondents that indicated they raised a second wildlife species, 50% said they raised	267 respondents 17 communes 44.6 % women across farms Mean age 48.7 (Range 18 to 88 year) 23.5% over 60 years Significant differences in activities by gender--more men owned or managed WLF and handled dead animals	46.3% of WLF expressed concern about the possibility of disease transmission affecting humans or animal health. 48.4% had no concern. WLF indicated that they used PPE, but respondents were not frequently observed to have the specified PPE	Multiple sources of water were available to the WLF 38.4% of WLF used surface waters or uncovered reservoirs that were ranked as greater likelihood of impact Multiple types of Waste management practices were noted across the WLF, including practices that were ranked as having a greater likelihood of impact (94.3% of farmers with medium to	About 75% listed WLF as a primary source of income Income impact varied widely (from 5 to 100% of family income) Reasons for doing WLF was to increase income, family tradition/family labor, easy to raise	DVMs lack disease knowledge Human respiratory effects linked with bamboo rat contact Husbandry care interventions lacking Breeding information could be useful and targeted at potential higher risk interface

Actors/ Sectors	Activity	Gender AGE	PPE Risk Perception	Water/Waste Management Infrastructure	Value Chain	Health Care
			one of the 4 high-risk species. 75.5% of Wildlife farms had both wild and domestic species Porcupines, civets and bamboo rats are primarily raised for breeding stock and meat, while sambar deer are mainly raised for antlers as a medicine Coronavirus serology from existing evidence has identified positive cases in bamboo rats, porcupines and domestic pigs	Direct observation of PPE usage did not support the levels of PPE usage reported in surveys	higher hazard methods in practice) 19.1% of WLF indicated that they would eat or sell dead wildlife		
Why it Matters	Diversity of WLF by wildlife species, diversity and proximity of domestic farming indicates that both core as well as directed	Targets for gender specific considerations include encouraging women as	Biosafety guidance and rationale for using PPE is needed Specific targeted	Variability across WLF in infrastructure not only support prioritized core interventions but also support detailed targeted interventions under these broader	Variability in reason and motivation suggests need for targeted interventions across examples	Improving health care has the potential to enhance several key intervention interfaces for both animals and humans

Note: The "one of the 4 high-risk species" block and subsequent items appear under the Activity column; "Direct observation..." under PPE Risk Perception; "higher hazard methods..." under Water/Waste Management Infrastructure.

Actors/ Sectors	Activity	Gender AGE	PPE Risk Perception	Water/Waste Management Infrastructure	Value Chain	Health Care
	interventions are needed	owners and managers Ensuring that PPE is available across activities and gender	interventions would be indicated with some items such as clothing	infrastructural interventions Significant decrease in spillover risks could be averted by targeted interventions on how to handle and dispose of dead animals		Targeting knowledge gaps for DVMs would be especially impactful and affect sustainability of message
WILDLIFE TRADERS						
Wildlife Traders **Highlights**	60.5% traded both wildlife and domestic animals 79% traded multiple WL species. 21% traded 1 WL species. 17.1% raised pigs which may carry coronavirus 19.5 % raised poultry	43 respondents 39.5% were female. Mean age 43.4 years ranging from 25 to 64 Recruited from same area as WLF	Not discussed	There are no wildlife markets	For 58.1% a major source of income adding 32.9% to household income 72.1% believed income from WL trading decreased by 13.1% over 3 years WL purchased mainly for meat and breeding Farmgate sales 89 to 100% depending on species Wildlife products are unregulated from a health perspective. No inspection or	DVMs lack disease knowledge Human respiratory effects linked with bamboo rat contact Husbandry care interventions lacking Breeding information could be useful and targeted at potential higher risk interface

Actors/ Sectors	Activity	Gender AGE	PPE Risk Perception	Water/Waste Management Infrastructure	Value Chain	Health Care
					processes to control disease spread or food safety in wildlife products	
Why it Matters	Multiple species increase probability of disease spillover	Women's involvement in wildlife trade is significant	Not discussed	NA	Variability may affect strategy for interventions Wildlife products are unregulated from a health perspective. No inspection or processes to control disease spread or food safety in wildlife products	Improving health care has the potential to enhance several key intervention interfaces for both animals and humans Targeting knowledge gaps for DVMs would be especially impactful and affect sustainability of message
WIILDLIFE NEIGHBORS						
Wildlife Neighbors **Highlights**	85% reported raising domestic animals 72% raised poultry. 24% raised pigs.	103 respondents Mean age 44 range 24 to 72 From same area as WLF 46% were women	50% concerned about disease in humans and animals 40% expressed no concern	75% used covered drilled wells or water taps 15% used uncovered rainwater or pond/river water		DVMs lack disease knowledge Human respiratory effects linked with bamboo rat contact Husbandry care interventions lacking Breeding information could be useful and

Actors/ Sectors	Activity	Gender AGE	PPE Risk Perception	Water/Waste Management Infrastructure	Value Chain	Health Care
						targeted at potential higher risk interface
Why it Matters	Livestock populations at risk of spillover from neighboring WLF		Target for education about biosecurity and biosafety measurers	Water sources are important for disease spillover and targeted interventions for education of neighbors is needed		Improving health care has the potential to enhance several key intervention interfaces for both animals and humans Targeting knowledge gaps for DVMs would be especially impactful and affect sustainability of message

4.1 Knowledge, Attitudes, and Practices

Within the One Health (OH) agencies of government, there is limited capacity to provide the wildlife sector with services in zoonotic disease control, animal health management, biosecurity and health surveillance. Veterinary services do not have the capacity and training to support wildlife farmers. Veterinary staff have limited experience treating and handling wild animals and little knowledge of wildlife diseases. In the human health sector, there are limited resources to monitor the specific health concerns and risks faced by wildlife farmers. Non-domestic species are excluded from the slaughter facilities used for livestock and are not subject to food safety inspection regimes. The Forest Protection Department (FPD) is one of the key governmental agencies working on wildlife management from the provincial to the commune level, but FPD staff have limited capacity to address issues of captive wildlife farming or wildlife farmer health issues and risks.

Almost all actors lack sufficient knowledge on zoonotic disease control and biosecurity. Wildlife farming practices and animal treatments are largely based on experience in livestock production due to the absence of training, extension, or good educational materials.

The study respondents believed the captive breeding models for wildlife farming were highly successful. When asked directly, many stated they saw no disease risk in their farms, either to themselves or their animals. On the other hand, 46.3% of respondents are concerned about the possibility of disease transmission affecting humans or animal health, which reflects an awareness of this potential risk.

Biosecurity practices on wildlife farms were often poor. Some positive factors were evident: many farms were entirely operated by a single individual and kept only one species. Moderate use of PPE was reported but was sporadic and often ill-matched to the hazards involved. There is no clear guidance on practical, effective practices regarding the use of PPE. Although many farms demonstrated good hygiene standards, others exhibited poor hygiene with no barriers to entry of pests or free-ranging wildlife. Contact with free-ranging wildlife can be a significant risk. Sanitation was highly variable with untreated wastewater and excrement disposed of on the premises in many cases. The wide diversity in the level of biosecurity offers an opportunity for positive deviance approaches where successful practices in the community can be used to lead change.

There are few formal marketing channels for wildlife products and no access to regulated slaughter facilities. There were 21 respondents (19.1% of 110) who reported they ate or shared wildlife that died on the farm with friends, family, or neighbors for the intent of consumption. Sale of deceased wildlife or wildlife products from deceased animals was reported in semi-structured interviews. Since wildlife products are excluded from the regulated slaughter facilities, there is no food safety inspection or pathogen surveillance and unsafe products are able enter the value chain unimpeded and undetected.

The engagement of government agencies across the One Health sectors exhibited some gaps both internally and externally. Environmental agencies have limited regulations on environmental management functions pertaining to wildlife farms. The Forest Protection Department plays a vital role in management of wildlife farms regarding the origin of captive wildlife and the licensing of wildlife farms but does not routinely perform any animal health management or surveillance functions for farmed wildlife.

The human health sector currently monitors five common zoonotic diseases (Avian influenza; Rabies; Streptococcus suis (type 2); Anthrax; Leptospirosis) (MOH and MARD 2013) but these do not include all serious potential emerging threats relevant to wildlife farming. The animal health agencies manage quarantine of domestic animals but lack adequate training on biosecurity, especially in relation to farmed wildlife. The animal health agencies also lack knowledge on the recognition and treatment of common wildlife diseases and are therefore unable to educate farmers on the warning signs for which they should monitor or management steps they should take to improve the health of their herds. The environmental and food safety control agencies presently play no role in the management of wildlife farming or quality control of wildlife food products – these agencies currently focus solely on domestic animal farming quality control of products from livestock. As such, the captive wildlife value chain is uncontrolled and uninspected. There are no barriers to entry of unsafe products into the market and a weak ability to trace the source of unsafe products in the event of an outbreak or adverse event.

4.2   Gender

The Viet Nam Initiative on Zoonotic Infections is conducting research on emerging pathogens within the country. Their publication states that they "aim to investigate the socio-cultural context of wildlife consumption and farming" (Rabaa et al. 2015). However, their report does not include a gender analysis of any aspect of wildlife farming or any sex and age disaggregation of their data, making it very difficult to better understand the zoonotic risk and appropriate, targeted responses.

The Risk Assessment Report evaluated wildlife farm respondents by gender. A total of 267 respondents were farmers, with 119 (45% of 267) women Farmers. The only activity that showed a significant gender disparity was farm ownership/management, with roughly twice the number of men participating in this activity than women (χ^2 test p<0.0001; Table 3). Other activities (such as breeding, slaughter, feeding, and cleaning) did not display a significant gender disparity based on χ^2 test for binomial data, though there was a noted trend toward greater participation of men in removal of sick and dead animals (p=0.05).

Among the wildlife traders and wildlife restaurants interviewed (N=43), most were retailers and 39.4% were women. There were no gender differences in risk perception with 48.4 % of women and men reporting that they had concerns about risk of disease from wildlife farming.

In summary, these comparisons between Activities 1.3.1.1 and 1.2.6.1 provided a robust risk and evidence basis for the next phase of intervention prioritization and design.

4.3   Opportunities and Challenges

Farmers are the central actors in the wildlife value chain from breeding supply and production to processing, slaughter and sales, so future interventions should focus primarily on farmers. Given the apparent lack of overt disease detectable by farmers, the main incentives to improve the quality and safety of wildlife products will come from market forces. Biosecurity and risk reduction strategies that enhance the market value of a product have the potential to be adopted and sustained, depending on willingness to pay and perceived value. Exclusion of wildlife and wildlife products from livestock slaughter facilities and inspection processes, while safeguarding the safety of livestock products, results in an unregulated, high-risk value chain for wildlife products. This contributes to increased risk of disease transmission to humans and health problems in the farmed wildlife population going undetected for extended periods of time. In the absence of inspection and regulation, even the marketing of dead animals was reported. There is a strong need for focused wildlife product value chain analysis to identify nodes of zoonotic spillover risk and opportunities to implement effective, achievable, and sustainable biosecurity and zoonotic disease prevention interventions. Wildlife farms have strong networks of peer groups that include social media groups, but they lack sufficient knowledge on biosecurity or zoonotic disease prevention. Furthermore, the Provincial People's Committee publishes a circular guiding the inter-sectoral coordination mechanism in zoonotic disease prevention that is intended to create favorable conditions to strengthen coordination among stakeholders tasked with preventing spillover. The role of the wildlife trader also needs to be evaluated in this context as described above since they potentially represent a critical control point for intervention in spillover risk.

4.4   Guidance for interventions and subsequent risk assessments

- During implementation activities, proactively communicate to key stakeholders to promote coordination and follow-up activities

- Start IRB applications at the earliest possible time to avoid delays.

- From the outset, we should aim to strengthen engagement of government agencies related to One Health: animal health, human health, forest protection, environmental and food safety.

- The community is clearly more aware of the livelihoods and household economic opportunities associated with wildlife farming than the diseases risks. This is in part because there are no overt signs of disease greatly harming livestock or people.

Therefore, risk reduction interventions should use market-based incentives, and incorporate awareness-raising activities.

- Most farmers would like to scale up their wildlife production, as it is considered as a legitimate livelihood that brings higher income compared to other alternatives.

- Ensure outreach that includes both direct and indirect communications in line with the local cultural context in risk reduction interventions.

- The peer network for wildlife farmers is strong and is a trusted source of information. It may work well to train peer farmers, community One Health workers, or others on zoonotic disease prevention and biosecurity and allow these agents to share knowledge through the network.

- In conclusion, communication and risk reduction interventions need to be associated with market incentives, livelihood activities, and community mobilization.

4.5 General Recommendations

- Strengthen stakeholder engagement in One Health sectors including human health, veterinary services, forest protection, environment, food safety and other sectors under the direction of the Provincial Peoples' Committee;

- Identify control points, economic drivers and potential incentives from the perspective of the wildlife value chain to inform interventions and drive adoption of spillover risk mitigation measures;

- For farmer health, apply participatory and/or syndromic surveillance to monitor and detect zoonotic disease spillover on wildlife farms;

- Strengthen capacity of the public veterinary sector on zoonotic disease control, biosecurity, biosafety and quarantine in relation to wildlife farms;

- Strengthen and train community One Health workers working under professional supervision and peer networks on zoonotic disease and biosecurity.

4.6 Opportunities for Risk Mitigation

There were five farm infrastructure areas where improvements should be encouraged, based on the survey.

4.6.1   Improve treatment of animal waste on wildlife farms

Although 79 farmers (32.2% of 245 respondents) used some methods for handling waste that were ranked as low risk, there were only 14 farmers (5.7% of 245) that only used low risk methods, and 162 farmers (66,1% of 245) that used a mixture of medium and higher risk waste management methods involving the use of untreated waste. There were 44 farmers (18.0% of 245) using higher risk options that are critical targets for interventions that mitigate spillover transmission risk in waste management. The lower risk methods included composting, treating with probiotics, and biogas technology; the medium risk methods included collection of waste into a bag or cesspit and applying to crops without composting; the higher risk methods included the application of wastewater and manure directly to crops, and feeding waste directly to fish.

4.6.2   Integrate wildlife farming into animal health institutions

The wildlife farms do not have access to wildlife health services as veterinarians do not currently have capacity in this area and wildlife products are excluded by law from livestock slaughter and inspection processes. Robust peer networks are the primary source of information on production and health care of wildlife. Slaughter and processing are mainly done by producers and consumers. Interventions targeted to increasing access to animal health services would enhance information flow (disease reporting) and reduce the risk of disease transmission within wildlife populations and spillover to humans. Interventions to introduce animal health monitoring and inspection of wildlife products would mitigate the risk of spillover.

4.6.3   Increase use of PPE

The results relative to the use of PPE were complex. Although moderate to high levels of use were reported in the biosecurity questionnaire surveys (Activity 1.3.1) and in cleaning and feeding activities in this study, observation indicated PPE was not widely used. In the risk assessment questionnaire, PPE was reported to be used only 20% to 40% of the time for the catching and handling of animals and about 10% of the time during slaughter. Women reported a greater use of PPE than men. The main drivers for PPE use appear to be injury prevention and cleanliness rather than prevention of infection. The use of PPE is one of the most direct methods to reduce exposure available and interventions to enhance PPE use that are based on a good understanding of social drivers and peer education networks could significantly mitigate the risk of spillover.

4.6.4   Reduce number of species on wildlife farms:

There were 62 farmers (23.2% of 267) considered as low risk with a single species of wildlife and 67 farmers (25.0% of 267) considered as medium risk with two species (wildlife and domestic). There were 138 farmers (51.8% of 267) considered as high risk with three or more species who would be critical targets for the directed interventions.

4.6.5 Improve water sources on wildlife farms:

There were 157 farmers (61.6% of 255 respondents) that used low risk water sources for all types of water uses and 98 farmers (38.4% of 255) that used medium and high risk water sources. There were 43 farmers (17.0% of 255) using higher risk options who would be critical targets for the interventions directed to the mitigation of water borne transmission risk. The lower risk group included covered drilled wells, water taps, and filtered water; the medium risk group included covered rainwater and covered dug wells; the higher risk group included uncovered dug wells, uncovered rainwater, and ponds or rivers.

4.6.6 Decrease overall risk based on combined evaluation of the three criteria of treatment of waste, number of species, and water sources to assess overall risk:

There were 76 farmers (32.3% of 235 respondents) that used only low and medium risk methods (no high risk methods) for these three criteria, and only 2 farmers (0.8% of 235) that used only low risk methods for all three criteria. There were 159 farmers (67.7% of 235) using higher risk options that would be critical targets for an integrated intervention that targets waste treatment, water source, and species composition of the farms.

4.7 *Informing Trials of Improved Practices*

A key output from the Risk Assessment and Activity 1.3.1.1 is to inform intervention selection and design under Activity 2.2.2.1. In this section, evidence from the Risk Assessment Report (Activity 1.2.6.1) and the Rapid Assessment of Prior Biosafety Training (Activity 1.3.1.1) that is directly relevant to the TIP selection process is presented and discussed. It also highlights information that differs between the two studies and explains when and how these differences could affect the choice of interventions.

In Activity 1.3.1.1, the most important barriers to implementing biosafety and biosecurity measures as cited by wildlife farmers were: cost of measures, discomfort of wearing PPE, and the lack of information on biosafety and biosecurity for wildlife. Of the 267 study participants interviewed in the risk assessment, 74.9% listed wildlife farming as one of their primary sources of income and the mean percentage of household income from wildlife farming was 64.8%. Participants were therefore economically dependent on wildlife farming and added expenses could be perceived as a threat to their livelihoods. Consequently, any new biosafety and biosecurity practices proposed must be cost-effective and presented such that they add economic value to the product or reduce unnecessary losses due to disease or other costs.

The data collected showed that approximately half of the wildlife farmers expressed biosafety concerns regarding the risk of personal illness resulting from their exposure to their wildlife holdings. However, when asked directly, many farmers answered that they had never seen any

disease in farmed wild animals and were not concerned about this issue. Based on household observations, interviews and checking of medical records, some people had symptoms of respiratory disease at the bamboo rat farms. Yet, they did not believe there was a link between the illness in humans and disease in animals. These results taken together indicate that the community's knowledge and awareness of disease risk is a complex topic that cannot be easily categorized. It suggests that some wildlife farmers are aware of the potential for zoonotic spillover, but they view the topic as a sensitive subject and are sometimes reluctant to discuss the topic openly.

4.7.1 Improving waste management, handling, and processing on wildlife farms (for 4 species civet, bamboo rat, porcupine, and sambar deer)

The findings of the Behavior Risk Assessment and Rapid Biosafety Assessment highlighted the risks and gaps in good biosafety and biosecurity practice for waste processing and the lack of PPE use in cleaning and waste processing. The Biosafety Assessment noted that most wildlife farms are not well designed and lack a waste disposal system.

The Behavioral Risk Assessment found that although 79 farmers (32.2% of 245 respondents) used some low risk methods for handling waste, there were only 14 farmers (5.7% of 245) that exclusively used lower risk methods, placing them into the low risk group. The other 65 farmers (26.5% of 245) also used some medium and higher risk methods for treating animal waste. The largest group of farmers (188 farmers, 76.8% of 245 respondents) employed some medium risk methods and no high risk methods, comprising the medium risk group. There were 43 farms with some higher risk methods for treating animal waste (17.5% of 245 farmers) which placed them into the high risk group. Together this identified 94.3 percent of farms in the medium to high risk categories based on their waste disposal infrastructure. These issues with hygiene and waste handling were further supported by the 20 observational site visits conducted as part of the Behavioral Risk Assessment.

Accodring to the Behavior Risk Assessment report, "many farmers had ideas for better treatment of wastewater and wildlife waste. They expressed interest in suitable probiotics (microbial additives) to treat manure, wastewater, and wildlife waste to limit odor and prevent environmental contamination. Some indicated that they are considering building a gutter to drain wastewater from barns to manure cellars or build biogas harvesting systems." This finding suggests that the wildlife farmers are interested in co-solutions and co-creation for waste infrastructure and indicates a receptive atmosphere for achieving successful SBC.

The Rapid Biosafety Assessment found that wildlife farmers do usually use PPE while cleaning and when they come into contact with waste. More detailed results from the Behavioral Risk Assessment indicated respondents reported that shoes or boots were commonly used when feeding (55%), cleaning cages (65%), and catching/touching animals directly (36%). Gloves are reportedly often used when cleaning the barn (66.7%) and catching/touching animals directly

(42.7%). Masks were frequently used during feeding (70%), cleaning of cages (71.9%) and velveting (39.7%).

There are still a number of farmers who do not use any PPE in livestock production activities (accounting for 11-28%). During 20 visits to wildlife farms as part of Activity 1.2.6.1, a number of gaps in hygiene and biosecurity practices were observed - PPE use was observed to be limited or moderate on most farms and observation did not support the higher levels of use reported in questionnaires.

The Rapid Biosafety Assessment revealed that none of the wildlife farming households visited had adequate separation of wildlife from domestic animals and that waste from wildlife and domestic animal barns were drained into a pit without treatment (especially for civet and bamboo rats).

A risk matrix was created to rank the potential for risk of spillover based on waste disposal and number of species kept on a farm. The combination of criteria shows that 59.6% are at the highest level of concern whereas based only on animal waste methods 17.5% were at the highest potential for spread of disease and based on the number of species 51.8% were at the highest risk level for spillover events. These findings suggest a great amount of room for improvement and define the space that biosafety and biosecurity interventions will target.

In the Rapid Biosafety Assessment, the general attitude of farmers and consumers in terms of biosecurity is that wild animals are very clean, rarely get diseases, and carry a low risk of disease transmission. This does not align exactly with the Risk Assessment (RA). The RA report states "Regarding farmers' knowledge and practices regarding biosecurity and zoonotic diseases, most farmers have not observed transmissible diseases in their captive wildlife, but are concerned about the risk of disease transmission from their holdings."

Despite the expressed observation that captive wildlife does not show diseases, there were 113 (46.3% of 244) respondents in the behavioral risk assessment survey that expressed concern about the possibility of animal or human disease transmission affecting human health. Among those respondents who were worried about diseases, 82 people (33.6% of 244) were worried about diseases in animals only; 31 people (12.7% of 244) worried about both animal and human diseases.

For neighbors of the wildlife farms, the study found "Many respondents (40.8% of 103) had no concerns about disease at the farm." A further 9.7% (of 103) indicated that they did not know. Among the respondents who had concerns about disease, 36.9% (of 103) worried about disease in animals; 12.6% (of 103) had concern about diseases in humans and animals. From the point of view of the risk of disease if exposed to live or recently slaughtered wildlife while having an open wound, 21.4% answered "No risk" (of 103), 27.2% answered "Yes" but were "unsure of what the risk is."

These results suggest that there is an important opportunity to mitigate risk in the processing of waste. The range in hazard levels associated with the different approaches used for treating waste indicate that positive examples exist within the wildlife producing community that could act as champions to drive change. The results on gaps in PPE use suggest that an intervention on waste processing should include appropriate attention to use of PPE.

4.7.2 Improving biosecurity through disease control and monitoring

The risk assessment report quoted wildlife farmers as saying "They raise wildlife based on their experience in livestock husbandry. Selection of breeding stock, farming techniques and attempts to cure sick animals are learned from peers who are successful in raising the species in question. The strong wildlife producer peer networks in place are a positive opportunity for communication, surveillance and training."

The biosafety assessment found that there are currently no surveillance, monitoring or reporting systems for the management of disease transmission risks from captive wildlife to domestic animals or to humans. There is a lack of coordination among veterinary, human health and forest protection agencies in the management and prevention of zoonotic diseases to:

- Improve the health of captive wildlife.
- Decrease the risk of disease transmission from captive wildlife to humans.
- Increase disease reporting on wildlife farms.
- Increase coordination and communication between human health and captive wildlife health institutions and stakeholders.

The limited role of human health or environmental agencies was reported by the other sectors, though it is possible the informants were unaware of such roles. No health check or surveillance for farmers was in place and there is no food safety inspection of wildlife meat or meat products.

The risk assessment found that there is weak monitoring and evaluation of wildlife farms. Veterinary medicine is under DARD and exclusively focuses on domestic animals. Circular 07/2016/ TT-BNNPTNT which describes agency policy does not include zoonotic diseases in wildlife (MARD 2016). Veterinary officials stated "The issue of wildlife quarantine is very difficult, because the current regulations [does] not mention the list of wildlife quarantine diseases. I don't know what disease the civet has, what disease the porcupine has. In fact, in Tan Phu, the quarantine for wild animals has not been implemented for many years" (KII, Tan Phu VET)" and "From my experience, I only quarantined by observation without any tests. For example, pheasants quarantined against influenza H5N1 (KII, Provincial VET)."

The Risk Assessment report also states "Some farmers expressed a desire to apply cooling measures for farmed animals and to be instructed in reproductive techniques. There are no

records of disease management, quarantine, and disease testing on animals and farmers are interested in improving this situation. Some farmers expressed an interest to be provided with suitable disinfectants and to disinfect their farms." Interviewees expressed their hopes of being trained on disease prevention, and safe and hygienic captive breeding techniques, and being guided by veterinary authorities on professional sanitation techniques. Some households desired support through labor protection equipment, disinfectants, and instructions on disease management standards.

Furthermore, our data revealed that breeding practices, farming techniques, and treatment of sick animals are learned from other wildlife farmers who are successful in rearing each respective species. This indicates that peers influence behavior, which can be leveraged for social and behavior change interventions. The significance of this peer network is echoed across the TIPs Report as peer-to-peer training and is foundational to many of the improvements the interventions are designed to implement.

In summary, the data from Activities 1.3.1.1 and 1.2.6.1 provided a robust risk and evidence basis for the next phase of intervention prioritization and design *. The absence of any wildlife health services linked to public or private veterinary practice is a major gap contributing to risk of disease spillover. Outbreaks of spillover disease pathogens in farmed wildlife populations could go undetected for prolonged periods and increase the likelihood of one or more spillover events. Present sharing of health information on captive wildlife is mainly through peer networks including social media groups. In all the TIPs, the project proposes to utilize peer educators who are members of existing producer peer networks at the community level as champions for uptake of mitigation measures. In this manner, TIPs will build on existing, self-sustaining mechanisms for knowledge transfer and introduce service provision elements. The results indicate a strong need for appropriate wildlife health services where guidance on common production diseases of the major species could be used as an incentive to include measures addressing spillover risk and disease reporting.

* Note for Activity 1.2.6.1 (Behavioral Risk Assessment Report) 267 wildlife farmers were included from 17 communes in Tan Phu and Vinh Cuu. KAP assessments for Activity 1.3.1.1 were carried out in the Dinh Quan District on 66 wildlife farms.

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ILLUSTRATION PHOTOS

Site activation visit in May 2022

Training workshop on risk assessment in July 2022

OHDWG meeting in July 2022
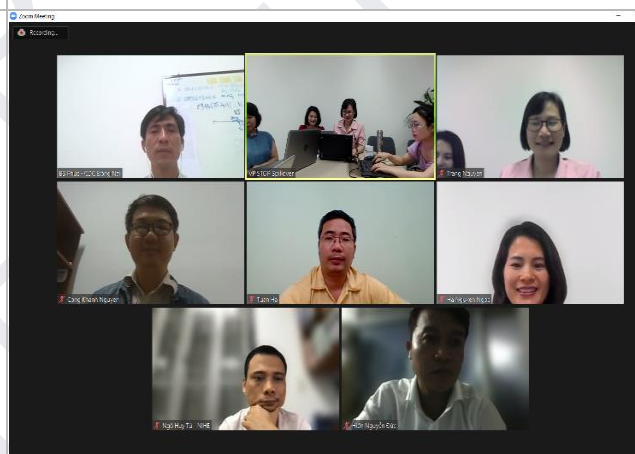
Virtual meeting in May 2022

In person interview in August, 2022

Focus group discussion in August 2022

Observation at wildlife farms in August 2022
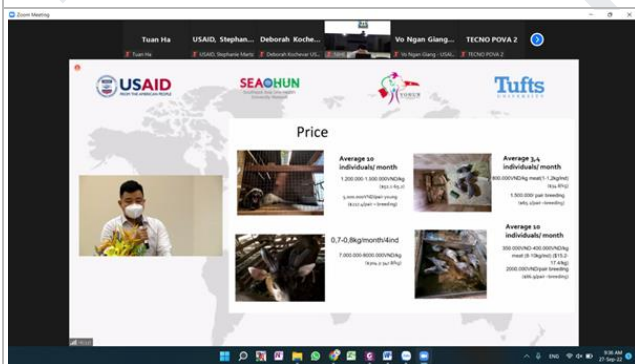
Validation workshop in September 2022

Photo credit: OH-Dream members

APPENDIX 1: IMPLEMENTATION TIMELINE

#	Key steps	Deliverables	Completed
1	OH-DReaM write concept paper + revision	Concept paper	11/5
	Virtual meeting to and discuss about concept paper and develop an action plan within OH-DReaM working group	Meeting minutes	12/5
2	OH-DReaM prepare IRB applications and tools (questionnaires, guidance of in-depth interview, FGD, IRB forms + revisions	IRB approval	12/8
3	Two days In-person meeting among OH-DReaM teams and targeted districts to discuss about the detailed action plan for the activities, develop Risk Framework	Risk Framework /Risk pathway	14/6-15/6
	Site activation visit	Minutes	2/6
4	OH-DReaM prepare relevant inputs to develop risk framing; diagram on risk pathways and characterize spillover risks at the high-risk interface, risk assessment output and detailed work plan	Detailed action plan	6/6
5	Organize virtual meeting to develop risk assessment output (risk management) and finalize work plan of risk assessment - one day amongst OH-DWG members	Meeting minutes	25/6
6	Organize a 2 day - training workshop on risk assessment at 01 targeted district	Initial findings report	19-20/7
7	Conducting risk assessment at field		12/8-25/8
	Enter qualitative and quantitative data (developing data entry form + data entry + data clean and analysis)		10/9
8	OH-DReaM develop and finalize initial risk assessment		25/9
9	Organize virtual meeting to update progress, debrief study findings	Meeting minutes	23/9
10	Organize an in-person workshop on risk assessment findings dissemination	Summary activity report	27/9

APPENDIX 2: QUESTIONNAIRES

Wildlife Survey Questionnaire

QUESTIONNAIRE

(For wildlife farm households)

A behavioral risk assessment to characterize risk associated with the wildlife farming value chain in Dong Nai province

Research information
This study aims at unpacking the social and behavioral risk factors of those involved in wildlife value chains in Dong Nai province that can lead to spillover of coronaviruses to domestic animals and humans. Actors in this study are: farmers (both individuals and households), households near farms, breed suppliers, traders, restaurant workers, and animal transporters, consumers, livestock associations/cooperatives, and government staff in the one-health sector (i.e. human health, animal health, forest protection and environmental officials). The qualitative and quantitative data collected from this questionnaire will be used to identify and help reduce the various levels of risk at different points throughout the wildlife value chain in Dong Nai province.

(You don't need to write your name. All your personal information will be confidential)

ADMINISTRATION

Name of Interviewer:		
Time:	...... hour date ...../...../2022	
Commune:	District:	Dong Nai province
		ID (for entry data only) ....

SECTION I: GENERAL INFORMATION

#	Question	Response
1	What gender do you identify with?	1. Male 2. Female 3. Other _____
2	In what year were you born?	[open ended for year]
3	What is your marital status?	1. Married 2. Single 3. Divorced 4. Widowed 5. Other _____
4	What are your income-generating jobs? (select all that apply and indicate percent time for each, if applicable)	1. Breeding wild animals _____% 2. Breeding livestock _____% 3. Crop production _____% 4. Housewife [2] _____% 5. Other [provide detail] _____% 6. Don't know
5	What is the highest level of education that you completed?	1. No education 2. Primary school (grade 1-5) 3. Secondary school (grade 6-9) 4. High school (grade 10-12) 5. Intermediate school 6. College/university/professional and above 7. Don't know
6	How many people are in your household?	[open ended # people]

SECTION II: INFORMATION ON WILDLIFE FARM ACTIVITIES

#	Question	Response
7	Who in your family is involved in taking care of captive wild animals? (select all that apply)	1. Self 2. Spouse/partner 3. Other Adults 4. Children (under 5 years old) 5. Children (5-9 years old) 6. Children (10-12 years old) 7. Children (13-18 years old) 8. Other _____
8	Do you have domestic animals at your home? If yes, what kinds? (select all that apply)	1. Yes 2. No 3. I don't know 1. Poultry 2. Pig 3. Fish 4. Other: _____
9	What activities are you involved in at this wildlife farm? (select all that apply)	1. Farm owner/manager 2. Living at farm 3. Breeding 4. Slaughter/Butcher 5. Feeding 6. Cleaning 7. Removing sick or dead animals 8. Other: _____
10	When did you start being involved in captive wildlife breeding activities?	[Open ended for year]
11	Why do you raise captive wildlife? (provide up to 3 reasons)	Reason 1: _____ Reason 2: _____ Reason 3: _____
12	How much does wildlife breeding contribute to household income per year? And to what extent has this contribution rate increased, decreased, or remained the same over the past three years?	_____ % 1. Increased _____% 2. Decreased _____% 3. Unchanged

#	Question	Response
13	Breeding plans for the next 2 years are expected to…	1. Increase 2. Decrease 3. Stay the same 4. Don't Know 5. Other: _____
	And the reason for the expected change is because…	[open ended answer with reason]
14	What biosafety measures are in place for captive wildlife at this farm?	[open ended]
15	What additional safety measures would you like to have here?	[open ended]
16	Where does drinking water for your household on the farm come from? (select all that apply)	1. Covered dug well 2. Uncovered well water 3. Covered drilled well 4. Water taps 5. Covered rain water 6. Uncovered rain water 7. Filtered water 8. Pond/river 9. Other: _____
17	Where does water for captive animals come from? (select all that apply)	1. Covered dug well 2. Uncovered well water 3. Covered drilled well 4. Water taps 5. Covered rain water 6. Uncovered rain water 7. Filtered water 8. Pond/river 9. Other: _____
18	Where does water for your domestic animals come from (select all that apply if applicable)	1. Not applicable 2. Covered dug well 3. Uncovered well water 4. Covered drilled well 5. Water taps 6. Covered rain water 7. Uncovered rain water 8. Filtered water 9. Pond/river 10. Other: _____

#	Question	Response
19	Where does animal waste from slaughter/butcher and animal excrement on the farm go?	[open ended]

20. Do you have any special protective equipment that you use for the following activities? (select all that apply)

	1.Shoes/ boots	2. Gloves	3. Masks	4. Protective clothes/ gown / apron	5. Other:	6. Nothing
1. Feeding						
2.Catching/ touching						
3. Slaughtering /butchering						
4. Velveting/ Harvest						
5. Cleaning						
6. Other:						
7. Other:						

#	Question	Response
21	Are you concerned about diseases on the farm? If yes, which ones?	1. Yes, in animals 2. Yes, in humans 3. Yes, in both animals and humans 4. No 5. I don't know 6. Other: _____ [open ended]
22	If you have ever had wildlife die on your farm, what have you done? (select all that apply)	1. Not ever 2. Used the animal for eating or sharing 3. Buried 4. Took it to the landfill/pond/river 5. Disinfected and buried 6. Report to veterinarian or forest protection 7. Other [open ended]

#	Question	Response
23	What happens if there is a sick or dead animal on the farm?	[open ended]

24.

Wildlife Species Raised (list all species and provide details for top four traded species)	24a. What is the purpose of raising captive wildlife? (select all that apply for the top 4 species)	24b. Who are the buyers? (provide % for the top 4 species)	24c. How are wildlife transported from the farm? (select all that apply for the top 4 species)
List species e.g. civet 1.	1. For Meat 2. Breeding 3. For medicine 4. Tourism or display 5. Other [open ended]	1. Farmer ___% 2. Trader ___ % 3. Consumer __% 4. Restaurant ____% 5. Company ___% 6. Other: __%	1. Retail buyers directly come to pick up and ship out 2. Traders collect at gathering point and transport them 3. Farm transports to buyers 4. Buyers hiring a shipper to transport them 5. By bus/public car 6. Other: _____
2.	1. For Meat 2. Breeding 3. For medicine 4. Tourism or display 5. Other [open ended]	1. Farmer ___% 2. Trader ___ % 3. Consumer __% 4. Restaurant ____% 5. Company ___% 6. Other: __%	1. Retail buyers directly come to pick up and ship out 2. Traders collect at gathering point and transport them 3. Farm transports to buyers 4. Buyers hiring a shipper to transport them 5. By bus/public car 6. Other: _____
3.	1. For Meat 2. Breeding 3. For medicine 4. Tourism or display 5. Other [open ended]	1. Farmer ___% 2. Trader ___ % 3. Consumer __% 4. Restaurant ____% 5. Company ___% 6. Other: __%	1. Retail buyers directly come to pick up and ship out 2. Traders collect at gathering point and transport them 3. Farm transports to buyers 4. Buyers hiring a shipper to transport them 5. By bus/public car 6. Other: _____
4.	1. For Meat 2. Breeding 3. For medicine 4. Tourism or display	1. Farmer ___% 2. Trader ___ % 3. Consumer __% 4. Restaurant ____% 5. Company ___%	1. Retail buyers directly come to pick up and ship out 2. Traders collect at gathering point and transport them 3. Farm transports to buyers

Wildlife Species Raised (list all species and provide details for top four traded species)	24a. What is the purpose of raising captive wildlife? (select all that apply for the top 4 species)	24b. Who are the buyers? (provide % for the top 4 species)	24c. How are wildlife transported from the farm? (select all that apply for the top 4 species)
	5. Other [open ended]	6. Other: ___%	4. Buyers hiring a shipper to transport them 5. By bus/public car 6. Other: _____
List additional species:			

25.

Wildlife Species Traded (top four species traded)	25a. What is the average selling volume (by day or month) for each of the top 4 species?	25b. What is the average selling price for each of the top 4 species?
List species e.g. civet	Indicate # of wildlife sold per day (or month)	e.g. # thousand VND per individual
1.		
2.		
3.		
4.		

SECTION III: BENEFITS, CHALLENGES, & ALTERNATIVES in WILDLIFE BREEDING

#	Question	Response
26	What are the main benefits in captive breeding and sale of wildlife at farms (list up to 3)?	1. _____ 2. _____ 3. _____

#	Question	Response
27	What are the main challenges in captive breeding and sale of wildlife at farms (list up to 3)?	1. _____ 2._____ 3._____
28	Which options would be more likely to make you want to stop breeding wildlife? (select all that apply)	1. If the price decreased 2. If the laws changed and penalties increased 3. If the laws were enforced more often 4. If myself or a family member became ill 5. If there was a disease outbreak nearby related to wildlife 6. If my family or community expressed disapproval of wildlife breeding 7. Other _____
29	If you were to stop breeding wildlife, which of the following would be most helpful to you? (select all that apply)	1. Free or low-cost trainings in another trade or profession 2. Access to domestic animals/livestock 3. A network of other former wildlife farmers for support 4. Other _____

Thank you for your participation in this survey!

Wildlife Trader Survey Questionnaire

QUESTIONNAIRE

 (For traders, wholesalers, retailers)

A behavioral risk assessment to characterize risk associated with the wildlife farming value chain in Dong Nai province

Research information This study aims at unpacking the social and behavioral risk factors of those involved in wildlife value chains in Dong Nai province that can lead to spillover of coronaviruses to domestic animals and humans. Actors in this study are: farmers (both individuals and households), households near farms, breed suppliers, traders, restaurant workers, and animal transporters, consumers, livestock associations/cooperatives, and government staff in the one-health sector (i.e. human health, animal health, forest protection and environmental officials). The qualitative and quantitative data collected from this questionnaire will be used to identify and help reduce the various levels of risk at different points throughout the wildlife value chain in Dong Nai province.

(You don't need to write your name. All your personal information will be confidential)

ADMINISTRATION

Name of Interviewer:		
Time:	...... hour date ...../...../2022	
Commune:	District:	Dong Nai province
		ID (for entry data only) ....

SECTION I: GENERAL INFORMATION

#	Question	Response
1	What gender do you identify with?	1. Male 2. Female 3. Other _____
2	In what year were you born?	[open ended for year]
3	What is your marital status?	1. Married 2. Single 3. Divorced 4. Widowed 5. Other _____
4	What are your income-generating jobs? (select all that apply and indicate percent time for each, if applicable)	1. Trading wild animals _____% 2. Breeding livestock _____% 3. Crop production _____% 4. Housewife _____% 5. Other [provide detail] _____% 6. Don't know
5	What is the highest level of education that you completed?	1. No education 2. Primary school (grade 1-5) 3. Secondary school (grade 6-9) 4. High school (grade 10-12) 5. Intermediate school 6. College/university/professional and above 7. Don't know

SECTION II: INFORMATION ON WILDLIFE TRADING

#	Question	Response
6	Do you have domestic animals at your home?	1. Yes 2. No 3. I don't know
7	When did you start wildlife trading activities?	[Open ended for year]
8	Who in your family is involved in the wildlife trade?	1. Only me 2. My spouse/partner 3. All family members 4. Other [provide who]

#	Question	Response
9	Why do you trade captive wildlife? (provide up to 3 reasons)	Reason 1: _____ Reason 2: _____ Reason 3: _____
10	How much does wildlife trading contribute to household income per year? And to what extent has this contribution rate increased, decreased, or remained the same over the past three years?	_____ % 1. Increased _____% 2. Decreased _____% 3. Unchanged

11.

Wildlife Species Traded (list all species and provide details for top four traded species)	11a. What is the purpose of trading? (select all that apply for the top 4 species)	11b. How do you usually obtain wildlife for trading? (select all that apply for the top 4 species)	11c. Who are the buyers? (provide % for the top 4 species)	11d. How are wildlife transported? (select all that apply for the top 4 species)
List species e.g. civet 1.	1. Meat 2. Breed 3. For medicine 4. Tourism or display 5. Other [open ended]	1. Buy from small wildlife farm 2. Buy from large wildlife farm 3. Breed wildlife 4. Capture wildlife 5. Other [open ended]	1. Farmer ___% 2. Consumer __% 3. Restaurant ____% 4. Company ___% 5. Other [open ended] __%	1. Retail buyers directly come to pick up and ship out 2. Traders collect at gathering point and transport them 3. Farm transports to traders 4. Traders hiring a shipper to transport them 5. By bus/public car 6.Other [open ended]

Wildlife Species Traded (list all species and provide details for top four traded species)	11a. What is the purpose of trading? (select all that apply for the top 4 species)	11b. How do you usually obtain wildlife for trading? (select all that apply for the top 4 species)	11c. Who are the buyers? (provide % for the top 4 species)	11d. How are wildlife transported? (select all that apply for the top 4 species)
2.	1. Meat 2. Breed 3. For medicine 4. Tourism or display 5. Other [open ended]	1. Buy from small wildlife farm 2. Buy from large wildlife farm 3. Breed wildlife 4. Capture wildlife 5. Other [open ended]	1. Farmer __% 2. Consumer __% 3. Restaurant ___% 4. Company __% 5. Other [open ended] __%	1. Retail buyers directly come to pick up and ship out 2. Traders collect at gathering point and transport them 3. Farm transports to traders 4. Traders hiring a shipper to transport them 5. By bus/public car 6.Other [open ended]
3.	1. Meat 2. Breed 3. For medicine 4. Tourism or display 5. Other [open ended]	1. Buy from small wildlife farm 2. Buy from large wildlife farm 3. Breed wildlife 4. Capture wildlife 5. Other [open ended]	1. Farmer __% 2. Consumer __% 3. Restaurant ___% 4. Company __% 5. Other [open ended] __%	1. Retail buyers directly come to pick up and ship out 2. Traders collect at gathering point and transport them 3. Farm transports to traders 4. Traders hiring a shipper to transport them 5. By bus/public car 6.Other [open ended]

Wildlife Species Traded (list all species and provide details for top four traded species)	11a. What is the purpose of trading? (select all that apply for the top 4 species)	11b. How do you usually obtain wildlife for trading? (select all that apply for the top 4 species)	11c. Who are the buyers? (provide % for the top 4 species)	11d. How are wildlife transported? (select all that apply for the top 4 species)
4.	1. Meat 2. Breed 3. For medicine 4. Tourism or display 5. Other [open ended]	1. Buy from small wildlife farm 2. Buy from large wildlife farm 3. Breed wildlife 4. Capture wildlife 5. Other [open ended]	1. Farmer __% 2. Consumer __% 3. Restaurant ___% 4. Company __% 5. Other [open ended] __%	1. Retail buyers directly come to pick up and ship out 2. Traders collect at gathering point and transport them 3. Farm transports to traders 4. Traders hiring a shipper to transport them 5. By bus/public car 6.Other [open ended]
List additional species:				

12.

Wildlife Species Traded (top four species traded)	12a. What is the average purchasing volume (by day or month) for each of the top 4 species?	12b. What is the average purchasing price for each of the top 4 species?	12c. What is the average selling volume (by day or month) for each of the top 4 species?	12d. What is the average selling price for each of the top 4 species?
List species e.g. civet	*Indicate # of purchased wildlife per day (or month)*	*e.g. # thousand VND per individual*	*Indicate # of wildlife sold per day (or month)*	*e.g. # thousand VND per individual*
1.				
2.				
3.				
4.				

SECTION III: BENEFITS, CHALLENGES, & ALTERNATIVES in WILDLIFE TRADING

#	Question	Response
13	What are the main benefits in wildlife trading (list up to 3)?	1. _____ 2. _____ 3. _____
14	What are the main challenges in wildlife trading (list up to 3)?	1. _____ 2. _____ 3. _____
15	Which options would be more likely to make you want to stop wildlife trading? (select all that apply)	1. If the price decreased 2. If the laws changed and penalties increased 3. If the laws were enforced more often 4. If myself or a family member became ill 5. If there was a disease outbreak nearby related to wildlife 6. If my family or community expressed disapproval of wildlife trading 7. Other _____
16	If you were to stop trading wildlife, which of the following would be most helpful to you? (select all that apply)	1. Free or low-cost trainings in another trade or profession 2. Access to domestic animals/livestock 3. A network of other former wildlife traders for support 4. Other _____

Thank you for your participation in this survey!

Wildlife Neighbors Survey Questionnaire

QUESTIONNAIRE

(For wildlife farm neighbors, consumers)

A behavioral risk assessment to characterize risk associated with the wildlife farming value chain in Dong Nai province

Research information
This study aims at unpacking the social and behavioral risk factors of those involved in wildlife value chains in Dong Nai province that can lead to spillover of coronaviruses to domestic animals and humans. Actors in this study are: farmers (both individuals and households), households near farms, breed suppliers, traders, restaurant workers, and animal transporters, consumers, livestock associations/cooperatives, and government staff in the one-health sector (i.e. human health, animal health, forest protection and environmental officials). The qualitative and quantitative data collected from this questionnaire will be used to identify and help reduce the various levels of risk at different points throughout the wildlife value chain in Dong Nai province.

(YOU DON'T NEED TO WRITE YOUR NAME. ALL YOUR PERSONAL
        INFORMATION WILL BE CONFIDENTIAL)

ADMINISTRATION

Name of Interviewer:		
Time:	...... hour date ...../...../2022	
Commune:	District:	Dong Nai province
		ID (for entry data only) ....

SECTION I: GENERAL INFORMATION

#	Question	Response

1	What gender do you identify with?	1. Male 2. Female 3. Other _____
2	In what year were you born?	_____
3	What is your marital status?	1. Married 2. Single 3. Divorced 9. Other _____
4	What are your income-generating jobs? (select all that apply and indicate percent time for each, if applicable)	1. Breeding livestock _____% 2. Crop production _____% 3. Housewife _____% 4. Other trading_____% 5. Other [detail_____]_____% 6. Don't know
5	What is the highest level of education that you completed?	1. No education 2. Primary school (grade 1-5 3. Secondary school (grade 6-9) 4. High school (grade 10-12) 5. Intermediate school 6. College/university/professional and above 7. Don't know
6	How many people are in your household?	_____ people

SECTION II: INFORMATION ON LIVESTOCK FARMING ACTIVITIES

#	Question	Response
7	Do you have domestic animals at your home? If yes, what kinds? (select all that apply)	1. Yes 2. No 3. Don't know 1. Poultry 2. Pig

#	Question	Response
		3. Cow/ buffalo 4. Dog/cat 5. Fish 6 Other:: _____
8	What biosafety measures are in place for captive wildlife at this farm? (Suggestion: Construction specifications of the barn, Environmental sanitation measures, breeding selection, disease control, visitor management, …)	[Open ended]
9	What additional safety measures would you like to have here?	[Open ended]
10	Where does drinking water for your household on the farm come from? (select all that apply)	1. Covered dug well 2. Uncovered well 3. Covered drilled well 4. Water taps 5. Covered rain water 6. Uncovered rain water 7. Filtered water 8. Pond/river 9. Other: _____
11	Where does water for domestic animals come from? (select all that apply)	1. *Don't use water* 2. Covered dug well 3. Uncovered well 4. Covered drilled well 5. Water taps 6. Covered rain water 7. Uncovered rain water 8. Filtered water 9. Pond/river 10. Other _____
12	Where does animal waste from slaughter/butcher and animal excrement on the farm go?	[Open ended]

#	Question	Response

13. Do you have any special protective equipment that you use for the following activities? (select all that apply)

	1.Shoes/ boots	2. Gloves	3. Masks	4. Protective clothes/ gown / apron	5. Other:	6. Nothing
1. Feeding						
2.Catching/ touching						
3. Slaughtering /butchering						
4. Harvest						
5. Cleaning						
6. Other(detail)						
7. Other(detail)						

#	Question	Response
14	Are you concerned about diseases on the farm?	1. Yes, in animals 2. Yes, in humans 3. Yes, in both animals and humans 4. No

	14b. If yes, which ones?	5. I don't know 6. Other: _____ [Open ended]
15	If you have ever had wildlife die on your farm, what have you done? (select all that apply)	1. Not ever 2. Used the animal for eating or sharing 3. Buried 4. Took it to the landfill or pond/river 5. Disinfected and buried 6. Report to veterinarian or forest protection 7. Other [detail_____]
16	What happens if there is a sick or dead animal on the farm?	[Open ended]

17. Kindly answer the following questions about your experiences with wildlife?

	Question	Response
1.	In the past 1 year, have you cooked or handled meat, organs or blood from a recently killed animal?	1. Yes 2. No 3. Don't remember
2.	Have you ever eaten meat from a wild animal that you know was sick or dead?	1. Yes 2. No 3. Don't remember
3.	Have you hunted or trapped an animal?	1. Yes 2. No 3. Don't remember
4.	Have you slaughted an wild animal?	1. Yes 2. No 3. Don't remember
5.	Have you ever been ever attacked or scratched, bitten by an animal? *(If "No" or "Don't remember" →Question 7)*	1. Yes 2. No 3. Don't remember
6.	If yes, the last time you were scratched or bitten, or attacked, what did you do? (select all that apply) Yes, but I don't know what they ares	1. Wash wound with soap and fresh water 2. Rinse wound with water 3. Bandage wound 4. Visit doctor/health facility 5. Nothing, keep working 6. Don't remember

		9. Other ....
7.	Are you worried about zoonotic diseases or disease outbreaks?	1. Yes 2. No 3. Don't know
8.	Are there any risks associated with closed contact or slaughtering or butchering when you have an open wound? (select all that apply)	1. No 2. Yes, but I don't know what they ares 3. Yes, it can make you sick 4. Yest, it can poison you 5. Yes, it can infect you with a disease 6. Other (...) 9. Don't know

Thank you for your participation in this survey!

APPENDIX 3: KEY INFORMANT INTERVIEW

QUALITATIVE INTERVIEW GUIDE

(For actors along the wildlife farming value chain, including wildlife farmers, traders, and government staff in the One Health sector including human health, animal health, forest protection, and environmental officials)

A behavioral risk assessment to characterize risk associated with the wildlife farming value chain in Dong Nai province

Core Themes
1. Spatial location
2. Actors in the wildlife farming value chain (i.e., socioeconomic, gender, cultural, & environmental factors)
3. Biosecurity
4. Illness, medical care/treatment

I. Spatial location

A. Wildlife farming
1. In which areas are captive wildlife breeding facilities concentrated?
   a. Approximately how many facilities are there?
   b. Where are they located?
2. What are the main types of wildlife (species) and what is the scale of captivity (number of individual animals)?
3. What is the motivation for participation in wildlife farming?
4. Is wildlife farming seasonal?
5. How has the trade in captive wildlife changed over the past few years, especially since COVID-19?
   a. How has the number of facilities changed (% increase, decrease, or unchanged)?
6. Have there been changes in areas that used to have a large number of captive wildlife farms in the past but now have fewer animals?
   a. If yes, where are these areas?
   b. What is the reason for these changes?
7. What areas have the potential to develop captive wildlife activities in the future?
   a. What makes them likely areas for this development?
8. How much does wildlife farming contribute to a household's income per year?
   a. How has this contribution changed over the past few years, especially since COVID-19? (% increase, decrease, unchanged)
9. What are the main benefits and challenges facing wildlife captive facilities?
10. Who works on the farm and what are their roles?
    a. For example, who in the family?
    b. Are their age-specific activities on the farm? (e.g., if children work on the farm, do their roles depend on age?)

B. Wildlife trading
1. In which areas are there markets that have wildlife trading in and near Dong Nai province?

a. Approximately how many markets are there?
b. Are these markets for wholesale and/or retail?
c. Where are they located?
d. How many days do they operate per week?
e. What are the main types of wildlife (species) at these markets?
f. What is the volume of wildlife traded per day (kg or number of animals)?
g. How many traders (wholesalers/retailers) are participating in market transactions?
h. How do prices and/or trading volumes change at different times of the year?
i. Have there been changes in the number of markets, sales, and/or volume traded since COVID-19? If yes, why specifically?

2. Please describe what you know about the wildlife transportation routes.
   a. What are the estimated transportation costs to the market (can be estimated by individual or trip)?
   b. What is the transit time (estimated travel time from wildlife farm captivity to market)?
   c. What are the main modes of transportation used for each route?
3. Where do wildlife traders come from?
   a. How many traders are there typically (per day or month)?
   b. When does trading take place (e.g. specific months)?
   c. How many transactions take place (average number of purchases per time)?
4. What is the motivation for participation in wildlife trading?
5. How much does wildlife trading contribute to a household's income per year?
   a. How has this contribution changed over the past few years, especially since COVID-19? (% increase, decrease, unchanged)
6. What are the main benefits and challenges facing wildlife captive facilities?

C. *Wildlife consumption*
   1. In which areas is there a high demand for wildlife consumption?
      a. What are common characteristics of these regions (e.g., average income, population density, urban/rural, land use, etc.)
   2. How has the demand for wildlife consumption (i.e., quantity, preferred type of wildlife, eaten at a restaurant or prepared at home) has changed over the past 10 years, especially since COVID-19?
      a. What is the reason for this change?
   3. Do you know people in this area who consume wildlife?
      a. Does it matter if the wildlife is already dead or alive when they obtain it for consumption?
      b. How do people prepare wildlife?
      c. Why do they consume wildlife?
      d. How often do they consume wildlife?
D. *Management of captive breeding and wildlife trade*
   1. What are the names of agencies involved in captive breeding and/or wildlife trade?
      a. Where are they located?
   2. What are the main roles of these agencies?
      a. Do they help set-up contracts?
      b. Do they provide biosafety training?
      c. Do they provide any resources?
   3. How has the number, function/authority/field of operations of these agencies changed over the past few years and are there any new trends in how they operate?

II. Actors in wildlife value chains (i.e., socioeconomic, gender, cultural, & environmental factors)
1. What are the roles of people involved in the chain of captive breeding and wildlife trade?
    a. Do the roles vary by gender?
    b. Do the roles vary by age?
    c. Do the roles vary by region or rural/urban area?
    d. Do the roles vary by culture?
    e. Do the roles vary by something else?
2. How have these actors changed over the past few years, especially since COVID-19? (for example, there were no exporters before, but now there are exporters; or there were brokers for contracts in the past, but now there are not)?
    a. Why have there been changes?
3. What motivates these actors to engage in captive wildlife breeding/trading activities?

III. Biosecurity
1. Are you aware of any trainings in biosecurity practices for captive wildlife or wildlife trade that have been done?
    a. If yes, who are the trainers (e.g. which organizations)?
    b. If yes, how many trainees have been trained?
    c. If yes, how often have trainings taken place?
    d. If yes, who was trained and how were they selected (e.g. is training voluntary or mandatory, free or low-cost, or neither, etc.)?
    e. If yes, what content has been covered in these trainings?
2. In your opinion, how do farmers practice wildlife farming?
    a. What is their average level of knowledge regarding biosecurity?
3. How do people usually handle situations when a captive wild animal becomes sick or dies?
4. Who can support farmers to ensure that they are aware of and practice biosafety measures?
    a. How can this goal best be accomplished?
5. What measures are taken by farmers to ensure biosafety (gloves, masks, sanitation routine, quarantining new animals, etc.)?
    a. If measures are not being taken, why not (e.g. are people not aware of biosafety practices? Are they aware but don't think it is necessary? Do they consider it important, but face other barriers such as access to resources, costs, time constraints, etc.)?

A. For wildlife farmers
1. What is the most serious risk to your health/safety that you have encountered while working as a wildlife farmer?
2. Have you ever received biosafety training on the farm?
    a. If yes, when?
    b. If yes, what did you learn?
    c. Have you continued to apply what you learned at the farm?
3. Do you sell live, dead, or a combination of both live and dead animals?
4. Where does animal waste from slaughter/butcher and animal excrement on the farm go?
5. Where do animal bodies go after slaughter?

B. For wildlife traders
1. What is the most serious risk to your health/safety that you have encountered while working as a wildlife trader?
2. Have you ever received biosafety training for wildlife trading?
    a. If yes, when?

        b.   If yes, what did you learn?

        c.   Have you continued to apply what you learned in wildlife training?

3.   Are you buying live, dead, or a combination of both live and dead animals?

IV. Illness, medical care/treatment

1.   What do people usually do when they get disease symptoms or feel ill?

2.   Where do you usually go to get treatment for illness or infection?

        a.   When do you decide to seek treatment?

        b.   How often do you seek treatment (month/year)?

3.   Have any outbreaks/infectious cases related to animals been detected in recent years?

        a.   If yes, what were they?

        b.   If yes, how did you react?

        c.   If yes, how did different people in the community react?

APPENDIX 4: FOCUS GROUP DISCUSSION

Focus Group Discussion Guide
(For wildlife farmers)

A behavioral risk assessment to characterize risk associated with the wildlife farming value chain in Dong Nai province

FOCUS GROUP: DEMOGRAPHIC DETAILS QUESTIONNAIRE

Please answer the following questions in the spaces provided, circle or tick the most appropriate options.

1. Age:…………….Average   (Oldest ……………   Youngest……………………)

2. Total people by Gender: □ Male   □ Female

4. How many species have you cared for in the last month (approximately)? _____

5. How many years of experience have you had in this current job?
  □ <1 Year □ 1-2 Years
  □ 2-5 Years □ 5-10 Years
  □ >10 Years

FOCUS GROUP: DISCUSSION GUIDE

Facilitator's welcome, introduction and instructions to participants

Welcome and thank you for volunteering to take part in this focus group. You have been asked to participate as your point of view is important. I realize you are busy and I appreciate your time.

Introduction: This focus group discussion is designed to assess your current thoughts and feelings about factors driving spill over (i.e., socioeconomics, gender, cultural, environment factors), your biosecurity practices in wildlife farming, your medical history and some actors along the value chain. The focus group discussion will take no more than two hours.

Anonymity: I would like to assure you that the discussion will be anonymous. The transcribed notes of the focus group will contain no information that would allow individual subjects to be linked to specific statements. You should try to answer and comment as accurately and truthfully as possible. I and the other focus group participants would appreciate it if you would refrain from discussing the comments of other group members outside the focus group. If there are any questions or discussions that you do not wish to answer or participate in, you do not have to do so; however please try to answer and be as involved as possible.

Ground rules

- The most important rule is that only one person speaks at a time. There may be a temptation to jump in when someone is talking but please wait until they have finished.
- There are no right or wrong answers
- You do not have to speak in any particular order
- When you do have something to say, please do so. There are many of you in the group and it is important that I obtain the views of each of you
- You do not have to agree with the views of other people in the group
- Does anyone have any questions? (answers).
- OK, let's begin

Warm up

- First, I'd like everyone to introduce themselves. Can you tell us your name and main task related to WL?

Introductory question

I am just going to give you a couple of minutes to think about your experience of your work related to wildlife value chain. Is anyone happy to share his or her experience?

Guiding questions

I. Wildlife farming
1. What are the main types of wildlife (species) and what is the scale of captivity (number of individual animals)?
2. What is the motivation for participation in wildlife farming?
1. Who works on the farm and what are their roles?
4. Do you raise any livestock in your farm? If yes, list of livestock
5. How have farming facilities changed over the past few years, especially since COVID-19?
6. What areas have the potential to develop captive wildlife activities in the future?
7. How much does wildlife farming contribute to a household's income per year?
    What is the average selling price? (breed, mature wildlife)
    . How has this contribution changed over the past few years, especially since COVID-19? (% increase, decrease, unchanged)
8. What are the main benefits, challenges and alternatives in captive wildlife farming?

II. Biosecurity

1. What is the most serious risk to your health/safety that you have encountered while working as a wildlife farmer?
2. How are your biosafety training sessions on the farm? (when, what did you learn, trainers, …)
1. Can you describe how to breed wildlife in detail? (breed selection, breeding stock, care, daily feeding, breeding, midwifery, etc.)
2. Do you have any special protective equipment that you use for wildlife farming? (Feeding, Catching/ touching, Slaughtering /butchering, Harvest, Cleaning, etc.)
3. Do you need support about biosafety and biosecurity in wildlife farming (from veterinarian, or anyone else)?

III. Illness, medical care/treatment
1. What do you usually do when they get disease symptoms or feel ill?
2. Where do you usually go to get treatment for illness or infection? How often?
3. Have any outbreaks/infectious cases related to animals been detected in recent years? If yes, what were they? How did you react? How did different people in the community react?

IV. Other wildlife actors
1. Are you aware of markets that have wildlife trading in and near Dong Nai province?
    Where are they located?
1. Please describe what you know about the wildlife transportation routes.
3. Where do wildlife traders come from?
4. Do you know people who consume wildlife? If yes, who are they? Why do they consume wildlife? How often do they consume wildlife?

Concluding question

- Of all the things we've discussed today, what would you say are the most important issues you would like to express about this checklist?

Conclusion

- Thank you for participating. This has been a very successful discussion
- Your opinions will be a valuable asset to the study
- We hope you have found the discussion interesting

- If there is anything you are unhappy with or wish to complain about, please contact the local PI or speak to me later
- I would like to remind you that any comments featuring in this report will be anonymous
- Please remember to maintain confidentiality of the participating individuals by not disclosing their names.

APPENDIX 5: DATA DICTIONARY

Appendix 5 Table 1: Wildlife survey

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
name_interviewer	1	Name of Interviewer	Nominal	Input	6	Right	F2.0	F2.0
commune	2	commune	Nominal	Input	9	Right	F2.0	F2.0
district	3	district	Nominal	Input	10	Right	F1.0	F1.0
ID	4	id	Scale	Input	6	Right	F4.0	F4.0
sex	5	gender	Nominal	Input	5	Right	F1.0	F1.0
year_of_birth	6	year of birth	Scale	Input	15	Right	F4.0	F4.0
relationship	7	marital status	Nominal	Input	15	Right	F1.0	F1.0
other_relationship	8	other status	Nominal	Input	9	Left	A27	A27
job1	9	WL farming	Nominal	Input	6	Right	F1.0	F1.0
V4.1_WLpercentime	10	% time for WL farming	Nominal	Input	5	Right	F3.0	F3.0
job2	11	Breeding livestock	Nominal	Input	6	Right	F1.0	F1.0
V4.2_livestockpercentime	12	% time for breeding livestock	Nominal	Input	5	Right	F2.0	F2.0
job3	13	Crop production	Nominal	Input	6	Right	F1.0	F1.0
V4.3_cropproductionpercenttime	14	% time for crop production	Scale	Input	5	Right	F3.0	F3.0
job4	15	Just housewife	Nominal	Input	6	Right	F1.0	F1.0
V4.4_housewifepercenttime	16	% time for housewife	Scale	Input	5	Right	F3.0	F3.0
job5	17	other trading	Nominal	Input	6	Right	F1.0	F1.0
V4.5_othertradingpercenttime	18	% time for other trading	Scale	Input	5	Right	F3.0	F3.0
job6	19	other business	Nominal	Input	6	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
V4.6_otherbussiness percentrime	20	detail	Nominal	Input	26	Left	A108	A108
job7	21	don't know	Nominal	Input	6	Right	F1.0	F1.0
V5_highestedu	22	level of education	Nominal	Input	6	Right	F1.0	F1.0
V6_#peopleHH	23	# people in your household	Nominal	Input	5	Right	F1.0	F1.0
V7.1_self_takecareWL	24	1. Self	Nominal	Input	5	Right	F1.0	F1.0
V7.2_spouse_takecareWL	25	2. Spouse/partner	Nominal	Input	5	Right	F1.0	F1.0
V7.3_others_takecareWL	26	3. Other Adults	Nominal	Input	6	Right	F1.0	F1.0
V7.4_childunder5_takecareWL	27	4. Children (under 5 years old)	Nominal	Input	5	Right	F1.0	F1.0
V7.5_child5to9_takecareWL	28	5. Children (5-9 years old)	Nominal	Input	5	Right	F1.0	F1.0
V7.6_child10to12_takecareWL	29	6. Children (10-12 years old)	Nominal	Input	5	Right	F1.0	F1.0
V7.7_child13to18_takecareWL	30	7. Children (13-18 years old)	Nominal	Input	5	Right	F1.0	F1.0
V7.8_else_takecareWL	31	8. Other	Nominal	Input	5	Right	F1.0	F1.0
V7.8_detail	32	detail	Nominal	Input	26	Left	A117	A117
V8a_domesticanimal	33	8a. Domestic animals at your home	Nominal	Input	5	Right	F1.0	F1.0
V8b1_poultry	34	Poultry	Nominal	Input	5	Right	F1.0	F1.0
V8b2_pig	35	Pig	Nominal	Input	5	Right	F1.0	F1.0
V8b3_cow	36	Cow	Nominal	Input	5	Right	F1.0	F1.0
V8b4_pet	37	Dog, cat	Nominal	Input	5	Right	F1.0	F1.0
V8b5_fish	38	Fish	Nominal	Input	5	Right	F1.0	F1.0
V8b6_otheranimal	39	Other	Nominal	Input	5	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
V8b6_others_detail	40	detail	Nominal	Input	26	Left	A66	A66
V9.1_owner	41	Farm owner/manager	Nominal	Input	5	Right	F1.0	F1.0
V9.2_breeding	42	Breeding	Nominal	Input	5	Right	F1.0	F1.0
V9.3_slaughter	43	Slaughter/Butcher	Nominal	Input	5	Right	F1.0	F1.0
V9.4_feeding	44	Feeding	Nominal	Input	5	Right	F1.0	F1.0
V9.5_cleaning	45	Cleaning	Nominal	Input	5	Right	F1.0	F1.0
V9.6_removedeathWL	46	Removing sick or dead animals	Nominal	Input	5	Right	F1.0	F1.0
V9.7_resident	47	Living at farm	Nominal	Input	5	Right	F1.0	F1.0
V9.8_otheract	48	Other	Nominal	Input	5	Right	F1.0	F1.0
V9.8_other_detail	49	detail	Nominal	Input	26	Left	A84	A84
V10_WLstarting	50	Year of starting involved in captive wildlife breeding activities	Scale	Input	6	Right	F4.0	F4.0
V11.1_reasonWLraising	51	Reason 1	Nominal	Input	26	Left	A186	A186
V11.2_reasonWLraising	52	Reason 2	Nominal	Input	26	Left	A153	A153
V11.3_reasonWLraising	53	Reason 3	Nominal	Input	26	Left	A132	A132
V12_incomeHH	54	12a. % wildlife breeding contribute to household income per year	Nominal	Input	5	Right	F3.0	F3.0
V12b_incomeratechanged	55	12b. This contribution rate increased, decreased, or remained the same	Nominal	Input	5	Right	F1.0	F1.0
V12b_increased	56	% increased	Scale	Input	5	Right	F3.0	F3.0
V12b_decreased	57	% decreased	Scale	Input	5	Right	F2.0	F2.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
V13a_plan2year	58	13a. Breeding plans for the next 2 years	Nominal	Input	5	Right	F1.0	F1.0
V13b_reasonchanged	59	13b. Reason for the expected change	Nominal	Input	19	Left	A183	A183
V14_biosafetymeasures	60	14. Biosafety measures are in place	Nominal	Input	64	Left	A1476	A1476
V14.a.WLbarnorganized	61	14.a. Wildlife barn are organized (solidly or covered by a roof, divided into cell or airly)	Nominal	Input	17	Right	F8.2	F8.2
V14.b.WLbarnlocated	62	14.b. Wildlife barn is far from home or seperated with other roost	Nominal	Input	15	Right	F8.2	F8.2
V14.6_barndailycleaned	63	14.6. Barn is daily cleaned	Nominal	Input	8	Right	F8.0	F8.0
V14.7_barnregularly cleaned	64	14.7. Barn is regularly cleaned	Nominal	Input	8	Right	F8.0	F8.0
V14.9_disinfectant	65	14.9. Barn is disinfected by lime or bioproduct	Nominal	Input	8	Right	F8.0	F8.0
V14.10_safefood	66	14.10. Food is safe	Nominal	Input	8	Right	F8.0	F8.0
V14.11_selectedbreeding	67	14.11. Breeding is selected from peer farmers	Nominal	Input	8	Right	F8.0	F8.0
V14.12_UsePPE	68	14.12. Use PPE	Nominal	Input	8	Right	F8.0	F8.0
V14.13_Strangers	69	14.13. Don't allow stranger to enter the barn	Nominal	Input	8	Right	F8.0	F8.0
V14.14_quarantine	70	14.14. There is quarantine space	Nominal	Input	8	Right	F8.0	F8.0
V15_addedmeasures	71	15. Additional safety measures supposed to apply	Nominal	Input	26	Left	A429	A429
V15.1_betrained	72	15.1. Being trained on zoonotic diseases and farming technique	Nominal	Input	8	Right	F8.0	F8.0

Table: Variables								
Name	Position	Label	Measure ment Level	Role	Width	Alignm ent	Print Format	Write Format
V15.2_probiotic	73	15.2. Support probiotic or chemical product to treat manure and excrement	Nominal	Input	8	Right	F9.0	F9.0
V15.3_applybiosecur ity	74	15.3. Apply biosecurity measurement	Nominal	Input	8	Right	F8.0	F8.0
V15.4_deodorizing	75	15.4. Apply deodorizing method	Nominal	Input	8	Right	F8.0	F8.0
V15.5_disinfectant	76	15.5. Disinfectant the barn	Nominal	Input	8	Right	F8.0	F8.0
V15.6_healthcare	77	15.6. Health care and prevent zoonotic disease	Nominal	Input	8	Right	F8.0	F8.0
V15.7_nothing	78	15.7. Not at all	Nominal	Input	8	Right	F8.0	F8.0
V15.8_dontknow	79	15.8. Don't know	Nominal	Input	8	Right	F8.0	F8.0
V16.1_drink_coverd ugwell	80	1. Covered dug well	Nominal	Input	5	Right	F1.0	F1.0
V16.2_drink_uncove rdugwell	81	2. Uncovered dug well	Nominal	Input	5	Right	F1.0	F1.0
V16.3_drink_coverd rillwell	82	3. Covered drilled well	Nominal	Input	5	Right	F1.0	F1.0
V16.4_drink_watert ap	83	4. Water taps	Nominal	Input	5	Right	F1.0	F1.0
V16.5_drink_coverr ainwater	84	5. Covered rain water	Nominal	Input	5	Right	F1.0	F1.0
V16.6_drink_uncove rrainwater	85	6. Uncovered rain water	Nominal	Input	5	Right	F1.0	F1.0
V16.7_drink_filterwa ter	86	7. Filtered water	Nominal	Input	5	Right	F1.0	F1.0
V16.8_drink_pondri ver	87	8. Pond/river	Nominal	Input	5	Right	F1.0	F1.0
V16.9_other	88	9. Other source	Nominal	Input	5	Right	F1.0	F1.0
V16.9_other_detail	89	detail	Nominal	Input	26	Left	A30	A30
V17.1_WL_coverdu gwell	90	1. Covered dug well	Nominal	Input	5	Right	F1.0	F1.0
V17.2_WL_uncover dugwell	91	2. Uncovered dug well	Nominal	Input	5	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
V17.3_WL_coverdrillwell	92	3. Covered drilled well	Nominal	Input	5	Right	F1.0	F1.0
V17.4_WL_watertap	93	4. Water taps	Nominal	Input	5	Right	F1.0	F1.0
V17.5_WL_coverrainwater	94	5. Covered rain water	Nominal	Input	5	Right	F1.0	F1.0
V17.6_WL_uncoverrainwater	95	6. Uncovered rain water	Nominal	Input	5	Right	F1.0	F1.0
V17.7_WL_filterwater	96	7. Filtered water	Nominal	Input	5	Right	F1.0	F1.0
V17.8_WL_pondriver	97	8. Pond/river	Nominal	Input	5	Right	F1.0	F1.0
V17.9_WL_other	98	9. Other source	Nominal	Input	5	Right	F1.0	F1.0
V17.9_WL_other_detail	99	detail	Nominal	Input	26	Left	A75	A75
V18.1_DA_coverdugwell	100	1. Covered dug well	Nominal	Input	5	Right	F1.0	F1.0
V18.2_DA_uncoverdugwell	101	2. Uncovered dug well	Nominal	Input	5	Right	F1.0	F1.0
V18.3_DA_coverdrillwell	102	3. Covered drilled well	Nominal	Input	5	Right	F1.0	F1.0
V18.4_DA_watertap	103	4. Water taps	Nominal	Input	5	Right	F1.0	F1.0
V18.5_DA_coverrainwater	104	5. Covered rain water	Nominal	Input	5	Right	F1.0	F1.0
V18.6_DA_uncoverrainwater	105	6. Uncovered rain water	Nominal	Input	5	Right	F1.0	F1.0
V18.7_DA_filterwater	106	7. Filtered water	Nominal	Input	5	Right	F1.0	F1.0
V18.8_DA_pondriver	107	8. Pond/river	Nominal	Input	5	Right	F1.0	F1.0
V18.9_DA_other	108	9. Other source	Nominal	Input	5	Right	F1.0	F1.0
V18.9_DA_other_detail	109	detail	Nominal	Input	7	Left	A54	A54
V19_wastedeal	110	19. Animal waste from slaughter/butcher and animal excrement on the farm go	Nominal	Input	73	Left	A309	A309

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
V19.1_manurecompost	111	manure composting	Nominal	Input	8	Right	F8.0	F8.0
V19.2_manurefertilize	112	manure, excrement are collected into the bag of pit to fertilize the plant	Nominal	Input	8	Right	F8.0	F8.0
V19.3.flowedtopit	113	Excrement/wastewater is flowed to the pit	Nominal	Input	6	Right	F8.0	F8.0
V19.4.feedfish	114	Feed to fish	Nominal	Input	8	Right	F8.0	F8.0
V19.5_biogas	115	apply biogas	Nominal	Input	11	Right	F8.0	F8.0
V19.6_notreated	116	Wastewater directly to crops, or no treated, manure to fertilize the green vegetable	Nominal	Input	9	Right	F8.0	F8.0
V19.7_treatedprobiotic	117	manure, excrement are treated with probiotic	Nominal	Input	8	Right	F8.0	F8.0
V19.9_other	118	other	Nominal	Input	8	Right	F8.0	F8.0
V20.1_feeding_shoes	119	1.Shoes/ boots	Nominal	Input	6	Right	F1.0	F1.0
V20.1_feeding_glov	120	2. Gloves	Nominal	Input	6	Right	F1.0	F1.0
V20.1_feeding_mask	121	3. Masks	Nominal	Input	6	Right	F1.0	F1.0
V20.1_feeding_clot	122	4. Protective clothes/ gown / apron	Nominal	Input	6	Right	F1.0	F1.0
V20.1_feeding_other	123	5. Other	Nominal	Input	6	Right	F1.0	F1.0
V20.1_feeding_nothing	124	6. Nothing	Nominal	Input	6	Right	F1.0	F1.0
V20.2_catching_shoes	125	1.Shoes/ boots	Nominal	Input	6	Right	F1.0	F1.0
V20.2_catching_glov	126	2. Gloves	Nominal	Input	6	Right	F1.0	F1.0
V20.2_catching_mask	127	3. Masks	Nominal	Input	6	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
V20.2_catching_clot	128	4. Protective clothes/ gown / apron	Nominal	Input	6	Right	F1.0	F1.0
V20.2_catching_other	129	5. Other	Nominal	Input	6	Right	F1.0	F1.0
V20.2_catching_nothing	130	6. Nothing	Nominal	Input	6	Right	F1.0	F1.0
V20.3_slaughtering_shoes	131	1.Shoes/ boots	Nominal	Input	6	Right	F1.0	F1.0
V20.3_slaughtering_glov	132	2. Gloves	Nominal	Input	6	Right	F1.0	F1.0
V20.3_slaughtering_mask	133	3. Masks	Nominal	Input	6	Right	F1.0	F1.0
V20.3_slaughtering_clot	134	4. Protective clothes/ gown / apron	Nominal	Input	6	Right	F1.0	F1.0
V20.3_slaughtering_other	135	5. Other	Nominal	Input	6	Right	F1.0	F1.0
V20.3_slaughtering_nothing	136	6. Nothing	Nominal	Input	6	Right	F1.0	F1.0
V20.4_harvest_shoes	137	1.Shoes/ boots	Nominal	Input	6	Right	F1.0	F1.0
V20.4_harvest_glov	138	2. Gloves	Nominal	Input	6	Right	F1.0	F1.0
V20.4_harvest_mask	139	3. Masks	Nominal	Input	6	Right	F1.0	F1.0
V20.4_harvest_clot	140	4. Protective clothes/ gown / apron	Nominal	Input	6	Right	F1.0	F1.0
V20.4_harvest_other	141	5. Other	Nominal	Input	6	Right	F1.0	F1.0
V20.4_harvest_nothing	142	6. Nothing	Nominal	Input	6	Right	F1.0	F1.0
V20.5_cleaning_shoes	143	1.Shoes/ boots	Nominal	Input	6	Right	F1.0	F1.0
V20.5_cleaning_glov	144	2. Gloves	Nominal	Input	6	Right	F1.0	F1.0
V20.5_cleaning_mask	145	3. Masks	Nominal	Input	6	Right	F1.0	F1.0
V20.5_cleaning_clot	146	4. Protective clothes/ gown / apron	Nominal	Input	6	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measure ment Level	Role	Width	Alignm ent	Print Format	Write Format
V20.5_cleaning_other	147	5. Other	Nominal	Input	6	Right	F1.0	F1.0
V20.5_cleaning_nothing	148	6. Nothing	Nominal	Input	6	Right	F1.0	F1.0
V20.6_other	149	20.6. Other activities (detail)	Nominal	Input	26	Left	A168	A168
V21.1_diseaseconcerned	150	Yes, in animals	Nominal	Input	6	Right	F1.0	F1.0
V21.2_diseaseconcerned	151	Yes, in humans	Nominal	Input	6	Right	F1.0	F1.0
V21.3_diseaseconcerned	152	Yes, in both animals and humans	Nominal	Input	6	Right	F1.0	F1.0
V21.4_no	153	No concerned	Nominal	Input	6	Right	F1.0	F1.0
V21.5_dontknow	154	I don't know	Nominal	Input	6	Right	F1.0	F1.0
V21.6_other	155	Other	Nominal	Input	26	Left	A102	A102
V21.b	156	21b. which diseases	Nominal	Input	26	Left	A201	A201
V22.0_everdeathWL	157	Not ever	Nominal	Input	6	Right	F1.0	F1.0
V22.1_eatingdeathWL	158	1. Used the animal for eating or sharing	Nominal	Input	6	Right	F1.0	F1.0
V22.2_burriedeathWL	159	2. Buried	Nominal	Input	6	Right	F1.0	F1.0
V22.3_landfilldeathWL	160	3. Took it to the landfill	Nominal	Input	6	Right	F1.0	F1.0
V22.4_disinfdeathWL	161	4. Disinfected and buried	Nominal	Input	6	Right	F1.0	F1.0
V22.5_reportVET	162	5. Report to veterinarian or forest protection	Nominal	Input	6	Right	F1.0	F1.0
V22.6_otheredeathWL	163	6. Other	Nominal	Input	26	Left	A168	A168
V23_happened	164	23. What happens if there is a sick or dead animal on the farm?	Nominal	Input	26	Left	A369	A369
V24.1.Specy1	165	Specy 1st	Nominal	Input	11	Left	A57	A57
V24.1.Specy1_formeat	166	1. For Meat	Nominal	Input	6	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
V24.1.Specy1_breeding	167	2. Breeding	Nominal	Input	6	Right	F1.0	F1.0
V24.1.Specy1_formed	168	3. For medicine	Nominal	Input	6	Right	F1.0	F1.0
V24.1.Specy1_tourism	169	4. Tourism or display	Nominal	Input	6	Right	F1.0	F1.0
V24.1.Specy1_other purpose	170	other	Nominal	Input	10	Left	A42	A42
V24.1.Specy1_buyer_1	171	1. Farmer	Nominal	Input	6	Right	F2.0	F2.0
V24.1.Specy1_farmer	172	%	Nominal	Input	6	Right	F3.0	F3.0
V24.1.Specy1_buyer_2	173	2. Trader	Nominal	Input	6	Right	F1.0	F1.0
V24.1.Specy1_trader	174	%	Scale	Input	6	Right	F3.2	F3.2
V24.1.Specy1_buyer_3	175	3. Consumer	Nominal	Input	6	Right	F1.0	F1.0
V24.1.Specy1_consumer	176	%	Nominal	Input	6	Right	F4.0	F4.0
V24.1.Specy1_buyer_4	177	4. Restaurant	Nominal	Input	6	Right	F1.0	F1.0
V24.1.Specy1_restaurant	178	%	Scale	Input	6	Right	F3.0	F3.0
V24.1.Specy1_buyer_5	179	5. Company	Nominal	Input	6	Right	F1.0	F1.0
V24.1.Specy1_company	180	%	Nominal	Input	6	Right	F1.0	F1.0
V24.1.Specy1_buyer_other	181	6.other	Nominal	Input	6	Right	F1.0	F1.0
V24.1.Specy1_other	182	%	Nominal	Input	6	Right	F1.0	F1.0
V24.1.Specy1_trans_1	183	1. Retail buyers directly come to pick up and ship out	Nominal	Input	6	Right	F1.0	F1.0
V24.1.Specy1_trans_2	184	2. Traders collect at gathering point and transport them	Nominal	Input	6	Right	F1.0	F1.0
V24.1.Specy1_trans_3	185	3. Farm transports to buyers	Nominal	Input	6	Right	F1.0	F1.0
V24.1.Specy1_trans_4	186	4. Buyer hiring shipper to transport them	Nominal	Input	6	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measure ment Level	Role	Width	Alignm ent	Print Format	Write Format
V24.1.Specy1_trans_5	187	5. Public bus	Nominal	Input	6	Right	F1.0	F1.0
V24.1.Specy1_trans_other	188	6. Other mode	Nominal	Input	6	Right	F1.0	F1.0
V24.1_other	189	Detail	Nominal	Input	26	Left	A60	A60
V24.2.Specy2	190	Specy 2nd	Nominal	Input	26	Left	A27	A27
V24.2.Specy2_formeat	191	1. For Meat	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_breeding	192	2. Breeding	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_formed	193	3. For medicine	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_tourism	194	4. Tourism or display	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_other purpose	195	other	Nominal	Input	26	Left	A27	A27
V24.2.Specy2_buyer_1	196	1. Farmer	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_farmer	197	%	Scale	Input	6	Right	F3.0	F3.0
V24.2.Specy2_buyer_2	198	2. Trader	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_trader	199	%	Scale	Input	6	Right	F3.0	F3.0
V24.2.Specy2_buyer_3	200	3. Consumer	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_consumer	201	%	Scale	Input	6	Right	F3.0	F3.0
V24.2.Specy2_buyer_4	202	4. Restaurant	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_restaurant	203	%	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_buyer_5	204	5. Company	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_company	205	%	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_buyer_other	206	6.other	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_other	207	%	Nominal	Input	6	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measure ment Level	Role	Width	Alignm ent	Print Format	Write Format
V24.2.Specy2_trans_ 1	208	1. Retail buyers directly come to pick up and ship out	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_trans_ 2	209	2. Traders collect at gathering point and transport them	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_trans_ 3	210	3. Farm transports to buyers	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_trans_ 4	211	4. Buyer hiring shipper to transport them	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_trans_ 5	212	5. Public bus	Nominal	Input	6	Right	F1.0	F1.0
V24.2.Specy2_trans_ other	213	6. Other mode	Nominal	Input	6	Right	F1.0	F1.0
V24.2_other	214	Detail	Nominal	Input	26	Left	A24	A24
V24.3.Specy3	215	Specy 3rd	Nominal	Input	23	Left	A21	A21
V24.3.Specy3_forme at	216	1. For Meat	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_breedi ng	217	2. Breeding	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_forme d	218	3. For medicine	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_touris m	219	4. Tourism or display	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_other purpose	220	other	Nominal	Input	26	Left	A90	A90
V24.3.Specy3_buyer _1	221	1. Farmer	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_farme r	222	%	Scale	Input	6	Right	F2.0	F2.0
V24.3.Specy3_buyer _2	223	2. Trader	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_trader	224	%	Scale	Input	6	Right	F3.0	F3.0
V24.3.Specy3_buyer _3	225	3. Consumer	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_consu mer	226	%	Scale	Input	6	Right	F3.0	F3.0
V24.3.Specy3_buyer _4	227	4. Restaurant	Nominal	Input	6	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measure ment Level	Role	Width	Alignm ent	Print Format	Write Format
V24.3.Specy3_restau rant	228	%	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_buyer _5	229	5. Company	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_comp any	230	%	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_buyer _other	231	6.other	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_other	232	%	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_trans_ 1	233	1. Retail buyers directly come to pick up and ship out	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_trans_ 2	234	2. Traders collect at gathering point and transport them	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_trans_ 3	235	3. Farm transports to buyers	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_trans_ 4	236	4. Buyer hiring shipper to transport them	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_trans_ 5	237	5. Public bus	Nominal	Input	6	Right	F1.0	F1.0
V24.3.Specy3_trans_ other	238	6. Other mode	Nominal	Input	6	Right	F1.0	F1.0
V24.3_other	239	Detail	Nominal	Input	6	Left	A3	A3
V24.4.Specy4	240	Specy 4th	Nominal	Input	11	Left	A9	A9
V24.4.Specy4_forme at	241	1. For Meat	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_breedi ng	242	2. Breeding	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_forme d	243	3. For medicine	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_touris m	244	4. Tourism or display	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_other purpose	245	other	Nominal	Input	6	Left	A3	A3
V24.4.Specy4_buyer _1	246	1. Farmer	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_farme r	247	%	Nominal	Input	6	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
V24.4.Specy4_buyer_2	248	2. Trader	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_trader	249	%	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_buyer_3	250	3. Consumer	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_consumer	251	%	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_buyer_4	252	4. Restaurant	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_restaurant	253	%	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_buyer_5	254	5. Company	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_company	255	%	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_buyer_other	256	6.other	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_other	257	%	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_trans_1	258	1. Retail buyers directly come to pick up and ship out	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_trans_2	259	2. Traders collect at gathering point and transport them	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_trans_3	260	3. Farm transports to buyers	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_trans_4	261	4. Buyer hiring shipper to transport them	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_trans_5	262	5. Public bus	Nominal	Input	6	Right	F1.0	F1.0
V24.4.Specy4_trans_other	263	6. Other mode	Nominal	Input	6	Right	F1.0	F1.0
V24.4_other	264	Detail	Nominal	Input	6	Left	A3	A3
V24.b	265	List additional species	Nominal	Input	26	Left	A81	A81
V25.1a_volumesold	266	# of wildlife sold per month	Nominal	Input	6	Right	F2.0	F2.0
V25.1b_price	267	# thousand VND per individual	Scale	Input	10	Right	F8.0	F8.0

Table: Variables								
Name	Position	Label	Measure ment Level	Role	Width	Alignm ent	Print Format	Write Format
V25.2a_volumesold	268	# of wildlife sold per month	Nominal	Input	6	Right	F1.0	F1.0
V25.2b_price	269	# thousand VND per individual	Scale	Input	10	Right	F8.0	F8.0
V25.3a_volumesold	270	# of wildlife sold per month	Nominal	Input	6	Right	F1.0	F1.0
V25.3b_price	271	# thousand VND per individual	Nominal	Input	6	Right	F1.0	F1.0
V25.4a_volumesold	272	# of wildlife sold per month	Nominal	Input	6	Right	F1.0	F1.0
V25.4b_price	273	# thousand VND per individual	Nominal	Input	6	Right	F1.0	F1.0
V25.9_noted	274	noted for wildlife sold and price	Nominal	Input	24	Left	A200	A200
V25.9_notsold	275	Wildlife has not sold yet	Nominal	Input	8	Right	F8.2	F8.2
V25.9_dontknow	276	I don't know	Nominal	Input	8	Right	F8.2	F8.2
V26.1_benefit1	277	Benefit1	Nominal	Input	37	Left	A261	A261
V26.2_benefit2	278	Benefit2	Nominal	Input	26	Left	A204	A204
V26.3_benefit3	279	Benefit3	Nominal	Input	26	Left	A204	A204
V27.1_challenge1	280	Challenge1	Nominal	Input	26	Left	A246	A246
V27.2_challenge2	281	Challenge2	Nominal	Input	26	Left	A168	A168
V27.3_challenge3	282	Challenge3	Nominal	Input	26	Left	A270	A270
V28.0_nonstop	283	Non-stop	Nominal	Input	6	Right	F1.0	F1.0
V28.1_decreaseprice	284	1. If the price decreased	Nominal	Input	6	Right	F1.0	F1.0
V28.2_changelaw	285	2. If the laws changed and penalties increased	Nominal	Input	6	Right	F1.0	F1.0
V28.3_strictlylaw	286	3. If the laws were enforced more often	Nominal	Input	6	Right	F1.0	F1.0
V28.4_ill	287	4. If myself or a family member became ill	Nominal	Input	6	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
V28.5_outbreak	288	5. If there was a disease outbreak nearby related to wildlife	Nominal	Input	6	Right	F1.0	F1.0
V28.6_disapproval	289	6. If my family or community expressed disapproval of wildlife breeding	Nominal	Input	6	Right	F1.0	F1.0
V28.7_other	290	7.other option	Nominal	Input	6	Right	F2.0	F2.0
V28.70_detail	291	detail	Nominal	Input	26	Left	A66	A66
V29.1_freetrained	292	1. Free or low-cost trainings in another trade or profession	Nominal	Input	6	Right	F1.0	F1.0
V29.2_livestock	293	2. Access to domestic animals/livestock	Nominal	Input	6	Right	F1.0	F1.0
V29.3_network	294	3. A network of other former wildlife farmers for support	Nominal	Input	6	Right	F1.0	F1.0
V29.4_other	295	4. Other	Nominal	Input	6	Right	F1.0	F1.0
V29.40_detail	296	detail	Nominal	Input	26	Left	A72	A72
V30	297	note	Nominal	Input	26	Left	A759	A759
age	298		Scale	Input	10	Right	F8.2	F8.2
WLfarmingduration	299		Scale	Input	15	Right	F8.2	F8.2
treatmanure	300	treatmanure	Nominal	Input	13	Right	F8.2	F8.2
filter_$	301	V19.9_other = 1 (FILTER)	Nominal	Input	10	Right	F1.0	F1.0
waste_excrement	302		Nominal	Input	8	Right	F8.2	F8.2

Appendix 5 Table 2: Value Labels

Table: Value Labels		
Variable Value		Label
Name of Interviewer	1	Nguyen Thi Binh
	2	Nguyen Duy Quan
	3	Nguyen Kim Thanh
	4	Pham Van Xuan
	5	Le Duy Binh
	6	Le Tan Phat
	7	Mai Minh Phuc
	8	Pham Thi Luong
	9	Dang Van Vinh
	10	Nguyen Ba Manh
	11	Truong Ky Nhon
	13	Nguyen Thi Hue
	14	Tran Khanh Hung
	15	Vu Thi Lien
	16	Dang Van Linh
	17	Dang Van Minh
	18	Duong Minh Nghia
commune	1	Phu An
	2	Phu Binh

Table: Value Labels		
Variable Value		Label
	3	Phu Loc
	4	Tan Phu
	5	Thanh Son
	6	Nam Cat Tien
	7	Phu Thanh
	8	Phu Xuan
	9	Phu Trung
	10	Phu Lap
	11	Phu Son
	12	Phu Lam
	13	Nui Tuong
	14	Tra Co
	15	Ta Lai
	16	Hieu Liem
	17	Vinh An town
	18	Phu Ly
district	1	Tan Phu
	2	Vinh Cuu
gender	1	Male
	2	Female

Table: Value Labels		
Variable Value		Label
	9	Other
marital status	1	Married
	2	Single
	3	Divorced
	9	Other
WL farming	0	no
	1	yes
Breeding livestock	0	no
	1	yes
Crop production	0	no
	1	yes
Just housewife	0	no
	1	yes
other trading	0	no
	1	yes
other bussiness	0	no
	1	yes
level of education	1	No education
	2	Primary school (grade 1-5)
	3	Secondary school (grade 6-9)

Table: Value Labels		
Variable Value		Label
	4	High school (grade 10-12)
	5	Intermediate school
	6	College/university/professional and above
	7	Don't know
1. Self	0	No
	1	yes
2. Spouse/partner	0	No
	1	yes
3. Other Adults	0	No
	1	yes
4. Children (under 5 years old)	0	No
	1	yes
5. Children (5-9 years old)	0	No
	1	yes
6. Children (10-12 years old)	0	No
	1	yes
7. Children (13-18 years old))	0	No
	1	yes
8a. Domestic animals at your home	1	yes
	2	no

Table: Value Labels		
Variable Value		Label
	3	don't know
Poultry	0	No
	I	yes
Pig	0	No
	I	yes
Cow	0	No
	I	yes
Dog, cat	0	No
	I	yes
Fish	0	No
	I	yes
Other	0	No
	I	yes
Farm owner/manager	0	No
	I	yes
Breeding	0	No
	I	yes
Slaughter/Butcher	0	No
	I	yes
Feeding	0	No

Table: Value Labels		
Variable Value		Label
	1	yes
Cleaning	0	No
	1	yes
Removing sick or dead animals	0	No
	1	yes
Living at farm	0	No
	1	yes
Other	0	No
	1	yes
12b. This contribution rate increased, decreased, or remained the same	1	Increased
	2	Decreased
	3	Unchanged
13a. Breeding plans for the next 2 years	1	Increase
	2	Decrease
	3	Stay the same
	4	Don't know
14.a. Wildlife barn are organized (solidly or covered by a roof, divided into cell or airly)	0	No
	1	yes
14.b. Wildlife barn is far from home or separated with other roost	0	No

Table: Value Labels		
Variable Value		Label
	1	yes
14.6. Barn is daily cleaned	0	no
	1	yes
14.7. Barn is regularly cleaned	0	no
	1	yes
14.9. Barn is disinfected by lime or bioproduct	0	no
	1	yes
14.10. Food is safe	0	no
	1	yes
14.11. Breeding is selected from peer farmers	0	no
	1	yes
14.12. Use PPE	0	no
	1	yes
14.13. Don't allow stranger to enter the barn	0	no
	1	yes
14.14. There is quarantine space	0	no
	1	yes
15.1. Being trained on zoonotic diseases and farming technique	0	no
	1	yes

Table: Value Labels		
Variable Value		Label
15.2. Support probiotic or chemical product to treat manure and excrement	0	no
	1	yes
15.3. Apply biosecurity measurement	0	no
	1	yes
15.4. Apply deodorizing method	0	no
	1	yes
15.5. Disinfectant the barn	0	no
	1	yes
15.6. Health care and prevent zoonotic disease	0	no
	1	yes
15.7. Not at all	0	no
	1	yes
15.8. Don't know	0	no
	1	yes
1. Covered dug well	0	No
	1	yes
2. Uncovered dug well	0	No
	1	yes
3. Covered drilled well	0	No
	1	yes

Table: Value Labels		
Variable Value		Label
4. Water taps	0	No
	1	yes
5. Covered rain water	0	No
	1	yes
6. Uncovered rain water	0	No
	1	yes
7. Filtered water	0	No
	1	yes
8. Pond/river	0	No
	1	yes
9. Other source	0	No
	1	yes
1. Covered dug well	0	No
	1	yes
2. Uncovered dug well	0	No
	1	yes
3. Covered drilled well	0	No
	1	yes
4. Water taps	0	No
	1	yes

Table: Value Labels		
Variable Value		Label
5. Covered rain water	0	No
	I	yes
6. Uncovered rain water	0	No
	I	yes
7. Filtered water	0	No
	I	yes
8. Pond/river	0	No
	I	yes
9. Other source	0	No
	I	yes
I. Covered dug well	0	No
	I	yes
2. Uncovered dug well	0	No
	I	yes
3. Covered drilled well	0	No
	I	yes
4. Water taps	0	No
	I	yes
5. Covered rain water	0	No
	I	yes

Table: Value Labels		
Variable Value		Label
6. Uncovered rain water	0	No
	I	yes
7. Filtered water	0	No
	I	yes
8. Pond/river	0	No
	I	yes
9. Other source	0	No
	I	yes
manure composting	0	No
	I	yes
manure, excrement are collected into the bag of pit to fertilize the plant	0	No
	I	yes
Excrement/wastewater is flowed to the pit	0	No
	I	yes
Feed to fish	0	No
	I	yes
apply biogas	0	No
	I	yes
Wastewater directly to crops, or no treated, manure to fertilize the green vegetable	0	No

Table: Value Labels		
Variable Value		Label
	1	yes
manure, excrement are treated with probiotic	0	No
	1	yes
other	0	No
	1	yes
1.Shoes/ boots	0	No
	1	yes
2. Gloves	0	No
	1	yes
3. Masks	0	No
	1	yes
4. Protective clothes/ gown / apron	0	No
	1	yes
5. Other	0	No
	1	yes
6. Nothing	0	No
	1	yes
1.Shoes/ boots	0	No
	1	yes
2. Gloves	0	No

Table: Value Labels		
Variable Value		Label
	1	yes
3. Masks	0	No
	1	yes
4. Protective clothes/ gown / apron	0	No
	1	yes
5. Other	0	No
	1	yes
6. Nothing	0	No
	1	yes
1.Shoes/ boots	0	No
	1	yes
2. Gloves	0	No
	1	yes
3. Masks	0	No
	1	yes
4. Protective clothes/ gown / apron	0	No
	1	yes
5. Other	0	No
	1	yes
6. Nothing	0	No

Table: Value Labels		
Variable Value		Label
	1	yes
1.Shoes/ boots	0	No
	1	yes
2. Gloves	0	No
	1	yes
3. Masks	0	No
	1	yes
4. Protective clothes/ gown / apron	0	No
	1	yes
5. Other	0	No
	1	yes
6. Nothing	0	No
	1	yes
1.Shoes/ boots	0	No
	1	yes
2. Gloves	0	No
	1	yes
3. Masks	0	No
	1	yes
4. Protective clothes/ gown / apron	0	No

Table: Value Labels		
Variable Value		Label
	1	yes
5. Other	0	No
	1	yes
6. Nothing	0	No
	1	yes
Yes, in animals	0	No
	1	yes
Yes, in humans	0	No
	1	yes
Yes, in both animals and humans	0	No
	1	yes
No concerned	0	No
	1	yes
I don't know	0	No
	1	yes
Not ever	0	No
	1	yes
1. Used the animal for eating or sharing	0	No
	1	yes
2. Buried	0	No

Table: Value Labels		
Variable Value		Label
	1	yes
3. Took it to the landfill	0	No
	1	yes
4. Disinfected and buried	0	No
	1	yes
5. Report to veterinarian or forest protection	0	No
	1	yes
1. For Meat	0	No
	1	yes
2. Breeding	0	No
	1	yes
3. For medicine	0	No
	1	yes
4. Tourism or display	0	No
	1	yes
1. Farmer	0	No
	1	yes
2. Trader	0	No
	1	yes
3. Consumer	0	No

Table: Value Labels		
Variable Value		Label
	1	yes
4. Restaurant	0	No
	1	yes
5. Company	0	No
	1	yes
6.other	0	No
	1	yes
1. Retail buyers directly come to pick up and ship out	0	No
	1	yes
2. Traders collect at gathering point and transport them	0	No
	1	yes
3. Farm transports to buyers	0	No
	1	yes
4. Buyer hiring shipper to transport them	0	No
	1	yes
5. Public bus	0	No
	1	yes
6. Other mode	0	No
	1	yes

Table: Value Labels		
Variable Value		Label
1. For Meat	0	No
	1	yes
2. Breeding	0	No
	1	yes
3. For medicine	0	No
	1	yes
4. Tourism or display	0	No
	1	yes
1. Farmer	0	No
	1	yes
2. Trader	0	No
	1	yes
3. Consumer	0	No
	1	yes
4. Restaurant	0	No
	1	yes
5. Company	0	No
	1	yes
6. Other	0	No
	1	yes

Table: Value Labels		
Variable Value		Label
1. Retail buyers directly come to pick up and ship out	0	No
	1	yes
2. Traders collect at gathering point and transport them	0	No
	1	yes
3. Farm transports to buyers	0	No
	1	yes
4. Buyer hiring shipper to transport them	0	No
	1	yes
5. Public bus	0	No
	1	yes
6. Other mode	0	No
	1	yes
1. For Meat	0	No
	1	yes
2. Breeding	0	No
	1	yes
3. For medicine	0	No
	1	yes
4. Tourism or display	0	No

Table: Value Labels		
Variable Value		Label
	1	yes
1. Farmer	0	No
	1	yes
2. Trader	0	No
	1	yes
3. Consumer	0	No
	1	yes
4. Restaurant	0	No
	1	yes
5. Company	0	No
	1	yes
6. Other	0	No
	1	yes
1. Retail buyers directly come to pick up and ship out	0	No
	1	yes
2. Traders collect at gathering point and transport them	0	No
	1	yes
3. Farm transports to buyers	0	No
	1	yes

Table: Value Labels		
Variable Value		Label
4. Buyer hiring shipper to transport them	0	No
	1	yes
5. Public bus	0	No
	1	yes
6. Other mode	0	No
	1	yes
1. For Meat	0	No
	1	yes
2. Breeding	0	No
	1	yes
3. For medicine	0	No
	1	yes
4. Tourism or display	0	No
	1	yes
1. Farmer	0	No
	1	yes
2. Trader	0	No
	1	yes
3. Consumer	0	No
	1	yes

Table: Value Labels		
Variable Value		Label
4. Restaurant	0	No
	I	yes
5. Company	0	No
	I	yes
6.other	0	No
	I	yes
I. Retail buyers directly come to pick up and ship out	0	No
	I	yes
2. Traders collect at gathering point and transport them	0	No
	I	yes
3. Farm transports to buyers	0	No
	I	yes
4. Buyer hiring shipper to transport them	0	No
	I	yes
5. Public bus	0	No
	I	yes
6. Other mode	0	No
	I	yes
Wildlife has not sold yet	0	No

Table: Value Labels		
Variable Value		Label
	1	yes
I don't know	0	No
	1	yes
1. If the price decreased	0	No
	1	yes
2. If the laws changed and penalties increased	0	No
	1	yes
3. If the laws were enforced more often	0	No
	1	yes
4. If myself or a family member became ill	0	No
	1	yes
5. If there was a disease outbreak nearby related to wildlife	0	No
	1	yes
6. If my family or community expressed disapproval of wildlife breeding	0	No
	1	yes
7.other option	0	No
	1	yes
1. Free or low-cost trainings in another trade or profession	0	No
	1	yes

Table: Value Labels		
Variable Value		Label
2. Access to domestic animals/livestock	0	No
	1	yes
3. A network of other former wildlife farmers for support	0	No
	1	yes
4. Other	0	No
	1	yes
V19.9_other = 1 (FILTER)	0	Not Selected
	1	Selected

Appendix 5 Data Table 3: Wildlife Trader Survey

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
Name_Interviewer	1	Name of Interviewer:	Nominal	Input	6	Right	F1.0	F1.0
Commune	2	Commune	Nominal	Input	6	Right	F1.0	F1.0
District	3	District	Nominal	Input	6	Right	F1.0	F1.0
ID	4	id	Scale	Input	6	Right	F4.0	F4.0
sex	5	Gender	Nominal	Input	5	Right	F1.0	F1.0
year_of_birth	6	Year of birth	Scale	Input	15	Right	F4.0	F4.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
relationship	7	Marital status	Nominal	Input	15	Right	F1.0	F1.0
T3_other	8	Detail	Nominal	Input	5	Left	A3	A3
T4.1_WLtrading	9	Trading wild animals	Nominal	Input	10	Right	F1.0	F1.0
T4.1_WLtrading_time	10	% time for WL trading	Scale	Input	13	Right	F3.0	F3.0
T4.2_othertrading	11	Other trading	Nominal	Input	6	Right	F1.0	F1.0
T4.2_othertrading_time	12	% time for other trading	Scale	Input	5	Right	F3.0	F3.0
T4.3_livestock	13	Breeding livestock	Nominal	Input	6	Right	F1.0	F1.0
T4.3_livestock_time	14	% time for breeding livestock	Scale	Input	5	Right	F2.0	F2.0
T4.4._crop	15	Crop production	Nominal	Input	6	Right	F1.0	F1.0
T4.4_crop_time	16	% time for crop production	Scale	Input	5	Right	F2.0	F2.0
T4.5_housewife	17	Housewife	Nominal	Input	5	Right	F1.0	F1.0
T4.5_housewife_time	18	% time for housewife	Scale	Input	5	Right	F2.0	F2.0
T4.5_otherjob	19	Other job	Nominal	Input	6	Right	F1.0	F1.0
T4.5_other	20	detail	Nominal	Input	26	Left	A63	A63
T4.5_other_time	21	% time of other job	Scale	Input	5	Right	F2.0	F2.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
T4.6_dontknow	22	Don't know	Nominal	Input	6	Right	F1.0	F1.0
T5.edu_level	23	5. highest level of education	Nominal	Input	6	Right	F1.0	F1.0
T6_domesticanimal	24	6a. Have domestic animals	Nominal	Input	5	Right	F1.0	F1.0
T6.1_poultry	25	Poultry	Nominal	Input	5	Right	F1.0	F1.0
T6.2_pig	26	Pig	Nominal	Input	5	Right	F1.0	F1.0
T6.3_cow	27	Cow/buffalo	Nominal	Input	5	Right	F1.0	F1.0
T6.4_dog	28	Dog/cat	Nominal	Input	5	Right	F1.0	F1.0
T6.5_fish	29	Fish	Nominal	Input	5	Right	F1.0	F1.0
T6.6_other	30	Other	Nominal	Input	5	Right	F1.0	F1.0
T6.6	31	detail	Nominal	Input	26	Left	A72	A72
T7_year_trading	32	year of starting WL trading	Scale	Input	6	Right	F4.0	F4.0
T8_family	33	who involved in WL trading	Nominal	Input	5	Right	F1.0	F1.0
T8_other	34	detail	Nominal	Input	5	Left	A3	A3
T9_reason1	35	Reason 1	Nominal	Input	26	Left	A120	A120
T9_reason2	36	Reason 2	Nominal	Input	26	Left	A114	A114

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
T9_reason3	37	Reason 3	Nominal	Input	26	Left	A69	A69
T10a_income	38	10a. wildlife trading contribute to household income per year	Nominal	Input	5	Right	F2.0	F2.0
T10b_incomechanged	39	10b. this contribution rate changed over the past 3years	Nominal	Input	5	Right	F1.0	F1.0
T10b.1	40	% increased	Scale	Input	5	Right	F2.0	F2.0
T10b.2	41	% decreased	Scale	Input	5	Right	F2.0	F2.0
T11_specy1	42	Specy 1	Nominal	Input	26	Left	A54	A54
T11_spe1_a.1_meat	43	1. For Meat	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_a.2_Breeding	44	2. Breeding	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_a.3_medicine	45	3. For medicine	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_a.4_tourism	46	4. Tourism or display	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_a.5_other	47	5. Other	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_a5	48	Detail	Nominal	Input	26	Left	A42	A42
T11_spe1_b1	49	1. Buy from small wildlife farm	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_b2	50	2. Buy from large wildlife farm	Nominal	Input	5	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
T11_spe1_b3	51	3. Breed wildlife	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_b4	52	4. Capture wildlife	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_b5	53	5. Other	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_detail	54	detail	Nominal	Input	26	Left	A78	A78
T11_spe1_c1	55	1. Farmer	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_#c1	56	%	Scale	Input	5	Right	F3.0	F3.0
T11_spe1_c2	57	2. Consumer	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_#c2	58	%	Scale	Input	5	Right	F3.0	F3.0
T11_spe1_c3	59	3. Restaurant	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_#c3	60	%	Scale	Input	5	Right	F2.0	F2.0
T11_spe1_c4	61	4. Company	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_#c4	62	%	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_c5	63	5. Other	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_other	64	Detail	Nominal	Input	26	Left	A63	A63
T11_spe1_#other	65	%	Scale	Input	5	Right	F2.0	F2.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
T11_spe1_d1	66	1. Retail buyers directly come to pick up and ship out	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_d2	67	2. Traders collect at gathering point and transport them	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_d3	68	3. Farm transports to buyers	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_d4	69	4. Buyer hiring shipper to transport them	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_d5	70	5. Public bus	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_d6	71	6. Other mode	Nominal	Input	5	Right	F1.0	F1.0
T11_spe1_d6 detail	72	Detail	Nominal	Input	26	Left	A57	A57
T11_specy2	73	Specy 2	Nominal	Input	26	Left	A54	A54
T11_spe2_a.1 _meat	74	1. For Meat	Nominal	Input	5	Right	F1.0	F1.0
T11_spe2_a.2 _Breeding	75	2. Breeding	Nominal	Input	5	Right	F1.0	F1.0
T11_spe2_a.3 _medicine	76	3. For medicine	Nominal	Input	5	Right	F1.0	F1.0
T11_spe2_a.4 _tourism	77	4. Tourism or display	Nominal	Input	5	Right	F1.0	F1.0
T11_spe2_a.5 _other	78	5. Other	Nominal	Input	5	Right	F1.0	F1.0
T11_spe2_a5	79	Detail	Nominal	Input	5	Left	A3	A3

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
T11_spe2_b1	80	1. Buy from small wildlife farm	Nominal	Input	5	Right	F1.0	F1.0
T11_spe2_b2	81	2. Buy from large wildlife farm	Nominal	Input	5	Right	F1.0	F1.0
T11_spe2_b3	82	3. Breed wildlife	Nominal	Input	5	Right	F1.0	F1.0
T11_spe2_b4	83	4. Capture wildlife	Nominal	Input	5	Right	F1.0	F1.0
T11_spe2_b5	84	5. Other	Nominal	Input	5	Right	F1.0	F1.0
T11_spe2_detail	85	detail	Nominal	Input	26	Left	A54	A54
T11_spe2_c1	86	1. Farmer	Nominal	Input	5	Right	F1.0	F1.0
T11_spe2_#c1	87	%	Scale	Input	5	Right	F2.0	F2.0
T11_spe2_c2	88	2. Consumer	Nominal	Input	5	Right	F1.0	F1.0
T11_spe2_#c2	89	%	Scale	Input	5	Right	F3.0	F3.0
T11_spe2_c3	90	3. Restaurant	Nominal	Input	5	Right	F1.0	F1.0
T11_spe2_#c3	91	%	Scale	Input	5	Right	F2.0	F2.0
T11_spe2_c4	92	4. Company	Nominal	Input	5	Right	F1.0	F1.0
T11_spe2_#c4	93	%	Nominal	Input	5	Right	F1.0	F1.0
T11_spe2_c5	94	5. Other	Nominal	Input	5	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
T11_spe2_other	95	Detail	Nominal	Input	26	Left	A39	A39
T11_spe2_#other	96	%	Scale	Input	5	Right	F2.0	F2.0
T11_spe2_d1	97	1. Retail buyers directly come to pick up and ship out	Nominal	Input	5	Right	F1.0	F1.0
T11_spe2_d2	98	2. Traders collect at gathering point and transport them	Nominal	Input	6	Right	F1.0	F1.0
T11_spe2_d3	99	3. Farm transports to buyers	Nominal	Input	6	Right	F1.0	F1.0
T11_spe2_d4	100	4. Buyer hiring shipper to transport them	Nominal	Input	6	Right	F1.0	F1.0
T11_spe2_d5	101	5. Public bus	Nominal	Input	6	Right	F1.0	F1.0
T11_spe2_d6	102	6. Other mode	Nominal	Input	6	Right	F1.0	F1.0
T11_spe2_d6 detail	103	Detail	Nominal	Input	26	Left	A57	A57
T11_specy3	104	Specy 3	Nominal	Input	17	Left	A15	A15
T11_spe3_a.1_meat	105	1. For Meat	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_a.2_Breeding	106	2. Breeding	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_a.3_medicine	107	3. For medicine	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_a.4_tourism	108	4. Tourism or display	Nominal	Input	6	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Widt h	Alignm ent	Print Forma t	Write Format
T11_spe3_a.5 _other	109	5. Other	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_a5	110	Detail	Nominal	Input	6	Left	A3	A3
T11_spe3_b1	111	1. Buy from small wildlife farm	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_b2	112	2. Buy from large wildlife farm	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_b3	113	3. Breed wildlife	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_b4	114	4. Capture wildlife	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_b5	115	5. Other	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_det ail	116	detail	Nominal	Input	26	Left	A48	A48
T11_spe3_c1	117	1. Farmer	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_#c 1	118	%	Scale	Input	6	Right	F2.0	F2.0
T11_spe3_c2	119	2. Consumer	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_#c 2	120	%	Scale	Input	6	Right	F3.0	F3.0
T11_spe3_c3	121	3. Restaurant	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_#c 3	122	%	Scale	Input	6	Right	F2.0	F2.0
T11_spe3_c4	123	4. Company	Nominal	Input	6	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Widt h	Alignm ent	Print Forma t	Write Format
T11_spe3_#c 4	124	%	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_c5	125	5. Other	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_oth er	126	Detail	Nominal	Input	26	Left	A39	A39
T11_spe3_#ot her	127	%	Scale	Input	6	Right	F3.0	F3.0
T11_spe3_d1	128	1. Retail buyers directly come to pick up and ship out	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_d2	129	2. Traders collect at gathering point and transport them	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_d3	130	3. Farm transports to buyers	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_d4	131	4. Buyer hiring shipper to transport them	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_d5	132	5. Public bus	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_d6	133	6. Other mode	Nominal	Input	6	Right	F1.0	F1.0
T11_spe3_d7	134	Detail	Nominal	Input	26	Left	A57	A57
T137	135	Specy 4	Nominal	Input	14	Left	A12	A12
T11_spe4_a.1 _meat	136	1. For Meat	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_a.2 _Breeding	137	2. Breeding	Nominal	Input	6	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Widt h	Alignm ent	Print Forma t	Write Format
T11_spe4_a.3 _medicine	138	3. For medicine	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_a.4 _tourism	139	4. Tourism or display	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_a.5 _other	140	5. Other	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_a5	141	Detail	Nominal	Input	6	Left	A3	A3
T11_spe4_b1	142	1. Buy from small wildlife farm	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_b2	143	2. Buy from large wildlife farm	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_b3	144	3. Breed wildlife	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_b4	145	4. Capture wildlife	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_b5	146	5. Other	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_det ail	147	detail	Nominal	Input	26	Left	A48	A48
T11_spe4_c1	148	1. Farmer	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_#c 1	149	%	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_c2	150	2. Consumer	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_#c 2	151	%	Scale	Input	6	Right	F3.0	F3.0
T11_spe4_c3	152	3. Restaurant	Nominal	Input	6	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
T11_spe4_#c3	153	%	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_c4	154	4. Company	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_#c4	155	%	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_c5	156	5. Other	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_other	157	Detail	Nominal	Input	6	Left	A3	A3
T11_spe4_#other	158	%	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_d1	159	1. Retail buyers directly come to pick up and ship out	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_d2	160	2. Traders collect at gathering point and transport them	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_d3	161	3. Farm transports to buyers	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_d4	162	4. Buyer hiring shipper to transport them	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_d5	163	5. Public bus	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_d6	164	6. Other mode	Nominal	Input	6	Right	F1.0	F1.0
T11_spe4_d7	165	Detail	Nominal	Input	6	Left	A3	A3
T11_other_species	166	List additional species for trading	Nominal	Input	26	Left	A189	A189

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
T12.1_traded_spe1	167	Specy 1	Nominal	Input	26	Left	A54	A54
T12.1_spe1_volume	168	12a. Average purchasing volume per month	Nominal	Input	26	Left	A54	A54
T12.1_spe1_price	169	12b. Average purchasing price	Nominal	Input	26	Left	A84	A84
T12.1_spe1_sell_vol	170	12c. Average selling volume per month	Nominal	Input	26	Left	A132	A132
T12.1_spe1_sell_price	171	12d. Average selling price	Nominal	Input	26	Left	A72	A72
T12.2_traded_spe2	172	Specy 2	Nominal	Input	26	Left	A54	A54
T12.2_spe2_volume	173	12a. Average purchasing volume per month	Nominal	Input	26	Left	A45	A45
T12.2_spe2_price	174	12b. Average purchasing price	Nominal	Input	26	Left	A39	A39
T12.2_spe2_sell_vol	175	12c. Average selling volume per month	Nominal	Input	26	Left	A45	A45
T12.2_spe2_sell_price	176	12d. Average selling price	Nominal	Input	26	Left	A39	A39
T12.3_traded_spe3	177	Specy 3	Nominal	Input	17	Left	A15	A15
T12.3_spe3_volume	178	12a. Average purchasing volume per month	Nominal	Input	26	Left	A48	A48
T12.3_spe3_price	179	12b. Average purchasing price	Nominal	Input	26	Left	A39	A39
T12.3_spe3_sell_vol	180	12c. Average selling volume per month	Nominal	Input	26	Left	A48	A48

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
T12.3_spe3_sell_price	181	12d. Average selling price	Nominal	Input	26	Left	A39	A39
T12.4_traded_spe4	182	Specy 4	Nominal	Input	14	Left	A12	A12
T12.4_spe4_volume	183	12a. Average purchasing volume per month	Nominal	Input	26	Left	A27	A27
T12.4_spe4_price	184	12b. Average purchasing price	Nominal	Input	26	Left	A30	A30
T12.4_spe4_sell_vol	185	12c. Average selling volume per month	Nominal	Input	26	Left	A27	A27
T12.4_spe4_sell_price	186	12d. Average selling price	Nominal	Input	26	Left	A30	A30
T13.1_benefit	187	1. Benefit1	Nominal	Input	26	Left	A171	A171
T13.2_benefit	188	2. Benefit2	Nominal	Input	26	Left	A138	A138
T13.3._benefit	189	3. Benefit3	Nominal	Input	26	Left	A78	A78
T14.1_challenge	190	1. Challenge1	Nominal	Input	26	Left	A198	A198
T14.2_challenge	191	2. Challenge2	Nominal	Input	26	Left	A159	A159
T14.3_challenge	192	3. Challenge3	Nominal	Input	26	Left	A150	A150
T15.0_nonstoptrading	193	Non-stop wildlife trading	Nominal	Input	6	Right	F1.0	F1.0
T15.1_stop	194	1. If the price decreased	Nominal	Input	6	Right	F1.0	F1.0
T15.2_stop	195	2. If the laws changed and	Nominal	Input	6	Right	F1.0	F1.0

Table: Variables								
Name	Position	Label	Measurement Level	Role	Widt h	Alignm ent	Print Forma t	Write Format
		penalties increased						
T15.3_stop	196	3. If the laws were enforced more often	Nominal	Input	6	Right	F1.0	F1.0
T15.4_stop	197	4. If myself or a family member became ill	Nominal	Input	6	Right	F1.0	F1.0
T15.5_stop	198	5. If there was a disease outbreak nearby related to wildlife	Nominal	Input	6	Right	F1.0	F1.0
T15.6_stop	199	6. If my family or community expressed disapproval of wildlife trading	Nominal	Input	6	Right	F1.0	F1.0
T15.7_stop	200	7. Other	Nominal	Input	6	Right	F1.0	F1.0
T15.7_other	201	detail	Nominal	Input	26	Left	A84	A84
T16.1_desired	202	1. Free or low-cost trainings in another trade or profession	Nominal	Input	6	Right	F1.0	F1.0
T16.2_desired	203	2. Access to domestic animals/livestock	Nominal	Input	6	Right	F1.0	F1.0
T16.3_desired	204	3. A network of other former wildlife traders for support	Nominal	Input	6	Right	F1.0	F1.0
T16.4_desired	205	4. Other option	Nominal	Input	6	Right	F1.0	F1.0
T16.4_other	206	detail	Nominal	Input	26	Left	A69	A69

Table: Variables								
Name	Position	Label	Measurement Level	Role	Width	Alignment	Print Format	Write Format
age	207	age	Scale	Input	10	Right	F8.2	F8.2
Year_WLtrading	208	WL trading duration	Nominal	Input	14	Right	F8.2	F8.2

<mark>Appendix 5 Data Table 4:</mark> Value Labels

Table: Value Labels			Label
Variable Value			Label
Name of Interviewer:		1	Nguyen Ba Manh
		2	Hoang Khanh Hung
		3	Dang Van Vinh
		4	Truong Ky Nhon
		5	Vu Thi Lien
		6	Nguyen Kim Thanh
		7	Le Duy Binh
		8	Pham Van Xuan
Commune		1	Phu Ly
		2	Vinh An
		3	Hieu Liem
		4	Tan Phu

Table: Value Labels		
Variable Value		Label
	5	Phu An
	6	Phu Binh
	7	Phu Trung
District	1	Vinh Cuu
	2	Tan Phu
Gender	1	Male
	2	Female
	9	Other
Marital status	1	Married
	2	Single
	3	Divorced
	9	Other
Trading wild animals	0	No
	1	Yes
Other trading	0	No
	1	Yes
Breeding livestock	0	No
	1	Yes
Crop production	0	No

Table: Value Labels		
Variable Value		Label
	1	Yes
Housewife	0	No
	1	Yes
Other job	0	No
	1	Yes
Don't know	0	No
	1	Yes
5. highest level of education	1	No education
	2	Primary school (grade 1-5)
	3	Secondary school (grade 6-9)
	4	High school (grade 10-12)
	5	Intermediate school
	6	College/university/professional and above
	7	Don't know
6a. Have domestic animals	0	No
	1	Yes
Poultry	0	No
	1	Yes
Pig	0	No

Table: Value Labels		
Variable Value		Label
	1	Yes
Cow/buffalo	0	No
	1	Yes
Dog/cat	0	No
	1	Yes
Fish	0	No
	1	Yes
Other	0	No
	1	Yes
who involved in WL trading	1	Only me
	2	My spouse/partner
	3	All family members
	4	Other
10b. this contribution rate changed over the past 3years	1	Increased
	2	Decreased
	3	Unchanged
1. For Meat	0	No
	1	yes
2. Breeding	0	No

Table: Value Labels		
Variable Value		Label
	1	yes
3. For medicine	0	No
	1	yes
4. Tourism or display	0	No
	1	yes
5. Other	0	No
	1	yes
1. Retail buyers directly come to pick up and ship out	0	No
	1	yes
2. Traders collect at gathering point and transport them	0	No
	1	yes
3. Farm transports to buyers	0	No
	1	yes
4. Buyer hiring shipper to transport them	0	No
	1	yes
5. Public bus	0	No
	1	yes
6. Other mode	0	No
	1	yes

Table: Value Labels		
Variable Value		Label
1. For Meat	0	No
	1	yes
2. Breeding	0	No
	1	yes
3. For medicine	0	No
	1	yes
4. Tourism or display	0	No
	1	yes
5. Other	0	No
	1	yes
1. Buy from small wildlife farm	0	No
	1	yes
2. Buy from large wildlife farm	0	No
	1	yes
3. Breed wildlife	0	No
	1	yes
4. Capture wildlife	0	No
	1	yes
5. Other	0	No

Table: Value Labels		
Variable Value		Label
	1	yes
1. Farmer	0	No
	1	yes
2. Consumer	0	No
	1	yes
3. Restaurant	0	No
	1	yes
4. Company	0	No
	1	yes
5. Other	0	No
	1	yes
1. Retail buyers directly come to pick up and ship out	0	No
	1	yes
2. Traders collect at gathering point and transport them	0	No
	1	yes
3. Farm transports to buyers	0	No
	1	yes
4. Buyer hiring shipper to transport them	0	No
	1	yes

Table: Value Labels		
Variable Value		Label
5. Public bus	0	No
	1	yes
6. Other mode	0	No
	1	yes
1. For Meat	0	No
	1	yes
2. Breeding	0	No
	1	yes
3. For medicine	0	No
	1	yes
4. Tourism or display	0	No
	1	yes
5. Other	0	No
	1	yes
1. Buy from small wildlife farm	0	No
	1	yes
2. Buy from large wildlife farm	0	No
	1	yes
3. Breed wildlife	0	No

Table: Value Labels		
Variable Value		Label
	1	yes
4. Capture wildlife	0	No
	1	yes
5. Other	0	No
	1	yes
1. Farmer	0	No
	1	yes
2. Consumer	0	No
	1	yes
3. Restaurant	0	No
	1	yes
4. Company	0	No
	1	yes
5. Other	0	No
	1	yes
1. Retail buyers directly come to pick up and ship out	0	No
	1	yes
2. Traders collect at gathering point and transport them	0	No
	1	yes

Table: Value Labels		
Variable Value		Label
3. Farm transports to buyers	0	No
	1	yes
4. Buyer hiring shipper to transport them	0	No
	1	yes
5. Public bus	0	No
	1	yes
6. Other mode	0	No
	1	yes
1. For Meat	0	No
	1	yes
2. Breeding	0	No
	1	yes
3. For medicine	0	No
	1	yes
4. Tourism or display	0	No
	1	yes
5. Other	0	No
	1	yes
1. Buy from small wildlife farm	0	No

Table: Value Labels		
Variable Value		Label
	I	yes
2. Buy from large wildlife farm	0	No
	I	yes
3. Breed wildlife	0	No
	I	yes
4. Capture wildlife	0	No
	I	yes
5. Other	0	No
	I	yes
I. Farmer	0	No
	I	yes
2. Consumer	0	No
	I	yes
3. Restaurant	0	No
	I	yes
4. Company	0	No
	I	yes
5. Other	0	No
	I	yes

Table: Value Labels		
Variable Value		Label
1. Retail buyers directly come to pick up and ship out	0	No
	1	yes
2. Traders collect at gathering point and transport them	0	No
	1	yes
3. Farm transports to buyers	0	No
	1	yes
4. Buyer hiring shipper to transport them	0	No
	1	yes
5. Public bus	0	No
	1	yes
6. Other mode	0	No
	1	yes
Non-stop wildlife trading	0	no
	1	yes

Frequency Tables

Wildlife survey

V23: What happens if there is a sick or dead animal on the farm?

	Frequency	% of respondents
affect income	34	12.7%
transmission	21	7.9%
burying dead animals	9	3.4%
affect herd	8	3.0%
other	6	2.2%
none	5	1.9%
disinfectant	3	1.1%
impact	3	1.1%
no dead animal	3	1.1%
report to government	3	1.1%
report to veterinarians	3	1.1%
affect health	2	0.7%
insecurity	2	0.7%
affect productivity	2	0.7%
affect breeding	1	0.4%
impact on breeding	1	0.4%
isolation	1	0.4%
Don't know	4	1.5%

Table V25a: # of wildlife sold per month Ã— Specy 1ˢᵗ & 2nd

# of wildlife sold per month	Sambar deer	civet	porcupine	Spotted deer	Total
1	3	3	0		6
2	5	3	0		8
3	1	0	0		1
4				2	2
5	2	0	3		5
6	0	1	0		1
7	0	3	0		3
8	0	3	0		3
9	1	2	2		5
10	0	3	0		3
Total	**12**	**18**	**5**	**2**	**37**

Table V25b: # thousand VND per individual Ã— Specy 1st & 2nd

# thousand VND per individual	Sambar deer	civet	porcupine	Spotted deer	Total
700,000	0	1	0		1
1,000,000	0	1	1		2
1,200,000	0	1	0		1
1,500,000	0	2	0		2
2,500,000	0	1	1		2
3,000,000	0	4	2		6
4,000,000	0	7	0		7
6,000,000	2	1	1		4
6,500,000	1	0	0		1
7,000,000	4	0	0		4

# thousand VND per individual	Sambar deer	civet	porcupine	Spotted deer	Total
8,000,000	0	1	0		1
20,000,000	2	0	0		2
30,000,000	1	0	0		1
40,000,000				2	2
50,000,000	2	0	0		2
Total	**12**	**19**	**5**	**2**	**38**

Wildlife Trader Survey

TR: T12. Purchasing volume by WL species

	Bamboo Rat (n=15)	Civet (n=16)	Porcupine (n=14)	Samba Deer (n=9)	Snake (n=9)	Other (n=4)
<10 heads per month	4	5	2			
10 to 20 heads per month	4	3	4			
20 to 30 heads per month			2			
>30 heads per month		2				
10 to 20 heads per year			1			
10 to 20 kg	1			2		
15 to 30 kg			2			
50 kg						1
10 to 25 kg per year		4				3
>=30 kg per year	3				4	
<10 kg per month			1	2		
10 to 25 kg per month	2			3		
>=30kg per month				2	2	
10 to 15 con per month			1			
Missing	1	2	1		3	

	Bamboo Rat (n=15)	Civet (n=16)	Porcupine (n=14)	Samba Deer (n=9)	Snake (n=9)	Other (n=4)
Total	**15**	**16**	**14**	**9**	**9**	**4**

TS: T12 Purchasing price by WL species

	Bamboo Rat (n=15)	Civet (n=16)	Porcupine (n=14)	Samba Deer (n=9)	Snake (n=9)	Other (n=4)
<500K per head	1					
500K to 1 million per head	2	1				
1 million to 2.5 million per head		10	6			
>2.5 million per head			1			
<200K per kg				2	1	1
250K to 500K per kg	3		4	3	8	2
500K to 900K per kg	9	5		4		1
3 million to 5 million per month			2			
missing			1			
Total	**15**	**16**	**14**	**9**	**9**	**4**

TT: T12 Selling volume by WL species

	Bamboo Rat (n=15)	Civet (n=16)	Porcupine (n=14)	Samba Deer (n=9)	Snake (n=9)	Other (n=4)
1 to 5 heads per month	2	4	2			
10 to 20 heads per month	1	1	3			
20 to 50 heads per month		1	1			
3 to 10 kg per month	1		1			
10 to 50 kg	2		1	2		1
3 to 10 kg per month				2		
20 to 30 kg per month	2			5		

	Bamboo Rat (n=15)	Civet (n=16)	Porcupine (n=14)	Samba Deer (n=9)	Snake (n=9)	Other (n=4)
>=150 kg per month					4	
10 to 25 kg per year		3				3
Don't know exactly			1			
missing	7	7	5		4	
Total	**15**	**16**	**14**	**9**	**9**	**4**

TV: T12 Selling price by WL species

	Bamboo Rat (n=15)	Civet (n=16)	Porcupine (n=14)	Samba Deer (n=9)	Snake (n=9)	Other (n=4)
400K to 1 million per head	2	1	2	7		
1.2 million to 1.5 million per head	1	3	1			
2 million to 3,5 million per head		6	6			
<200K per kg					1	
200K to 500K per kg					7	1
500 K to 1 million per kg	8					1
1.1 to 1.6 million per kg	1	6				1
700K per year	1					
don't know exactly			1			
Missing	2		4	2	1	1
Total	**15**	**16**	**14**	**9**	**9**	**4**

APPENDIX 6: DATA PROCESSING (QA/QC)

After receiving the data, the following process was taken prior to data analysis:

1. Data dictionary was generated from the SPSS data file (.sav file) received to check:

    a. Data entries corresponding to translated questionnaire and

    b. Responses in the data file

2. Data dictionary was also compared the corresponding survey questionnaire, which identified:

    a. Some modifications to the questionnaire were made after translation and

    b. Need for translation of some of the responses in the data file, i.e. responses to open-ended questions.

3. The QA/QC process has generated reports about issues and needs for clarification. These issues and requests for clarification were communicated to the country team in order to:

    a. Obtaining translation to the modified questionnaire and

    b. Translation of responses for key questions

4. This QA/QC process indicated a potential problem,

    a. The data file did not have indicators to link the surveys completed by participants at a same firm nor unique participants who might have worked at multiple firms.

5. Many of the open-ended questions were reviewed and coded to a category for analysis. (i.e., V14, V15, V19 and V23 in the survey)

6. Any questions to the data set or the questionnaires were communicated to the country team for clarification to help interpret the results.