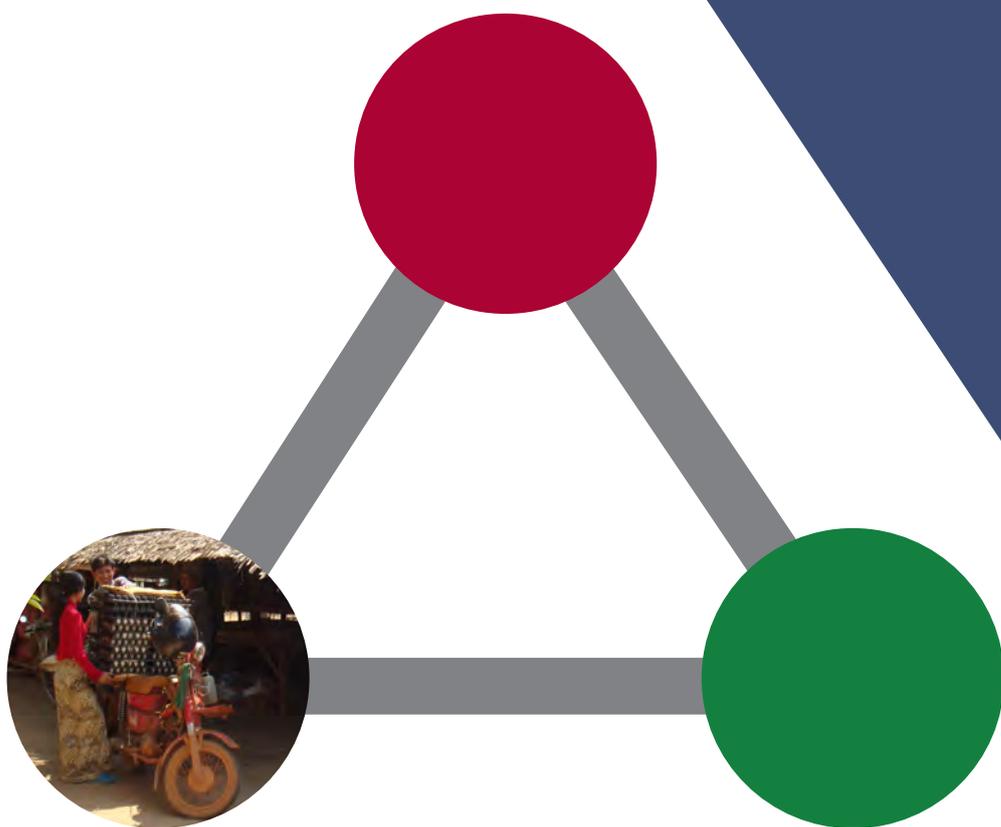


Rural livelihood and biosecurity of smallholder poultry producers and poultry value chain

Gender and socio-economic impacts of
highly pathogenic avian influenza (HPAI) and
its control in Siem Reap Province, Cambodia



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Contents

TABLES/FIGURES/PHOTOS	2
ABBREVIATIONS	3
ACKNOWLEDGEMENTS	3
EXECUTIVE SUMMARY	4
INTRODUCTION	8
METHODOLOGY AND PROCESSES	10
FORMATION OF RESEARCH TEAM	10
TRAINING WORKSHOP FOR THE RESEARCH TEAM	10
VILLAGE SAMPLE SELECTION	10
INTERVIEW SAMPLES	12
DATA COLLECTION AND TOOLS EMPLOYED	13
SOCIO-ECONOMICAL AND GEOGRAPHICAL PROFILES	15
MAIN PROFILES OF THE VILLAGES STUDIED	15
Geographical and demographic settings	15
Access to public services and health facilities	15
Access to development services and social capital	16
DESCRIPTION OF RURAL LIVELIHOOD SYSTEMS	19
Description of poverty and wealth of rural people	19
Economic activities and livelihood strategies	19
POULTRY PRODUCTION SYSTEMS	21
POULTRY BREED RESOURCES	21
Chicken breed resources	21
Duck breeds	21
Other birds raised in the villages studied	22
CHICKEN-RAISING SYSTEMS	22
Small-scale chickens raising	22
Chicken diseases and controls	25
HOW SERIOUS IS CHICKEN DISEASE FROM THE FARMERS' VIEWPOINT?	25
Commercial and large-scale chicken raising	25
DUCK-RAISING SYSTEMS	26
Scales and types of duck-raising systems	26
The Small-scale duck-raising system	26
Medium-scale duck-raising systems	27
The large-scale duck-raising systems	29
Duck raisings systems and sub-systems in Siem Reap can be summerized as follows:	29
Constraints to duck raising in Siem Reap Province	31
Muscovy duck-raising systems	33
LABOUR DIVISION IN POULTRY-RAISING SYSTEMS	34
DYNAMICS IN POULTRY-RAISING SYSTEMS	37
Farmers' knowledge in poultry-raising systems	37
Prevention of the loss of potential produces	37
CONSTRAINTS IN POULTRY-RAISING SYSTEMS	38
Technical, economical and natural constraints	38
The land availability constraint	38
Socio-cultural constraints	38
ROLES OF POULTRY PRODUCTION SYSTEMS	38
ROLES OF POULTRY PRODUCTION IN FARMING SYSTEMS	38
ROLES OF POULTRY PRODUCTION IN SOCIO-CULTURAL PRACTICES	39
ROLES OF POULTRY PRODUCTION IN HOUSEHOLD ECONOMICS	39
POULTRY TRADE AND DISTRIBUTION NETWORK	42
TRADE IN POULTRY-RELATED PRODUCTS	42
POULTRY TRADING ACTIVITIES AND MARKETING NETWORKS	42
Actors in chicken trading	42
Actors in duck trading	43
DEMANDS AND SUPPLY OF POULTRY PRODUCTS IN SIEM REAP TOWN	44
IMPACTS OF HPAI AND POULTRY PRODUCERS' RESPONSES	46



ECONOMIC LOSS AND ITS IMPACT ON VILLAGERS' LIVELIHOOD STRATEGIES	46
CHANGES IN ATTITUDES AND BEHAVIOUR IN VILLAGES WITH AND WITHOUT HPAI OCCURRENCES.....	48
PRODUCERS' STRATEGIES IN RECOVERING INVESTMENT CAPITAL.....	50
RE STOCKING STRATEGIES AFTER LOSING POULTRY	51
ALTERNATIVES AND CHOICES OF LIVELIHOOD STRATEGIES.....	51
BIOSECURITY PRACTICES BEFORE AND AFTER EXPERIENCES WITH HPAI	51
STAKEHOLDERS INVOLVED IN POULTRY PRODUCTION	52
ROLES OF PRIVATE ACTORS IN PROMOTING POULTRY PRODUCTION.....	52
ROLES OF GOVERNMENT AGENCIES AND NGOs IN POULTRY PRODUCTION	52
POULTRY PRODUCTION SERVICES.....	53
DISCUSSION AND CONCLUSIONS	53
REFERENCES.....	57
ANNEXES	58
ANNEX 1. VILLAGES SELECTED FOR LIVELIHOODS ASSESSMENT IN SEAM REAP PROVINCE, 2008.....	58
ANNEX 2. LOCATION MAP OF SELECTED COMMUNES.....	59

Tables/Figures/Photos

TABLE 1 : DEMOGRAPHIC SETTING IN THE VILLAGES STUDIED	15
TABLE 2. DISTANCE BETWEEN VILLAGES AND PUBLIC FACILITIES (KM)	16
TABLE 3. DISTANCE BETWEEN VILLAGES AND HUMAN HEALTH FACILITIES (KM)	16
TABLE 4. NUMBER OF DEVELOPMENT INSTITUTIONS IN THE VILLAGES STUDIED	19
TABLE 5. DESCRIPTION OF POVERTY AND WEALTH OF VILLAGES STUDIED	20
TABLE 6. MAIN ECONOMIC ACTIVITIES OBSERVED IN EACH AREA STUDIED (% OF HOUSEHOLDS ESTIMATED BY THE GROUP DISCUSSION)	21
TABLE 7. RELATIVE SHARE OF MEN, WOMEN AND CHILDREN IN CHICKEN-RAISING ACTIVITIES	35
TABLE 8. RELATIVE SHARE OF MEN, WOMEN AND CHILDREN INVOLVED IN SMALL-SCALE DUCK RAISING IN THE FREE SCAVENGING SYSTEM.....	36
TABLE 9. RELATIVE SHARE OF MEN, WOMEN AND CHILDREN IN ACTIVITIES OF FREE SCAVENGING OF MEDIUM- AND LARGE-SCALE DUCK-RAISING SYSTEMS.....	36
TABLE 10. RELATIVE SHARE OF MEN, WOMEN AND CHILDREN IN THE CONFINED MEDIUM- AND LARGE-SCALE DUCK PRODUCTION SYSTEM.....	37
TABLE 11. SHARE OF HOUSEHOLD INCOME FROM CHICKEN OR DUCK, AREA 1A	40
TABLE 12. SHARE OF HOUSEHOLD INCOME FROM CHICKEN OR DUCK, AREA 1B	40
TABLE 13. SHARE OF HOUSEHOLD INCOME FROM CHICKEN OR DUCK, AREA 2A	40
TABLE 14. SHARE OF HOUSEHOLD INCOME FROM CHICKEN OR DUCK, AREA 2B	40
TABLE 15. SHARE OF HOUSEHOLD INCOME FROM CHICKEN OR DUCK, AREA 2C	40
TABLE 16. SHARE OF HOUSEHOLD INCOME FROM CHICKEN OR DUCK, AREA 3A	40
TABLE 17. SHARE OF HOUSEHOLD INCOME FROM CHICKEN OR DUCK, AREA 3B	41
TABLE 18. PRICE OF CHICKEN PRODUCTS IN 2007–2008	43
TABLE 19. PRICE OF DUCK PRODUCTS	44
TABLE 20. AVERAGE SHARE OF INCOME FROM POULTRY OUT OF TOTAL HOUSE INCOME, AREA 1A	47
TABLE 21. AVERAGE SHARE OF INCOME FROM POULTRY OUT OF TOTAL HOUSE INCOME, AREA 1B.....	47
TABLE 22. AVERAGE SHARE OF INCOME FROM POULTRY OUT OF TOTAL HOUSE INCOME, AREA 2A.....	47
TABLE 23. AVERAGE SHARE OF INCOME FROM POULTRY OUT OF TOTAL HOUSE INCOME, AREA 2B.....	47
TABLE 24. AVERAGE SHARE OF INCOME FROM POULTRY OUT OF TOTAL HOUSE INCOME, AREA 2C.....	47
TABLE 25. AVERAGE SHARE OF INCOME FROM POULTRY OUT OF TOTAL HOUSE INCOME, AREA 3A.....	47
TABLE 26. AVERAGE SHARE OF INCOME FROM POULTRY OUT OF TOTAL HOUSE INCOME, AREA 3B.....	48
TABLE 27. ATTITUDES AND BEHAVIOUR OF PEOPLE BEFORE, DURING AND AFTER HPAI OUTBREAK IN SIEM REAP PROVINCE, BY AREA.....	49
TABLE 28: CHANGES IN PRODUCTION SCALE OF DUCK RAISING IN PERI-URBAN AREAS	50
FIGURE 1. CHICKEN DISEASE AND LOSSES CALENDAR	25
FIGURE 2. DUCK RAISING CALENDAR.....	31
FIGURE 3. COMPARISON OF HOUSEHOLD NET INCOME FROM POULTRY PRODUCTION IN DIFFERENT SUB-AREAS (US\$/YEAR)	41
FIGURE 4. DEMAND AND STRUCTURE OF POULTRY PRODUCTS SUPPLY IN SIEM REAP TOWN	45
PHOTO 1. DISCUSSION WITH A MEN'S DISCUSSION GROUP IN BEOUNG DON PA VILLE, SIEM REAP PROVINCE.....	14
PHOTO 2. DISCUSSION WITH A WOMEN'S DISCUSSION GROUP IN KORK POUR VILLAGE, SIEM REAP PROVINCE	14
PHOTO 3. YOUTH GROUP DISCUSSION IN KORK SMEI VILLAGE, SIEM REAP PROVINCE	14
PHOTO 4. AN INDIVIDUAL INTERVIEW IN VATH SVAY VILLAGE, SIEM REAP PROVINCE.....	14
PHOTO 5. SMALL-SCALE CHICKEN RAISING IN TOUL ROVEANG VILLAGE, SIEM REAP PROVINCE	24
PHOTO 6. COCK-FIGHTING ROOSTER	24
PHOTO 7. SMALL-SCALE DUCK RAISING IN AREA 3A.....	27
PHOTO 8. LARGE-SCALE DUCK RAISING IN KORK POUR VILLAGE (AREA 2), SIEM REAP PROVINCE.....	32
PHOTO 9. DUCK HATCHERY IN POUK DISTRICT, SIEM REAP PROVINCE	33
PHOTO 10: DUCKLING SUPPLY IN POUK DISTRICT, SIEM REAP PROVINCE	33
PHOTO 11. MUSCOVY DUCK RAISING IN AREA 1, SIEM REAP PROVINCE	34
PHOTO 12. KEEPER TAKING CARE OF HIS FIGHTING ROOSTER.....	49



Abbreviations

ACLEDA	Association of Cambodia Local Economic Development Agencies
ADDA	Agricultural Development Denmark Asia
ADRA	Adventist Development and Relief Agency
AMK	<i>Angkor Mikroheranhvatho Kampuchea</i> (Angkor Microfinance in Cambodia)
AMRIT	A microfinance institution in Khmer
CEDAC	Centre d'Etude et de Développement Agricole Cambodgien (Cambodian Centre for Study and Development in Agriculture)
CENTDOR	Centre for Development-Oriented Research in Agriculture and Livelihood Systems
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross domestic product
GTZ-PSP	GTZ Project on Cambodia Private Sector Promotion in Siem Reap
HPAI	highly pathogenic avian influenza
IMF	International Monetary Fund
KAKO	Khmer Akphiwat Khmer Organization (Cambodian helps Cambodians)[Cambodians help Cambodians?]
NGO	non-governmental Organization
PADEK	Partnership for Development in Kampuchea
PML	Private money lender
PRASAC	Rehabilitation and Support Programme to the Agriculture Sector in Cambodia
RACHA	Reproductive Health and Child Health Alliance
SEILA	Socio-Economic Improvement in Local Areas of Cambodia
STAPANA	In Khmer: Construction or Building)
VAHW	village animal health worker
VRC	Vétérinaire Rurale Du Cambodge (Rural Veterinarians in Cambodia)
VSF	Vétérinaires Sans Frontières (Vetrinarians without Borders)
US\$ 1	4100 Riel

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EXECUTIVE SUMMARY

- 1 Recently, Cambodia has faced the risk of outbreaks of highly pathogenic avian influenza (HPAI) and is vulnerable to other animal diseases, including transboundary diseases, which not only cause significant economic losses to both national and rural economies, but also intensify food insecurity and threaten public health. Although experiencing a relatively low incidence of HPAI outbreaks compared to other countries, Cambodia's smallholder sectors have been significantly affected. There have also been human fatalities. However, with recent efforts, veterinary services have been improved; village animal health workers (VAHWs) in particular have played an important role in reporting the occurrences of diseases from the community to the national level.
- 2 FAO continues to play a key role in assisting the Government of Cambodia to contain HPAI outbreaks with the aim of its eventual eradication in the country. The control and eradication of HPAI in Cambodia also plays an important part in FAO's overall animal health strategy for Southeast Asia. In addition, FAO runs a regional animal health project, Transboundary Animal Disease (TAD) Control in the Greater Mekong Subregion (GCP/RAS/206/ASB), which is currently operating in the country. The project has focused on other transboundary diseases as well, incorporating HPAI, socio-economics and biosecurity elements, which will therefore add considerable value and contribute to the ongoing FAO initiative in Cambodia and within the wider region.
- 3 In 2007, FAO provided a grant to a Cambodian NGO, *Centre d'Etude et de Développement Agricole Cambodgien* (CEDAC, The Cambodian Centre for Study and Development in Agriculture) to study the impacts of HPAI and its control measures on rural livelihoods of smallholder poultry producers in four provinces – Kampong Cham, Takeo, Kampong Speu and Kampot. A second livelihood study was later conducted by the Centre for Development-Oriented Research in Agriculture and Livelihood Systems (CENTDOR) in Siem Reap Province, where two cases of HPAI had emerged in 2004. The fieldwork was carried out in late April to May 2008, covering 12 villages in Siem Reap Province, which represent the three socio-economic areas of the province. The classification was made by analysing the main socio-economic activities of each poultry-related production area and its impact. This classification is mainly used to present the findings of the study; it does not aim at any official classification of the socio-economic areas of the province.
- 4 Twelve villages were studied. Four villages were located in urban areas (Area 1), two of which were exposed to HPAI in 2004. The farmers are engaged in small-scale chicken raising, which is less important for the livelihood system than other livelihood activities. Four villages are located in the sub-urban centre near the floodplain of Tonle Sap Great Lake (Area 2). Here, farmers engage in medium- and large-scale duck-raising, supply produce to Siem Reap Town; duck-raising is a main livelihood activity. Four villages are located in a terrace area (Area 3). Here, farmers are engaged in small-scale chicken raising and small-scale duck raising, with integration into the livelihood systems. From these 12 villages, the study carried out 24 group discussions (male, female and youth groups), 24 key informant interviews and 100 household cases studies. Based on this approach, the study resulted in the following summary findings:



- 5 Poultry production in Siem Reap Province is strongly related to wealth categories and geographical area: traditional chicken raising and small-scale duck raising are mainly found in Areas 3a and 3b. Medium- and large-scale duck raising are found in sub-urban areas and practised by middle-income and better-off farmers. Commercial chicken farms are mainly in the urban centre and are practised by better-off farmers. HPAI outbreaks mainly affected the medium- and large-scale duck farms and commercial chicken farms. Small-scale chicken raising was not strongly affected by HPAI, since small-scale production does not require large investments, except for buying a few hens. Poultry raisers are not well aware of this disease or its negative impacts. In general when a disease occurs, duck farmers seek solutions to cure their flock by sharing their problems with their friends who also raise ducks, or with owners of veterinarian supply shops in order to access medicine or recommendations for treatment. Since no HPAI control measures have been carried out and HPAI cases were not widely disseminated, medium- and large-scale duck raising and commercial chicken raising experienced negative impacts of HPAI indirectly. This resulted in lower prices of poultry products and the inability of farmers and commercial producers to sell their poultry products during the outbreak period. This caused a great loss of investment during the outbreak of HPAI and other diseases.
- 6 The poor and poorest farmers are not directly or seriously affected by HPAI outbreak, since they are not able to be involved in medium- or large-scale duck raising or commercial chicken raising. The poorest households depend on selling their labour for farming or non-farming activities. Due to job opportunities in garment factories (in Phnom Penh) and construction work in the Siem Reap urban centre, young people currently migrate to urban centres in search of jobs. The poor and poorest households in the community can sell their labour easily, even during the outbreak of disease. Poor women-headed families, which had previously depended on raising chickens and selling chickens for petty cash in case of urgent need, experienced difficulties during the HPAI outbreak in 2004 and 2005.
- 7 Poultry production has played a vital role in providing food (meat and eggs) for home consumption, cash income to meet urgent needs, and capital for investment in other economic activities. Taking advantage of cultural practices, resource-poor farmers could also ask their relatives or neighbours for one or two chickens to raise. However, due to the increasing price of poultry, there were gradually less requests after the HPAI crisis was over. It should be pointed out that poultry meat prices decreased during the HPAI outbreak only, but became increasingly more expensive years later. Many woman-headed families expressed considerable appreciation for the roles played by poultry in providing food for their families, especially for their children's education and healthcare, and as an investment in other economic activities. Couple families suffered less negative impacts from HPAI due to their greater opportunities for other livelihood strategies.
- 8 Concerning the roles of poultry in farming systems and livelihood systems, small-scale duck raising is well integrated into the rice farming system, providing eggs during the busy farming season (Area 3a). Medium- and large-scale duck raising are also well integrated with vegetable farming in sub-urban Area 2, providing manure for vegetable production. Vegetable production is one of the most important economic activities in sub-urban centres.



- 9 Poultry-related threats, including HPAI outbreaks, to the livelihoods of rural women, the rural poor and vulnerable groups can be classified into two categories: direct and indirect impacts. Direct impacts to livelihoods included poultry losses from the disease and from culling campaigns. In Siem Reap, there were indirect impacts only. Indirect impacts were mainly observed in the early stages of HPAI outbreak in 2004 and 2005, where many people were afraid of eating chicken meat. Poor families dependent on the sale of poultry products for cash in case of urgent need could not sell them because consumers changed their eating practices, preferring to eat other meats or vegetables. Moreover, this made other food basket items more expensive. Poor households have difficulty affording such items for food consumption. Like poor farmer families, poor urban consumers returned to eating chicken meat because other consumption commodities were expensive. The situation has now improved and poultry meat is now marketed as before.
- 10 In terms of HPAI-related threats, economic threats were experienced mainly by the medium- and large-scale duck producers and commercial chicken enterprises. This posed a threat to the public, since the large farm owners tried to recover their investments by selling sick birds to markets or restaurants. However, it is difficult to identify the economic losses of small-scale poultry producers, because they consider them normal for the hot season or early rainy season. Indirect threats were not perceived as a hardship by the middle-income or better-off families, since they had other income sources to subsidize or secure their living, except during the earlier stage of the disease outbreak in 2004–5.
- 11 Smallholder producers still perceive that HPAI can occur only in commercial poultry farms with large numbers of poultry and concentrate feed. They do not perceive HPAI-related threats as serious as their livelihood threats such as losing a rice harvest, social insecurity or floods. Thus, all poultry activities, small-, medium- and large-scale, resumed to normal unless farmers had no financial capacity to reinvest. Keepers of fighting-cocks still use their mouths to suck blood from the cocks' throats after cock-fighting. The general threat in the duck-raising system at present is the increasing price of concentrate feed, since many duck raisers now mainly depend on commercial feed.
- 12 In addition to poultry activities, farmers in sub-urban Areas 2a, 2b and 2c have the possibility of being involved in dry season rice farming and small-scale fishing activities. They can use these activities to reinvest in poultry production because it has been their main livelihood activity for many generations. However, people living in urban centres, i.e. Areas 1a and 1b, and in Area 3a had to sell land assets in order to restart economic activities because these lands were very valuable to sell. People living in Area 3b have very limited resources to improve their lives even without suffering the strongly negative impacts of HPAI: most of them depend on seasonal migration to Thailand for job opportunities.
- 13 Livelihood strategies, social relations and production practices are closely related to livelihood outcomes. Social relations and social capital are the main factors in producing different livelihood outcomes of the different poultry producers in response to the HPAI threat. Since the early stages of HPAI, many poultry producers have lost income and investments due to the lower prices of poultry-related products. Producers with poor



resources and poor social relations have depleted their investments and cannot restart their businesses, while those with rich social relations or social capital can access favourable loan conditions or donations to reinvest in poultry raising. It is important to note that poultry meat in Cambodia is largely supplied from Thailand and Viet Nam. Since the serious outbreaks of HPAI in Viet Nam and Thailand, however, the importation of poultry meat from these countries has decreased. Cambodian consumers are also afraid of poultry meat from these commercial farms, which provides an opportunity for the poultry products produced locally on small-scale farms. As a result, those who can reinvest in poultry production can recover most of their investment lost during the HPAI outbreaks in 2004 and 2005; this is mainly true for medium- and large-scale duck farms.

- 14 In Siem Reap Province, there are no differences in the impacts on or outcomes in villages with and those without HPAI outbreaks, since few people had heard about these cases. It is not an agriculture or livestock area. The different impacts are rather found on the different types of production systems and geographical areas. Farmers whose livelihoods were mainly engaged in duck-raising Areas 2a, 2b and 2c experienced stronger negative impacts than those in other areas.
- 15 Due to the importance of poultry production in rural livelihood systems, farmers are committed to continue raising poultry, especially chickens for resource-poor farmers and ducks for middle income and better-off farmers. As a result, the study found that farmers simply began to restock poultry only about a few months after the disease outbreak was over. Poultry has traditionally played an important role in their rural livelihood systems – in farming, household economics and socio-cultural practices. Moreover, the study also found many misunderstandings on the part of villagers and/or farmers. For example, most villagers believe that consuming dead chickens is harmful to their health, thinking that the disease is in the blood. If they see their chicken sick, therefore, they hurry to bleed it before it dies. The study also often found that for large-scale duck producers, if many ducks die and they cannot sell the rest, they give some to their poor neighbours. Poor people, on the other hand, seem not worried about the disease risks and eat ducks that may be contaminated.
- 16 Protecting poultry production systems from the spread of HPAI requires multi-stakeholder involvement. The government certainly plays a vital role in imposing biosecurity-related measures in the poultry production system. In Siem Reap Province, poultry production plays an important role in livelihood systems by supplying meat for the urban centre. However, it has been observed that duck-raising areas are located in the urban and the sub-urban centres of the province where there is a high population density. Then an outbreak of diseases can easily spread. Biosecurity practices should be introduced and strictly followed in the duck-raising areas. Duck migration in the country should be mapped out for disease control in the future. Poultry producers, especially duck raisers, should be educated about their personal risks and safety precautions within their poultry-based livelihood systems.
- 17 Villagers' attitudes and behaviour have changed due to major media and television broadcasts as well as posters and direct education on the negative impacts of HPAI. However, these changes are mainly observed in better-off households who live in the urban



centre (Siem Reap Town). The poor and poorest households are still not convinced about the negative aspects of HPAI. There is little doubt that, due to poverty, the poor and poorest households face the risk of hunger from this challenge. Poor and poorest respondents did not admit to eating dead and sick chickens due to hunger, which could risk their health or life, but they did state that they did not believe in the existence of HPAI and the serious risk it poses. These attitudes may mask their sensitivity to being poor and the bad image portrayed in consuming such risky food. Moreover, in villages that suffered from human deaths due to HPAI, the villagers were more aware of negative impact of HPAI than in those that did not. It is important to provide education to community members, especially medium- and large-scale duck raisers. Best practices in duck raising and biosecurity practices should be documented and shared with the duck-raising community.

INTRODUCTION

Agriculture is by far the largest sector of the Cambodian economy, encompassing diverse economic and physical environments. Crops, fisheries and livestock are the most important subsectors in the agricultural sector, contributing 50 percent, 30 percent and 12 percent of the agricultural GDP, respectively, over the 1995-2002 period. However, for lack of alternative income-generating activities and with low growth rates in agriculture (1.6 percent per year), the rapid growth of Cambodia's population (2.4 percent per year) places additional pressure on natural resources and impacts on the current employment situation. Given the high incidence of rural poverty, agriculture has a decisive role to play in enhancing food security in the country. However, low productivity of land, labour and water are the main constraints to agricultural growth. As a consequence, most rural households continue to experience food insecurity.

The poultry sector in Cambodia is dominated by smallholder producers (FAO sectors 3 and 4, which refers to small-scale commercial and backyard producers, respectively) for whom poultry production, processing and marketing are important components of the nation's rural livelihood development strategies. The country faces potential outbreaks of HPAI and is vulnerable to other animal diseases including transboundary ones, which not only cause significant economic losses to the national and rural economies, but also intensify risk for food security and threaten public health. Although experiencing a relatively low incidence of highly pathogenic avian influenza (HPAI)/H5N1 outbreaks compared to some other countries, Cambodia's smallholder sectors have been significantly affected, including human fatalities. However, recent efforts have improved veterinary services. In particular, village animal health workers (VAHWs) have played an important role in reporting the occurrences of diseases from the community to the national level.

FAO continues to play a key role in assisting the Government of Cambodia in containing outbreaks of HPAI with the aim of its eventual eradication in the country. The control or eradication of HPAI in Cambodia also plays an important part in the overall FAO animal health strategy for Southeast Asia and a regional FAO animal health project, Transboundary Animal Disease (TAD) Control in the Greater Mekong Sub-Region (GCP/RAS/206/ASB) is currently operating in the country. This project focuses on other transboundary diseases as well, incorporating HPAI, socio-economics and biosecurity elements, which will therefore add considerable value and contribute to the ongoing FAO initiative in Cambodia and within the wider region.



This research study focuses on the gender and socio-economic dimensions of the impacts of HPAI and its impact on and control over the livelihoods and biosecurity of smallholder producers, small-scale commercial and backyard sectors, as well as other actors in rural poultry value chains in Cambodia. In 2007, FAO provided a grant to a Cambodian NGO, the *Centre d'Etude et de Développement Agricole Cambodgien* (Cambodian Centre for Study and Development in Agriculture, CEDAC), to conduct an initial study in four provinces of the country (Suon Seng, 2007), namely Kampong Cham, Kampong Speu, Takeo and Kampot. This present study aimed at better understanding the impact of HPAI in Siem Reap Province, where two cases of HPAI occurred in 2004.

This study addressed the same research questions as in the earlier 2007 study. The research questions were as follows:

- What are the salient features, including disease control and the biosecurity aspects of smallholder production systems, both backyard and semi-commercial, in rural areas that have been affected by HPAI and its control measures? How do these systems vary by wealth group and according to social factors, particularly with respect to gender?
- What role(s) do these poultry production systems play in the farming systems and in the overall livelihoods systems of these smallholders?
- What threats do HPAI outbreaks and the measures taken to control them pose for the livelihoods of smallholder poultry producers in rural Cambodia, especially those of rural women, rural poor and various vulnerable groups? How do these threats vary according to poultry production system, wealth category, gender and other social attributes? How do smallholder producers perceive these HPAI-related threats relative to other livelihood threats?
- What salient livelihood assets (with the exception of poultry), attitudes, behaviours, beliefs, processes and structures do smallholders have in order to respond to HPAI-related livelihood threats? How and under what circumstances do they differ by production system, wealth group, gender and other social attributes?
- How did these forces – livelihoods strategies, social relations, production practices – interact to result in the observed livelihood strategies of different producers to respond to HPAI-related threats?
- What livelihood outcomes did these livelihood strategies produce in response to HPAI-related threats, especially for rural women, the rural poor and vulnerable groups?
- Were the outcomes in affected communities different from those in other communities with no HPAI outbreaks and control measures? How did different producers, especially rural women, the rural poor and vulnerable groups, perceive these livelihood impacts/outcomes?
- What were the implications of these perceptions for future behavioural changes?
- What were the policy implications of such impacts, especially for improved biosecurity and HPAI control programmes, and what were the smallholder responses to them?



- What recommendations for future research and/or interventions resulted from this study on the topics identified?

METHODOLOGY AND PROCESSES

Formation of Research Team

The study was coordinated by the Executive Director of CENTDOR with his team of four researchers. The team was responsible for making appointments with villagers and conducting interviews (group discussions, individual interviews and case studies). The Research Team was responsible for writing individual interview notes as well as recording accurate accounts of group discussion notes from men's, women's and youth discussion groups).

The Research Coordinator had the overall responsibility for this research project. This included providing training support to the Research Team, making initial contacts at both the provincial and district levels, and facilitating a brainstorming session on the writing up of the research findings and this synthesis report.

Training Workshop for the Research Team

Prior to commencing the fieldwork, the Research Team participated in a five-day Training Workshop. It was facilitated by CENTDOR's Executive Director acting as Research Coordinator of this study. The training mainly focused on the methodology and tools employed, and lessons learned in conducting the 2007 study. The main issue for the Training Workshop was *how to get better results in this study than in the first*. This led to a critical review of lessons learned from the first study, and sought to make necessary improvements wherever possible.

The Research Team decided to employ the same methods and tools as in the previous study. Workshop discussions essentially consisted in seeking more meaningful ways to apply the methodological tools. What information needs to be collected from each tool? How to be more flexible with these tools in situations where their application cannot collect such information? Previous and new toolkits provided by FAO as well as the tools used during the first study were reviewed and subsequently adopted for this second study.

Village sample selection

In reflecting on the aims of the study, it was expected that the study would capture, as much as possible, the diversity of issues related to HPAI and rural livelihoods with regard to gender and socio-economic roles. At the beginning of the study, there was some confusion regarding information on villages with and villages without HPAI occurrence. It is important to note that the list provided by FAO of villages with HPAI experiences was different from that provided by the provincial Department of Agriculture. After seeking clarification on this discrepancy, it was confirmed that FAO's list was the correct one.

The study covers 12 villages and aims to represent all three main socio-economic areas and the sub-areas of the provinces, as follows:



Area 1 (urban centre)¹

1a. Two villages (Boeung Donpa and Chong Kao Sou villages), located in the urban centre, where poultry activity is relatively small. Most people engage in non-farming activities. *Cock fighting* is one of the prevalent poultry activities.

1b. Two villages (Vath Svay and Vath Bou villages) located in the urban centre, where poultry activity is relatively important; the main activity is duck raising, including Muscovy duck raising. This was a former agricultural area; it has recently become the urban or sub-urban area due to rapid urban growth.

¹. Boeung Donpa and Vath Bou villages experienced HPAI outbreak in 2004

Area 2 (sub-urban area near the floodplain of Tonle Sap Great Lake)

2a. One village (Phnom Krom village) with access to a natural water body, located next to the floodplain of Tonle Sap Great Lake, where large-scale duck raising is an important poultry activity. The determinant factors of this activity are availability of water and water feed, and available space for duck raising, which allows to implement the free scavenging system. This system is mainly practised by poor or middle-income farmers.

2b. One village (Bralay village) with no access to a natural water body, located next to an urban centre with a high population density, where medium- and large-scale duck-raising activities are one of the most important poultry activities. These are the determinant factors for this activity. This was a former agricultural area that became an urban or sub-urban area due to rapid urban growth. It should be pointed out that only the middle-income farmers can raise ducks on a medium or large scale since the system almost completely depends on concentrate feed.

2c. Two villages (Kouk Russey and Kouk Pour villages) with access to a natural water body, with mixed duck-raising system: some duck raisers practise the scavenging system, while others practise the fencing system. The systems differ by wealth category. Poor households prefer the former since they can benefit from natural feeding (fish) and leftover panicles from the dry season rice after harvest. Better-off or middle-income households prefer the latter, since it requires less labour and is better able to manage market demands.



Area 3 (terrace)

3a. Two villages (Kork Thmei and Toul Roveang villages), located in a terrace ecosystem where small poultry production (chicken) is greatly integrated into the livelihood systems. Villages are located along National Road No. 6, from Kampong Thom Province to Banteay Meanchey Province, passing through Siem Reap town. Since they are located far from a natural water body, some households own small ponds, which have resulted from digging the land to raise up the level of their homestead. Thus, farmers make use of water in small ponds for small-scale duck raising (20–30 heads/family).

3b. Two villages (Sre Noi and Roveang Thmei villages), located in a terrace ecosystem where small poultry production (chicken) is greatly integrated into the livelihood systems. Villages are located far from the national road and consequently, there are mostly subsistence farms. Farming activities are mainly for consumption, not for commercial purposes. Only small-scale chicken raising is found in this farming system.

Interview samples

Based on the previous 2007 study, it was expected that the research team would spend three days per village to cover three group discussions (of men's, women's, and youth or teen discussion groups) and 6-8 household interviews. However, in this second study, the Research Team was unable to organize group discussions in three villages, which are located in the city centre (Siem Reap Town). However, in order to cover the scope of the study and answer the research questions, the Research Team increased the number of household interviews to 14–16 in each village. Moreover, youth group discussions in some villages could not be organized since the youth were busy with school duties or needed to leave their villages for job opportunities in the urban centres. It was then decided to invite male youth to participate in the men's group discussions and female youth to participate in the women's group discussions.

As a result, the study in 12 villages covered the following sample size :

Men's group discussions	9
Women's group discussions	9
Youth group discussions	5
Mixed group discussions	1
Key Informant Interviews	24
Household Interviews	100



Data collection and tools employed

In order to answer the research questions, the study focused on the following areas:

Rural livelihoods: assets, strategies, outcomes, vulnerabilities, influencing factors.
 Poultry-raising system(s): types of poultry, practices in each system, potentials and constraints in each system, the actors in each system and the evolution of the system.
 Roles of poultry in rural economies: types of poultry: enterprises, systems, breed/selection, production and uses, product marketing, investments/returns, enterprise success/failure, practices related to HPAI prevention/control.
 Gender issues in rural livelihoods: roles in decision-making, productive activities, poultry production and access/control over resources.
 HPAI impacts on rural livelihoods: disease/outbreaks description, outbreaks and awareness education, poultry losses, household restocking strategies, impacts on different households (poor/poorest, medium, better-off, and women-headed).
 Actors in the poultry sector: Who are the main actors in the poultry sector in the community or province? How do these actors influence the sector? What are their contributions to the sector?
 An overview of the poultry movement and market in the province: This area is based on the interviews of market actors. Key actors in the poultry value chain have provided significant amounts of information on the market and the distribution of poultry products.

Different tools were used in the different methods. Since the study team could not organize group discussions in some villages, some tools for discussion were also applied to the individual interviews.

<p>For the individual interviews, the following tools were used: Household profile interviews and household livelihood strategies Questions on poultry species and breeds Poultry production checklist Gender analysis/Labour Division Matrix (for poultry enterprises and daily activities) Poultry diagram Impact ranking exercises Institutional analysis Seasonal calendar (poultry production and annual economic activities)</p>	<p>For group discussions (men and women), the following tools were used: Wealth ranking Questions on poultry species and breeds Poultry production checklist Gender analysis/Labour Division Matrix (for poultry enterprises and daily activities) Value chain mapping Impact ranking exercises Stakeholders/ institutional analysis Seasonal calendar(poultry production and annual economic activities) Community/village trends (timeline)</p>
<p>For key informant interviews, the following tools were used: Checklist for interviewing VAWH Questions on poultry species and breeds Poultry production checklist Impact ranking exercises Institutional analysis Seasonal calendar (poultry production)</p>	<p>For group discussions with youth, the following tools were used: Questions on poultry species and breeds Gender analysis and Labour Division Matrix (for poultry enterprise and daily activities).</p>



In focus group discussions, flip charts were used to record data and to display the results to the participants. Several rounds of censuses on discussion findings were carried out on each point for agreement.



Photo 1. Discussion with a men's discussion group in Beoung Don Pa ville, Siem Reap Province

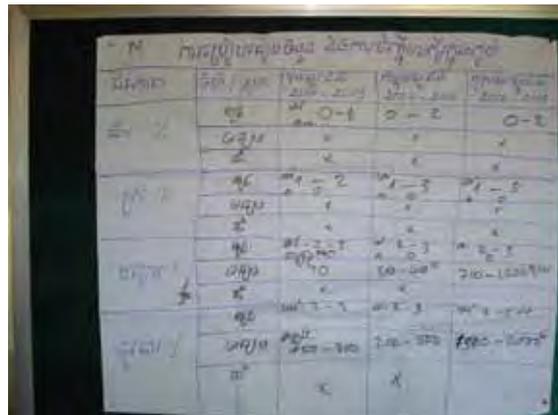


Photo 2. Discussion with a women's discussion group in Kork Pour Village, Siem Reap Province



Photo 3. Youth group discussion in Kork Smei village, Siem Reap Province



Photo 4. An individual interview in Vath Svay village, Siem Reap Province



SOCIO-ECONOMICAL AND GEOGRAPHICAL PROFILES

Main profiles of the villages studied

Geographical and demographic settings

Village selection aims to represent each of the three main geographical areas identified: the urban centre area, the sub-urban area next to the floodplain of Tonle Sap Great Lake and the terrace area. Each area is also divided into two or three sub-areas in which farmers practice slightly different economic activities. HPAI outbreak is not dominant in the three defined areas, but has created indirect impacts, including on the marketing of poultry products (refer to the section, *Village sample selection*, and Annexes 1 and 2).

Table 1 : Demographic setting in the villages studied

Code	Name of villages	Total no. of households	No. of woman-headed households	No. of inhabitants	No. of women
V1	Chong Keo Sou	2 086	178	11 245	5 765
V2	Beoung Donpa	778	317	3 969	2 015
V3	Vath Bou	1 342	123	6 888	3 738
V4	Vath Svay	810	226	4 480	2 285
V5	Phnom Krom	498	26	3 202	1 636
V6	Brolay	129	28	759	387
V7	Kouk Russey	176	27	917	470
V8	Kouk Pour	126	15	688	360
V9	Kouk Thmei	141	12	712	374
V10	Toul Roveang	191	32	1 007	501
V11	Roveang Thmei	160	22	844	439
V12	Sre Noi	190	16	950	505

Source: CENTDOR, Fieldwork in May 2008, information provided by the Village Head

It is observed that in the urban area, population density is very high compared to other areas, Areas 2 and 3.

Access to public services and health facilities

As in the four provinces studied in 2007, healthcare services have significantly improved in the last few years. In the health services hierarchy, from lowest to highest, there are health posts, health centres, referral hospitals, provincial hospitals and national hospitals. Moreover, in the market centres, there are also private clinics that provide services to rural people. Complementary to rural road improvement and the telecommunication network in the rural areas, it also provided a good connection between the rural areas and the urban centre. However, financial capacity to access public services is the rural people's current concern. Most public services are currently privatized. Government health services are mainly active in vaccinating children, birth spacing and Human Immunodeficiency Virus (HIV)/Acquired Immunodeficiency Syndrome (AIDS) care services, which received financial support from the international communities and NGO projects. In Siem Reap Province, there are higher standard hospitals (International Standard Hospitals), which can deal with serious health problems in both private hospital and state-run hospitals with financial support from international communities and private donors, as well as from private investment.



Table 2. Distance between villages and public facilities (km)

Village	Primary school	Junior high school	High school	Provincial centre	District office	Commune office	Market	National Road
Chong Keo Sou	1	3	3	2.5	7	2.5	In village	In village
Beoung Donpa	0.5	In village	3	3	5	1	2	1
Vath Bou	In village	In village	In village	1	7	1	1	In village
Vath Svay	In village	In village	In village	3	10	2	2	In village
Phnom Krom	In village	8	8	12	19	6	8	1
Brolay	1	4	4	8	8	3	7	1
Kouk Russey	1.5	6	6	17	6	1	7	7
Kouk Pour	1	8	8	17.5	7.5	1	8	8
Kouk Thmei	2	6	13	25	7	5	7	2
Toul Roveang	In village	7	9	23	7	5	7	In village
Roveang Thmei	In village	4	9	53	9	4	9	32
Sre Noi	0.5	1.5	40	63	30	1	1.5	1

Source: CENTDOR, Fieldwork in May 2008

Table 3. Distance between villages and human health facilities (km)

Village	Health centre	Referral hospital	Provincial hospitals with national and international standards
Chong Keo Sou	1.5	2	2
Beoung Donpa	1.5	3	3
Vath Bou	1	2	3
Vath Svay	3	3	3
Phnom Krom	6	12	12
Brolay	3	6	9
Kouk Russey	1	6	17
Kouk Pour	3.5	8	18
Kouk Thmei	2.5	9	25
Toul Roveang	2	7	23
Roveang Thmei	6	9	53
Sre Noi	1.5	40	63

Source: CENTDOR, Fieldwork in May 2008

Access to development services and social capital

There are numerous projects and NGOs working in Siem Reap Province and providing different types of development services: physical, financial, spiritual as well as capacity building. The poorest households have less access to capacity-building services and to the social network. This is not because these services do not provide for them, but because these households give priority time for earning a daily income for their families. Time needed to participate or engage in these services and social networks competes with economic activities.

Cash credit is the main development service in rural areas. Access to loans is possible at all economic levels. However, the amount of the loan differs between the poor and the better-off families in the village. Microfinance institutions (MFIs) or banks in the village create different modalities for loan access according to the various categories of clients. The poorest and poor household categories can access loans through a group loan, in which group



members guarantee each other for the loan repayment. Middle-income and better-off families can access loans individually, using their own assets (land or house) as loan collateral. The people in the urban centre (Area 1) generally have access to both formal and informal financial services due to the available services and greater economic opportunities. It is also important to note that the poor and poorest households obtain loans to solve their urgent needs, paying for food and other urgent health services, and repaying previous loans. The better-off and middle-income families mainly obtain loans for investments.

Culturally, Cambodian society is still strongly dependent on the family. When any member of the family faces a money shortage, he or she seeks help from other family members and expects favoured conditions (e.g. borrowing money without interest and without a time frame for repayment). Unofficially, better-off members are also obliged to help the poorer members with favourable conditions. For example, duck raising often requires large amounts of money. Poor farmers or newly married couples can raise ducks with the financial support from their family members: parents, brothers or sisters. This kind of support can be in the form of a start-up loan and for buying animal feed on credit. But if access of financial support from the family line is impossible or unavailable, poor households will then approach MFIs or money lenders. Most medium- and large-scale duck raisers take loans from MFIs or banks, since duck-raising activities require a large investment, particularly for feed. Duck raisers also receive loans from private money lenders (PMLs) in communities since their loan arrangement is simple and more flexible with the terms of repayment.

Similar to the study in 2007, the interest rate and the modality of financial services are as follows:

- MFIs or banks: 3–3.5 percent interest rate per month; large loan, 2 percent. Farmers, however, cannot access large loans at a low interest rate of 2 percent per month. Loan amount: wide range. Small loans, less than US\$5 000; medium loans, US\$5 000–10 000; and large loans, more than US\$10 000.
- Private money lenders: 5–10 percent interest rate per month. Small loans, less than US\$ 12.5 (10 percent interest); medium loans, US\$ 12.5 to 125 (5–10 percent depending on negotiation); and large loans, over US\$ 125 (5 percent interest), depending on negotiations and loan collateral.



Group I: Credit
<p>ACLEDA (Association of Cambodia Local Economic Development Agencies) <i>AMRITH</i> (Name of Microfinance Institution, which means "wishes") <i>STAPANA</i> ("Construction" or "Building") Angkor Micro-finance in Cambodia (AMK) ANZ Royal (Name of the Foreign Bank in Cambodia) Village bank (Name of Church Relief Services [CRS] Credit Institution) <i>Hatha KaSekor</i> ("Farmers' Hands") PRASAC (Rehabilitation and Support Programme to the Agriculture Sector in Cambodia) Lusina Foundation (Lusina is the name of a humanitarian) RACHA (Reproductive Health and Child Health Alliance)</p>

Group II: Agriculture and community development
<p><i>Kruosar Thmei</i> ("New Family") Caritas Cambodia: The word "Caritas" comes from Latin, meaning charity and love. The name connotes the Church's efforts to bring compassion and love to humanity. Sam Brother-Cambodian Foundation in Florida-US: Sam is the name of a Cambodian humanitarian living in the United States GTZ-PSP: Cambodia Private Sector Promotion in Siem Reap <i>Chivet Neiy Kdei Sangkheum</i> ("Life with Hope") Agricultural Development Denmark Asia (ADDA) <i>Sre Khmer</i> (Cambodia Rice Field) Partnership for Development in Kampuchea (PADEK) Adventist Development and Relief Agency (ADRA)</p>

Group III: Government project, relief
<p>SEILA (Socio-Economic Improvement in Local Area of Cambodia) Cambodian Red Cross (CRC) Korea Foundation</p>

Group IV: Health, education and human right
<p>RHAC (Reproduction Health Association of Cambodia) Khmer Akphiwat Khmer Organization (KAKO, "Cambodian helps Cambodian") Friends Unlimited Organization Plan Cambodia Organization Buddhism for development</p>



Table 4. Number of development institutions in the villages studied

Village	Group I	Group II	Group III	Group IV
Chong Keo Sou	3	1	1	1
Beoung Donpa	3	2	1	1
Vath Bou	3	2	1	1
Vath Svay	3	2	1	1
Phnom Krom	4	4	1	1
Brolay	2	2	1	1
Kouk Russey	5	1	2	1
Kouk Pour	6	1	1	1
Kouk Thmei	1	2	1	3
Toul Roveang	5	2	1	1
Roveang Thmei	3	3	2	4
Sre Noi	2	2	1	1

Source

ce: Source: CENTDOR, Fieldwork in May 2008, Information provided by Village Head and Group Discussion.

Description of rural livelihood systems

Description of poverty and wealth of rural people

Discussions from the men's and women's discussion groups resulted in the most important criteria used to classify the poverty categories: rice cultivated land, types of houses, number of cattle, means of transportation and types of economic activities, which can indicate approximate how much they can earn per year.

Economic activities and livelihood strategies

Chicken raising differs in the 12 villages studied. In Area 1, not many chickens are raised for meat; most are raised for fighting. In Area 2, which is mainly for duck raising, chicken raising is relatively smaller than in Area 3; chicken raising is not much different in terms of number of chicken within each area. In Siem Reap Province, on the other hand, there is a very large variation between the poorest and the very rich households. The study could not interview the better-off, because they are always extremely busy; some information was obtained from their employees. Large-scale duck raising is practised by middle-income and better-off farmers, and not by the very rich in the urban centre.

In the rural area (Area 3) and the sub-urban area (Area 2), a good sign that a family is better-off or of middle income is its ability to demonstrate that it has a stable source of cash income. Poor households can become poorer if they lose secure cash income sources. For example, when the rice harvest is not good due to the rainfall regime or insect damage, households face losing their assets because they need to sell them or use them as collateral for credit to respond to food shortages. Moreover, health problems pose the greatest risk to poor households and lead to a loss of household assets, mainly land, which can easily be sold due to the current high market demand. The livelihood strategies of the poor and poorest households partly depend on harvesting natural resources for direct consumption or sale for cash income. This was mainly the case in Area 3b. It was reported, however, that the natural resources greatly decreased. Culturally and traditionally, young or newly married couples in rural areas largely depend on their parents for their livelihoods. If they wish to start an economic activity and do not have enough capital to invest, they generally approach their parents for an interest-free loan without any time frame for repayment.



Table 5. Description of poverty and wealth of villages studied

	Area 1: Urban	Area 2: Sub-urban	Area 3: Terrace
Poorest	Proportion: 19 percent Rice cultivated land: No Type of house: A small house (cottage) close to the ground, 3 m x 4 m and leaf roof. Number of cattle: None Means of transportation: 0–1 set of bicycles Number of chickens raised: 0–2 heads Number of ducks raised: None	Proportion: 22 percent Rice cultivated land: 0–0.20ha Type of house: A small house (cottage) close to the ground, 3 m x 4 m, and leaf roof. Number of cattle: None Means of transportation: 0–1 set of bicycles Number of chickens raised: 0–1 head Number of ducks raised: None	Proportion: 13 percent Rice cultivated land: under 0–0.50 ha Type of house: A small house (cottage) close to ground floor, 3 m x 4 m, and palm or thatch leaf. Number of cattle: None Means of transportation: 0–1 bicycles Number of chickens raised: 0–2 hens Number of ducks raised: 4–5
Poor	Proportion: 31 percent Rice cultivated land: less than 0.50 ha Type of house: a small house (cottage) close to ground, 4 m x 5 m, leaf/zinc roof Number of cattle: None Means of transportation: 1–2 bicycles and 0–1 motorbikes Number of chickens raised: 1–3 hens Number of ducks raised: less than 10 ducks and less than 2–4 Muscovy ducks.	Proportion: 33 percent Rice cultivated land: less than 10 – 0.50 ha. Type of house: a small house (cottage) close to ground, 4 m x 5 m, leaf/zinc roof and bamboo wall. Number of cattle: 0 – 2 cows Means of transportation: 0–2 set of bicycles and 0–1 set of motorbike for motor taxi driver Number of chickens raised: 1–2 hens. Number of ducks raised: 1–5 ducks and less than 1–3 Muscovy ducks.	Proportion: 26 percent Rice cultivated land: 0.25–1.50 ha Type of house: a small house (cottage) close to ground, 4 m x 6 m, leaf/zinc roof and bamboo wall. Number of cattle: 1–2 cows Means of transportation: 1 bicycle and 1 motorbike Number of chickens raised: 1–4 hens. Number of ducks raised: 0–5 ducks and Muscovy duck 0–2 hens
Middle-income	Proportion: 26 percent Rice cultivated land: 0.50 - 1 ha Type of house: two roof houses 6 m x 7 m, tile or fibre cement or zinc and wooden wall, concrete ground floor or flat house. Number of cattle: 0–2 heads Means of transportation: 1–2 motorbikes and more than 1 bicycle and 0 –1 cars for business. Number of chickens raised: 2–6 hens Number of ducks raised: 200–1 000 ducks and 2–4 Muscovy ducks	Proportion: 28 percent Rice cultivated land: 0.50–1.50 ha Type of house: two roof houses 5 m x 7 m, tile or fibre cement or zinc, wooden wall and concrete ground floor. Number of cattle: 1–5 heads Means of transportation: 0–2 motorbikes and more than 1 bicycle, and 0–1 cars. Number of chickens raised: 2–5 hens Number of ducks raised: 300 – 1 000 ducks and 2–5 Muscovy ducks.	Proportion: 38 percent Rice cultivated land: 1–4 ha Type of house: two roof houses 6 m x 8 m, tile or fibre cement or zinc, wooden wall and concrete ground floor. Number of cattle: 2–4 cows Means of transportation: 1–2 bicycles and 1 motorbike Number of chickens raised: 3–6 hens Number of ducks raised: 1–15 hens and 1–4 Muscovy ducks
Better-off	Proportion: 24 percent Rice cultivated land: 1–1.5 ha Type of house: two roof houses, 8 m x 12 m, tile or fibre cement, wooden wall and concrete ground floor and flat house. Number of cattle: None Means of transportation: 1–4 motorbikes or bicycles for their children drive to school. Number of chickens raised: 2–7 hens and 2–3 fighting cocks for decoration and betting Number of ducks raised: 1 100–3 000 ducks and 2–4 Muscovy ducks	Proportion: 17 percent Rice cultivated land: 1–5 ha Type of house: two roof houses with 7 m x 10 m size. Tile or fibre cement and wooden wall and concrete ground and flat house or Villa. Number of cattle: 1–5 cows Means of transportation: 1–3 motorbikes or bicycles for their children to drive to school and 1 car, generator and battery recharge service. Number of chickens raised: 3–10 hens and 2–3 fighting cocks decoration and betting Number of ducks raised: 500–3000	Proportion: 13 percent Rice cultivated land: 3–10 ha Type of house: 7 m x 10 m Number of cattle: 2–5 cows Means of transportation: 1–3 bicycles and 1–2 motorbikes, and car: 0–1 car and 1 rice mill Number of chickens raised: 4–15 hens Number of ducks raised: 5–20 ducks and Muscovy ducks 2–5 heads

Source: CENTDOR, Fieldwork in May 2008, Information provided by Group Discussions, Key Informants and Village Heads



Table 6. Main economic activities observed in each area studied (% of households estimated by the group discussion)

Economic activities	Area 1a	Area 1b	Area 2a	Area 2b	Area 2c	Area 3a	Area 3b
Rice farming	0	2	80	70	82	74	98
Chicken raising	27	25	80	58	92	68	91
Duck raising	10	10	20	78	13	27	12
A. <i>Small-scale</i>	10	9	19	40	7	27	12
B. <i>Medium-scale</i>	-	0	0	8	3	-	-
C. <i>Large-scale</i>	-	1	0	16	3	-	-
Salary workers	49	31	20	10	5	7	3
Daily wage workers	32	6	40	30	59	40	39
Small-scale entrepreneurs	19	31	12	5	7	3	4

Source: CENTDOR, Fieldwork in May 2008, Information provided by Village Head and Group Discussions

POULTRY PRODUCTION SYSTEMS

Poultry breed resources

Chicken breed resources

Similar chicken breeds are raised by all economic strata, except for the fighting cocks, which are raised by the better-off households only. The chickens are mainly domestic breeds. The breeds for fighting cocks come from different areas of the country as well as from Viet Nam, Malaysia and Myanmar, among others. It is not certain, however, if names of breeds are arbitrary or related to the countries of origin. The ISA Brown chicken breed is raised by a commercial chicken farm, which has now greatly decreased for various reasons: (i) increasing land prices; (ii) foul smells from chicken farms in the urban and sub-urban centres disturbing neighbours; (iii) increasing chicken feed prices; (iv) difficulty in obtaining chicks to raise since the HPAI outbreak and the phasing out of the supported project (Agrisud); and (v) loss of investment from the impact of disease outbreak in 2004.

The selection of chicken breeds to be raised is the same as in the 2007 study. Farmers stated that the selection criteria mainly depended on good appearance, such as large size, good feathers and yellow legs. But in practice, they keep any chickens that are resistant to diseases or climatic stress. As a result, chickens remaining in the house do not fit the criteria; local chicken breeds seem not to be clearly distinguished from each other. They are mainly identified by the colour of feathers only, for example, "black chickens", "white chickens" and "grey chickens". Since people suffer greatly from chickens lost to disease in the hot season, the chickens of any breeds that remain are most welcome for the next season. Farmers often ask for chickens from relatives or friends without caring which breed is offered.

Duck breeds

The choice of duck breeds to be raised is related to the type of production and geographical setting. There were only two main types of duck breeds raised identified: Ankam and Khaki Campbell. Ankam duck is found in the terrace area (Area 3a) and Khaki Campbell duck is predominantly found in sub-urban area (Area 1) and the sub-urban area (Area 2), especially in medium- and large-scale production systems. Muscovy duck is also found in the urban and sub-urban areas, but in small-scale production only.



Other birds raised in the villages studied

In addition to chickens, ducks and Muscovy ducks, other bird species are found: dove (for raising meat) (Thai breed), pigeon, geese, guinea fowl (for meat and decoration), blackbird and parrot (for decoration). There are only a small number of these birds in the community.

Chicken-raising systems

Small-scale chickens raising

As in the four provinces in the previous study, farmers usually start raising chickens in the early rainy season, May or June, due to its favourable conditions. However, there is no source of chick supply for small-scale chicken raising or the traditional chicken-raising system. If farmers mention that they “start to raise” chickens during this seasons, this may also mean that they “start to increase” the number of chickens due to the favourable conditions in early rainy season.

Small-scale or traditional chicken raising is characterized by 3–4 hens, no chicken house, no additional feed and no vaccinations.

- **Why do so many farmers keep just a few chickens only?** Similar to the findings in the previous study in 2007, this study found that animal feed and capacity to provide additional feed are the main criteria to determine the scale of chicken production. In villages where farmers have large rice cultivated land and can reap a large harvest, the scale of chicken-raising is also respectively large. Few farmers in each community have considered chicken raising as their main economic activities; they keep more than 10 and up to 100 hens and sell about 100-150 chicken annually. These farmers mostly build their houses far from the others (about 500 m or more). Since unlike villagers living close to each other and thus at risk of their chickens being infected by disease, these villagers can raise more chickens without risk.
- **Why don't many farmers build chicken houses?** From field observations and group discussions, only 10 percent of small-scale chicken raisers build chicken houses, which are not well made. Deciding on preparing a chicken house involves family discussion. On the one hand, farmers usually prepare a cattle house and chickens can stay there. On the other hand, for security reasons, they are not willing to prepare a chicken house or keep chickens in the chicken house at night time, since it would be easy for thieves to steal them all. They prefer, therefore, to let them sleep on the tree branches or in the cattle house. Many villagers stated that they took better care of cattle due to their higher value. They are not overly concerned if they lose one or two chickens, whereas loss of cattle is greatly felt. They allow chickens to stay in the cattle house rather than building a separate house for them. Poor and poorest households feel that housing for family members is much more important than having a chicken house. Since many of them live in very poor housing conditions, it was inappropriate to ask them why they do not build chicken houses.
- **How do farmers decide on building chicken houses?** Chicken houses can be built close to the main house or far away from the main house. This depends on security and the presence of male members in the family. If the villages where they live do not have good security, they prefer to build chicken houses connecting to the main house (farmers' houses) in order to take better care of their chickens. If, however, they have enough male members in



the family, they can take the risk of looking after chickens during the night and therefore may decide to build chicken houses far from their main house. Farmers raising cocks for fighting do prepare chicken houses since this is their main economic activity.

- **Why is additional feed usually not provided to small-scale chicken-raising?**

Farmers believe that chickens can find feed themselves and therefore believe that it is less expensive to raise them. Since they have rarely succeeded in chicken raising, they do not want to further invest in the business and prefer to keep chickens with minimum input. Some farmers only provide grains of rice to the chicken once or twice a day in order to check and count them.

- **Why do farmers not vaccinate their chickens?** Since farmers keep very few chickens, they are not interested in providing vaccinations. They also do not know how to vaccinate chickens nor understand its importance. VAHWs are mainly asked to provide veterinary services to pigs or cattle only. It is not surprising that they do not vaccinate their chickens, because they do not even vaccinate their children. Few farmers provide medicine to chickens in the hot season because they think that it would be additional stress. Some improvements have been made by small groups of farmers in small-scale chicken raising, however, the system is mainly practised by middle-income or better farmers in the rural areas:

- **Who is interested in using concentrate feed, vaccinations or medicines for chickens?** VAHWs often use additional concentrate feed and provide vaccinations and medicine because they can at least understand the instructions on the medicine labels and animal feed packages. When farmers buy medicine for their chickens, they ask the veterinary shop owners, who is often the district veterinarian, for instructions. Better-off households tend to provide the concentrate feed to chickens and improve chicken housing conditions, which results in a slight improvement in their poultry production.

Mr Teung Ki, living in Angkor Chum District in Seim Reap Province, raised three hens in 2007–8 (one year):	
How many eggs did he produce?	108
How many eggs did he sell for cash?	0
How many eggs did he share or give to relatives?	0
How many eggs were spoiled?	27
How many eggs were hatched?	81
How many chickens did he consume (heads)?	3
How many chickens got lost (heads)?	36
How many chickens were sold for cash (heads)?	42
How much did he invest in additional feeding (US\$)?	0
How much did he earn from the chickens raised (US\$)?	126
How much net cash income did he earn (US\$)?	126





Photo 5. Small-scale chicken raising in Toul Roveang village, Siem Reap Province

Two systems of raising fighting cocks have been observed: for sale and for cock fighting.

Raising fighting cocks for sale: This system is done by farmers, mostly by middle-income or better-off farmers. Fighting cock producers expect that cocks will be sold at a much higher price than the normal meat chicken. However, the expensive cock is only the cock that used to fight and win over its opponents. The more opponents it has defeated, the more expensive it is. One expensive cock can cost about US\$ 1,500 while the cheapest one is US\$30.

Raising fighting cocks for cock-fighting: This is a maintenance, not a raising system. Better-off households or those of high-ranking officers, often keep fighting cocks and occasionally engage them in cock fighting.



Photo 6. Cock-fighting rooster

Chicken diseases and controls

How serious is chicken disease from the farmers' viewpoint? Just as in the 2007 study, diseases are a major constraint in raising chicken. All farmers interviewed reported that many chickens die during the hot season, from February to April. This kind of loss has become the norm. They seem to have no solution nor try to find one. Newcastle and fowl cholera, or *Dangkor Kach*, are common chicken diseases in the hot season. Fowl pox, *Ot*, is common chick disease. Farmers do not carefully examine the disease or symptoms due to their yearly repetition. When chicks die from a disease, farmers erroneously assume that *Dankor Kach* is the reason and that it is normal for that season. When chickens die in different seasons, farmers assume that *Dangkor Kach* has attacked them in different seasons from past years. Most farmers in Siem Reap Province (Areas 3a and 3b) do not try to find solutions to the diseases, possibly due to the lack of a development project to promote poultry production. Farmers in the four previously studied provinces, on the other hand, tried both traditional and modern solutions as a result of the support of CEDAC, Veterinarians without Border (VFS) and Veterinarians in Rural Cambodia (VRC), the former Rehabilitation and Support Programme to the Agriculture Sector in Cambodia (PRASAC) project, and others.

Figure 1. Chicken disease and losses calendar

Type of chicken diseases	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Newcastle			■	■	■	■						
Climatic stress, but not serious (wet and cold)											■	■
Predators (rats, snakes)	■	■	■	■	■	■	■	■	■	■	■	■
Fowl pox			■	■		■	■					
Fowl cholera					■	■	■					
Favourable season							■	■	■	■	■	■
Many chicken die		■		■	■	■						

Source: CENTDOR, Fieldwork in May 2008

Commercial and large-scale chicken raising

Vaccinations and feeding with concentrate feed are commonly used in large chicken farms, which are well-equipped with farm materials. Large commercial chicken farms were first introduced in Siem Reap Province by Agrisud, a French NGO. Agrisud formed a group of farmers interested in raising chicken to supply the Siem Reap markets with both chicken eggs and chicken meat. At the initial stage, the system was strongly supported by Agrisud, including techniques, inputs supply (chicks, feed and vaccines) and marketing. Some start-up capital was also provided to chicken raisers, of approximately US\$500 per farmer, to purchase equipment to produce feed, raw materials for feed production, chicks, vaccines and medicines. Since the HPAI outbreak in 2004–5, in Cambodia and more seriously in Viet Nam, consumers have been afraid of eating poultry products, especially poultry products from commercial chicken and duck farms. Similarly, commercial chicken producers in Siem Reap Province have faced difficulties in selling their produce even without any direct cases of HPAI on their farms. A chicken of approximately 1.4 kg was sold for US\$1.5 at the beginning of the HPAI crisis, then fell to US\$1, then US\$0.50 and US\$0.25, and finally they were distributed free of charge. From



20 large farms, both Agrisud-supported and not, only four farms remained, in the Siem Reap urban and sub-urban centres.

Duck-raising systems

Scales and types of duck-raising systems

The production scale of ducks can easily be differentiated by wealth category, i.e. better-off, middle-income, poor and poorest farmers, and by geographical area, i.e. urban, sub-urban and terrace. The poorest households are not involved in duck raising because they cannot regularly afford to buy additional feed. Moreover, they are also not sure whether they will stay permanently at home to take care of the ducks. They often have to migrate for job opportunity. Very rich households are also not involved in duck raising because it is labour-intensive; they prefer less labour-intensive businesses or systems for which they can use hired, not family, labour.

The number of ducks kept is therefore related to the economic level of the household: poor households raise about 10–20 ducks, middle-income households raise about 200–500 ducks and better-off households raise about 500–2 000 ducks. People in the urban area do not raise ducks; people in the terrace area raise ducks (Ankam breed) only on a small scale; and people living in sub-urban area near Tonle Sap Great Lake raise ducks (Khaki Campbell) on a medium and large scale.

The Small-scale duck-raising system

To raise ducks on a small scale, ducklings can be bought directly from duckling vendors or at the hatchery houses in Pouk District Centre, Siem Reap Province. This system, which is mainly found in Area 3a, is well integrated into the entire household farm production system for several reasons: farmers can make use of their free time to be more productive; small-scale duck-raising requires less labour and permits them to stay at home; and accessing ducklings is easy due to the middlemen who come to sell them in the village, or from hatchery houses in Pouk District Centre. Moreover, small-scale production requires less investment than larger-scale production, both in start-up capital to buy ducklings and in feed. In addition, smallholder farmers can take advantage of the potential feed in the rice field during the rainy season and after the rice harvest. Finally, these farmers can obtain eggs for home consumption during the rice farming seasons when they have no time to harvest natural fish and no cash income to buy meat, so they can consume duck eggs with vegetables grown around their homesteads.

Caring and additional feeding: When ducks are small, protecting them from rats or dogs is crucial. Prior to leaving ducks in the rice field, farmers examine whether or not the fields have applied chemical pesticides to ensure that the ducks will not be poisoned with pesticide residue. When a duck is small, farmers provide it with paddy only once a day in the evening; when it is preparing to lay eggs, they give it more paddy.





Photo 7. Small-scale duck raising in Area 3a

Duck-raising by poor and middle-income households in the terrace area (Area 3a):

With 30 to 40 ducklings, producers can initially expect to have about 20 ducks remaining for egg-laying. Twenty ducks in the full production stage can lay about 10 eggs per day and fully provide food for the family for almost the entire rainy season.

Mr Chhouy Sokeoun, living in Varin District in Siem Reap Province, raised ten ducks for egg production, eight females and two males, in 2007–8 (one year):

How many eggs did he produce?	1 080
How many eggs did he consume?	1 060
How many ducks did he consume (heads)?	3
How many eggs did he sell for cash?	0
How many eggs did he share or give to relatives?	20
How much did he invest in ducklings (10 heads) (US\$)	12
How much did he invest in feed? (US\$)	60
How much did he earn from duck raising in cash? (US\$)	0
How much net cash income did he earn? (US\$)	0

Source: CENTDOR, fieldwork in May 2008

Medium-scale duck-raising systems

Duck farms with approximately 300-500 ducks are considered medium-scale. The decision to raise ducks at this scale is determined by the farmer's financial capacity both for buying ducklings and duck feed during the raising period. Different types of systems require different financial investments, even at the same scale. The findings from the study in Siem Reap Province were similar to the four provinces previously studied. Layer duck raising yields a higher profit than mixed duck raising, which yields a higher profit than broiler duck raising. Different investment capacities are required according to the type of duck raised: at the medium scale, a reserved capital of at least about 12 million riels (US\$3 000); 2 million riels (US\$500) for mixed duck raising and 0.5 million riels (US\$200) for broiler duck raising in the scavenging system. This cost is for ducks only; it does not include the living costs of the duck raisers. Access to loans for family and non-family members are required.



Ms Phun Phorn, living in Siem Reap District in Siem Reap Province, raised 400 ducks for egg production in 2007–8 (one year):	
How many eggs did she produce?	90 000
How many eggs did she consume?	150
How many eggs did she sell for cash?	89 850
How many spent layer ducks did she sell for cash? (heads)	370
How many ducks were lost by disease? (heads)	30
How many eggs did she share or give to relatives?	0
How much did she invest in layer ducks? (US\$)	1 100
How much did she invest in feed and vaccines? (US\$)	8 030
How much did she earn from selling eggs? (US\$)	10 108
How much did she earn from selling spent layers? (US\$)	740
How much net cash income did she earn? (US\$)	1 718

Source: CENTDOR, fieldwork in May 2008

Mr Em Eouey, living in Pouk District, Siem Reap Province, raised 500 ducks for broiler production in 2007–8 (one year):	
How many ducks did he produce? (heads)	500
How many ducks did he consume? (heads)	15
How many ducks did he sell for cash? (heads)	335
How many ducks died from disease? (heads)	150
How many duck did he share or give to relatives? (heads)	0
How much did he invest in ducklings? (US\$)	112
How much did he invest in feed? (US\$)	253
How much did he invest in vaccines and medicine? (US\$)	50
What was the amount of the MFI loan that he took out? (three months) (US\$)?	500
What did he have to repay to the MFI (US\$)	515
How much did he earn from ducks? Stage 1 (US\$)	15
How much do he earn from ducks? Stage 2 (US\$)	650
How much net cash income did he earn?	233

Source: CENTDOR, fieldwork in May 2008

Duck raising for egg production from the mixed ducks-raising system in the middle-income household: starting with 400 to 500 ducklings, about 300–400 will reach the laying stage. In the full production stage, 300–400 ducks can lay about 200–300 eggs per day. Ducklings can be purchased from hatchery houses in Pouk District. Farmers buy “mixed” ducks, i.e. about half male and half female. Normally, female ducklings are more expensive, at approximately 1 000 riels/head, while male ducklings cost about 700 riels/head.

Why do farmers raise mixed ducks? There are financial issues surrounding this decision. When they raise mixed ducks, they can sell male ducks in the mid-term of their production, so that they can earn cash to continue to feed female ducks until they produce eggs. Production of ducks for eggs yields a higher profit than for meat. But if they have limited financial capacity to feed female ducks, they have to raise mixed ducks. On the contrary, if they have the financial capacity to raise layer ducks, they can raise all female ducks, but they must ensure that they have other sources of income to buy feed for the female ducks until they produce eggs. If they have very critical financial constraints, however, they will decide to raise ducks for meat only (broiler ducks), since during periods of cash shortages, instead of buying feed



for their ducks, they can depend on natural feed in the free scavenging system in the rice field or water body.

The large-scale duck-raising systems

For large duck farms, vaccinations and concentrate feed have become commonly used, especially after the outbreak of HPAI and other diseases in 2004. Large-scale duck farms mainly use family labour. Additional workers are employed when they practise the free scavenging system. Large-scale duck raising for egg production and meat production is done primarily by medium and better-off living households. When using 1 500 to 2 000 ducklings, they can be mixed, half male and half female; males are sold for cash and females are kept for egg production.

Similar to the four provinces previously studied in 2007, from 1 500–2 000 mixed ducks, about 500-600 female ducks survive. At the full production stage, they can lay about 400 to 500 eggs/day. To secure cash incomes to buy feed for the next generation of ducks, farmers will add the new duck generation by October, but actually one cycle of layer duck raising is 18 months.

Table 7. Cycle of duck raising and restocking

Duck generation	First six months Oct – Mar	Second six months Apr – Sept	Third six months Oct – Mar	Forth six months Apr – Sept	Fifth six months Oct – Mar
Generation 1	Raising ducklings	- First round of egg production - Selling male ducks	- Second round of egg production - Finishing egg production		
Generation 2			Raising duckling	- First round of egg production - Selling male ducks	- Second round of egg production - Selling layer ducks - Finishing egg production

Source: CENTDOR, Fieldwork in May 2008

Duck raisings systems and sub-systems in Siem Reap can be summarized as follows:

- raising ducks for egg production from ducklings;
- raising ducks for egg production by purchasing ducks at the preparing-to-lay eggs stage (layer ducks);
- fattening ducks for sale: purchasing ducks at about 0.5 kg/head and fattening them up to 1–1.2 kg/head for sale, which requires about seven to eight weeks.
- raising mixed ducks from ducklings and selling male ducks to the slaughterhouse and female ducks to duck egg producers;
- raising mixed ducks from ducklings, selling male ducks to the slaughterhouse and keeping female ducks for egg production.



Mr Kouy Lart, living in Siem Reap District in Siem Reap Province, raised 1 600 ducks for egg production in 2007–8 (one year):	
How many eggs did he produce?	292 000
How many eggs did he consume?	200
How many eggs did he sell for cash?	291 600
How many eggs did he share or give to relatives?	200
How much did he invest for 1 600 layers ducks) (US\$)	4 400
How much did he invest in feed? (US\$)	23 600
How much did he invest in vaccines and medicines? (US\$)	33
How much did he earn from duck eggs? (US\$)	33 818
How much did he earn from the spent layer ducks? (1600 heads) (US\$)	3 200
How much net cash income did he earn? (US\$)	5 784

Source: CENTDOR, Fieldwork in May 2008

Mr Bouy Leang, living in Siem Reap District in Siem Reap Province, raised 1 300 ducks for egg production and broiler production (mixed production) in 2007–8 (one year):	
How many ducks did he produce? (heads)	1 300
How many ducks did he consume? (heads)	5
How many ducks did he sell for cash? (heads)	1 280
How many ducks died from disease? (heads)	15
How many ducks did he share or give to relatives? (heads)	0
How much did he invest in ducklings? (US\$)	292
How much did he invest in feed? (US\$)	1 200
How much did he invest in vaccines and medicines? (US\$)	25
How much did he earn from the adult ducks in cash? (US\$)	2 080
How much net cash income did he earn? (US\$)	562

Source: CENTDOR, Fieldwork in May 2008

Mr Sen Nol, living in Siem Reap District in Siem Reap Province, raised 1 000 ducks for broiler production in 2007–8 (one year):	
How many ducks did he consume? (heads)	35
How many eggs did he consume?	300
How many eggs did he give to relative/ neighbours?	240
How many eggs did he sell for cash?	500
How many ducks did he sell for cash? (heads)	950
How many ducks did he share or give to relatives? (heads)	15
How much did he invest in ducklings? (US\$)	225
How much did he invest in feed? (US\$)	794
How much did he invest in vaccines and medicines? (US\$)	13
How much did he earn from duck raising in cash? (US\$)	1 900
How much did he earn from eggs in cash? (US\$)	53
How much net cash income did he earn? (US\$)	922

Source: CENTDOR, Fieldwork in May 2008



It should be pointed out that medium- and large-scale duck raising are profitable economic activities, but also risky. For example, if 1 000 layers can produce 500 eggs/day, this only covers the feed expenses for ducks; over 500 eggs/day is the daily income above feed expenses. In one year, one layer can produce about 220 eggs on average.

In the best case scenario (a 100 percent success rate) where ducks are not affected by diseases, it can be calculated as follows:

- 120 eggs/layer to cover feed (and other expenses);
- 30 eggs/layer to cover the layer cost (one layer costs US\$3);
- 70 eggs/layer as the margin per layer;
- Spent layer ducks can be sold at US\$2/head.

The margin from 1 000 layer ducks/year = (70 eggs x 400 riels/egg x 1 000 layers + US\$2/ layer is estimated at approximately US\$9 000.

However, producers can normally achieve a success rate of only about 70-80 percent. Therefore, per year a large-scale farm (1 000 ducks) can achieve a margin of about US\$6 000–7 000 year.

Source: CENTDOR, Fieldwork in May 2008

Constraints to duck raising in Siem Reap Province

In the previously studied provinces, due to the increase of crop damage by pests, such as insects, crabs and rats, the use of pesticides in the rice farming practices increased, which became a major constraint. But in Siem Reap Province, this was not a major constraint since ducks do not freely scavenge in the field after the rice harvest season (Areas 2a and 2c), except in the small-scale duck-raising system (Area 3a). The large-scale duck-raising system in Siem Reap Province is within a fencing system; here, a major constraint for duck raisers is the increased price of duck feed.

Figure 2. Duck raising calendar

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Raising ducklings for medium-and large-scale flocks begins										■	■	
Male ducks are sold	■	■										
Eggs are laid			■	■	■	■	■	■	■			
Many ducks die					■	■						

Source: CENTDOR, Fieldwork in May 2008





Photo 8. Large-scale duck raising in Kork Pour Village (Area 2), Siem Reap Province



Photo 8, Large-scale duck raising in Brolay Village (Area 2), Siem Reap Province



Photo 9. Duck hatchery in Pouk District, Siem Reap Province



Photo 10: Duckling supply in Pouk District, Siem Reap Province

Muscovy duck-raising systems

Muscovy duck is mainly found in the sub-urban centre. Muscovy duck is a kind of poultry that is currently easier to be raised or sold. Farmers rarely sell the eggs because they keep them for hatching and continue to raise them the following year. This breed can be raised throughout the year and produce eggs, and hatch ducklings naturally. According to tradition, it is believed that Muscovy duck raising for commercial purposes brings bad luck. However, since there is a demand for Muscovy duck meat in the restaurant market, there are farmers who now no longer follow this belief and invest in Muscovy duck farms. Young people are willing to challenge this traditional belief, raising this duck and most often gaining a satisfactory profit.

Some farmers also reported not wishing to raise Muscovy ducks because they make the ground dirty and it is difficult then for their children to play on.

In general, the production scale of Muscovy duck is much smaller than that of normal duck (Ankam Duck or Khaki Campbell). In this study, small-scale Muscovy duck production was less than 20 ducks; medium-scale ranged from 20-50 heads; and large-scale, more than 50 heads. Muscovy ducks are raised in residential areas, hence in a fencing system. A connection with a water system is necessary. They are fed with concentrate feed. Whereas farmers have to sell almost all their Khaki Campbell or Ankam ducks almost at once, they can sell the large Muscovy ducks and continue to raise the remaining smaller ones. In one year, farmers can sell Muscovy ducks either 4-5 times, or at any time depending on their need for money to support their families. In general, Muscovy duck raising has increased over the last 3-4 years due to market demand and its resistance to disease.

Ms. Ngan Houy, living in Pouk District in Siem Reap Province, raises 10 Muscovy ducks in 2007–8 (one year):	
How many eggs did she consume?	70
How many eggs did she sell for cash?	0
How many eggs did her ducks hatch?	335
How many Muscovy ducks did she consume (heads)?	20
How many eggs did she share or give to relatives?	0
How much did she invest in ducklings? (US\$)	0
How much did she invest in feed? (US\$)	180
How much did she earn from duck raising in cash? (90 heads) (US\$)	725
How much net cash income did she earn? (US\$)	545
How much did she invest for the next generation (for 12 heads – i.e. ten females and two males) (US\$)	12

Source: CENTDOR, Fieldwork in May 2008



Photo 11. Muscovy duck raising in Area 1, Siem Reap Province

Labour division in poultry-raising systems

Similar to the previous study, it has been found that in small-scale chicken- and duck- raising systems, women play a more important role than men. However, in the medium- and large-

scale duck-raising systems, men play more important roles than women, especially in the free scavenging system.

The division of child labour depends on gender: sons share responsibilities with their fathers, and daughters share responsibilities with their mothers. Findings in Siem Reap Province are different concerning the male and female labour allocation in poultry systems from the four provinces previously studied. In Siem Reap Province, the roles of men, women and children are clearly defined and differ by areas. This is because they are the dominant economic activities and livelihood systems in each area: in the urban area, few people engage in poultry raising, except some commercial chicken raising; in the sub-urban area, there are medium- and large-scale duck raising; and in the terrace area, there are chicken and small-scale duck raising.

In commercial chicken raising, the system is run by external labour and a manager. The owner engages in other economic activities. On the contrary, in medium- to large-sale duck raising, there is a strong demand for family labour. Even when external labour is hired to work on the farm, family labour is still very important. Thus, households that do not have enough family labour do not engage in medium- and large-scale duck raising.

Table 8-11 show an estimate of the share of tasks and responsibilities for different activities (as proportion) undertaken by men, women and children. This is based on the results from men's and women's group discussions, and when possible, also youth group discussions. In general, in the men's groups, men tend to slightly over-report their responsibilities, while in women's group, women tend to slightly over-report theirs. Additionally, this data is also cross-checked with individual case studies to gain insight into how men, women and children share responsibilities in each activity. The production scale is a main factor in sharing responsibility.

Table 7. Relative share of men, women and children in chicken-raising activities

Description of activities	Men (%)	Women (%)	Children (%)
Selecting new birds	50	40	10
Buying or asking for new birds	30	60	10
Building houses	60	10	30
Purchasing additional feed	10	70	20
Preparing feed	10	60	30
Buying medicine/vaccines	30	70	0
Providing water	20	60	20
Providing feed	20	60	20
Cleaning houses	10	50	40
Repairing houses	70	10	20
Treating diseases	40	50	10
Vaccinating	90	10	0
Collecting eggs for sale	0	80	20
Transporting eggs for sale	70	20	10
Selling eggs	10	90	10
Catching chickens for sale	50	20	30
Selling chickens	10	70	20
Slaughter the birds	10	60	30
Preparing nests	30	50	20
Preparing materials to take care of small ducks (e.g. preparing their nests)	70	10	20
Buying materials to take care of small chickens	50	30	20
Feeding of small chickens	10	60	30
Total activities	34	47	19

Source: CENTDOR, Fieldwork in May 2008



Table 8. Relative share of men, women and children involved in small-scale duck raising in the free scavenging system

Description of activities	Men (%)	Men (%)	Children (%)
Selecting new birds	40	60	0
Buying or asking for new birds	20	70	10
Building houses	50	30	20
Buying additional feed	10	60	30
Preparing feed	20	60	20
Buying medicine/vaccines	40	40	20
Providing water	20	60	20
Providing feed	20	60	20
Cleaning house	10	50	40
Repairing houses	40	40	20
Treating diseases	30	60	10
Vaccinating	0	0	0
Collecting eggs for sale	10	50	40
Transporting eggs for sale	20	50	30
Selling eggs	10	50	40
Catching ducks for sale	20	50	30
Selling ducks	10	70	20
Slaughter the birds	50	10	40
Preparing nests	10	60	30
Preparing materials to take care of small ducks (e.g. preparing their nests)	80	10	10
Buying materials to take care of small ducks	30	60	10
Feeding small ducks	10	70	20
Total activities	26	51	23

Source: CENTDOR, Fieldwork in May 2008

Table 9. Relative share of men, women and children in activities of free scavenging of medium- and large-scale duck-raising systems

Description of activities	Men (%)	Women (%)	Children (%)
Selecting new birds	90	10	0
Buying or asking for breeds	90	10	0
Building houses	70	10	20
Buying additional feed	50	30	20
Preparing feed	40	40	20
Buying medicine/vaccines	50	40	10
Providing water	40	30	30
Providing feed	40	30	30
Cleaning house	50	20	30
Repairing houses	60	20	30
Treating diseases	50	40	10
Vaccinating	70	10	20
Collecting eggs for sale	30	30	40
Transporting eggs for sale	50	40	10
Selling eggs	20	60	20
Catching ducks for sale	50	20	30
Selling ducks	40	50	10
Slaughter the birds	60	10	30
Preparing nests	0	0	0
Preparing materials to take care of small ducks (e.g. preparing their nests)	40	40	20
Buying materials to take care of small ducks	50	40	10
Feeding small ducks	40	40	20
Total activities	51	29	19

Source: CENTDOR, Fieldwork in May 2008



Table 10. Relative share of men, women and children in the confined medium- and large-scale duck production system

Description of activities	Men (%)	Women (%)	Children (%)
Selecting new birds	90	10	0
Buying or asking for new birds	90	10	0
Building houses	50	20	30
Buying additional feed	50	30	20
Preparing feed	40	40	20
Buying medicine/vaccines	50	40	10
Providing water	40	40	20
Providing feed	40	40	20
Cleaning houses	40	40	20
Repairing houses	50	20	30
Treating diseases	50	30	20
Vaccination	60	10	30
Collecting eggs for sale	30	40	30
Transporting eggs for sale	50	40	20
Selling eggs	20	60	20
Catching ducks for sale	50	20	30
Selling chickens	30	50	20
Slaughter the birds	40	30	30
Preparing nests	0	0	0
Preparing materials to take care of small ducks (e.g. preparing their nests)	40	40	20
Buying materials to take care of small ducks	40	40	20
Feeding small ducks	30	50	20
Total activities	46	33	20

Source: CENTDOR, Fieldwork in May 2008

Dynamics in poultry-raising systems

Farmers' knowledge in poultry-raising systems

Poultry production has been practised for many generations in the community as one of the traditional activities of rural people. The case interviews show that, duck producers have been involved in duck raising for many years and knowledge has been passed on from their parents or relatives.

New knowledge and innovations are also obtained from producers' training provided by both the government and NGOs on a variety of topics, including: the use of modern inputs; hybrid poultry breeds; medicine and vaccinations; concentrate feed; and the use of poultry farm equipment. For example, commercial chicken raising in Siem Reap Province was first introduced by Agrisud.

In the previous 2007 study, hens were found to be more valuable than cocks, but some farmers preferred to raise cocks or male chickens to be castrated. Since the castrated cocks provide good-tasting meat, they can yield double the price of normal male chickens. This was not found to be the case in Siem Reap Province, however.

Prevention of the loss of potential produces

In addition to unfavourable conditions in the hot season, many people living in Siem Reap Province believe to know the cause of problems relating to poultry death. They often complain that their neighbours bring dead or sick chickens or ducks to eat and leave the waste or the feathers on the ground, which contaminates their chickens during scavenging for feed. However, they themselves do the same thing. Unlike the four provinces previously studied, the farmers in Siem Reap Province do not invent many ideas to improve poultry production. Since



the outbreak of HPAI in 2004–5, one significant adoption in medium- and large-scale duck raising has been vaccination and treatment. The findings in the four previously studied provinces showed that many farmers had tried both traditional, botanical medicine and modern medicine to cure or prevent poultry diseases, especially those related to chickens.

Constraints in poultry-raising systems

Technical, economical and natural constraints

The hot climate in the dry season and lack of water are the major constraints on chicken raising. These conditions lead to the susceptibility of chickens to diseases. Chicken disease is a serious limitation to scaling up or expanding the sector. Presently, farmers cannot depend on available knowledge to prevent chickens from contracting diseases.

Feeding can be a major constraint for duck raising: there is only one feed company in Siem Reap Province. Recently feed had become increasingly expensive every season or even every month.

The land availability constraint

Raising chickens under the free scavenging system requires adequate ground space. Thus, in villages where settlements are close to each other (in the urban area and the sub-urban area), farmers reported that they had difficulty in raising chickens. Since people were aware of HPAI, mainly in the urban centre, better-off households discouraged the poor households around them to keep free scavenging chickens in their backyard or homestead. Thus, the numbers of chickens raised in the urban centre is strongly reduced.

Socio-cultural constraints

Similar to 2007 study, several cultural constraints were identified: poor households feel that they are not supposed to raise Muscovy ducks, small white chickens and geese; widows are not supposed to raise Muscovy ducks because they believe that it will bring them bad luck; and old people are not allowed to raise animals for commercial or consumption purposes because they should devote themselves to Buddhism. Theft is also reported to be a constraint to the households; due to insufficient male household members to protect them from theft, they are unable to raise poultry or to enlarge their poultry production. In particular, due to personal security, women are excluded from large-scale duck raising in free scavenging systems, which depends on flocks scavenging freely on fields, far away from home.

ROLES OF POULTRY PRODUCTION SYSTEMS

Roles of poultry production in farming systems

The rice-duck system is well known in Siem Reap Province, especially in Area 3a. Farmers use free scavenging ducks in the rice field, which can make rice grow much better, since it provides manure to fertilize the soil and aerate soil and water. Ducks also eat insects on the rice plant but they can only be integrated into the rice field at certain rice growing stages, particularly the tillering stage. At this stage, ducks are welcome to scavenge in any fields of the owners or of others. Except for the early stage and before rice harvest, ducks are not allowed to go into rice fields. Only the small-scale duck-raising system can be integrated with rice farming; large-scale duck raising is not suitable. Since ducks are very sensitive to strange



noises, strong winds or hard rain they will run into the forest, if they suddenly become scared of hard rain or strong wind. If they see rice fields close by, they will run through them, which causes their complete destruction.

In addition to directly introducing ducks into the rice field, duck manure is also used as fertilizer for rice farming and vegetable growing. The system is mainly found in the sub-urban area (Area 2b).

Roles of poultry production in socio-cultural practices

The 2007 study found that farmers would ask each other for some young chickens or ducks, or would give one or two chickens to other households for raising (breeding), particularly to relatives and close friends, since the chickens purchased from the market might not be free from diseases.

Moreover, parents, relatives and elders in rural areas still make a gift of chickens to newly married couples. This practice shows their kindness and full support to the newly married couple. They welcome the in-law as a member of the entire family line. In 2008, however, the practice of donating chickens has become less common, since chickens have become increasingly more expensive.

In addition to donations, chickens still play important roles in household socio-cultural practices, especially in hosting honoured guests, respected relatives or close friends.

Roles of poultry production in household economics

Respondents often reported that they raise chickens for home consumption and selling, but the level of both varies from one economic group to another: better-off groups raise chicken mainly for home consumption; middle-income groups raise chickens and ducks for consumption and selling; poor groups raise chicken for welcoming honoured guests and for sale; and the poorest groups do not greatly involve in poultry production. If middle-income and better-off households engage in duck raising, it becomes a main economic activity from which their livelihoods are almost totally dependent.

Summarized, chickens in households have the following economic roles:

- Household food consumption. Chicken raising is mainly for consumption in the better-off families, especially in the rainy season when they are busy with rice farming and during the ceremony seasons.
- Income-generation. Chickens are a source of cash income-generation to meet urgent needs such as paying for medical treatment, paying off debts, buying school uniforms for children and buying food during food shortages.

Since chickens are easy to sell, farmers living close to the market (Area 3a) have more chickens than those living far away (Area 3b). It is also important to note that farmers often talk about the greater importance of chickens than ducks, since almost all of them are involved in chicken raising; not all farmers can be involved in duck raising. But for those involved in duck raising, it can be a main economic activity for their families.

Tables 12–15 show the share of household income from chicken and duck raising by each sub-area and socio-economic group. Data on how many households are considered in each socio-economic group are obtained from group discussions, while data on the amount of



household income obtained from poultry and total annual household income are obtained from case studies. Income from poultry is calculated in percentage of total annual household income for the different socio-economic groups.

Table 11. Share of household income from chicken or duck, Area 1a

Households	Chicken raising (%)	Duck raising (%)	Others activities (%)	Average income from poultry (US\$/year)
Poorest	1	0	99	15
Poor	2	0.5	97.5	56
Middle-income	2	0.5	97.5	93
Better-off	1	0	99	62

Source: CENTDOR, Fieldwork in May 2008

Table 12. Share of household income from chicken or duck, Area 1b

Households	Chicken raising (%)	Duck raising (%)	Others activities (%)	Average income from poultry (US\$/year)
Poorest	1	0.5	98.5	22
Poor	2	1	97	67
Middle-income	1	50	49	1 912
Better-off	1	2	97	187

Source: CENTDOR, Fieldwork in May 2008

Table 13. Share of household income from chicken or duck, Area 2a

Households	Chicken raising (%)	Duck raising (%)	Others activities (%)	Average income from poultry (US\$/year)
Poorest	2	0	98	20
Poor	2	1	97	45
Middle-income	3	70	27	1 277
Better-off	2	50	48	1 820

Source: CENTDOR, Fieldwork in May 2008

Table 14. Share of household income from chicken or duck, Area 2b

Households	Chicken raising (%)	Duck raising (%)	Others activities (%)	Average income from poultry (US\$/year)
Poorest	2	1	97	30
Poor	2	2	96	70
Middle-income	2	55	43	1 425
Better-off	3	2	95	225

Source: CENTDOR, Fieldwork in May 2008

Table 15. Share of household income from chicken or duck, Area 2c

Households	Chicken raising (%)	Duck raising (%)	Others activities (%)	Average income from poultry (US\$/Year)
Poorest	3	1	96	25
Poor	4	2	94	97
Middle-income	2	30	68	1 200
Better-off	1	30	69	2 325

Source: CENTDOR, Fieldwork in May 2008 US\$1 = 4 000 riels

Table 16. Share of household income from chicken or duck, Area 3a

Households	Chicken raising (%)	Duck raising (%)	Others activities (%)	Average income from poultry (US\$/year)
Poorest	4	1	95	25
Poor	4	2	94	52
Middle-income	4	2	94	134
Better-off	3	2	95	175

Source: CENTDOR, Fieldwork in May 2008 US\$1 = 4000 riels

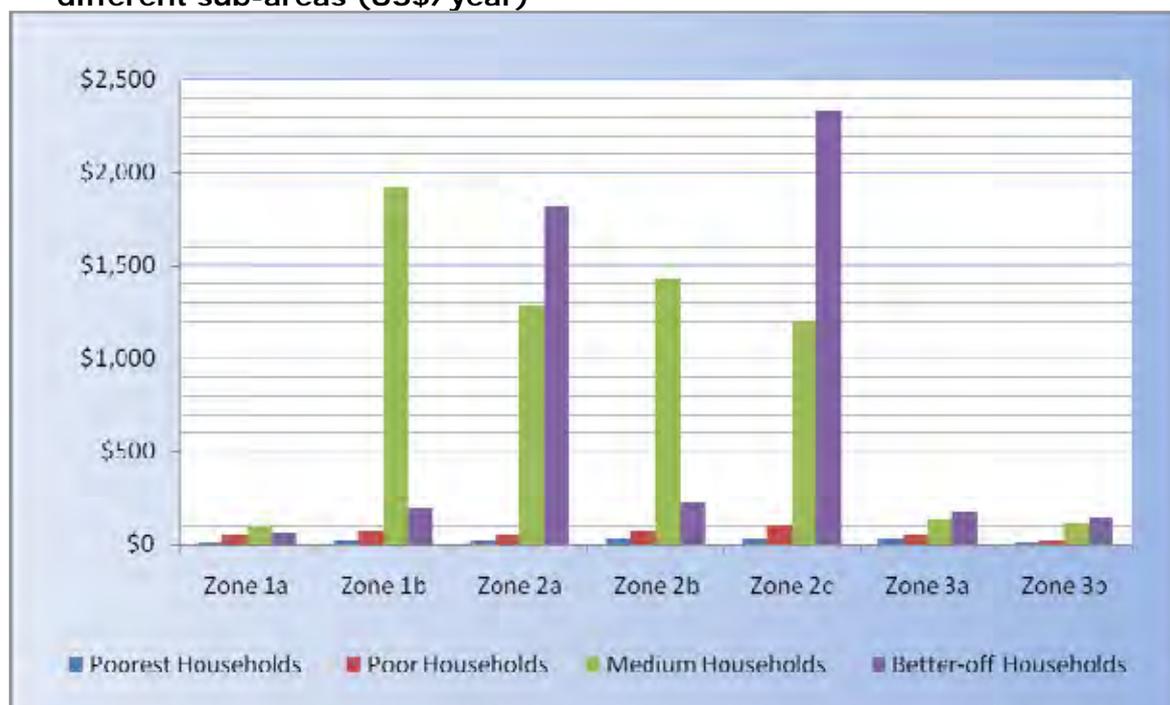


Table 17. Share of household income from chicken or duck, Area 3b

Households	Chicken raising (%)	Duck raising (%)	Others activities (%)	Average income from poultry (US\$/year)
Poorest	3	0	97	10
Poor	3	1	96	20
Middle-income	11	3	86	111
Better-off	5	2	93	140

Source: CENTDOR, Fieldwork in May 2008 US\$1 = 4 000 riels

Figure 3. Comparison of household net income from poultry production in different sub-areas (US\$/year)



	Zone 1a	Zone 1b	Zone 2a	Zone 2b	Zone 3a	Zone 3b	Zone 3c
Poorest household	15	22	20	30	25	25	10
Poor household	56	67	45	70	97	52	20
Middle-income household	93	1 912	1 277	1 425	1 200	134	111
Better-off household	62	187	1 820	225	2 325	175	140

Source: CENTDOR, Fieldwork in May 2008 US\$1 = 4 000 riels



POULTRY TRADE AND DISTRIBUTION NETWORK

Trade in poultry-related products

Chickens, ducks, including Muscovy ducks, are commonly traded by producers and middlemen. The related products of chickens and Muscovy ducks are not as diversified as those of the Mallard-type ducks. The chickens and Muscovy ducks are sold mainly as adult animals, while Mallard-type ducks are sold in a wide range of related products: duck eggs, ducklings, ducks ready to lay eggs (layer ducks), spent layer ducks and fertilized eggs.

Trading of chickens and related products is very active in the dry season to supply weddings and religious ceremonies. In February, there is a high demand for both ducks and chickens for the Chinese New Year ceremony, when farmers often sell chickens at a high price due to the market demand. Cambodia is a country known for its enjoyment of many ceremonies of different cultures: Khmer, Chinese and Christian.

Poultry trading activities and marketing networks

The 2007 study found that chickens and ducks and their related products were important commodities traded in the poultry sector. In many villages, there were middlemen. However, the trading volume varied according to the population and production scale of poultry in the village and villages nearby. Poultry products were not only sold to the middlemen in their own villages, but also to middlemen from other villages. The choice of middlemen depends on the buyer-seller relationship and the price offered.

The 2008 study, however, found that most duck raisers in Siem Reap Province (Area 2a, Area 2b and Area 2c) had direct contact with middlemen or slaughterhouses in Siem Reap Town. Duck raisers bought ducklings directly from hatchery houses and sold ducks or duck eggs directly to slaughterhouses or middlemen in the market.

The value chain of the duck commodity in Siem Reap Province is short. In contrast, in the 2007 study, the duck value chain was long: from hatchery houses, to middlemen for ducklings or duckling vendors, duck raisers, middlemen for ducks or duck eggs, to traders or importers to the main city, and then to slaughterhouses.

Actors in chicken trading

Collectors play an important role in chicken-trading activities. The coverage area of the collectors can vary according to the social network and financial capital. They often travel from one house to another house, one village to another village by motorbike. They sell their chickens to market retailers, middlemen or slaughterhouses. Farmers tell collectors that they want to sell their birds, and then the collectors make an appointment to get them, normally one or two days later (Area 3b). Some farmers who can access the market easily (Area 3a) and are used to petty trade in the market, prefer to sell chickens directly on the market themselves since they feel that the collector always cheats on the weight of their chickens.

In Area 3a, since villages are located along the road, if farmers wish to sell chickens, they can catch them and display them along the road. When middlemen arrive, they negotiate prices with them. In Area 3b, selling behaviour is different: middlemen go directly to the farms to buy them.



Table 18. Price of chicken products in 2007–2008

Chicken	Farm gate price (riels/kg)		Market retail price (riels/kg)	
	Normal season	Ceremony season	Normal season	Ceremony season
Hens over 1 kg	11 500–12 500	12 500–13 500	14 500–15 500	15 500–16 500
Hens under 1 kg	11 500–12 500	12 500–13 500	14 500–15 500	15 500–16 500
Roosters over 1 kg	11 500–12 500	12 500–13 500	14 500–15 500	15 500–16 500
Roosters over 3 kg	7 000–7 500	7 500–8 000	8 000–8 500	8 500–9 000

Source: CENTDOR, Fieldwork in May 2008 US\$1 = 4 000 riels

Actors in duck trading

- Egg collectors:** The 2007 study found that in the area where there are duck egg producers, middlemen often come to purchase the eggs. They offer lower prices for small amounts of duck eggs than for large amounts, due to the time spent in collection from one house to another. This leads producers to collect eggs themselves and bring them to one site. Duck egg producers who have small amounts of eggs bring them to the house of those who have large amounts. Duck egg collectors sell eggs to the hatchery house or egg retailers at the market. In this 2008 study, however, it was found that middlemen or hatchery houses had direct contact with egg producers. This might be due to the fact that the production area was not far from the consumption area, unlike in the previous study. In this case, the proximity helps to facilitate the marketing of egg products.
- Duckling suppliers (hatchery houses):** Duck raisers have to buy ducklings from the duckling producers (hatchery houses), who have specialized knowledge and skills that allow them to satisfy their clients' demands. For instance, they can separate male or female ducklings at one day old. They can identify which fertilized eggs will provide good ducklings and which will not. They can therefore decide which to sell for food or to sellers of cooked fertilized eggs. Most duck raisers buy ducklings from a hatchery house regardless of the size of production: small-, medium- or large-scale, unlike in the previous study, in which small-scale duck raisers mostly buy ducklings from duckling vendors.
- Slaughterhouses and middlemen:** Farmers sell broiler ducks or spent layer ducks mostly to the permanent clients, because there are less middlemen than in trading chicken. They have also built long-term relationships in the business. Slaughterhouses and restaurant owners also purchase small ducks at low prices and hire local people to take care of them for a few weeks. Then they exclusively select the large ones to serve their clients. Duck food vendors can go to the villages to buy ducks because they require a certain size. Restaurant owners, on the other hand, get duck raisers to bring ducks to them and they do not mind slight differences in size of ducks delivered.



Table 19. Price of duck products

Duck commodity	Unit/cost	Normal season	Ceremony season
Duck eggs	Riels/egg	420–430	440–450
Female ducklings	Riels/head	1 000–1 100	1 000–1 100
Male ducklings	Riels/head	800–900	800–900
Duck-laying eggs	Riels/head	11 000	11 000
Spent layer duck	Riels/head	8 500–9 000	9 500–10 000
Broiler ducks	Riels/head	7 500 8000	7 500 8000
Female Muscovy	Riels/head	25 000–27 000	28 000–30 000
Male Muscovy	Riels/head	40 000	40 000

Source: CENTDOR, Fieldwork in May 2008US\$1= 4 000 riels

Demands and supply of poultry products in Siem Reap Town

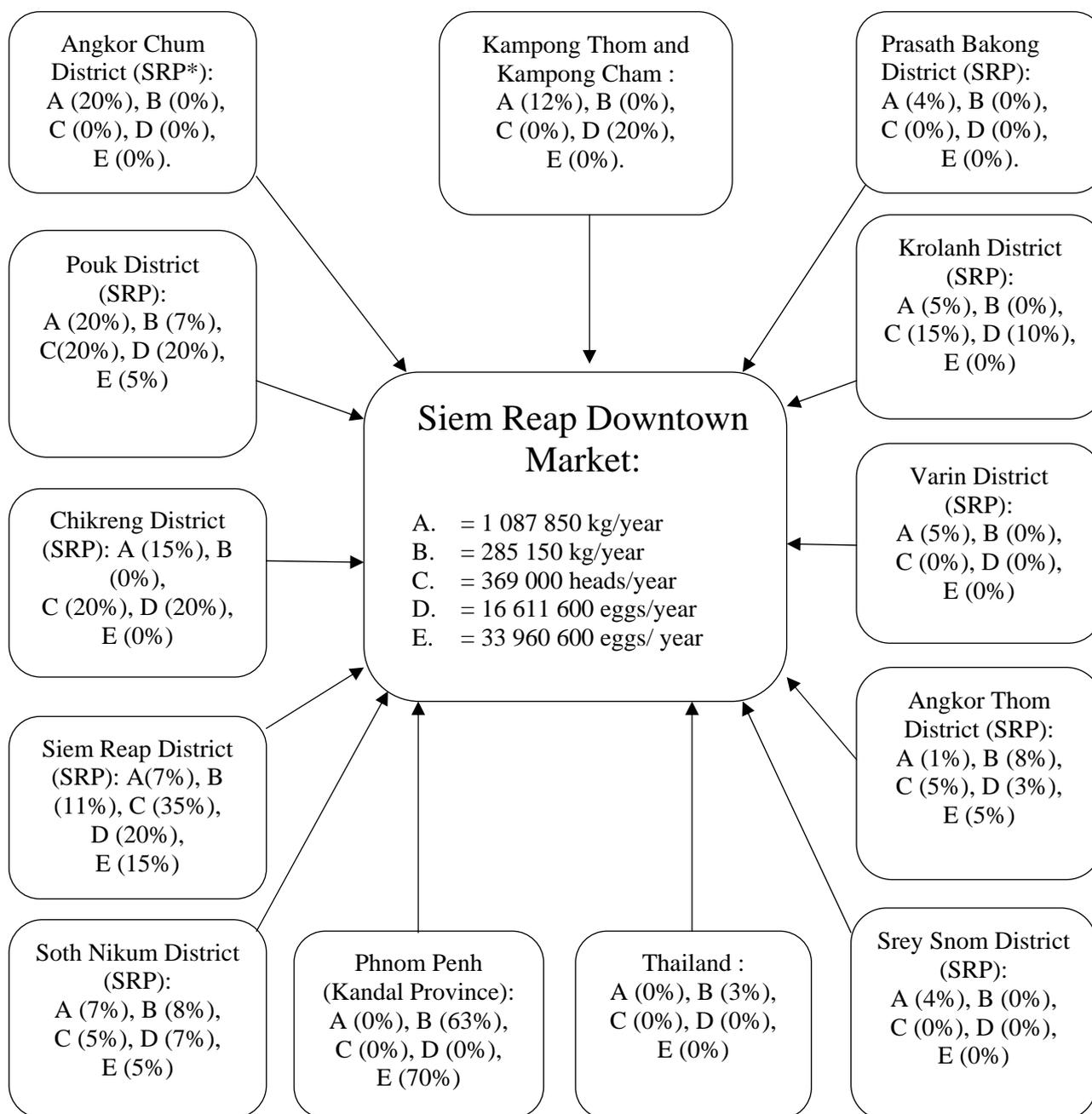
Poultry producers in Siem Reap Province have difficulty in supplying the large demand of its provincial town. Poultry meat and eggs are imported from other sources to supply Siem Reap Town, mainly from large chicken farms located close to Phnom Penh (Kandal Province) and large-scale duck raising in Kampong Cham and Kampong Thom. There is import of commercial chicken meat from Thailand, but it is not possible to assess the amount due to its illegality. According to the estimate of poultry market actors, it remains very small, because this chicken meat is not preferred by consumers.

This study estimated the supply of poultry products and sources in 2007–8 as follows:

- A. Local chicken imported to Siem Reap Town = 1 087 850 kg/year
- B. Large farm chicken supplies to Siem Reap Town = 285 150 kg/year
- C. Duck supplies to Siem Reap Town = 369 000 Heads/year
- D. Duck eggs supply to Siem Reap Town = 16 611 600 Eggs/year
- E. Chicken egg supply to Siem Reap Town = 33 960 600 Eggs/ year



Figure 4. Demand and structure of poultry products supply in Siem Reap Town



Note: SRP = Siem Reap Province



IMPACTS OF HPAI AND POULTRY PRODUCERS' RESPONSES

In Siem Reap Province, even though two cases of HPAI occurred in Siem Reap town not many people are aware of that. People only know about HPAI from television, which reported the cases of HPAI in other provinces and mainly in Viet Nam and Thailand. Poultry producers in Siem Reap Province faced only indirect impacts, which caused low prices of poultry meat and poultry eggs, and eventually, the inability to sell them. These negative impacts are strongly felt among commercial chicken producers, and medium- and large-scale duck farms.

Economic loss and its impact on villagers' livelihood strategies

In general, it was observed that, in Siem Reap Province, except during the HPAI outbreak in 2004 and 2005, the poultry market has remained normal. Moreover, chicken prices have even increased over the last few years. This might be due to the lack of supply of poultry products at the market due to the culling and stopping of the import of chickens from commercial farms in Viet Nam and Thailand, which have a long history of importing to Cambodia. In Siem Reap Province, an increasing number of chicken and duck products are imported, mainly from Phnom Penh, Kandal Province and Kampong Thom and Kampong Cham Provinces.

In general, HPAI created negative impacts on medium- and large-scale duck raisers. However, those who had capital to restock the flock could recover their financial losses during the outbreak period as poultry products became increasingly expensive after the HPAI outbreak. Those who had no financial capital to reinvest in duck raising, on the other hand, completely lost their investment during the outbreak.

Commercial chicken raisers are strongly affected by HPAI even when the impact is indirect. They cannot recover their investment because consumers can easily distinguish traditionally raised from commercially raised chickens. Since the HPAI outbreak, consumers do not buy or eat the commercially raised chickens, if possible. The price of commercial chickens has not increased as much as that of traditionally raised chickens or ducks. Moreover, the system of commercial chicken raising is dependent on external inputs such as chicks, feed and medicines. Since the outbreak, and with the phasing-out of the development project (Agrisud), farmers have faced difficulty in accessing inputs. There is only one company to work with, Charoen Pokphand Group (CP Group), should they wish to continue to raise commercial chickens, being the only company that supplies inputs for commercial chicken raising.

The commercial chicken farms are operated by the better-off or middle-income farmers in the urban centre only; no rural households are engaged in this system.

Tables 21 to 27 show the changes of annual income from poultry raising before, during and after the HPAI outbreak. These data were obtained from case studies on different socio-economic groups. In an early stage of the fieldwork, data were requested in percentages. However, the Research Team realized that this can have large errors in term of estimation by farmers. The Research Team therefore decided to request data in monetary values, which were then converted to percentages.



Table 20. Average share of income from poultry out of total house income, Area 1a

Households	Before the HPAI outbreak (%)	During the first HPAI outbreak (%)	After the HPAI outbreak (%)
Poorest	2	0.5	1
Poor	3	2	2.5
Middle-income	3	2	2.5
Better-off	4	0.5	1

Source: CENTDOR, Fieldwork in May 2008, US\$1= 4 000 riels

Table 21. Average share of income from poultry out of total house income, Area 1b

Households	Before the HPAI outbreak (%)	During the first HPAI outbreaks (%)	After the HPAI outbreaks (%)
Poorest	2	1	1.5
Poor	4	2	3
Middle-income	4	2	5
Better-off	3	1	3

Source: CENTDOR, Fieldwork in May 2008, US\$1= 4 000 riels

Table 22. Average share of income from poultry out of total house income, Area 2a

Households	Before the HPAI outbreak (%)	During the first HPAI outbreaks (%)	After the HPAI outbreaks (%)
Poorest	2	1	2
Poor	3	2	3
Medium	40	30	73
Better-off	45	40	52

Source: CENTDOR Team Survey, May 2008, US\$1= 4 000 riels

Table 23. Average share of income from poultry out of total house income, Area 2b

Households	Before the HPAI outbreak (%)	During the first HPAI outbreaks (%)	After the HPAI outbreaks (%)
Poorest	2	1	3
Poor	6	3	4
Middle-income	40	30	57
Better-off	6	3	5

Source: CENTDOR, Fieldwork in May 2008, US\$1= 4 000 riels

Table 24. Average share of income from poultry out of total house income, Area 2c

Households	Before the HPAI outbreak (%)	During the first HPAI outbreak (%)	After the HPAI outbreaks (%)
Poorest	5	3	4
Poor	7	4	6
Middle-income	20	15	32
Better-off	30	25	31

Source: CENTDOR, Fieldwork in May 2008, US\$1= 4 000 riels

Table 25. Average share of income from poultry out of total house income, Area 3a

Households	Before the HPAI outbreak (%)	During the first HPAI outbreak (%)	After the HPAI outbreaks (%)
Poorest	6	4	5
Poor	6	4	6
Middle-income	7	5	6
Better-off	6	4	5

Source: CENTDOR, Fieldwork in May 2008, US\$1= 4 000 riels



Table 26. Average share of income from poultry out of total house income, Area 3b

Households	Before the HPAI outbreak (%)	During the first HPAI outbreak (%)	After the HPAI outbreaks (%)
Poorest	2	1	3
Poor	4	1	4
Middle-income	8	4	14
Better-off	6	3	7

Source: CENTDOR, Fieldwork in May 2008, US\$1= 4 000 riels

In general, the study found that for medium- or large-scale duck producers whose main economic activity was duck raising, HPAI surely had a strongly negative impact on their lives; they lost their poultry-related livelihood activities. Since their knowledge and skills in duck raising were built up over so many years and their daily lives focused on it, they have had difficulty in starting up new and alternative economic activities. Moreover, a large part of their capital was also lost due to the death of poultry from diseases. New economic activities require new socio-economic networks. They have no idea about how to start up another business, and can only restart duck-raising activities on a small scale.

Concerning the gender dimension, women have experienced stronger negative impacts than men:

- **In small-scale chicken and duck-raising systems:** Since women manage the system, they have experienced stronger negative impacts than men. The loss of income from this activity led to their marginalization because they lost purchasing power in the family. A woman cannot independently decide to purchase something for her own use without agreement from her husband, since he is in charge of new income.
- **In medium- and large-scale duck systems:** Since duck-raising is the men's main economic activity, they have experienced stronger direct negative impacts than women. Due to losses incurred from poultry raising from medium- and large-scale duck-raising systems, men lost job opportunities. On the other hand, men can still find other opportunities in the urban centres such as construction work, while women are responsible for house duties, such as taking care of children, and therefore cannot leave home for outside opportunities.

Thus, in all systems, women still experience stronger negative impacts than men in terms of alternative opportunities, purchasing power and loss of control over income.

The 2007 study found that the impact of HPAI on the small-scale duck and small-scale chicken producers before, during and after HPAI outbreaks varied: this included the loss of birds from diseases and culling campaigns; restrictions of selling birds outside the village; and the ban on raising birds for certain periods. However, the study also found that during the outbreak, poultry products became very cheap and eventually impossible to sell. There was no restriction on the selling of birds or ban on the raising of birds at the household or farm level.

Changes in Attitudes and behaviour in villages with and without HPAI occurrences

The 2007 study found great differences in attitudes and behaviour with respect to food consumption in villages with and without HPAI occurrences. In the Seam Reap study, on the



other hand, there were no differences. This might be explained by the fact that in the previously studied villages, there were cases of human deaths, whereas in Siem Reap Province, even in the villages with HPAI, people did not directly affect and, did not know of such cases in their villages or in the province.

Most villagers have better understanding of the negative impact of HPAI on their health than when the HPAI crisis started. They received information from TV broadcasts, videos or drama performances in the villages, especially in the urban and sub-urban centres. Even though villagers understand the negative impacts of HPAI, they are still little afraid of its effects on their health. In all villages studied, except in the better-off households in the urban centre and sub-urban centre, the villagers reported that they consumed dead chickens and ducks.

Many farmers were not afraid of contracting diseases or HPAI because they thought that only chickens raised on large farms and on concentrate feed could become infected and that chickens raised at the family level, using natural feed, could not. Surprisingly, people were concerned about dead birds but showed little concern about sick birds; they thought that if they slaughtered them and bled them, their health will no longer be affected. Therefore, even though almost the people interviewed did not report consuming dead chickens, they slaughtered the birds and bled them due to erroneously thinking that they could not contract the disease.

Keepers of fighting-cocks do not believe that their roosters can carry viruses or diseases due to their demonstrated fighting strength. After cock fighting, the keepers suck the blood from the throat of the cock with their lips.



Photo 12. Keeper taking care of his fighting rooster

Table 28 shows changing attitudes and behaviour before, during and after HPAI outbreak in Cambodia according to different areas.

Table 27. Attitudes and behaviour of people before, during and after HPAI outbreak in Siem Reap Province, by area

Areas	Prior to HPAI (before 2004)	During HPAI (2004–5)	After HPAI (2006 to date)
Areas 1 and 2	<ul style="list-style-type: none"> -Households had never heard about HPAI. -All but better-off households do consume dead and sick birds -Better-off households did 	<ul style="list-style-type: none"> -Households believed that HPAI existed, but only on commercial farms. -People still consumed dead and sick birds, especially the poor and 	<ul style="list-style-type: none"> -Households believe that HPAI exists, but only on commercial farms -Households, especially the poor and poorest, still consume dead and sick



	not consume dead and sick birds, not out of fear of disease, but because they did not think it is was good food.	poorest households. - Better-off households carefully checked birds before buying them and did not consume dead birds.	birds. -Better-off households carefully check birds before buying them and do not knowingly consume birds that died before slaughter -Better-off households are afraid of direct contact with live birds. Some people did not slaughter the birds themselves.
Area 3	-Households had never heard about HPAI. -Households, including those better off, consumed dead and sick birds.	-Households had never heard about HPAI. -Households, including those better off, consumed dead and sick birds.	- Households have never heard about HPAI. - Households, including those better off, consume dead and sick birds.

Concerning the gender dimension, women are more afraid of consuming dead birds than men; they think of their family health more than men do. Men always enjoy the challenge of risks, especially when drinking alcohol with friends. It is often reported that if there is dead chicken in a household, woman will throw it away, but men ask to bring it back for food.

Medium- and large-scale duck raisers do not eat birds that died before slaughter because they have enough healthy ones. When ducks die, the duck owners do not consume them; other people still request them for food. Normally, duck raisers cannot reject the request, but ask for confirmation of whether the requester intends to eat them. When they give away death bird free of charge, they inform them that they do not take responsibility for any consequences.

Producers' strategies in recovering investment capital

Ducks are very sensitive to disease, which can kill them all in a few days. Even farmers cannot identify the types of diseases. When ducks get infected, it is difficult to cure them. Producers face the prospect of losing their investment capital. In order to recover the investment capital when ducks get sick, large-scale duck producers sell off their ducks.

Since the HPAI outbreak in 2004, the poultry sector in Siem Reap Province has changed substantially. Many commercial chicken producers have stopped business. Duck-raising activities have restarted, but with small amounts, since they lost their investment. But since they can recover the investment, the scale of production has improved from year to year or returned to normal. In general, the number of duck raisers in Area 2a, 2b and 3c has decreased, but the number of ducks has increased.

Table 28: Changes in production scale of duck raising in peri-urban areas

	Area 2a	Area 2b	Area 2c
Duck raising 2002–2003	– 2 households/village – 250–500 heads/household	– 10 households/ village –200-300 heads/household	– 7 households/village – 300–500 heads/household
Duck raising 2004–2005	– 2 households/village, – 500–700 heads/household	– 12 households/village --200- 500 heads/household	– 10 households/village – 500– 1000 heads/household
Duck raising 2005–2006	– 2 households/village – 500-1000 heads/household	– 15 households/village 500– 2500 heads/household	– 10 households/village – 300– 500 heads/household
Duck raising 2007–2008	– 2 households/village – 1200–2800 heads/household	– 25 households/village 500–2500 heads/household	– 10 households/village – 1000–1500 heads/household

Source: CENTDOR, Fieldwork in May 2008, Information provided by Group Discussion, Village Head



Restocking strategies after losing poultry

Restocking of birds in Siem Reap Province is mainly affected by wealth category. If farmers have enough financial capacity, they restock almost the same number of birds as they had prior to their loss. In practice, restocking is done a few months after the outbreak, since demand for poultry products at the market is notable.

For the traditional chicken-raising system, findings were similar to the 2007 study. Farmers mostly depend on the remaining chickens to raise in the following seasons. However, restocking attitudes and practices for duck raising in medium- and large-scale duck raising are different from the previous study. Duck raisers positively responded to disease outbreak, especially since the market price of poultry products increased.

It was easy to restock for duck production when producers had enough capital to reinvest because there are duckling suppliers (hatchery houses) that can provide as many ducklings as needed. Traditional chickens are not as easy to restock as ducks, even when farmers have enough capital to reinvest. Chickens from the market are not free from disease. To raise chickens, farmers have to restart on a small scale with breeding stock obtained from relatives and friends. Additionally, they can also buy chickens from the market after examining them to ensure their good health. Alternatively, if they know the chicken retailers at the market, they can ask them to sell them good hens for raising.

In 2004, Mrs Vay Touch, living in Pouk District in Siem Reap Province, raised 850 ducks, but they got sick and 800 died. In 2005, she restocked 500 ducklings with a loan of US\$1 500 from ACLEDA Bank. The outcome of duck raising in 2005–7 was good. She repaid the loan and is now raising 1 000 ducks (2007–8).

Alternatives and choices of livelihood strategies

For woman-headed families, the HPAI outbreak in Cambodia has had a strong negative impact on their income-generation abilities. Women's opportunities for wage labour are more limited than men's. Women sell their labour mainly in farming activities, while men can also sell labour in other activities. Only young woman are able to find jobs in the garment factory industry. Although poultry production is a high-risk enterprise due to disease in the hot season, other alternative farm enterprises also yield low profits with a high degree of uncertainty or risk. In contrast, job opportunities in urban areas provide relatively secure incomes as monthly salary. Such considerations often lead to discussions within rural households on the choice of livelihood strategies. This may send some family members to the city for non-farm job opportunities while others remain working in farming-related activities.

It was observed that only medium-scale duck raisers struggle to find alternative livelihood strategies when they lose investment in duck raising, because it is their main economic activity. Their social connections are mainly with people in the duck commodity chain. When they turn to other economic activities, they have difficulty in building up a new network.

Since the HPAI outbreak, the prices of poultry meat or eggs have increased. This attracts poultry farmers (large-scale duck raisers) who have the financial capacity to restart or to increase their investment to enlarge their enterprise. As a result, it was observed that poultry production in Siem Reap increased after HPAI outbreak in the country.

Biosecurity practices before and after experiences with HPAI

The study found that attitudes and behaviour with respect to biosecurity practices changed only slightly after the occurrences of HPAI. Some people now wash their hands, but still eat



sick birds. Some farmers have improved their living conditions or clean their hands after touching birds, but still do not use soap. Most people believe that HPAI affects only chickens or ducks in large-scale farms that use concentrate feed, vaccinations and medicine. This differs from the previous 2007 study in which people truly improved biosecurity practices or even stopped raising poultry in villages that suffered from HPAI and human deaths.

STAKEHOLDERS INVOLVED IN POULTRY PRODUCTION

Roles of private actors in promoting poultry production

One important observation is that poultry private actors and poultry enterprises have played an important role in promoting poultry-related activities in the area, particularly hatchery houses and veterinary shops/feed companies. Hatchery houses created other related activities such as the duck egg trade, the duckling trade, the fertilized egg trade and duck raising.

Like the hatchery house, the veterinary shop plays an important role in supporting poultry production by providing input services to veterinarians and poultry producers. As they are often operated by the district veterinarian, in addition to selling livestock materials and inputs, they provide advice to farmers.

Roles of government agencies and NGOs in poultry production

There were VAHWs in almost all villages from the line ministry and department, yet some were newly trained and still without experience in animal production. It is important to note that media broadcasts to educate the public on HPAI outbreaks and their effects have reached most people in the rural areas. Almost all respondents across all economic strata are aware of the effects of the disease, but in-depth understanding is still a challenge. National and international NGOs, in collaboration with government departments, have also trained VAHWs. VAHWs have played an important role in disseminating information from the government line ministry or line department and NGOs on the negative impacts of HPAI. The announcements on AI have been done on television and radio, and posters were set up by village health security agents, village chiefs and target villagers urging people to change their habits, discouraging them from keeping poultry under the free-range system, and recommending poultry fencing or keeping poultry indoors.

The VAHWs also provide animal health care services such as vaccinations and treatment. These services, however, are mainly requested for and provided to farmers of large animals such as pigs and cattle that can command better pay, whereas almost none of the farmers request this service for small animals such as chickens and ducks. In case of diseased chickens or ducks on medium- and large-scale farms, farmers prefer to buy medicine from veterinarian supply shops or use human medicine to cure their animals by themselves.

Farmers consider chickens and ducks as small animals. Also, when animals get sick, not all of them die. They consider the loss of pigs or cattle, on the other hand, as very serious. They carefully manage the large animals and adopt disease prevention measures. Moreover, if a chicken or duck dies, they can still consume it. In sum, a poultry death is not considered a loss, but rather slaughter for food.



Poultry production services

Poor households, whether they raise a few chickens or ducks, do not consider poultry's role as important for their families, especially its contribution to their cash income in urgent times. During interviews, they consequently argued for government assistance to the poultry sector in areas such as raising techniques and disease prevention.

It is important to note that when rural people or farmers do not succeed in something, they believe that it is due to their lack of knowledge. They expect the government or NGOs to have such knowledge and always request it from them. The findings in the 2007 study show that large-scale duck raisers did not demand better services for their productions from the government department or NGOs. When they needed technical knowledge, they approached outside sources in Thailand or Viet Nam. Similarly, in Siem Reap Province, when faced with duck diseases in medium- and large-scale duck raising, the owners approached the veterinary shop, because they do not expect advice from government veterinary services, such as VAHWs, provincial department officers or national officers.

DISCUSSION and CONCLUSIONS

This discussion of the research findings is based on the initial research questions. Answers have been consolidated from fieldwork findings as well as previous findings from other studies:

A. What are the salient features, including disease control and the biosecurity aspects of smallholder production systems in rural areas, both backyard and semi-commercial, that have been affected by HPAI and its control measures?

Poultry production in Siem Reap Province is strongly related to wealth category and geographical area: traditional chicken raising and small-scale duck raising are mainly found in Areas 3a and 3b. Medium- and large-scale duck raising are found in the sub-urban area (Area 2) and practised by middle-income and better-off farmers, while commercial chicken farms are mainly in the urban centre (Area 1) and practised by better-off farmers. HPAI outbreaks economically affected mainly the medium- and large-scale duck farms and commercial chicken farms. Small-scale chicken raising was not strongly affected by HPAI, since small-scale production does not require large investment, except for buying some hens. Poultry raisers are not well aware of this disease or of its negative impacts. When disease occurs, duck farmers seek to cure their flock by discussing problems with friends raising ducks or with veterinary shop owners in order to get medicine or recommendations for treatment. Since no HPAI control measures were carried out and HPAI cases were not common, medium- and large-scale duck raising and commercial chicken raising experienced negative impacts of HPAI indirectly, with lower prices of poultry products, and finally, the inability to sell their poultry products. This also created a great loss of investment during the HPAI outbreak; other diseases such as cholera and fowl pox have had economic impacts.

B. How do these poultry production systems vary by wealth group and with respect to social factors, particularly gender?

In terms of economic value, the poor and poorest farmers were not directly or seriously affected by HPAI outbreak, since they were not able to be involved in medium- or large-scale duck raising and commercial chicken raising. The poorest households depended on selling their labour for farming or non-farming activities. As a result of job opportunities in garment



factories in Phnom Penh and construction work in Siem Reap urban centres, young people have migrated and continue to migrate to urban centres in search of jobs. The poor and poorest households in the community were able to sell their labour easily, even during the outbreak of disease. Poor women-headed families that previously depended on raising chickens and selling chickens for petty cash in cases of urgent need, only experienced difficulty in 2004 and 2005, during the HPAI outbreak.

C. What role(s) do these poultry production systems play in both the farming systems and the overall livelihoods systems of the smallholders?

Poultry production has played a very important role in providing food (meat and eggs) for home consumption, cash income to meet urgent needs, and capital for investment in other economic activities. Taking advantage of cultural practices, resource-poor farmers can also ask relatives or neighbours for one or two chickens to raise. However, this practice has gradually decreased since the increasing price of poultry. Many woman-headed families expressed considerable appreciation for the roles played by poultry in providing food for their families, especially for educating their children and healthcare, and as an investment in other economic activities. Moreover, small-scale duck raising is also well integrated in the rice farming system since it can provide eggs during the busy-farming season (Area 3a). Medium- and large-scale duck raisings are also well integrated into vegetable farming in sub-urban Area 2, as it provides manure for vegetable production, which is one of its important economic activities.

D. What threats do HPAI outbreaks and its control measures pose for the livelihoods of smallholder poultry producers in rural Cambodia, especially those of rural women, the rural poor and vulnerable groups?

Poultry-related threats to the livelihoods of rural women, rural poor and vulnerable groups, including HPAI outbreaks, can be classified into two categories: direct and indirect threats. Direct threats are poultry losses from the disease itself and the loss of poultry from culling campaigns. In Siem Reap Province, there was no such impact; but rather indirect impacts/threats were mainly observed in the early stages of the HPAI outbreaks in 2004 and 2005 when many people were afraid of eating chicken meat. Consumers shifted to eating other meats or vegetables, which made other food basket items more expensive. Poor households had difficulty in affording such items for food consumption. Consumers have resumed eating chicken meat as other consumption commodities have become expensive.

E. How do these threats vary according to poultry production system, wealth level, gender and other social attributes?

Economic HPAI-related threats mainly affected the medium- and large-scale duck producers and commercial chicken enterprises. They also affected the public, since the large farm owners tried to recover their investments by selling sick birds to markets or restaurants. However, it is difficult to identify the economic losses incurred by small-scale poultry producers, because they considered these losses as normal for the hot season or early rainy season. Indirect threats appeared not to have been viewed as a hardship by the middle-income or better-off families, because they had other income sources to secure their living.

F. How do smallholder producers view these HPAI-related threats compared to other livelihood threats?



Smallholder producers still believe that HPAI can occur only in large commercial poultry farms that use concentrate feed. They do not consider HPAI-related threats as serious as livelihood threats such as losing the rice harvest, social insecurity or floods. Thus, all poultry activities – small-, medium- and large-scale – returned to normal unless there was no financial capacity to reinvest. Fighting-cock keepers still use their mouths to suck the blood from the throat of cocks after cock fighting. The general threat in the duck-raising system at present is the increasing price of concentrate feed, since a large part of the duck-raising period now mainly depends on supplementary feeding.

G. Apart from poultry-related activities, what are the salient livelihoods assets, behaviour, beliefs, attitudes, structures and processes available to smallholders to respond to HPAI-related livelihood threats? How do they differ by production system, wealth group, gender and other social attributes?

In addition to poultry activities, farmers in sub-urban areas (Areas 2a, 2b and 2c) can engage in dry season rice farming and small-scale fishing activities. With these possibilities, they can reinvest in poultry production, since it has been their main livelihood activity for many generations. However, people living in the urban centre, i.e. Areas 1a and 1b, and in Area 3a have valuable land assets for sale to restart economic activities. People in Area 3b, however, have very limited resources to improve their lives, even they do not face strong negative impacts of HPAI. Most of these people depend on the seasonal migration to Thailand for job opportunities.

H. How do these forces (livelihoods strategies, social relations, production practices) interact in the observed livelihood outcomes of different producers to respond to HPAI-related threats?

Livelihood strategies, social relations and production practices are obviously closely related to livelihood outcomes. Social relations and social capital are the main factors in the different outcomes of livelihood outcomes of the different poultry producers in response to the HPAI threat. Since the early stages of HPAI, many poultry producers lost income and investments due to the lower prices of poultry-related products. Producers with poor resources and poor social relations depleted their investment and could not restart their businesses, while farmers with rich social relations or social capital could access favourable loan conditions or financial donations to reinvest in poultry raising. It is important to note that poultry meat in Cambodia was largely supplied from Thailand and Viet Nam. Since the serious outbreaks of HPAI in Viet Nam and Thailand, importation of poultry meat from these two countries has decreased. Moreover, Cambodian consumers are also afraid of poultry meat from these commercial farms, which opens up an opportunity for the poultry products produced locally on small-scale farms. As a result, those who could reinvest in poultry production were able to recover most of their investment lost during the HPAI outbreaks in 2004 and 2005; this mainly applied to medium- and large-scale duck farms.

I. Were the outcomes in affected communities different from other communities without HPAI outbreaks and without control measures?

In Siem Reap Province, in urban or suburban areas where poultry has no major relevance, people did not take HPAI seriously. As a result, there was no difference between impacts or



outcomes in villages with and villages without HPAI. The different impacts were rather found in the different types of production systems and different geographical areas. Farmers that engaged in duck raising in Areas 2a, 2b, 2c experienced stronger negative impacts than those in other areas, since the former's livelihoods were mainly engaged in medium- and large-scale duck raising.

J. How do different producers, especially rural women, the rural poor and vulnerable groups, perceive these livelihood impacts/outcomes? What are the implications of these perceptions for future behavioural changes?

Due to the importance of poultry production in rural livelihood systems, farmers are committed to continue raising poultry, especially chickens for the resource-poor farmers and ducks for middle-income and better-off farmers. As a result, the study found that farmers simply began to restock poultry just a few months or so after the disease outbreak. Poultry has traditionally played an important role in their rural livelihood systems – in farming, household economics and socio-cultural practices. Moreover, the study also found many misunderstandings of villagers and/or farmers. For example, most villagers believed that consuming dead chickens was harmful to their health, so when they see that their chickens are sick, they hurry to bleed them before they die, erroneously thinking the disease is in the blood. The study often found that for the large-scale duck producers, if many ducks die and they cannot sell them all, they give some of dead ducks to their poor neighbours.

K. What are the policy implications of, and smallholder responses to, these impacts, especially for improved biosecurity and HPAI control programmes?

Protecting poultry production systems from the spread of HPAI requires multi-stakeholder involvement. The government certainly plays a vital role in imposing the biosecurity measures in the poultry production system. In Siem Reap Province, poultry production even plays an important role in livelihood systems of poultry producers and meat supply for urban centre. However, it is observed that duck-raising is practised in the urban and sub-urban centres, where there is high population density; an outbreak of diseases can easily spread. Biosecurity practices should be introduced and strictly followed in these area. Duck migration in the raising system with scavenging for feed should also be mapped in the country for disease control. Education should be provided to poultry producers, especially duck raisers, on their personal risks and safety in the poultry-based livelihood system.

In terms of behaviour change among the poultry producers, the better-off households and those in the urban centre have changed due to the impact from the large media broadcasts and direct education on the negative impacts of HPAI. The poor and poorest households, however, are still unconvinced of the negative aspects of HPAI. However, there is little doubt that, due to poverty, the poor and poorest households face the risk of hunger from this challenge. Poor and poorest respondents did not admit to eating dead and sick chickens due to hunger risking their health or life, but they did state that they did not believe in the existence of HPAI and the serious risk it poses. These attitudes may mask their sensitivity to being poor and the bad image portrayed in consuming such risky food. Continued education is recommended for community members, especially medium- and large-scale duck raisers, as an important task. Best practices on duck raising and biosecurity practices should be documented and shared with the duck- raising community.



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ANNEXES

Annex 1. Villages selected for livelihoods assessment in Seam Reap Province, 2008

District	Commune	Village selected	HPAI : Yes or no	GPS Coordinates		
				X	Y	
Siem Reap	Slor Kram	Chong Keo Sou	No	P1:0378657 P2:0379439 P3:0379932	P1:1477222 P2:1477831 P3:1477284	
		Beoung Donpa	Yes	P1:0377560 P2:0377494 P3:0377928	P1:1478417 P2:1478267 P3:1477999	
	Sala Kamrerk	Vath Bou	Yes	P1:0376432 P2:0377068 P3:0377169	P1:1476940 P2:1476705 P3:1476110	
		Vath Svay	No	P1:0375199 P2:0375885 P3:0375883	P1:1475185 P2:1475082 P3:1475827	
	Siem Reap	Phnom Krom		No	P1:0371036 P2:0371683 P3:0376041	P1:1469039 P2:1469324 P3:1472597
					Brolay	No
Puok	Keo Por	Kouk Russey	No	P1:0363370 P2:0363175 P3:0362825	P1:1479404 P2:1479896 P3:1481149	
		Kouk Pour	No	P1:0362793 P2:0362633 P3:0362846	P1:1479131 P2:1479023 P3:1479324	
	La Vea	Kouk Thmei	No	P1:0357520 P2:0357448 P3:0357754	P1:1490584 P2:1490944 P3:1490982	
		Toul Roveang	No	P1:0357462 P2:0356407 P3:0355578	P1:1489106 P2:1489330 P3:1490104	
	Angkor Chum	Sre Kvav	Roveang Thmei	No	P1:0352883 P2:0351691 P3:0350639	P1:1521424 P2:1521203 P3:1520781
			Sre Noi	No	P1:0394170 P2:0394083 P3:0393344	P1:1526029 P2:1526380 P3:1527071
Total: 4 Districts	7 Communes	12 Villages	2 Villages studied experiences with HPAI and 10 Villages studied without experiences on HPAI			



Annex 2. Location map of selected communes

