INSIGHTS ON LIVE BIRD MARKET IN BALI: THE SUSPECT SOURCE OF AVIAN INFLUENZA TRANSMISSION

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ABSTRAK

Topik mengenai merebaknya flu burung di Indonesia pada umumnya dan di Bali khususnya sampai saat kini masih sering mewarnai berita di media massa. Selain pemindahan kepemilikan sepanjang rantai pemasaran unggas, pasar hewan/ternak ditengarai merupakan sumber transmisi flu burung. Tulisan ini bertujuan untuk menjelaskan secara deskriptif pengelolaan pasar unggas tertentu di Bali dan melakukan penilaian terhadap resiko transmisi flu burung yang bresumber dari pasar unggas. Dengan melakukan penilaian ini, pengurangan faktor resiko dapat dilakukan untuk mencegah kerugian ekonomi dan kematian pada manusia.

Hasil penelitian menunjukkan bahwa unggas yang dijual di pasar memiliki potensi sebagai sumber penyebaran virus flu burung yang disebabkan oleh sistem transportasi dan pengelolaan *biosecurity* di pasar unggas. Analisis deskriptif ini memberikan informasi yang berguna untuk peningkatan pelaksanaan biosecurity di pasar unggas. Namun demikian, pasar unggas bukan merupakan satu-satunya sumber transmisi virus flu burung, maka diperlukan rencana strategis pengawasan penyebaran flu burung untuk membantu pemangku kepentingan sepanjang rantai pemasaran unggas. Pendekatan berupa kebijakan maupun non-kebijakan, seperti peningkatan pelaksanaan *biosecurity*, diperlukan untuk mengatasi penyebaran flu burung sehingga kerugian ekonomi dan kematian pada manusia dapat dicegah.

Kata kunci: pasar unggas, penyebaran flu burung, biosecurity, kerugian ekonomi

ABSTRACT

High Pathogenic Avian Influenza Virus (HPAI H5N1) has been discussed widely up to date as the impact is not only to the poultry industry but also to the fatality of human. Apart from changing ownership along the way of marketing chain, it is generally accepted that live bird markets (LBM) present a potentially high risk of spreading H5N1 virus. This is a cross-sectional study aims at describing management of birds at selected live bird markets and then assessing the risk of AI virus spreading from the LBM. By assesing the risk of AI spread, risk mitigation can be implemented to reduce the economic loss as well as to prevent human fatality.

Result of the study indicates that birds sold within the LBM system in Bali are at high risk for transmission of diseases since transportation and management of birds at markets reveal some behaviors against such recommended biosecurity measures. This descriptive analyses provides useful information about how to enhance maket biosecurity. As LBM cannot be separated as a sole player in the AI transmission, there is a need to take strategic collective action to help all stakeholders along the supply chain comply with AI Control Strategies. Policy and non-policy approaches are needed in addressing issues that exist around the live bird movement and markets in those high risky points.

Keywords: live bird market, HPAI spreading, biosecurity, economic loss

INTRODUCTION

Background

High Pathogenic Avian Influenza Virus (HPAI H5N1) has been discussed widely up to date since the viruses involved have been shown to affect not only to poultry industry but also to fatal disease in human. Ambarawati (2009) discussed that the nature of the marketing chain/live bird movement with many changes of ownership and potential to mix with other birds post-farm gate is being increasingly important in influencing the spread of disease. This is in addition to Sim's report (2007) that live bird markets (LBM) are an important in spreading H5N1 virus through Asian poultry market chains. Thornton's research (2008) on Bali live bird markets provided useful information regarding 17 risk factors and developed a risk ranking model based on selected criteria. Beyond the studies mentioned, little is known about live bird markets in Bali, especially related to trends in quantity, sources and destinations of birds. As indicated in Ambarawati (2009), collectors and vendors, directly or indirectly, are the key players in the live bird markets in Bali to the spread of HPAI. Therefore, a cross-sectional study is interesting to discuss regarding to HPAI spread and risk mitigation.

Aims of the Study

1. To describe management of birds at selected live bird markets in Bali.
2. To assess risk of HPAI spread in selected live bird markets in Bali

METHODOLOGY

Three surveys have been carried out covering nine live bird markets accross seven districts in Bali from May 2008 to January 2009. Table 1 presents name, location and criteria of live bird markets selected in Bali. Markets selected for the study based on the following criteria:

(1) The numbers of chicken and duck sell in the market per day (1.1. Big number; 1.2. Fair; 1.3. Few)
(2) The position of market along the main road (2.1. Heavy traffic; 2.1. Moderate traffic; 2.3. Low traffic)
(3) The numbers of bird farms around the market (3.1. Large; 3.2. Medium; 3.3. Small)
(4) Disease map – the case of AI identified (4.1. AI case found; 4.2. No AI case found)
(5) The size of the market (5.1. Big; 5.2. Medium; 5.3. Small)
(6) The market activities - open all days or every day or certain days in a week (6.1. Open every day from early morning until late evening; 6.2. Open every day but not until late evening; 6.3. Only open in a few days a week/not open every day).

Table 1. Live bird markets selected for cross sectional studies in Bali, 2009

No	Name of Market	Location(District)	Criteria
1	Bale Agung	Bangli	1.2, 2.1, 3.2, 4.2, 5.2, 6.3
2	Galiran	Klungkung	1.1, 2.1, 3.2, 4.1, 5.1, 6.2
3	Amlapura	Karangasem	1.1, 2.1, 3.2, 4.1, 5.1, 6.3
4	Anyar	Buleleng	1.2, 2.1, 3.3, 4.2, 5.1, 6.1
5	Seririt	Buleleng	1.1, 2.1, 3.2, 4.1, 5.1, 6.1
6	Umum	Jembrana	1.3, 2.1, 3.3, 4.2, 5.3, 6.1
7	Kediri	Tabanan	1.2, 2.1, 3.2, 4.2, 5.2, 6.3
8	Beringkit	Badung	1.1, 2.1, 3.2, 4.1, 5.1, 6.3
9	Mengwi	Badung	1.2, 2.1, 3.2, 4.1, 5.2, 6.3

Number of respondents interviewed according to their category is presented in Table 2. They were three different categories, i.e. collector, vendor and consumer. Definition of each category follows Ambarawati (2009).

Table 2. Number of Respondents according Their Category

Category of respondents	Round 1	Round 2	Round 3
1. Vendor	38	17	108
2. Collector	37	16	0
3. Consumer	39	18	0
Total	114	51	108

Factors used to describe management of birds at markets include 1) types of bird sold at markets, 2) source of birds sold at the market, 3) transportation of birds to and from the markets, 4) management of birds at market, 5) slaughter on site, and 6) knowledge of HPAI. From these factors, risk assessment of HPAI spread was then anaysed qualitatively.

RESULTS AND DISCUSSION

1. Types of birds sold at markets

Almost all type of birds are sold in the live bird markets in selected markets. These include broiler, layer, kampong chicken and ducks. Geese and quails are available sometimes. Balinese purchase kampong chicken and duck are for the purpose of offering and ceremony. There are high demand for certain colour of kampong chicken for ceremony according to Balinese calendar and big days such as *Tumpek, Galungan* and *Kuningan* as well as temple's festival. Meanwhle broilers and spent layers are bought for consumption. All respondents, vendors and collectors, mentioned that they sold more birds during Balinese big days and this can be three-fold in amount.

Table 3 shows number of birds sold at markets during the survey. For Round 1 and 2, it was asked the number of birds sold from the previous market day, while in Round 3 the number shown for the average week sold. As can be seen from the table that number of broiler sold is the highest, achieving 11,517 birds, followed by duck amounted to 10,778 birds and spent layer was the third type of bird in demand, achieving 9,590 birds. In Round 2, lots of broiler and duck sold because of ceremonies such as wedding, cremation, temple festivals at Klungkung regency and the surrounding. It is interesting finding in Round 1 that DOD (day old duck) were sold in Kediri market, amounting to more than 800 birds.

Table 3. Number of Birds Sold at Markets, 2009

Type of birds	Round 1		Round 2		Round 3	
	V	Co	V	Co	V	Co
Kampong chicken	610	940	97	55	9735	-
Broiler	803	300	345	1894	8175	-
Layer	147	833	80	355	3125	-
Duck	197	2593	350	2850	4788	-
Muscovies	0	0	0	0	314	-
Geese	0	0	0	0	17	-
Quail	0	0	0	0	0	-
Songbirds	0	0	0	0	70	-
Fighting Cockerel	0	0	0	0	2	-
DOC	0	0	0	0	0	-
Other – DOD and pullet	320	815	0	70	490	-
Total	1757	5481	872	5224	26716	-

Remark: V = vendor; Co = collector

2. Source of birds sold at the markets

According to collectors and vendors, all birds they sell are originally from Bali and none of them are from outside island, despite of suspicion of illegal birds (chickens and ducks) moved into in selected markets from outside island (mostly from East Java). The traders know the regulation of banning chicken and duck movement from outside Bali to prevent the

AI outbreak. This study finds that collectors move from one market to the other, especially to the nearby one. For example, collectors at Beringkit market sell their birds to Kediri and Mengwi markets as well.

The sources of birds varied from own farms, other households either in the same village or other villages, other traders and commercial farms. Result from the surveys reveals that the main source of birds for collectors and vendors are from the traders, an average of 60%. The second source of birds for collectors come from another village, meanwhile breeding from own farm for vendors.

Common experience has been used by vendors and collectors to ensure the birds are healthy, i.e. look at their physical appearance They are able to distinguish sick birds from the healthy ones. The most common way to ensure that the birds are free from diseases is to buy the healthy birds. The good performance of healthy birds can be seen from their color of comb, strong body, stable, clear eyes and nose. Another way to ensure that the birds are free from diseases is to sell the birds according to time when they buy them. First purchase of birds will be sold first to make sure the birds are not stress in the cage for such a long time.

Despite some collectors claimed in some cases they separate based on the source of birds, mostly they do not separate birds based on their place of origin. The earlier purchase birds will be put into different cages, separated from the new ones. Either vendors or collectors ignore the source of the birds. Separation is conducted only to differentiate the size of the birds to ease the sale for the same price.

3. Transportation of birds to and from the markets

All collectors transport the birds by themselves to the market. Collectors mainly (average of 70%) use pick-up vehicle to transport. The reasons are more economical and practical as the car can load a lot of birds for one trip. The second type of vehicle in common (about 40.54%) is motorbike. This is also owing to the same reasons as to the collectors, cheaper and easier to clean as well. Collectors feel comfortable to bring the birds to the market by motorbike. Meanwhile, vendors mainly depend on motorbike to transport the birds to the market. Some vendors use public transport to carry the birds such as mini bus and village public transport. None of collectors use bicycle to transport the birds to the market.

Collectors transport the birds at various distance to the markets, range from 1 to 40 km. About 13 % collectors do stop along the way to the market to pick up some more birds. They can stop more than two times, even one collector at Beringkit would stop stop five times before entering the market. This behaviour is susceptible to the AI transmission especially when the collector does not separate the source of the birds. Non-mobile vendors at Galiran and Anyar markets do not transport their unsold chickens and ducks home, but let their birds at their stall at the market. The security of the markets have responsible to look after the the safety of the markets.

Either collectors or vendors mainly (about 70%) use bamboo cages to transport the birds. Apart from easiness, they think this type of cage is economical and strong enough to carry the birds. A small percentage of collectors (around 13 to 18%) use wooden or metal as the type of cage. .

In terms of cleaning, more than 90% of collectors clean their vehicle and cages prior to transport. They mainly use water and detergent to clean, while only a small percentage (about 10%) use disinfectant to clean.

4. Birds management at the markets

Around 81% of collectors sell their birds themselves at markets and they have an average of four cages per day, range from 1 to 24 cages. In terms of cleaning, vendors and collectors vary in responding to the the question 'how often you clean your cages'. There was about 30% cage and stall are cleaned daily, while the most common practice is every 2-3 days. According to them, cleaning activity is depending on the condition of the cages. There was no such regular pattern of cleaning cages by the traders. The most common method of cleaning is scrub and rinse with water. Sometimes they use detergent. This study finds that both vendors and collectors may clean cages and stall if they think the tools are too dirty.

Both vendors and collectors experienced with sick or dead birds during the last 12 months. Aroud 40% collectors found that birds were sick or dead during transport, ranged from 1 to 5 birds, because of overcrowded in the cage. In regards to the sick and dead birds, vendors and collectors have very similar responses. For the sick birds, vendors and collectors separate them from the healthy ones, meanwhile for the dead birds, they throw in the rubish bin (like in Galiran market).

There are several common actions done by the vendors and collectors to ensure that their birds are protected from diseases. The most common way is to purchase healthy birds (81%). The second way is by cleaning the cage every day (54%), followed by vaccinating, and cleaning the cages on regular basis (40%). Only a small percentage of vendors and collectors apply vaccine to their birds, if they think necessary.

Regarding waste management, both vendors and collectors mostly discard the waste either to trash bin provided in the market or to the water way. The second option is bury or compost it to the paddy field or garden.

5. Slaughter at site

Vendors and collectors sell their birds as live birds. It is the consumers who decide to slaughter the birds at the markets or bring them home for later slaughter. This study reveals that most vendors and collectors do

not slaughter the birds, meanwhile consumers will more likely do the activity. It is not common for consumers in Bali to ask collectors or vendors or the slaughter groups to slaughter the birds in the markets. Consumers usually slaughter the birds (chicken or duck) at home as they often use for offering or ceremony.

Based on the interviews, the application of biosecurity on slaughter activities are minimum. Neither masks nor gloves are worn during slaughtering as they said they are used to do that. Sometimes repondents put hats on, but they do not wear safety glasses. Only one respondent answered that he was wearing boots when do slaughtering.

Most of the slaughter waste management by the respondents is leaving them at the backyard or bury. On the other hand, cleaning of the area is done after batch of slaughtered birds by using water. Postslaughter activities is conducted by decontaminating some equipments such as knife by rising with water. This study also finds that washing handsdone by respondents: after slaughtering (50%); before and after slaughtering (25%); after each slaughter batch (25%).

6. Knowledge and perception of Avian Influenza

This study finds that the main source of information of all respondents about AI knowledge is from television, achieving average of 81%. Through this medium they know the news and learn about AI outbreak. Second main source of information is from other people. This can be from their friends and from local government such as from the village head and the Livestock officers. Survey results also indicate that radio, to some extent, is still used by respondents to obtain information of AI. Other mass media such as newspaper, book, magazine, poster and brochure seem were not attractive as source of information about AI.

All vendors and collectors at the live bird market know and understand about the policy to ban of chickens and duck from other island – as one of strategies to address issues of HPAI. As a matter of fact, it is sill found of illegal movement of birds especially from East Java through Gilimanuk sea port. This occurs when there are lots of ceremonies in Bali where demand for birds (especially kampong chicken and duck) is very high while in Bali there is a shortage supply.

Based on respondents' knowledge, it is found that infected poultry as the main source of AI trasmission They add that the birds from East Java are susceptible to AI. The second possible way for AI introduction stated by vendors and collectors is from contaminated cages. In general, respondents do not really understand the specific symptoms of AI.

In line with the fact of respondents' knowledge to AI transmission, clean cages and stall area dominant response to the questions on *"how to prevent AI transmission at their respected markets"*, reaching for 66% of this response. In addition, most vendors and collectors neglect the importance of separating birds according to their species and sources. They also put less favorable to the importance of cleaning vehicles. Observation from the field shows that vendors and collectors do not separate birds according to the sources. For collectors with limited cages, mixing the birds such as chicken, duck, Muscovy is the common practices.

In terms of willingness to report AI suspect, there was about two third of vendors and collectors (69.12%) expressed their attitudes toward AI prevention. They said "possibly" to the questions of *"would you report for AI suspect?"*. On the other hand, only 15.75% vendors and collectors said "Yes" to report if there is AI suspect. However, those who are willing to report, most of them prefer *to report to the head of village*. Few of them would like to report to the local Livestock Office or the Department of Health.

7. Risk Analysis

On the basis of data collected from this cross sectional study, a qualitative analysis was applied to identify the level of risk associated with live bird movement and marketing management practices. At it is summarized in Table 4, the study reveals that the existing patterns of movement and management practices are at a high risk for HPAI transmission. This high risk for AI transmission is identified along the supply chain, from the first transaction point (between producer and village collectors) to the last transaction point (between live bird vendors and customers), or from the village level to the market level.

The high level of risk for AI transmission is due to low level of people knowledge, negative attitudes and perceptions toward AI and the need for proper marketing and bird management practices. Almost all practices identified and observed along the supply chain are prone to *AI virus release* and *exposure* that lead to AI case and transmission to the healthy birds. The study found that none of vendors and collectors use hand gloves, mixing their birds in the same cages/ stall, keeping sick birds at and around the healthy birds, leaving the dead bird wherever they like, mixing the sick bird and the healthy birds, selling the sick birds at a lower price, and even slaughter the sick birds for selling and or their own consumption. All these practices are against biosecurity measures that recommended in controlling AI transmission.

However, there are several positive points that promising for less likely of AI transmission as the vendors and collectors tend and eager to *buy healthy birds*, have a *good knowledge and skills* in identifying the difference between *healthy* and *sick birds* as they always observe and check the birds they are buying and collecting. The study confirmed that vendors and collectors know the healthy birds from observing the bird's performance such as by looking at and examining the birds' comb, feather, nose, mouth, wings, feces, and buttock.

Table 4. Gaps between Ideal, Knowledge and Practices – Identified Risk.

Ideal biosecurity	Knowledge, attitudes & perceptions	Practices (vendor, collector & customer)
Provide clean or disposable coveralls, head covers, and plastic boots or boots that can be cleaned and disinfected	Lack of knowledge on AI signs, AI transmission, actions to prevent AI release and exposure, and proper management practices during the transportation, at the markets and slaughter points	No head cover, no gloves, no boots
Do not share equipment or vehicles with other farms	Lack of knowledge on proper actions to prevent AI release and exposure during transportation, and at the slaughter point	Equipments, vehicles, stall/pens & cages were shared Mixing birds (even the sick birds with healthy birds)
Change disinfectant foot baths daily. Place foot baths at outside entries to poultry house(s) and egg room(s)	Lack of knowledge on AI transmission, actions to prevent AI release and exposure, and proper management practices	No particular disinfectant used at all points along the supply chain
Reduce traffic coming onto your premises	Lack of knowledge on AI signs, AI transmission, actions to prevent AI release and exposure, and proper management practices during the transportation, at the markets and slaughter points	Birds moving from one market to another as the vendors and collectors moving from one market to another to buy and sell birds
Dispose of dead birds safely (incineration, burial, composting, rendering). Never pile dead birds outside of a building or spread them on fields	Lack of knowledge on AI signs, AI transmission, actions to prevent AI release and exposure, and proper management practices during the transportation, at the markets and slaughter points Negative perceptions on sick birds – no problem to slaughter and eat sick birds	Draw dead birds every where
Report any increased illness or mortality to your company	Limited knowledge on AI risk management, lack of awareness to help prevent AI transmission and out-break	Not and reluctant to report to formal agencies

CONCLUSION AND POLICY IMPLICATIONS

Birds sold within the LBM system in Bali are at high risk for transmission of diseases since transportation and management of birds at markets reveal some behaviors against such recommended biosecurity measures. On the basis of these findings, there is a need to take strategic collective action to help all stakeholders along the supply chain comply with AI Control Strategies. Policy and non-policy approaches are needed in addressing issues that exist around the live bird movement in those high risky points.

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