INVESTIGATION OF SOME SOCIAL FACTORS ON THE EVOLUTION OF AVIAN INFLUENZA (AI) AND FOOT AND MOUTH DISEASE (FMD) IN LUONG SON DISTRICT, HOA BINH PROVINCE, VIETNAM

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ABSTRACT

Understanding the epidemiology and patterns of occurrence of disease is crucial in the progress toward control (and eventual eradication) of diseases. Each disease is the result of many natural, social, and geographical linkage factors, such as: the traditional methods in husbandry, animal transportation, the awareness and attitude of livestock holders, veterinary extension network, *etc.* This paper discusses some of the basic agents, focusing on social factors on the evolution of Avian Influenza (AI) as well as Foot and mouth disease (FMD) in Luong Son, Hoa Binh province. The study surveyed investigation, surveillance of disease occurrence, and social factors affecting the movement of diseases. The results will help to identify causes and sources of the outbreaks with a view to control and prevent disease in the future. By understanding the basic epidemiology of diseases, disease control programs could be designed by the authorities.

Key words: Social factors, Avian Influenza (AI), foot and mouth disease (FMD), Luong Son, Hoa Binh.

1. INTRODUCTION

Avian Influenza (AI) and Foot and Mouth Disease (FMD) have been spreading all over the World for some years ago. They caused enormous losses for households as well as livestock production from industrial to small scales. In 2003, AI occurred in 57 out of 64 provinces in Vietnam. There were over 44 billion head of poultry (17% of total number) infected, dead or damaged. Estimated loss was nearly 120 million USD, equal to 0.3% of the GDP (According to the report of the Department of Animal Health of Vietnam - DAH, 2007). In the year 2006, FMD spread in 40 provinces. According to the DAH, there were about 30.000 infected, and dead cattle and pigs. In the past few years, AI and FMD have brought many difficulties in livestock production and in social-economic development of the Hoa Binh province and the Luong Son district. According to the concepts of epidemiology, disease is a result of many linkage factors. Each disease is not only influenced by many natural and social rules and their properties, but also the awareness and knowledge of farmers play an important role in the development of diseases. Because of the reasons mentioned above, we carried out a study: "Investigation of some social factors on the evolution of Avian Influenza (AI) and Foot and Mouth Disease (FMD) in Luong Son district, Hoa Binh province".

2. MATERIALS AND METHODS

2.1. Materials

Questionnaire and data collected from the veterinary office of the Luong Son district.

2.2. Methods

- Interviewing households and filling the questionnaire with the help from local veterinarians
- Retrieving data
- Analyzing data according to epidemiologic methods

3. RESULTS AND DISCUSSION

Luong Son is upland area with a low annual average income per person of approximately 4.5 to 5.0 million VND/ person/ year (Annual report of the Veterinary Department in Luong Son, Hoa Binh, 2006). Although the contribution of livestock to the GDP of the Luong Son district is not high, it is the main food supply for people here.

In Luong Son, AI appeared in the years of 2003 and 2004 at 2/3 of the surveyed communes including Hoa Son, Cu Yen, and excepting Nhuan Trach commune. According to the statistic of the Veterinary Department in Luong Son, in 2003, there were 14 infected areas, and 2300 infected poultry were destroyed. In 2004, Hoa Son was the only commune which had AI, and 1500 head were destroyed. From 2005 to the end of our study, there was no report of AI from local areas.

With regard to FMD, the disease did not appear in years 2003, 2004 and 2007 at the 3 referred communes. However, in 2005 and 2006, FMD occurred at all 3 communes, causing big losses (Annual report of the Veterinary Department in Luong Son, Hoa Binh). In 2005, there were 18 infected areas and 30 destroyed animals. It was said that the number of sick animals killed did not eliminate FMD. In our opinion, that was a risk for an FMD outbreak in year 2006.In year 2006 FMD spread in our whole country. At 3 investigated communes, there was an increase in number of both infected areas and destroyed animals as follows: 28 infected areas and 56 killed animals in total.

3.1. The habit of livestock holders in choice of sources of breeding supply

Table 1. Sources of breed supplier.

Commune	No. of farmers	Breed supplier					
		Self supporting		Local market		Breeding center	
		No.	*Rate (%)*	*No.*	*Rate (%)*	*No.*	*Rate (%)*
Nhuan Trach	390	144	36.92	217	55.64	31	7.95
Hoa Son	345	119	34.49	199	57.68	25	7.25
Cu Yen	265	97	36.60	149	56.23	19	7.17
Sum	1000	360	36.00	565	56.50	75	7.50

Breed quality is one factor that takes into account the success of raising animals. Good breeds can yield high quantity product, resist diseases, and require less food intake (Toma *et al.,* 1996).

Our results indicated that the main sources of breed supply were self-supplier with the rate of 56.50% and the local market (36.00%). A few investigated households (7.50%) bought breeds of animals from the breeding center. There was no certificate for breed from private/ unofficial sources, the animal's productivity was not high and they might be infected and catch diseases easily. Apart from breed, quality of feed used can cause decline in productivity or increase in morbidity/ mortality rate during the raising period.

3.2. The animal production mode at local areas

Mode and techniques applied in animal production are important factors. Diseases are reduced significantly and more income is

created if suitable technical measures are presented in each household (Toma *et al*. 1996).

In the pig production sector we found that 100% of investigated farmers kept their pigs in pigpens which were simply built. Raising conditions were poor: high humidity; lack of sanitation; accumulation of urine, feces, *etc*. This affected the growing rate and spread of disease.

In the cattle production sector the percentage of farms with shelter for animals was 15.18% (104 cases in 685 cases total). Most of them were in a dairy production development program. There were about 76.79% and 8.03% of farms using the semi- natural pastures method and the traditional method, respectively. Because the herd was not managed (holders let them range free), Foot and Mouth Disease (FMD) broke out and spread through way of direct contact to healthy cattle.

In the poultry sector nearly 10.49% were small-scale to semi-intensive productions. In contrast, 89.57% of holders used traditional modes (raising poultry outdoors on pasture). The high rate of un-managed flocks was also a reason for spreading of disease from area to area.

3.3. Purpose of livestock holders in production and selling

The results of our survey in Table 2 indicated that most of the farm holders (89.10%) raised animals for their daily needs: meat, eggs and milk. We also found that only 7.50% of producers find another output for their livestock product (under the support of some ongoing programs or a few animal feed companies). Meanwhile, 92.5% of farm holders sold their product directly to customers at local markets but in a small scale. The logical result of the above situations lead to careless of selection breeds, hygiene, and disease prevention. In general, the farmer's concerns on livestock development depend on the purpose of raising and income benefit (Cameron *et al*, 1999). They will rear animals carefully, and follow disease prevention strategies when the output for their products is managed. However, with the properties of the local's livestock production system *(such as,* farm animals raised in small scale, using agro-byproducts, lack of market orientation *etc*.), people did not pay enough attention to either their animals or their diseases.

Table 2. Purpose of production and selling.

Commune	No. of investigated farmers	Purpose of production				Ways of selling			
		Breeding		Meat, egg, milk		Local market		Collected by company	
		No.	*Rate(%)*	*No.*	*Rate (%)*	*No.*	*Rate(%)*	*No.*	*Rate(%)*
Nhuan Trach	390	41	10.5	349	89.5	372	95.4	18	4.6
Hoa Son	345	37	10.7	308	89.3	312	90.4	33	9.6
Cu Yen	265	31	11.7	234	88.3	241	90.9	24	9.1
Sum	1000	109	10.90	891	89.10	925	92.50	75	7.50

Therefore, when infectious diseases occurred, they threw carcasses away, slaughtered, or even sold ill animals illegally. People also neglected reporting to technical agencies. All the above difficulties increase the likelihood of disease spread and silent circulation.

3.4. Attitudes of local people toward vaccination

Vaccination is an effective way to prevent and control diseases (Morris and Jackson, 2005). In fact, diseases cannot or rarely occur in the areas where a vaccination strategy is strictly applied. A low level of vaccine use plus weakness of local authorities creates ideal chances for the outbreak of diseases. Base on the analyzed data in Table 3, local people were concerned about vaccination when diseases broke out or vaccine was freely administered.

Our results revealed the fact that mandatory vaccines (FMD and AI vaccine) were not completely used at all investigated communes. It might rotation of result from herd without the additional vaccination, neglectful behavior among people, inadequacy of local authorities, insufficient veterinarians and shortage of budget for vaccination programs. In such a situation, the risk of FMD and AI was high and unknown dueto the presence of susceptible animals in the population, especially when the two outbreaks were not completely under control.

Table 3. Concern of local people on vaccination strategies at investigated communes

Commune	Cattle vaccination					Poultry vaccination				
	No. of farmers	FMD vaccine		Others		No. of farmers	AI vaccine		Others	
		No.	*Rate (%)*	*No.*	*Rate (%)*		*No.*	*Rate (%)*	*No.*	*Rate (%)*
NT	325	287	88.31	173	53.23	344	318	92.44	61	17.73
HS	298	255	85.57	167	56.04	299	273	91.30	54	18.06
CY	232	196	84.48	131	56.47	216	192	88.89	42	19.44
Sum	855	738	86.32	471	55.09	859	783	91.15	157	18.28

3.5. Attitudes of local people toward hygiene

Hygiene applied in livestock production is considered one of the most important factors. It reduces mortality and promotes productivity. As a general rule, animal health and hygiene are directly linked (Dao Ngoc Phong, 2001). Therefore, when farm animals are kept in clean, well-ventilated breeding facilities, they will grow faster and have fewer diseases. Otherwise, they might require more food intake and easily fall into bad condition.

The condition of breeding facilities in the three communes was generally low and did not follow the hygiene standard. They were dirty with high humidity. People did not collect waste (urine, feces, *etc*.), which accumulated directly to gardens or drain systems before any treatment process. The study showed that only 29.30% of households were cleaned up daily. In contrast, 70.70% of the others were rarely or never cleaned. Up to 87.0% of farm holders did not process waste. The households (13.0%) that performed waste processing used a Biogas system or some bio-based method. The rate of households that used chemicals to disinfect was extremely low (8.10%). All of those facts created a bad environment for animals and brought ideal conditions for the survival of many germs. That was why the mortality of local farm animals due to a wide range of diseases including FMD and AI was high.

We found that many local farmers have no quarantine areas for new introduced animals (94.20%). This caused a high potential for diseases occurring, as new animals might suffer from illness or carry germs having no clinical symptoms.

3.6. Behaviors of local people to the outbreak of diseases

Besides veterinary authorities on enforcing disease control and prevention measures, once diseases broke out farmers' behaviors significantly contributed to the success of prevention, quarantine, controlling and overcoming damage progress. Farmers and holders following orders in destroying infected animals, reporting suspected sick animals as soon as possible to the veterinarians, using appropriate disinfectant to keep the raising environment clean, etc. will help to control outbreak, and prevent serious damage to the national economy or threat to human health (Martin *et al*., 1987).

From the data in Table 4, we realized that farmers who had been investigated did not have good behavior towards disease prevention.

There were 84.30% of interviewes responding "yes" to the question "will you follow up the command to destroy your infected poultry or cattle"? In fact, a large number of households (79.20%) sold their infected animals illegally at the first sign of outbreak, 16.0% of farm holders threw ill animals away. Farmers who destroyed animals following procedure were lowest with the rate equal to 4.8%. There were 13.80% of farmers that reported diseases to local veterinarians, meanwhile most of them (86.20%) took no action. These facts require urgent attention of authorities, due to the high risk of reoccurrence of diseases. Apart from those facts, awareness of keeping their breeding facilities clean was poor: 64.30% households did not perform disinfection; only 35.70% were applying sanitary methods to eliminate disease agents.

Table 4. Awareness of local people dealing with diseases in the production sector.

Commune	No. of holders	Treatment of ill animals		Reporting diseases		Carcass processing			Disinfection		Follow the destraction order	
		Local vet	Self medicating	Yes	No	Sell, slaughter illegally	Throw away	Destroy	Yes	No	Yes	No
NT	390	272	118	58	332	314	64	12	135	255	341	49
		69.74%	30.26%	14.87%	85.13%	80.51%	16.41%	3.08%	34.62%	65.38%	87.44%	12.56%
HS	345	238	107	45	300	271	57	17	124	221	284	61
		68.99%	31.01%	13.04%	86.96%	78.55%	16.52%	4.93%	35.94%	64.06%	82.32%	17.68%
CY	265	191	74	35	230	207	39	19	98	167	218	47
		72.08%	27.92%	13.21%	86.79%	78.11%	14.72%	7.17%	36.98%	63.02%	82.26%	17.74%
Sum	1000	701	299	138	862	792	160	48	357	643	843	157
		70.10%	29.90%	13.80%	86.20%	79.20%	16.00%	4.80%	35.70%	64.30%	84.30%	15.70%

In addition, up to 29.90% of farmers cured sick animals themselves, and did not have a clear understanding about diseases and mechanisms of drug actions. The above behaviors of local people raised the risk of drug resistance or put animals into a chronic stage, carrying germs consistently.

3.7. Recovery of livestock production after outbreaks

Any harmful microorganisms have a potential of surviving outside their host for a limited time (Nguyen Nhu Thanh, 2001). Therefore, it is essential to keep raising areas empty for sufficient periods to destroy most

of the germs before resumption of raising (Toma *et al*., 1996). This simple procedure is very useful in disease prevention. However, like other farmers in our country, farmers at Hoa Binh province continued to raise animals after diseases had settled down without permission of the local officer. This has brought about uncontrollable FMD and AI in Vietnam.

Our results revealed the situation after outbreak as follows: 66.0% of households started to resume livestock raising right after the outbreak stopped; 26.40% waited for a long enough time. A high rate of households (87.50%) answered that they would not start to raise another breed. Answering the question, "what is your concern on livestock production"? above 80% of households paid attention to techniques of production, 55.60% to the outputs of product, 54.90% to capital, 40.50% were interested in breeding, and 24.40% to the feed used.

Those data reflected an overall picture in livestock production of local farmers: small scale, scattered, and lack of capital and output for the product. The limitation of knowledge in taking care of farm animals, paying inadequate attention to livestock production *etc*., set a high risk of reoccurrence.

3.8. Involvement of local authorities disease control and prevention

Local authorities and veterinarians are human resources that directly participate in disease control and prevention. Therefore, the effective activities of local authorities will be a barrier against the threat of diseases (Toma *et al*., 1996). One positive result is that 100% of local farmers receive AI and FMD update information from a variety of communications.

Table 5. Role and responsibility of local authorities and veterinary services to disease prevention and control.

Commune	No. of farmers	Source of AI and FMD information		Veterinarian response			Vaccinator		
		Local committee	Other sources	Immediate	Delayed	No response	Vet.	Services	Self -performad
Nhuan Trach	390	314	390	134	221	35	355	151	57
		80.51%	100%	34.4%	56.7%	8.97%	91.0%	38.7%	14.6%
Hoa Son	345	298	343	112	187	46	317	142	52
		86.38%	100%	32.5%	54.2%	13.3%	91.9%	41.2%	15.1%
Cu yen	265	211	265	86	145	34	241	110	38
		79.62%	100%	32.5%	54.7%	12.8%	90.8%	41.5%	14.3%
Sum	1000	823	1000	332	553	115	913	403	147
		82.30%	100%	33.20%	55.3%	11.50%	91.3%	40.3%	14.7%

To act effectively requires a big effort of local committees and veterinarians because of the large areas, difficulties in transportation and scattered households. There was a complaint from farmers about the response of veterinarians' services. Up to 55.30% of households reported veterinarians coming late after receiving diseases information, 11.50% had no response and

33.20% had a home visit immediately. In fact, it was difficult to fulfill all the needs of farm holders with the veterinary extension network in Luong Son, Hoa Binh. But with the efforts of local veterinarians, the rate of undertaking vaccination was quite high (91.30%).

Only 14.70% of the households vaccinated by themselves because of unavailable local veterinary services. We hope the local authorities, including veterinary services, will do their best to prevent the spread dangerous of AI and FMD.

4. CONCLUSIONS

In Luong Son, Hoa Binh province, the knowledge of livestock holders about disease was still limited. All of them contributed to the difficulties of disease prevention and control. Farmers had never quarantined new animals before introduction to the herd. Households lacked concern on disease control and prevention and did not follow vaccination orders completely. Normally, they did not report diseases to local authorities, or even to farm veterinarians. Usually they sold sick animals illegally, *etc*.

The veterinary extension networks did not have enough human resources to contribute to the disease prevention programme. Difficulties arose from topography, farmers' habit *etc*... The local veterinary system and veterinarians need to be strengthened. Local authorities should have strategies to change livestock production from small-scales to semi industrial/industrial scales, and avoid raising certain kinds of breeds to eliminate risk of cross-transmission. Local committees need to promote attitudes about disease prevention, including vaccination, destroying sick animals, hygiene, setting up waste processing by a short training course, making a fresh and disease-free environment for sustained development.

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