



Improvement on National Crisis and Emergency Management through a Core System: Lesson of the African Swine Fever Disaster

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ABSTRACT

The purpose of this study is to seek the problem and improvement on the national crisis and emergency management system in Korea through the core system. Based on the lesson of the ASF disaster, this study analyzed the five major elements of the core system : value, institution, leadership, devotion, and expertise. This article suggests recommendations for improving the national crisis and emergency management in Korea as follows; (①value) promoting animal welfare certification policies to spread respect for life, following the method of killing with pre-trainingt, (②prevention) establishing a defense system with North Korea through international organizations, (③preparedness) unification of the crisis warning level in the manual and guidelines, and to raise the crisis warning level when ASF occurs in neighboring countries, (④response) promptly holding Animal Disease Control Council involving livestock farmers to seek expert advice and establish regulations on the extent of preventative killings. (⑤Restoraiton) establishing compensation criteria, including the upper and lower limits for killing compensation, and supporting livelihood security funds before re-entry, (⑥leadership) change of national crisis management system to operate Central disaster and safety Countermeasure Headquarters in social disaster management agencies, (⑦devotion) strengthening disaster capacity of citizens and establishing a cooperative system among governments, corporations and civil society, (⑧expertise) modernization and specialization of livestock farms, expansion of inspection agencies and inspection personnel, expansion of vaccine research institutions and research personnel.

Key words: core system, crisis management model, ASF disaster, crisonomy, disaster, crisis management

Introduction

Since the African Swine Fever (ASF) was first confirmed on September 17 2019, the South Korean government took an in-

sufficient part in the phase of preparing for crisis management and the initial response phase due to disagreement among relevant departments on the possibility of spreading the disease from North Korea for about two months till November. Excessive emergency measures were taken such as issuing slaughtering and killing pigs

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orders and installing metropolitan fences to block wild pigs from coming South. Since October 7, no additional ASF disease is reported. In spite of this, wild pig ASF occurs on a regular basis, it is too early to be at ease.

In South Korea, a flu hit in 2010, slaughtering 3.48 million cows and pigs with about 2.7 trillion won spent for compensation, purchase and disinfection. Due to the high bird flu from 2014 to 2017, about 55 million chickens and ducks were buried, spending about 58.7 billion won (Standard Manual for Animal Disease Crisis Management, 73-75).

Despite tremendous amounts of money were invested to respond to animal diseases, foot-and-mouth diseases and bird influenza are occurring every year. Even if the ASF has 100% mortality rate, there is still no vaccine or treatment. Since consumers avoid pork stemming from excessive fear, pork price is declining (Ohmynews, October 24, 2019).

African Swine Fever (ASF) is a highly contagious haemorrhagic viral disease of domestic and wild pigs first occurred in September 2019 in South Korea. Since it is highly transmissible and 100% mortality rate once people are infected with the acute disease, it causes substantially losses in the pork industry. Once it breaks out, it must be immediately reported to the World Organization for Animal Health (OIE). Furthermore, international trade related with pigs must be immediately terminated. The South Korean government designates the ASF as the first type legal contagious disease under the Act on the Prevention of Contagious Diseases (Animal and Plant Quarantine Agency Homepage).

Since it first broke out in Kenya in 1921 and hit a number of sub-saharan countries for a long time. Since its clinical symptoms are similar to the swine flu and frequently occurs in Africa, it was called the ASF (Lee, 2015: 596).

Since the ASF was first confirmed in Paju, Gyeonggi-do, on September 17, a total of 14 were reported until October 9. No additional case is reported, yet further reports are derived from wild pigs. Drastic measures were taken to all pigs were buried as ASF mainly hit Gangwha-gun, Paju, Gimpo and Yeoncheon. This decision was extended within 10km from the southern boundary in Cheolwon. About 154,000 pigs were buried within 3km from the affected farm. In addition to this, about 65,000 pigs and 225,000 pigs were slaughtered and buried for the purpose of prevention (ASF, November 14, 2019).

Since the ASF virus was identified from a wild pig in the Demilitarized Zone (DMZ) at Sinseo-myeon, Yeoncheon-gun, on October 3, a total of 25 cases were reported in Cheolwon, Yeoncheon and Paju until November 14. The wild pig ASF cases happened in boundaries between South Korea and North Korea.

The Ministry of Environment classified management zones into

infection-risk zone, occurrence and buffer zone, boundary zone and block zone in an effort to curb the spread of virus caused by wild pigs. Given the regional characteristics, wild pig capturing strategies including installing barbed wires, capturing frames and traps and operating wild pig hunting area were carried out.

Since the ASF first hit the South Korea 2019 September, there are still problems in proposing problems and ways for improvement through analyzing references. This study aims to analyze problems and suggest ways for improvement through acts, manuals, guidelines, reports and press release on animal diseases. Elements of the core system such as value, institution, leadership, devotion and expertise were analyzed. In addition, institution were classified into prevention, preparation, response and restoration phases of crisis management.

Theoretical Review

Core System

The inadequate operation of crisis management under a state of emergency is derived from the lack of core system to operate and guide a crisis response system (Lee, 2015b: 53). The crisis management core system suggests policies and project directions for crisis management, coordinates, instructs and monitors the whole system at the state level (Cho, *et. al.*, 2016: 19).

The core system is network hub that guides and modulates a single entire system toward a consistent direction. Lee(2015) argued that it is necessary to pay attention to the process of converting various input elements of the system into outputs and identify its functions and roles in a bid to understand the core system (Lee, 2015a: 4).

Major elements of the core system include values, institution, leadership, devotion and expertise. First, value refers to the determination of ways forward for operating the system under a state of emergency. Second, social members should set up or establish socially or legally acceptable institutions in a bid to achieve desirable goals. Third, leadership is an element that affect system operation at the level of achieving goals and implementing cooperative works by members. Fourth, the system asks for their dedication to system works to successfully carry out works and fulfill goals. Lastly, the system should have expertise necessary for implementing tasks (Lee, 2015a: 4-5).

Crisis Management Model

Crisis management consists of four phases: prevention, preparation, response and restoration. Prior phases before emergency include prevention and preparation, while later phases include response and restoration. Prevention aims to reduce the long-term risk on human life and property from disasters. Preparedness aims to develop operational abilities in response to crisis in case of potential crisis, obtaining important resources and winning consent from various crisis management organizations in advance. Response is a process of applying all kinds of tasks and functions that such management agencies must undertake when crises occur. Restoration is a long-term process of activities to carry out right after crises break out until such crises return to normal states (Petak, 1985: 3; Lee, 2018: 150).

Analysis of ASF Disaster Problems Using Core System

The problems of the ASF disaster were analyzed by classifying elements of the core system such as value, institution, leadership, devotion and expertise. Institution was analyzed by classifying phases into prevention, preparation, response and restoration.

Value

Crisis management sets human dignity as an academic goal (Lee, 2014: 14). Just as human being have values for respecting their own lives, so do animals. Animals are raised in small and concentrated areas and affected by diseases under filthy environment such as rubbish. For food safety, animal welfare is significant.

As the ASF-infected pigs are dead 100%, this disease is severe. Pigs confirmed positive and those within 3km are subject to burial. Contract companies bury pigs for their increased profits. Wild pigs, a medium of spreading the ASF, were dead like raised pigs (Hangeora, October 21, 2019).

Institution

Prevention

Crisis management is the most important among others. Institutions are needed to predict, mitigate and prevent such risk.

More active preventive measures were needed to prevent this ASF.

In China, ASF-infected pigs were slaughtered and even the same disease was diagnosed in North Korea 2019 May. The South Korean government did not take an active part in curbing the spread of the ASF and even establish a close coordinating system.

Furthermore, little efforts were made to manage the current situation of livestock farms and set up relevant systems. Systems were not closely connected and illegal and unregistered farms were not reported to the government. Due to lack of regular disinfection management, a problem associated with preventive measures was identified. The movement history of livestock vehicles has not been fully tracked through the KAHIS system (Dong-a Ilbo, September 20, 2019).

The Ministry of Agriculture, Food and Rural Affairs has not amended standards on disinfection facilities since 2004. Since 2011, the Ministry has not revised it for 15 years amid a series of burial and ASF caused by foot-and-mouth diseases and bird influenza (Farmers Newspaper, August 30, 2019). The government conducted an investigation and found that farms, slaughter houses and feed farms did not meet good standards of epidemic prevention (Agrinet, November 11, 2019).

Preparation

The level of crisis alert was different according to types of animal diseases and different levels between manuals and guidelines on new animal diseases caused confusion. There are four levels of crisis information on foot-and-mouth diseases and new animal diseases in accordance with an animal disease crisis management standard manual and practice manuals: attention, caution, beware and serious. There are three levels of crisis alert based on bird influenza and ASF SOP: attention, caution and serious.

Despite cautious level due to the occurrence of ASF in neighboring countries, a single policy could not implemented due to disagreement among departments. When the ASF was reported in North Korea, the Ministry of Agriculture, Food and Rural Affairs stated that the number of wild pigs should be cut down due to concern over the ASF infection. The Ministry with the authority of modulating the number of wild pigs showed inactive attitude in the matter of modulating the number due to concern over gunshot accidents and disagreement by animal rights protection groups (Segye Ilbo, September 19, 2019).

Chinese illegal pork and processed food are distributed. The current situation of leftover farms is not reported. In actuality, the ASF occurred at these illegal leftover farms.

Response

In accordance with the ASF SOP, the first temporary stop for movement was ordered among livestock across the nation. However, it was scrapped after 48 hours. During that period, that termination needed to be extended and early preventive measures should be taken (Kangwon Ilbo, October 19, 2019).

According to the SOP, the scope of burial is within 500m from affected farms. It was extended to 10km considering its serious level. When the ASF was spread, stronger preventive burial was conducted among all pigs in Ganghwa, Paju, Gimpo and Yeoncheon. Forced purchase and burial were implemented in non-infected areas and ASF-hit Cheolwon.

To prevent the spread of ASF, burial must be ended within 24 hours. However, delayed response, equipment and understaff resulted in late works. Workers who entered the infected zones returned to home without some periods of isolation and went back to their works. Live burial was conducted as an alternative due to lack of stronger management and supervision for contract companies.

The Ministry of Environment said that only soft tick transmits virus in addition to wild pigs and there is low possibility of spreading virus from North Korea. However, it was found that wage standards or guidelines on treating captured wild pigs were not exactly defined.

There is no easier way to identify the proper density of disinfectants at the spot, except for the Korea Animal Health Products Research Institute. Debris and other materials were not fully removed from wheels due to inadequate location of disinfectant spraying nozzles and low spraying pressures of prevention machines.

Restoration

The problem lies in inadequate standards for burial reward. Reward has declined due to low pork price. With low reward, farmers tend to disagree with burial and avoid reporting. In addition, living subsidiary is insufficient. It is far less than their profits and only given for six months. It takes about three hours from production to the market following re-entry. However, the government give rewards for about six months.

Provincial government pays burial 100% without national budget. They are struggling with increased pig burial expenses due to excessive burial. In addition, environmental problems arising from burial are raised. Residents are complaining about serious underwater pollution due to leachate and odor. However, there are not enough rendering facilities for disposal.

Leadership

In accordance with the standard manual for animal disease crisis management, the Minister of Agriculture, Food and Rural Affairs runs the Central Disaster Management Headquarters and controls the ASF. The Ministry of the Interior and Safety operates a government-wide policy support headquarters and a spot operation support team. However, such system confuses a response system. Despite concerns over the spread of the ASF across the nation and its long-term spread, the Central Disaster Management Headquarters managed by Prime Minister did not launch its services.

The Ministry of the Interior and Safety viewed that the Ministry of Agriculture, Food and Rural Affairs are able to fully respond to the disease by running the Central Disaster Management Headquarters. It argued that the Central Disaster Management Headquarters establishes two control towers and causes redundant fear to people arising from excessive response (Seoul Daily, September 20, 2019).

The Ministry of Unification and National Defense stated that there is no concern about the spread of diseases through wild pigs from North Korea. The Ministry of Environment announced that there is no direct association due to no track of wild pigs near Paju. The Ministry of Agriculture, Food and Rural Affairs stated that there is a high possibility of spreading the ASF from North Korea (Chosun Ilbo, October 19, 2019).

Devotion

The government has taken emergency measures such as buying and burying pigs in Ganghwa, Gimpo, Paju and Yeoncheon cities in a bid to prevent further spread of the ASF. In this process, livestock farmers, leftover industries, land owners, provincial government and public servants had to make sacrifice, while reward was insufficient.

After the government ordered a drastic measure, all pigs were buried and farmers were at the verge of poverty and shutting down works without the date of re-entry. Although farmers were forced to bury pigs due to the burial order, the government did not announce special reward distinct from other regions to them. Suppliers are at the verge of collapse due to forbidden leftover (Dong-a Ilbo, October 22, 2019). Rendering companies in Yeoncheon-gun were old so that burial was delayed. Livestock farms near Pocheon disagreed with using rendering services. When people began to install fences at the spot where infected wild pigs were dead, some residents disagreed with such decision.

Although provincial governments conducted preventive burial

in accordance with the government order, the government avoids burial expense. The Paju spent more than 80 billion won for operating guide posts and burial reward. The Cheolwon receives the application of purchase from farmers, yet two participation is found due to concern over low reward and resumption of operating farms after burial. Public servants are grappling with both physical and mental stress from burial and round-the-clock emergency work.

Expertise

Above all, the number of agencies specialized in testing the ASF and staff was limited. It takes about 10 hours from reporting suspect diseases and confirmation as ASF suspect evidence is even transferred from Gyeonggi-do to the Animal and Plant Quarantine Agency in Gimcheon.

In addition, the number of ASF test agencies and employees for testing wild pigs is also insufficient. The outcomes of ASF virus-carrying tests following a series of captures are event delayed, because it is conducted at the National Institute of Environmental Research in Incheon under the Ministry of Environment. There is only one vet in charge of inspecting wild pig ASF.

Inspection methods were different among organizations. The Animal and Plant Quarantine Agency inspected infection such as CSF, pig cholera and foot-and-mouth diseases. The National Institute of Environmental Research inspected only ASF and CSF, and antigen test, excluding antibody that reveals the track of virus (Segye Ilbo, September 27, 2019).

Improvement

Value

Sound raising environment should be offered and stress and unnecessary pain should be minimized, thereby improving the level of animal welfare. Animal welfare shows how sound they maintain life and production activities. The value of respect for life should be disseminated through promoting animal welfare certification policies.

Burial workers and wild pig hunters need to receive education in advance. Relevant workers need to receive instruction on ways to bury and hunt wild pigs not to give unnecessary pain, fear or stress to animals in the process of slaughtering and burial. Public servants need to thoroughly monitor the process for workers to

comply with the burial procedures.

Institution

Prevention

A preliminary cooperative system should be established to prevent further spread of animal diseases through neighboring countries. Without cooperation with North Korea, the prevention system needs to be set up through international organizations.

Furthermore, a government-wide livestock farm management system needs to be built, through which basic information for prevent virus such as installing GPS on livestock vehicles, disinfection, vaccination and reviewing the current state of preventive measures and managing buried sites should be provided to the general public. In addition, KAHIS, livestock urination disposal facilities and AGRIX managing environment-friendly livestock payment system should be incorporated and connected. Livestock information such as a record of detecting illegal facilities and establishing disposal facilities approved by the Ministry of Environment should be managed in a single form.

Prevention-related acts and disinfection-related codes should be amended in accordance with the reality. Furthermore, disinfection and inspection should be stepped up among livestock farms with 50-square-meter.

Preparation

The level of crisis alert in manuals and guidelines should be consistent not to cause confusion. It should be revised to be immediately implemented at the spot. The four levels of crisis alert should be unified in standard manuals and SOP of animal disease crisis management and solutions should be made.

When animal diseases occur in neighboring countries, alert level should be upgraded from "attention" to "caution." Measures such as operating prevention emergency, inspecting national preventive facilities and emergency prevention and promoting livestock farms should be actively implemented.

The causes and solutions of ASF in neighboring countries should be benchmarked and resolve the causes. Relevant manuals and guidelines should be amended to be immediately applied when diseases occur. Early solutions should be made such as monitoring systems.

Response

When new animal diseases occur, Animal Disease Control Council

joined by producers should be immediately held, through which important decisions such as a temporary order to move around should be made. In addition, the scope of maximum burial should be limited and prohibit the wide scope of burial at the municipal and county levels. Since the ASF occurs through direct contact, precise and rapid burial are required.

Temporary workers at the spots should receive instructions on prevention guidelines in advance. When infected animals are buried, pains should be minimized and dead when they were unconscious.

In-advance instruction such as SOP center disinfection facilities, control guard posts and ways to disinfect facilities and dilute disinfectants should be explained in details to them. New standards for disinfection device performance to use properly diluted disinfectants should be defined and approved. In addition, an additional organization in charge of post management should be set up. A kit to measure the level of diluted disinfectants at the spot needs to be developed. Before moving animals to slaughter houses, they need to be disinfected and then transferred to other farms following disinfecting disinfection hub facilities. When the ASF occurs, the Central Safety Management Committee, Safety Policy Framework act on the management of disaster and safety if disagreement among departments needs to be mediated and cooperation is needed to resolve the crisis.

Restoration

Maximum and minimum levels of reward should be defined when infected animals are slaughtered and buried when a new disease hit. Farms ordered to bury them by the government should be given total amounts of reward. Detailed re-entry standards should be set up and proper living subsidiary should be provided until the re-entry date.

The slaughter reward should be distributed at once according to the average value of the previous month on the first date of occurrence like foot-and-mouth reward. Economic loss should be rewarded just for more than 1.6 years until the re-entry. Three-year average profits of farms should be calculated and more than 80% of profits should be rewarded until re-entry (Farmers Newspaper, October 23, 2019).

Government should provide budget to dispose and disinfect diseases. National provision evidence should be prepared to dispose increasing disposal expense of provincial governments. ASF should be included in the list of epidemics to operate control guard posts and provide disinfection expense.

The government should improve institutions for livestock farms to build modern facilities such as automatic disinfection and slaughter rendering facilities and further provide financial assistance to livestock farms.

Leadership

Control tower and leaders need to have abilities to actively find out points that affiliated agencies miss out such as reviewing the progress and monitoring. To this end, control tower should be elevated to demonstrate such abilities (Choi, *et. al.*, 2019: 167-168).

The existing national crisis system should be amended to allow the department in charge of social disasters assume overall responsibility and operation in the Central Disaster Headquarters. When a state of national emergency happened due to spread of ASF, the head of the Central Countermeasure Headquarters should be elevated to Prime Minister and the vice head as the Minister of Agriculture, Food and Rural Affairs. Organized by the Office of the Prime Minister, a crisis management assessment portal website should be opened and evaluate crisis management capabilities of departments. In addition, problems by crisis management phases and relevant plans should be prepared. The results of the assessment, along with policy satisfaction, should be made public to ordinary people. Animal Disease Control agency should be established to mainly undertake the disinfection of livestock and crisis management.

Devotion

All members including government, companies and civil society should make joint efforts with partnerships, share, modulates their individual function and role and provide assistance (Lee, 2015a: 10).

In addition, people should develop their disaster capabilities. Not just relying on central and provincial governments, they sincerely need to join the efforts to prevent disasters to protect themselves and others. When an earthquake hit Hanshin and Awaji in Japan, more than 90% of buried people escaped and saved their families, friends and neighbors (Asia Today, October 22, 2019). The role of neighbors is significant in treating animal diseases. If neighbors do not care of taking preventive measures, the virus could spread to neighboring farms and even the whole country.

Therefore, a cooperation system among government, companies and civil society should be formed to prevent further spread of animal diseases. Plus, a reward system for dedicated sacrifice should be institutionalized.

Expertise

Livestock farmers need to be modernized and specialized in order to prevent further animal-related diseases in the future. Farmers

should set up prevention, automatic disinfection and rendering facilities. In addition, an automatic livestock management facilities need to be equipped to curb other vehicles not to enter stalls. Stall standards need to be improved for proper raising environment(Olson & Bark, 1996: 198-204).

Research and development budgets should be expanded to develop treatment drugs and vaccines for new animal diseases. Furthermore, research institutes and researchers need to increase(Hungerford, 1967: 540; Dijkhuizen, *et. al.*, 1995: 135-149).

Inspection agencies should be established in metropolitan areas for a swift inspection when the wild pig ASF occurs and the number of researchers needs to further increase. Furthermore, inspection standards should be prepared for inspection agencies to test the same diseases.

Research on disinfectants needs to be conducted to basically prevent domestic animal diseases. In addition, disinfectants and proper disinfectant-diluted test kit should be developed. Standards on prevention device for automatic disinfection should be made. Lastly, disinfection-related facility inspection agencies should be established and relevant inspectors should be recruited.

Conclusion

Summary of Problems and Improvement

This research proposed problems and ways for improvement on the ASF crisis 2019 September. Analysis was classified into five elements such as value, institution, leadership, devotion and expertise of the theory of core system. Institutional aspect was classified into four phases: prevention, preparation, response and restoration. Regarding ASF-related problems through the core system, animals were buried alive due to disrespect for animals stemming from value. In seeing the problems in terms of institution, a joint prevention cooperation system was not established with North Korea due to inadequate response despite the occurrence of ASF. Even the current state of livestock farms was not managed properly(Vapnek, 1999: 1-19).

There was a little confusion due to different levels of crisis alert between manuals and guidelines at the preparation phase. In addition, wild pigs were not properly captured due to disagreements among government agencies. At the response phase, a temporary ban for movement was not extended and early response was not taken due to delayed action when the ASF broke out. In addition, late excessive measures were taken to slaughter pigs across the

designated areas. At the restoration phase, declining pork price reduced reward from slaughter and burial. Living subsidiary did not consider farm income and re-entry period(Stärk, *et. al.*, 1998: 682-690).

The Central disaster and safety Countermeasure Headquarters to coordinate cooperation among departments was not operated in terms of leadership. In terms of devotion, animal farms, leftover companies, land owners, provincial governments and public servants made sacrifice in excessive burial and slaughter works, but a hefty reward was not followed. The number of inspection agencies and researchers for testing the wild pig ASF was limited and different inspection standards caused confusion in terms of expertise(Sur, 2019: 1-5).

In accordance with the aforementioned core system and crisis management phases, ways for improvement on such ASF problems were proposed. Regarding value, animal welfare certification policies should be promoted and preliminary education both at pig burial spots and wild pig hunting places is pivotal to spread the value of respect for animal life.

In terms of institution, a prevention system should be set up through international organizations for prevention and an integrated livestock farm management system should be built in connection with all department systems. In terms of preparation, the level of crisis alert, as shown in manuals and guidelines, should match to the 4th level and a crisis alert level should be upgraded when the ASF hit neighboring countries(Geering, *et. al.*, 2001: 6).

In terms of response, a council for preventing animal diseases joined by farms should be held as early as possible and standards on the scope of preventive burial should be defined. Maximum and minimum reward and re-entry standards should be defined in terms of restoration. Before they resume their work, living subsidiary should be provided. In terms of leadership, a national crisis management system should be revised to allow relevant department in charge of social disasters to run the Central disaster and safety Countermeasure Headquarters.

A crisis management assessment portal website should be opened and crisis management abilities by departments should be evaluated and promote access to the general public. In terms of devotion, people should upgrade their disaster capabilities. In addition, a preliminary cooperative system among government, companies and civil society should be set up. In terms of expertise, livestock farms should be modernized and specialized. The number of treatment and vaccine institutes should increase. On top of that, animal disease-related inspection agencies should be built and the number of inspectors should increase(Gallardo, *et. al.*, 2015: 14; Khomenko, *et. al.*, 2013: 1).

Limitation

Since there is a little research papers on the ASF due to its first outbreak 2019 September, there

The author analyzed the disease mainly based on law on animal infectious diseases, relevant manuals, guidelines, website information from relevant agencies, a daily state report released by the ASF government-wide support headquarters of the Ministry of the Interior and Safety, press release by the Ministry of Agriculture, Food and Rural Affairs and the Ministry of Environment, and opinions from media outlets(Costard, 2015: 1-9).

This paper was added up on the basis of hands-on experiences such as the ASF government-wide support headquarters and a team for operation and support at Yeoncheon. If experts in animal disease disaster continue to conduct research on the ASF crisis management, problems and ways for improvement will come out in diverse perspectives, and ultimately research could be carried out in a more systematic manner.

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