GEOGRAPHIC MAPPING OF AFRICAN SWINE FEVER 2001-2 OUTBREAK IN SOUTHERN NIGERIA

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Abstract

The initial pattern of spread of African swine fever (ASF) in 2001 in southern Nigeria was studied using Ibadan southwest local government area as a case study. To ensure accuracy of map design, global positioning system (GPS) was used to collect geographic data and geographic information system (GIS) was used to display, edit, and analyze the data presented on a map. Location and distribution of pig farms, and their functional association with lake, streams and roads in the area were described on the map. The map showed direction of spread of ASF in the area. A strong positive coefficient of area correspondence (C*a*) was obtained for ASF outbreak, road networks and transportation to pig farms. A weak C*a* was obtained for streams and lake. The outbreak pattern was random but showed positive correlation to trade-route for pigs and pig farm inputs. The initial pattern of spread was therefore trade-route related. Increased contamination of the environment resulted in spread along stream. The map created was used at public presentations to pig farmers and animal health authority in Oyo state. This promoted community connections between farmers and veterinary authorities in southern Nigeria.

Introduction

Definition of geographic mapping of African swine fever outbreak

Geographic mapping of African swine fever may be defined as a special-purpose, statistical map (Dent, 1999) designed to demonstrate particular features such as pig farms, roads, streams and lake, and concepts such as transportation and trading, that may present a graphic theme about African swine fever outbreak in a study location. Mapping of physical, cultural and social adaptations to the outbreak and abstracting ideas about the disease gives us a clearer picture for visualization, communication and plans for its control. Structural features include distance and directional relationships, pattern of location and pattern of spread of the disease. Thus, ASF outbreak map provides us with a structure for storing geographic

knowledge and experience of an occurrence. It gives us a means not only for storing information, but for analyzing it, comparing it, generalizing or abstracting from it.

Elaboration on geographic mapping of ASF outbreaks

As technology advances, so do our capabilities for disease diagnosis and tracking. GIS is an exciting technology which is becoming a more common part of everyday life (Ramirez et al, 2004). GPS is a data collection technology, whereas GIS is a data analysis technology. These technologies enable effective and efficient performance of veterinary public health and preventive medicine roles in that it provides tools for environmental systems and community studies on problems affecting domestic animals. In a graphic presentation format, it readily enables communication and visualization of patterns of disease spread by bringing together numerous variables that contribute to the spread. This when focused on the living environment (Knapp and The Orton Family Foundation, 2003) where individuals make their daily living, they feel more willing to contribute to issues touching their own community as it is seen as theirs.

Justification for this study

Studying pattern of an epizootic is a practical opportunity for epizootiology. However preparing a map of the epizootic is an opportunity for appreciating basic geographic data management and planning analysis needed for environmental systems description and community studies to derive workable disease management plans. This justifies attempts made towards community connections for solving environmental problems.

Objectives of the study

There are 3 main objectives for which this work was started. These are:

1. To identify pig farms in Ibadan southwest local government area of Oyo state, and determine the geographic coordinates of their locations and use these to georeference other data including date of outbreak of ASF, initial population of pigs, number of clinically ill, number of dead pigs, and number of convalescent survivors.
2. To use the georeferenced data collected and data from other sources to create and edit a map of ASF outbreak pattern on a GIS.
3. To establish and promote community connection between animal health authorities and pig farmers with the map created through several public presentations.

Materials and Method

Study location

This case study was based on Ibadan southwest local government area, Oyo state Nigeria.

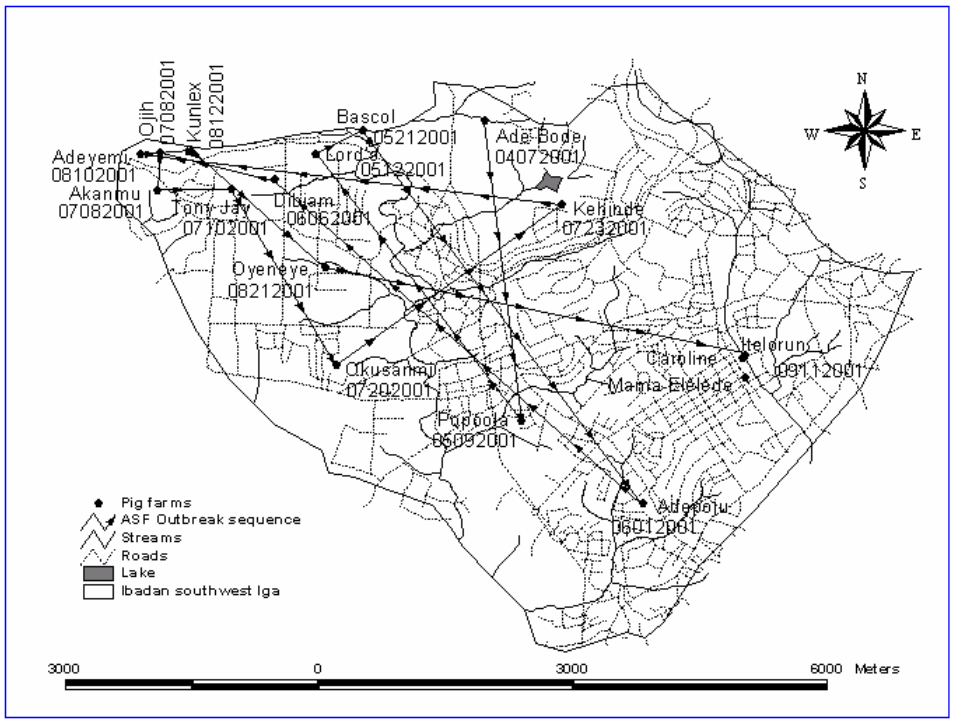
Materials and method for geographic data management

GPS (*Magellan* GPS 315) was used to obtain Pig Farm location coordinates and those of free range pigs. This was recorded in decimal degrees. A digital map of Ibadan southwest local government area was obtained from Ibadan southwest Town Planning Office, Ring Road, Ibadan. Shapefiles of streams, lake and roads in Ibadan southwest local government area were obtained from Department of Geography, University of Ibadan. A desktop and a laptop computer with Arc View GIS software license installed on them were used for data display and editing. Values of pig farm location coordinates were keyed into the GIS with other data gathered during field investigation to produce a map of the initial pattern of ASF spread in the local government area. Add Event Theme was used to plot pig farm points on the view.

Results

Seventeen pig farms with 15 operational ones were identified in Ibadan southwest in 2001 (Table 3.1). This ASF outbreak was a typical epizootic. The spread pattern was multi-directional and linear. The pattern of outbreak is shown with arrow lines in Figure 3.1. Roads, streams and lake had functional roles in the spread of ASF across farms.

Figure 3.1: Pattern of initial spread of ASF in Ibadan southwest local government area in 2001



The first outbreak point was in the north central area. The second outbreak point was in the south central area. The last outbreak point was in the mid eastern area. Six farms out of seventeen were within 100 meters distance to a stream. Farmers sometimes drew water from streams for use on farm without further treatment. This occurred in Ade Bode, Bascol, Kunlex, Oyeneye, Itelorun and Caroline. ASF outbreak on pig farms had a strong positive coefficient of area correspondence (C*a*=1) to road networks and transportation. The coefficient of correspondence to streams and lake was weak C*a*= 0.1.

Table 3.1: Pig farms in Ibadan southwest local government in 2001 with their attributes

Attributes of Pig farms.dbf

Shape	ID. No	Name of Pig Farm	X-CoordLong	Y-CoordLat	Date of ASF outbreak	Initial population of Pigs	Number Clincally Ill	Number Dead	Number Culled	Number of Survivors
Point	16	Caroline	3.88543	7.36774		0	0	0	0	0
Point	17	Mama Elelede	3.88566	7.36569		0	0	0	0	0
Point	1	Ade Bode	3.85802	7.39297	04072001	134	134	101	23	10
Point	2	Popoola	3.86182	7.36098	05092001	176	176	169	0	7
Point	3	Lord's	3.84005	7.38950	05122001	607	575	494	32	81
Point	4	Bascol	3.84508	7.39200	05212001	971	919	790	52	129
Point	5	Adepoju	3.87475	7.35225	06012001	88	88	79	5	4
Point	6	Dibiam	3.83572	7.38672	06062001	160	148	148	8	4
Point	7	Ojih	3.82250	7.38953	07082001	44	44	36	0	8
Point	8	Akanmu	3.82328	7.38553	07082001	214	214	214	0	0
Point	9	Tony Jay	3.83109	7.38569	07102001	126	116	110	10	6
Point	10	Okusanmi	3.84225	7.36703	07202001	91	91	68	15	8
Point	11	Kehinde	3.86624	7.38403	07232001	178	178	134	36	8
Point	12	Adeyemi	3.82722	7.38940	08102001	127	127	115	0	12
Point	13	Kunlex	3.82478	7.38977	08122001	46	30	30	15	1
Point	14	Oyeneye	3.84105	7.37739	08212001	14	14	14	0	0
Point	15	Itelorun freeran	3.88561	7.36806	09112001	157	157	150	7	0

Commodities purchased and transported to pig farms were, live pigs, spent grains (brewery wastes) fed to pigs, palm kernel cake (PKC). Other transportation factor was the visit of farm workers from one farm to another. Popoola farm was the 2nd outbreak point, but no specific clue to source of outbreak was established. Lord's Farm outbreak was traced to eight after sales return pigs, brought to the farm based on an initial opinion that these were poisoned at their own usual premises out of which three were clinically ill. The supposed poisoning was clinical ASF case. The last outbreak point was among free-range pigs by streamside at Itelorun farm in September 2001. This was hypothetically considered to be from contaminated stream by farms upstream with earlier outbreaks.

Discussion

This outbreak was a typical epizootic. Between 1997 and 2004 fourteen states in Nigeria were confirmed to have had outbreaks of ASF through diagnostic test results obtained at the National Veterinary Research Institute (Majiyagbe *et al,* 2004). The case study of Ibadan southwest local government was thus an extremely small coverage of national records. Although only coefficient of area correspondence and no further proofing or analysis was done on the descriptive map produced, the map enabled animal health authorities and pig farmers to follow the complex interrelated processes involved in the spread of ASF with precision. This gave opportunities for environmental systems description and community studies on problems affecting animals and by extension man.

Conclusion

This map of ASF outbreak in 2001 designed on Ibadan southwest local government area contributed to planning information for ASF control project in southern Nigeria. Leadership and the degree of public participation in each individual town will determine degree of success of the project. This map aided in public presentations especially to put together a mini-plan in an open and organized fashion with well-researched and carefully analyzed information, so that management of the plan should become somewhat obvious.

References

1. *Dent, B.D. (1999) Cartography: Thematic map design. Fifth edition 417pp. Published by WCB/McGraw-Hill, New York, United States of America*
2. *Knapp, C.L. and The Orton Family Foundation Community Mapping Program (2003) Making Community Connections 173pp. Published by Environmental Systems Research Institute (ESRI), 380 New York Street, Redlands, California. 92373-8100 United States of America*
3. *Majiyagbe K.A., Shamaki, D.., Luther, N.J. and Udeani, T.K.C. (2004) African swine fever epidemics: The Nigerian experience (1997-2004). Vom J. Vet Res. Vol.1, 138-153*
4. *Ramirez, A., Olugasa, B.O. and Bickett-Weddle, D. (2004) Geographic information system and its role in biological risk management. In: Biological Risk Management Manual. Published by the Center for Food Security and Public Health (CFSPH), Iowa State University, Ames, Iowa, United States of America*.