

Research Application Summary

**Information communication methods used for management of transboundary animal diseases (TADS) amongst livestock keepers: The case of selected counties in Kenya**

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**Abstract**

This study investigated utilization of Information Communication Technologies (ICTs) for management of Transboundary Animal Diseases (TADs). The study was informed by Theory of Planned Behavior (TPB) and Diffusion of Innovation theory as guiding towards establishing the factors for acceptance and use of ICTs for management of TADs. One of the study objectives investigated the role and type of information, communication methods used for management of TADs amongst livestock keepers. A mixed-methods approach involving documentary analysis, semi-structured and structured questionnaires was used to obtain data. Livestock keepers and community-based stakeholders (n=356) were interviewed in Uasin Gishu, Kajiado, Nandi and Trans Nzoia counties of Kenya. The Statistical Package for Social Scientists (SPSS) was used in analyzing data. The study applied descriptive statistics, correlations, tests of significance and regression statistical methods in establishing set objectives. The study established a positive correlation between ICT utilization (dependable variable) and access to information and technologies, contact with change agents, and training. The correlation between cost of ICT services and ICT utilization was negative. Findings from multiple regression established training as the highly rated factor contributing towards utilization of ICTs in management of TADs. The radio was the ICT most used and preferred in management of TADs. The respondents rated government officials, private companies and NGOs as the change agents with high influence towards management of TADs. However, religious groups and extension workers were reported as having minimal influence with regard to management of TADs. The use of radio, mobile telephone, CD Rom and television were the ICTs highly recommended as ideal to livestock keepers in management of TADs. The study calls for finalization of Kenya ICT policy of 2006, and also recommends for further research in establishing additional factors which would contribute towards utilization of ICTs for management of TADs by livestock keepers.

Key words: Access, factors, Information Communication Technologies (ICTs), influence, utilization

**Résumé**

Cette étude a examiné l'utilisation des technologies de l'information et de la communication (TIC) pour la gestion des maladies animales transfrontalières (TAD). L'étude s'est appuyée sur la théorie du comportement planifié (TPB) et la théorie de la diffusion de l'innovation pour établir les facteurs

d'acceptation et d'utilisation des TIC pour la gestion des maladies animales transfrontalières. L'un des objectifs de l'étude était d'examiner le rôle et le type d'informations, les méthodes de communication utilisées pour la gestion des maladies transmissibles du bétail chez les éleveurs. Une approche mixte impliquant une analyse documentaire, des questionnaires semi-structurés et structurés a été utilisée pour collecter des données. Des éleveurs et des acteurs communautaires (n=356) ont été enquêtés dans les comtés de Uasin Gishu, Kajiado, Nandi et Trans Nzoia au Kenya. Le logiciel statistique SPSS a été utilisé pour l'analyse des données. L'étude a utilisé des statistiques descriptives, des corrélations, des tests de signification et la régression pour établir les objectifs fixés. L'étude a établi une corrélation positive entre l'utilisation des TIC (variable fiable) et l'accès à l'information et aux technologies, le contact avec les agents de changement et la formation. La corrélation entre le coût des services TIC et l'utilisation des TIC était négative. Les résultats de la régression multiple ont établi la formation comme le facteur le plus important contribuant à l'utilisation des TIC dans la gestion des TAD. La radio était la TIC la plus utilisée et la plus préférée dans la gestion des TAD. Les enquêtés ont estimé que les fonctionnaires, les entreprises privées et les ONG étaient les agents de changement ayant une grande influence sur la gestion des TAD. Cependant, les groupes religieux et les agents de vulgarisation ont été signalés comme ayant une influence minimale en ce qui concerne la gestion des TAD. L'utilisation de la radio, du téléphone portable, des CD Rom et de la télévision a été fortement recommandée comme étant l'idéal pour les éleveurs de bétail dans la gestion des TAD. L'étude appelle à la finalisation de la politique de 2006 du Kenya en matière de TIC, et recommande également de poursuivre les recherches afin d'établir des facteurs supplémentaires qui contribueraient à l'utilisation des TIC pour la gestion des TAD par les éleveurs de bétail.

Mots clés : Accès, facteurs, Technologies de l'information et de la communication (TIC), influence, utilisation

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## Background

Recent research work associated with animal diseases suggests that new infectious diseases emerge because of a complex set of multifactorial circumstances. This includes population growth, changes in nutritional, agricultural, trade practices, and shifts in land use. Other factors are accelerated urbanization, deforestation and encroachment on wildlife (Wolfe *et al.*, 2007). According to animal diseases experts, pathogens circulating in animal populations threaten both animal and human health and consequently, both the animal and human health sectors have a responsibility towards their control (WHO *et al.*, 2004). Pathogens –viruses, bacteria or parasites–have evolved and perfected their life cycles in an environment that is more favorable to them and this ensures their continuity through time by replicating and moving from diseased host to a susceptible new host. The Eastern Africa region has not been spared the risks associated with transboundary animal diseases (TADS) outbreaks, which included the H1N1 2009 pandemic.

A review of existing interventions aimed at controlling spread of common TADs such as Rift Valley Fever (RVF) and Peste des Petits Ruminants (PPR), reveals a problem calling for specialized interventions. Rabies is known to spread from Lions or Cheetahs, across to domestic dogs. In revisiting H1N1 2009 pandemic in Eastern Africa, Tanzania, reported the first case of H1N1 2009 influenza in September 2009. By March 2010, there were 770 cases reported, with one (1) death. Due to shortage of qualified human resources essential medicines and laboratory supplies in health facilities, it was not known how effectively prepared health-care providers in Tanzania were in responding to the pandemic (Kamuhabwa and Chavda, 2011).

In the period 2013- 2018, it is evident that impacts of infectious diseases extended beyond direct morbidity and mortality. The 2014-2016 Ebola outbreak in West Africa was a potent reminder that infectious diseases also affect economic, sociocultural, educational, health and other development objectives. Furthermore, these disease events, whether persistent or sporadic, have been analyzed to contribute to cycles of disruption and limit the ability of communities and countries to pull themselves out of poverty (Bonds *et al.*, 2012). In the context of global environmental change, ecological and human dynamics are increasing pressures at human-animal-environment interfaces, now known to be leading to increasing risks of disease emergence or reemergence, spread, and persistence compounding already high burdens in affected communities where endemic zoonotic pathogens infect billions of people, and cause upward of two million deaths annually (Grace *et al.*, 2012). These numbers do not project a safe scenario for developing nations and in particular Eastern Africa whose countries lie on Africa wetland path which is predisposed to zoonosis and TADs.

These infectious disease events have been established to have close associations with changing ecological and demographic conditions from anthropogenic activity, often with shared drivers of disease and biodiversity loss and ecosystem degradation (WHO-CBD, 2015). For the case of Kenya and most developing nations, land use change is one of the leading drivers of emerging infectious diseases from wildlife (associated with factors like expanding urban populations, changing agricultural production to meet increased demand, and natural resource extraction, all which frequently correlate with habitat encroachment and loss) (Loh *et al.*, 2015).

The risk of emerging and re-emerging animal diseases cannot be overstated or otherwise left to veterinarians or policy makers, since the wider community and various sectors of national production have all suffered whenever such diseases emerge. The proliferation of Information Communication Technologies (ICTs) have been singled out as playing a greater role in livestock disease control, dairy herd management, livestock production and marketing of livestock and its produce (Meena and Singh, 2013). Adopting to information management approaches amongst farming communities is widely acknowledged as one of the critical factors for efficient and effective agricultural decision-making (Cash, 2001, Galloway and Mochrie, 2005). Sasidhar and Sharma (2006) emphasized that use of ICT tools has potential to change the economy of livestock, agriculture and rural artisans in India. Tiwari *et al.* (2010) argue that the livestock sector should develop need-based, location specific and local language contents in the form of computer softwares and other electronic material. These are viewed as requisite for livestock disease control, dairy herd management, livestock production and marketing of livestock and livestock products.

Kenya's information and communications technology sector policy guidelines have been guiding the ICT sector regulatory framework. However, the Kenya policy 2006 recognized that ICT issues which include the media sector were spread out under various legislations. These included; Science, Technology and Innovation Act number 28 of 2012, Kenya Broadcasting Corporation Act of 1988 and Kenya Information and Communications Act Chapter 411A (GOK, 2013). Unfortunately, these were found inadequate in meeting immediate ICT requirements for consumers, specifically on issues of convergence, electronic commerce and E-Government.

### **Research methodology**

This study was conducted in four (4) counties of Kenya namely Uasin Gishu, Kajiado, Nandi, Trans Nzoia counties. These counties were selected due to their habitation by livestock keepers and prevalence of TADs. Purposive sampling method was used in identifying respondents for this study. The specific

purposive sampling methods used were critical case, and homogenous sampling (Kombo and Tromp, 2006). Both qualitative and quantitative data for this study was collected using a questionnaire and Key Informants. There were structured interviews, archival records reviews, observations and document review undertaken. The investigators focused on asking appropriate questions related to study objectives, good listening skills, adaptability and flexibility. Any form of bias or preconceived notions including those derived from theories were discouraged (Yin, 1994).

The investigator interviewed representatives from private sector, government officials responsible for animal disease control, national disease emergency response representatives, wildlife and meteorology experts interested in animal disease control in Kenya and East Africa. The study evaluated information and communication media used by meteorology department of Kenya in disseminating information on animal disease control to stakeholders. Additional interviews were conducted in the ministry of veterinary services at Kenya's headquarters in Nairobi, information specialists at; International Livestock Research Institute (ILRI) and Food and Agricultural Organization of the United Nations (FAO). This was done in order to establish existing information and communication methods used.

Among the study objectives was to determine factors associated with acceptance of ICT utilization among livestock keepers for management of TADs. The aspects of ICT acceptance were  $\beta$  (independent variables) and dependent variable was Y. This statistic was used in testing significance of differences between two (2) or more groups. This was independent variable and in frequencies for the dependent variables.

The regression model below was used to investigate factors which influence utilization of ICTS for management of TADs:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon + \beta_5 X_5 + \epsilon + \beta_6 X_6 + \epsilon + \beta_7 X_7 + \epsilon$$

Where:

Y = Dependent Variable (ICT Utilization)  $\beta_0$  = Regression coefficient

$\beta_1$ ,  $\beta_2$ , and  $\beta_3$  are slopes of the regression equation  $X_1$  = Cost of ICT services and equipment

$X_2$  = Training

$X_3$  = Access to information and technologies

$X_4$  = Communication method

$X_5$  = Contact with change agents

$X_6$  = Interconnection with social groups

$\epsilon$  = is an error term normally distributed about a mean of 0 and for the purpose of computation,  $\alpha$  was assumed to be 0.

## Results and discussion

There were 356 out of 391 sample respondents who filled in and returned the questionnaire accounting for 90.8 % response rate. The study sought to investigate why respondents would consider accepting ICTs for management of TADs. From the results, the respondents indicated they would consider ICTs for convenience, reliability and availability in communication. The respondents were in agreement

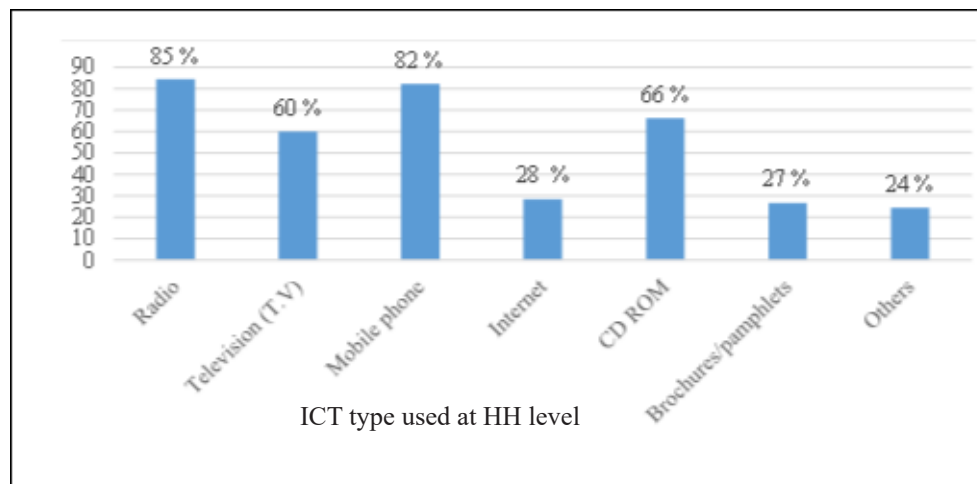
that ICTs were accessible across their home counties and as such preferred using them. The study further investigated the immediate information contact centers available to respondents during TADs outbreaks. The results established that outbreaks of TADs such as Rabies, Rift Valley Fever (RVF), Foot and Mouth Disease (FMD), Contagious Bovine Pleuropneumonia (CBPP), Pestes Des Petit Ruminants (PPR) were learned from neighbours, market places, cattle dips, slaughter houses, and other social functions.

The study sought to investigate benefits and limitations of information or communication technologies used by livestock keepers and community stakeholders while seeking information on management of TADs. Among the benefits cited by respondents were that ICTs such as mobile phones and radio disseminates information faster than other manual methods. The respondents explained that ICTs transferred information equally to most farmers, notwithstanding the affordable cost while communicating. In Nandi and Uasin Gishu counties, respondents commended ICTs as an available 'education source' on management of TADs. However, respondents cited limitations of information and communication methods used for management of TADs. Among the limitations were difficulties in understanding various languages broadcasted by media. In Kajiado and Nandi counties, respondents reiterated their preference for local dialect radio stations for communication on management of TADs. It was notable across the four (4) counties reached by this study that respondents lamented about the high costs levied on mobile phone services.

The results shown in Figure 1 confirmed that livestock keepers across Kajiado, Nandi, Trans-Nzoia and Uasin Gishu counties utilized ICTs for various purposes at household level. The underlying use of ICTs at household level thus presents a platform and basis from which ICTs would be utilized for management of TADs. The data in Figure 1 further confirmed that radio, mobile phone, Compact Disc Read Only Memory (CD ROM), and Television (T.V) as the most utilized ICTs at household level. The other communication methods commonly used by respondents included; Farmer Field Day (FFD), extension worker, books, magazines and pamphlets.

There were mentioned cases of information overlaps arising from ICTs which caused confusion. In Kajiado, respondents particularly lamented instances where they misinterpreted information on disease management communicated by ICTs. The lack of adequate electrical power was a limitation cited across the four (4) Kenya counties reached by the study. Frequent loss of power was blamed for delayed information transmission and feedback. There were similar complaints of frequent loss of mobile telephone and television network. This according to respondents caused lapses in communication regarding management of TADs. A notable limitation reported among some selected respondents was illiteracy. These respondents instead preferred face to face methods of communication in management of TADs, as opposed to ICTs.

From the study findings, it was evident that 48 % of local livestock keepers had received information on wildlife diseases which could affect livestock within their county / district or village. However, the challenge for these livestock keepers were the measures to implement should a TAD strike. In Kajiado County, livestock keepers explained their local coping mechanism against wildlife diseases, which they used as a safeguard against disease transmission to their livestock. According to study respondents, the radio was moderately helpful source of technical information in management of TADs. This statistic generated a mean score of 1.7893. The mobile phone generated a mean score of 2.3230, which was moderate as rated by respondents. These results are depicted on Table 1.



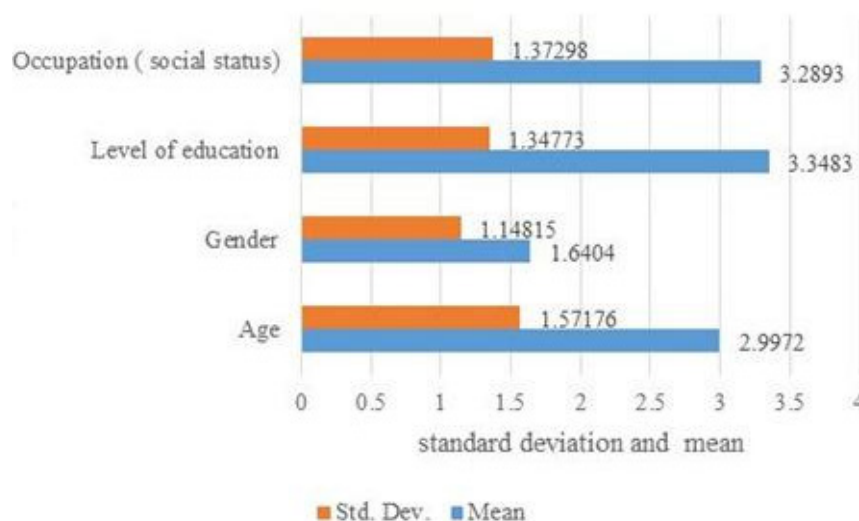
**Figure 1. The predominant ICTs used at HH level (source Wanjala *et al.*, 2015)**

**Table 1. Most helpful sources of Technical information in Management of TADs used by Livestock keepers**

Source	Mean	Std. Dev.
Radio	1.7893	0.89631
Television	2.8230	1.21476
Mobile phone	2.3230	1.00681
Internet	3.6067	0.94488
CD ROM	3.5730	1.00576
Books	3.7275	0.77017
Extension worker	3.5309	0.90796
Brochures	3.7163	0.74748
Farmer Field Day	3.6713	0.80936
Pamphlets	3.7163	0.78066
Magazines	3.8736	0.56497
Others	3.7978	0.64007

Source: Wanjala *et al.* (2015)

The Television (T.V) was moderately rated as helpful source for technical information in management of TADs with a mean score of 2.8230. However, the extension worker, Compact Disc Read Only Memory (CD ROM), internet, farmer field day, brochures, pamphlets, books, and magazines were rated less helpful. These generated mean scores ranging between 3.5309 and 3.8736, out of a possible five (5). This finding implied that respondents were not benefiting much from the communication methods listed.



**Figure 2. Demographic factors as they influenced utilization of ICTs. Source Wanjala *et al.* (2015)**

This study categorized the factors which influence acceptance for ICT utilization in management of TADs amongst livestock keepers. These were demographic, technological, economic and socio-cultural categories. For demographic factors, majority of respondents reiterated that level of education would influence their level of acceptance and utilization of ICTs in management of TADs to a moderate extent. This generated a mean score of 3.3483. Similarly, occupation or social status would influence level of acceptance and utilization of ICT in management of TADs to a moderate extent as given by a mean score of 3.2893. However, gender and age were rated with less influence given mean scores of 1.6404 and 2.9972, respectively. These results are depicted on Figure 2.

### Conclusion

This study concluded that attitudes of livestock keepers and community based stakeholders towards ICT would only to a moderate extent influence their decision towards utilizing ICTs for management of TADs. The study similarly concluded that education level attained, occupation or social status would to a moderate extent influence the decision by livestock keepers to utilize ICTs for management of TADs.

### Acknowledgement

The first author acknowledges the University of Nairobi, Faculty of Agriculture, for the opportunity to pursue his doctorate degree. This paper is a contribution to the 2018 Sixth African Higher Education Week and RUFORUM Biennial Conference.

### References

- Bonds, M.H., Dobson, A.P. and Keenan, D.C. 2012. Disease ecology, biodiversity, and the latitudinal gradient in income. *PLoS Biology* 10 (12): e1001456.
- Cash, D.W. 2001. In order to aid in diffusing useful and practical information: *Agricultural extension and boundary organizations. Science, Technology & Human Values* 26 (4): 431-453.

- Galloway, L. and Mochrie, R. 2005. The use of ICT in rural firms: a policy-orientated literature review. *Info* 7 (3): 33-46.
- Grace, D., Mutua, F., Ochungo, P., Kruska, R., Jones, K., Brierley, L. and Thao, N.B. 2012. Mapping of poverty and likely zoonoses hotspots. Zoonoses Project 4. Report to the UK Department for International Development. International Livestock Research Institute, Nairobi, Kenya.
- Kamuhabwa, A. and Chavda, R. 2011. Health-care providers' preparedness for H1N1/09 influenza prevention and treatment in Dar es Salaam, Tanzania. *The Journal of Infection in Developing Countries* 6 (03): 262-270.
- Kombo, D.K. and Tromp, D.L. 2006. Proposal and thesis writing: An introduction. Nairobi: *Paulines Publications Africa* 5: 814-30.
- Loh, E.H., Zambrana-Torrel, C., Olival, K. J., Bogich, T. L., Johnson, C. K., Mazet, J. A., and Daszak, P. 2015. Targeting transmission pathways for emerging zoonotic disease surveillance and control. *Vector-Borne and Zoonotic Diseases* 15 (7): 432-437.
- Sasidhar, P.V.K. and Sharma, V.P. 2006. Cyber livestock outreach services in India: a model framework. *Livestock Research for Rural Development* 18 (1): 1-12.
- Tiwari, R., Phand, S. and Sharma, M.C. 2010. Status and scope of information and communication technology for livestock and poultry production in India: A review. *Indian Journal of Animal Sciences* 80 (12): 1235.
- World Health Organization (WHO). 2015. Connecting global priorities: biodiversity and human health: A state of knowledge review. In: World Health Organization and Secretariat of the Convention on Biological Diversity, Geneva, Switzerland.
- Wolfe, N.D., Dunavan, C.P. and Diamond, J. 2007. Origins of major human infectious diseases. *Nature* 447 (7142): 279.
- Yin, R.K. 1994. Case study research: Design and methods. In: Applied Social Research Methods. Vol. 5. Sage Publications.