Journal of Agripreneurship and Sustainable Development (JASD)
Volume 5, Number 1, March, 2022
ISSN (Print): 2651-6144; ISSN (Online): 2651-6365

DETERMINANTS OF YOUTH POULTRY FARMERS' ADOPTION OF SELECTED BIOSAFETY PRACTICES AGAINST AVIAN-INFLUENZA OUTBREAKS IN JIGAWA STATE, NIGERIA

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ABSTRACT
The study examines the socio-economic determinant of youth poultry farmers' adoption of selected biosecurity practices against avian-influenza (HPAI-A/H5N1) outbreaks in Jigawa State, Nigeria. A total of 120 respondents were selected through a multistage sampling procedure were used for the study. Majority (75.0%) were married, males (92.5%) with average age of 24 years. Average proportion (50.0%) has secondary education while below average (40.0%) has no formal education. Average monthly income is ₦26,075.00 and farming experience of 13 years. Mean: household size of 5 persons; flock size of 411 birds; membership of social group (91.7%) and no extension contact (84.2%). The respondents highly practiced vaccination of birds ($\bar{x}$ = 1.000), constant cleaning of farm ($\bar{x}$ = 1.167), hand washing with soap and water after toileting ($\bar{x}$ = 1.492) and cleaning before restocking new birds ($\bar{x}$ = 1.625) in cleaning. In the disinfection sub-components only; keeping of farm records ($\bar{x}$ = 1.583), disinfection of equipment brought to the farm ($\bar{x}$ = 1.667) and constant and periodic disinfection of equipments, poultry house and cloths ($\bar{x}$ = 1.792) were highly practices while in segregation and traffic control sub-components, they highly practiced most of the activities except; employee restrictions ($\bar{x}$ = 2.250), periodic visitation to ADP Office for training ($\bar{x}$ = 2.750) and visitors/vehicle entry cleaning protocols ($\bar{x}$ = 3.000). The respondents have high adoption level ($\bar{x}$ = 1.832) on the segregation and traffic control, medium level of adoption for cleaning ($\bar{x}$ = 2.159) and disinfection shows low level of adoption of the standard biosecurity components ($\bar{x}$ = 2.458). Major source of awareness of AI are; Co-farmers/farmers group (79.2%), radio program (73.3%) and family/friends/neighbors (59.2%) among others. The highly severe constraints of the youth poultry farmers were; lack of education, poor extension/veterinary contact, lack of Buffer Areas around the farm site and lack/ poor farm record keeping ($\bar{x}$ = 1.000).

Keywords: Adoption, Avian-influenza, Biosecurity, Determinants, Poultry farmers.

INTRODUCTION
Poultry is the collective name designated to a group of birds reared or hunted for useful purposes. They are domesticated birds kept for purpose of egg or meat production which includes chickens (domestic fowls), turkeys, ducks and geese (FAO, 2017). It is the most commercialized of all the subsectors of the Nigerian agriculture with those commonly reared like chickens, ducks, guinea fowls, turkeys, pigeon and more recently ostriches (Adeyemo and Onikoyi, 2012). The total demand for poultry birds in Nigeria as at 2016 stood at 200million birds while supply was 140 million birds signifying an urge gap in the demand and supply chain. The demand-supply gap is filled by illegal imports that enter the Nigerian markets at lower prices than domestic producers (Federal Ministry of Agriculture and Rural Development [FMARD], 2016).

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ISSN (Print): 2651-6144; ISSN (Online): 2651-6365

This short fall among others is primarily due to diseases outbreak most of which are notifiable and reportable such as highly pathogenic avian influenza (HPAI A/H5N1) of very high economic importance and virulence (AICP, 2014). Avian influenza is a highly zoonotic disease of poultry that can cause wide range of economic, social and psychological damage to the farmers, consumers, national and international trade market (Henning *et al.,* 2009). In Nigeria, small scale poultry represents 85% of the estimated 82 million adult chickens, accounting for approximately 94% of the total poultry keeping and nearly 4% of the total estimated value of the livestock resources in the country (Eze *et al.,* 2017). Disease remains one of the major threats to boosting poultry production in Nigeria. These major diseases are; Newcastle disease, avian influenza, avian pox, infectious bursal disease, colisepticeamia, coccidiosis and worm infestation with Newcastle and avian influenza being the most recognized by poultry farmers (Musa *et al.,* 2012). Disease reduces the productivity of an animal and cause decline in output, increases cost of production and reduction in profit (Abdullahi *et al.,* 2015). According to CDC (2016), the estimated annual economic financial burden of livestock diseases is to the tune of ₦29.2 billion in Nigeria. The one experience in Nigeria in the year 2009-2011 due to infectious disease outbreaks amounted to over three billion naira (Eze *et al.,* 2017). To avert this disease use of vaccines, good hygiene, increasing standard of cleanliness and regular monitoring of flock health have enormous contributions to the establishment of flock with a low disease incidence. This practices in the livestock and poultry subsector are called biosecurity.

It (biosecurity) consists of a set of management practices which, when followed, collectively reduces the potential for the transmission or spread of disease-causing organisms such as the Avian Influenza virus onto and between sites, animals and humans (FAO, 2017; Obayelu, 2007; CIDRAP, 2017). Biosecurity consists of two major elements - bio-containment (prevention of spread of the virus from one infected premises to another) and bio-exclusion (measures to excluding infectious agents from uninfected sites). Biosecurity has three major components: isolation, traffic control and sanitation. Isolation refers to the confinement of animals within a controlled environment. A fence keeps birds in, but it also keeps other animals out. Isolation also applies to the practice of separating birds by age group or species. In large poultry operations, all in all-out management styles allow simultaneous depopulation of facilities between flocks and allow time for periodic clean-up and disinfection to break the cycle of disease. Traffic Control (human traffic as well as the vehicular traffic) includes both the traffic onto the farm and the traffic patterns within the farm. Sanitation addresses the disinfection of materials, people and equipment entering the farm and the cleanliness of the personnel on the farm (CEVA, 2011; OIE, 2017). The broad objective is the socioeconomic determination of youth poultry farmers' adoption of some selected biosecurity measures against avian-influenza outbreaks in Jigawa State, Nigeria. The specific objectives were to:

i. describe the socioeconomic characteristics of the youth poultry farmers in the study area;
ii. identify the diffused biosecurity practices available among the youth on poultry;
iii. examine the level of adoption of the standard biosecurity practices among the youth;
iv. identify the sources of information on biosecurity to the youth on poultry;
v. examine the constraints of the youth farmers to adoption of biosecurity measures

MATERIALS AND METHODS

The Study Area

The study was conducted in Jigawa State Nigeria. The population for the study was mainly all the youth poultry farmers in the state. Jigawa State is one of thirty-six states that constitute Federal Republic of Nigeria. It is situated in the north-western part of the country

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between latitudes 11.00°N to 13.00°N and longitudes 8.00°E to 10.15°E. The state has a total land area of approximately 22,410 square kilometers with 27 local governments (National Population Commission [NPC], 2006). The topography is characterized by high land areas which is almost 750meters. Soil tends to be fertile ranging from sandy-loamy with many pockets of *fadama* and alluvial plains suitable for the cultivation of rice, sugar-cane, millet, vegetables and sorghum, etc. The State shares common boundaries with three (3) states and Niger Republic. There are usually two seasons in the state viz the rainy season lasting from June through October and dry season spanning from November to May. The mean temperature ranges from 35◦c in October to about 50◦c in May, while mean annual rainfall varies from 700mm to over 1000mm and can last up to 200days in some lowland parts of the State. Jigawa state is predominantly an Agrarian state with over 80% of the population involved in Agriculture. The major rain fed crops grown in the state includes millet, sorghum, cowpea, groundnut, cocoyam, soya beans. Dry crops include sugarcane, Hot pepper, okra, tomatoes, onions and spinach (MTSS, 2016). The major livestock kept in the state includes, small ruminants (sheep and goat), poultry, cattle etc. The Hadejia-Nguru river has the largest fadama area in Nigeria. Jigawa state is divided into four ADP Zones 1, 2, 3 and 4

1. Zone 1. With headquarters in Brinin kudu comprises of Dutse, Kiyawa, Jahun, Buji, Brinikudu, Gwaram, and Miga;
2. Zone 2. With headquarters in Gumel comprises of Gumel, Maigatari, Ringim, Taura, Gagarawa;
3. Zone 3. with headquarters in Hadejia comprises of Briniuwa, Kirikasamma, Kafin-Hause, Auyo, Guri, Malamadori, Kaugama, Hadejia;
4. Zone 4. With headquarter in Kazaure comprises of Kazaure, Yankwashi, Gwiwa, Roni, Suletankarkar, Babura, Garki;

Sampling Procedure

The population for the study comprised of all the youth poultry farmers in the state as the sample unit. A multi-stage (3-stage) sample technique was employed for the study. The first stage, was a random selection of two local governments each from the ADP Zones as follows: Zone 1; Dutse and Kiyawa, Zone 2; Gumel and Ringim, Zone 3; Kafi-Hausa and Hadejia and Zone 4; Kazaure and Babura respectively. The second stage was a random selection of four communities each from the local government selected. The third stage was also the random selection of fifteen poultry farmers from each of the communities to give a sample size of 120 respondents for the research. The statistical analyses employed are descriptive statistics (percentages mean, frequency counts, standard deviation) and inferential statistics used was regression analysis.

RESULTS AND DISCUSSION

Socio-economic Characteristics of the Youth Poultry Farmers

Table 1 shows the result of the socioeconomic characteristics of the youth poultry farmers. Majority (75.0%) were married. This is in line with the submission of Ahien *et al.* (2017); Vogelstein (2013) and Unicef (2014a; 2014b) that marriage confers responsibility. Greater percentage (92.5%) were males, with average age of 24 years, having secondary education (50.0%) while 40.0% had no formal education. This implies that they within the active and productive age range. Average monthly income is ₦26,075.00 (85.0%) and farming experience of 13 years. It has been reported that farmers' experience in farming count more than educational attainment in order to increase productivity (Apantaku *et al.,* 2016). Asare *et al.* (2017) also stated that apart from the formal education being a source of information to farmers,

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experience in farming or number of years in farming can also serve as a means through which farmers get information. Mean household size is five (5) persons, flock size of 411 birds, no extension contact (84.2%) and they belong to social group (91.7%).

Table 1: Respondents' socio-economic characteristics

Variables	**Frequency**	**Percentage**	**$(\bar{x})\pm\delta$**
Age (years)			
≤ 20	21	17.5	23.7±2.6
21-30	89	74.2	
31-40	9	7.5	
≥ 41	1	0.8	
Sex			
Male	111	92.5	
Female	09	7.5	
Marital status			
Singled	28	23.3	
Married	90	75.0	
Widowed	1	0.8	
Divorced	1	0.8	
Farming experience (years)			
1-5	7	5.8	12.8±2.9
6-10	98	74.3	
11-15	23	8.3	
≥ 16	1	0.8	
Educational qualification			
No formal education	48	40.0	
Primary education	7	5.8	
Secondary education	60	50.0	
Tertiary education	2	1.7	
Islamic education	3	2.5	

Source: Field Survey, 2021 $(\bar{x})\pm\delta$=Mean ± Standard Deviation

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Table 1: Respondents' socio-economic characteristics **Cont'd.**

Variables	Frequency	Percentage	$(\bar{x})\pm\delta$
Average monthly income (₦)			
1-10,000	2	1.7	₦26,075±5,845.78
11,000-20,000	5	4.2	
21,000-30,000	102	85.0	
31,000-40,000	7	5.8	
≥ 41,000	4	3.3	
Flock size (No.)			
100-500	96	80.0	410.9±13.5
501-1000	20	16.7	
1001-1500	3	2.5	
≥ 1501	1	0.8	
Household size (person)			
1-5	91	75.8	4.79±1.25
6-10	22	18.3	
≥ 15	7	5.9	
Presence of extension			
Yes	19	15.8	
No	101	84.2	
Membership of social group			
Yes	110	91.7	
No	10	8.3	

Source: Field Survey, 2021 $(\bar{x})\pm\delta$=Mean ± Standard Deviation

Diffused Biosafety Practices Available to the Youth Poultry Farmers

Table 2 shows the diffused biosecurity practices used by the youth farmers in protecting their birds from AI infection. The practices were measure on a three-point likert type scale of Highly Practiced (HP = 1), Undecided (U = 2) and Not Practiced (NP = 3). Biosecurity in poultry production has three components according to FAO (2007) and CEVA-Chicks (2011); cleaning, disinfection and segregation and traffic control, respectively. Respondents were examined under each component to ascertain compliance with biosecurity best practices. In the cleaning sub-component, the respondents highly practiced vaccination of birds ($\bar{x}$ = 1.000), constant cleaning of farm ($\bar{x}$ = 1.167), hand washing with soap and water after toileting ($\bar{x}$ = 1.492) and cleaning before restocking new birds ($\bar{x}$ = 1.625) while others though equally important were not practices. In the disinfection sub-components only; keeping of farm records ($\bar{x}$ = 1.583), disinfection of equipment brought to the farm ($\bar{x}$ = 1.667) and constant and periodic disinfection of equipments, poultry house and cloths ($\bar{x}$ = 1.792) were highly practices by the youth among others. On segregation and traffic control sub-components, they highly practiced most of the activities except; employee restrictions ($\bar{x}$ = 2.250), periodic visitation to ADP Office for training ($\bar{x}$ = 2.750) and visitors/vehicle entry cleaning protocols ($\bar{x}$ = 3.000). All these improper practices of biosecurity measures observed may be due to farmers' lack of adequate knowledge, resources and initiatives to apply strict biosecurity measures on their farms (Eze *et al.,* 2017). Earlier studies conducted in Nigeria shows that, keeping poultry in captivity without the proper knowledge of the basic principles of biosecurity could expose human to flock resulting to risk of infection to flock and human (*zoonsis*) (Alhaji and Odetokun, 2011). Restrictive movement in the farm limits the introduction of infection agents to flock

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(Henning *et al.*, 2009). Shama (2010) reported that people who come into poultry houses can introduce very serious diseases. In some study, poultry farmers provided foot dip with disinfectant which is contrary to the findings of Ameji *et al.* (2012) in Kogi State, Nigeria and Ambarawati *et al.* (2010) in Bali, Melbourne Australia where poultry farmers had poor sanitation with the majority of farmers not having footbath. Sanitation is very crucial in poultry house in other to eliminate disease agents (Mccrea and Bradley, 2008). This means that all the standard biosecurity measures must be utilized by farmers to keep away infections (Banshi, 2010).

Table 2: Respondents based on diffused biosafety practices on poultry

Biosecurity components	**HP**	**U**	**NP**	$\bar{x}$	**R**
Cleaning sub-components					
Do you vaccinate your birds	104	13	3	1.158	1st
Constant Cleaning of entire farm	110	0	10	1.167	2nd
Hand washing with soap and water after toileting	90	1	29	1.492	3rd
Cleaning of residential farm before restocking	75	15	30	1.625	4th
Hand washing with soap before/after handling birds/eggs/feed etc.	20	7	93	2.608	5th
Presence of Rats and/or mice infestation on farm	10	5	105	2.792	6th
Presence of Darkly beetles, flies or other insect infestation	10	5	105	2.792	6th
Hand washing after sneezing	12	0	108	2.800	7th
Feed accessible to rodents or wild birds	0	0	120	3.000	8th
Disinfection sub-components					
Do you keep farm records of mortality/medication/vaccination etc	70	30	20	1.583	1st
Outside equipment brought on the farm disinfected	75	10	35	1.667	2nd
Constant/periodic disinfection of equipment, poultry houses and clothes.	60	25	35	1.792	3rd
Farm's specific cloth and foot wears for employees and visitors	15	15	90	2.625	4th
Plastic egg trays returned to farm from market, washed and disinfected	15	10	95	2.667	5th
d birds disposed in open or shallow ditch or water ways	10	5	105	2.792	6th
Foot baths disinfectants solution always changed daily	0	0	120	3.000	7th
Poultry manure piled or spread near poultry houses	0	0	120	3.000	7th
Disinfect cars, bikes, trucks, visitors and other before entering the farm	0	0	120	3.000	7th
Segregation and traffic control sub-components					
Other farm animals like cattle, goats etc raised on poultry farm	120	0	0	1.000	1st
Is wild bird into poultry houses that are vectors for AI	120	0	0	1.000	1st
All-in-all-out system of management	110	1	9	1.158	2nd
Pet birds like parrots/pigeon kept on the farm that can be vectors for AI	110	0	10	1.167	3rd
Large trees (that host wild birds) crowd around poultry houses	110	0	10	1.167	3rd
Employee restrictions from visiting other farms and vice versa	30	30	60	2.250	4th
Periodic visitation to ADP for training on poultry information	10	10	100	2.750	5th
Visitors' entry cleaning/protocol	0	0	120	3.000	6th
vehicles entry cleaning/protocol	0	0	120	3.000	6th

Mean Value ($\bar{x}$) =2, Value below 2 is highly practice while above is not practiced

Source: Field Survey, 2021.

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Level of Adoption of the Standard Biosafety Practices among Respondents

Based on the biosecurity components in Table 2, Table 3 indicates the categorization of the level of adoption of the biosecurity standard practices. The respondents have high adoption ($\bar{x}$ = 1.832) on the segregation and traffic control sub-component probably because it does not require any specialized educational procedure to operate and manage. In the cleaning sub-components, the respondents have medium level of adoption ($\bar{x}$ = 2.159) of the biosecurity practices probably because of the cost implication of buying disinfectants, drugs and expert technicalities involved, while at the disinfection sub-components the respondents show low level of adoption of the standard biosecurity components ($\bar{x}$ = 2.458). this is in support of the submission of Eze *et al.* (2017) that the adoption of biosecurity components and practices among poultry farmers is at different levels.

Table 3: Respondents' level of adoption of standard biosafety practices

Level of biosecurity adoption	**Operational**		
	High (1.000-1.400)	Medium (1.450-2.500)	Low (2.550-3.000)
Cleaning components		**2.159**	
Disinfection components			**2.458**
Segregation and traffic Control	**1.832**		

Source: Field Survey, 2021

Sources of information on Biosafety Practices Among the Youth Poultry Farmers

The source of information of the youths on biosecurity practices is shown in Table 4. The major source of information of the youth on poultry biosecurity practices to avert AI infection and outbreaks as opined by majority is Co-farmers/farmers group (79.2%). This was followed by Radio program (73.3%), Family/friends/ neighbors (59.2%) and Television programs (55.8%). Average proportion agreed on film show (50.0%), while extension agents/ADP/Veterinary Services (44.2%) and Newspaper (40.8%) were not really sources of information to the respondents. These is in line with the findings of Eze *et al.* (2017), that Co-farmers or farmers group had significant influence on the use of biosecurity among poultry farmers.

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Table 4: Rrespondents' sources of information on biosafety practices

Variables	Frequency	%	Rank
Co-farmers/Farmer's Group	95	79.2	1st
Radio Program	88	73.3	2nd
Family/Friends/Neighbors	71	59.2	3rd
Television Program	67	55.8	4th
Film Show/Postal/ Cinema	60	50.0	5th
Extension Agents/ADP Office/Veterinary Service	53	44.2	6th
Newspapers	49	40.8	7th

Source: Field Survey, 2021

Constraints of the Youth Farmers to Adoption of Biosafety Practices

Table 5 shows the respondents constraints to adoption of biosecurity measures on poultry. The constraint was measured on three-point likert type scale of Highly Severe (HS = 1), Moderately Severe (MS = 2) and Less Severe (LS = 3), respectively. The highly severe constraints of the youth poultry farmers were; lack of education, poor extension/veterinary contact lack of Buffer Areas around the farm site and lack/ poor farm record keeping ($\bar{x}$ = 1.000). Others are perception that AI is a natural disease in occurrence ($\bar{x}$ = 1.017), lack of exposure to other areas (Cosmopolitan, $\bar{x}$ = 1.025), high cost of drugs/ vaccines and lack of capital/resources/ technicalities ($\bar{x}$ = 1.033) to high cost of implementation of the biosecurity measures ($\bar{x}$ = 1.042). while lack of steady/sustainable market ($\bar{x}$ = 2.625), lack of manpower to implement biosecurity ($\bar{x}$ = 2.633) and incompatibility of the biosecurity measures with socio-cultural background of the farmers were not seen as severe constraints to the respondents. This is in line with the submission of Oladipo *et al.* (2020) that the major constraints of poultry farmers on biosecurity practices is literacy level among others.

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Table 5: Respondents' constraints to adoption of biosafety practices

Variables	HS	MS	LS	$\bar{x}$	R
Lack of education	120	0	0	1.000	1st
Poor extension contact/Veterinary involvement	120	0	0	1.000	1st
Lack of Integration of Buffer Areas around the farm	120	0	0	1.000	1st
Lack/poor farm record keeping	120	0	0	1.000	1st
Perception of AI as a natural disease of poultry	118	2	0	1.017	2nd
Lack/Low degree of cosmopolitan	117	3	0	1.025	3rd
High cost of preventive drugs, vaccines and disinfectants	118	0	2	1.033	4th
Lack of capital, resources and technicalities required for instituting the measure	118	0	2	1.033	4th
High cost of implementation of biosecurity measure	117	1	2	1.042	5th
Lack of steady and sustainable market outlet for chicken and its products	20	5	95	2.625	6th
Lack of manpower to implement biosecurity measure	20	4	96	2.633	7th
Incompatibility with the socio-cultural background of the farmers	15	5	100	2.708	8th

Mean Value = 2, Value below 2 is high severe while above is low severe
Source: Field Survey, 2021.

Determinants of Adoption of Biosafety Practices among the Youth Farmers

Table 6 depicted the socioeconomic determinants of adoption of biosafety practices among the respondents. Only age, average monthly income, farming experience and membership of social group shows positive significance to biosecurity measures. This is in line with the submission of Eze *et al.* (2017), that belonging to social group enhances social capital development, thus allowing trust, idea and information exchange, hence farmers within a social group learn from each other the benefits and use of new technology and practices. Farmers who belong to social organizations will learn more about biosecurity measures and therefore the likely hood of adopting them. Also, as the age of the respondents increases the biosecurity compliance practices increases too. Older farmers have accumulation of wealth, more contact with extension workers, large family size and are better preferred by credit institutions (Langy and Mekura, 2005). All of which will enhance their adoption and use of technologies such as biosecurity measures more than the younger ones. They are assumed to have gained knowledge and experience over time and better able to evaluate technology information than younger farmers (Mignouna *et al.*, 2011; Kariyasa and Dewi, 2011; Eze *et al.*, 2017). Year of experience has positive significance to biosecurity practices. Farmers with more experience would be more efficient, have better knowledge of biosecurity practices thus run a more efficient and profitable enterprise (Eze *et al.*, 2017), probability of farmers having experience in disease management and other farm practices increases. High income from farm has effect on purchasing ability and access to biosecurity measures.

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Table 6: Rspondents' socio-economic determinants to adoption of biosafety practices

Variables	**Unstandardized Coefficients**	**Standardized Coefficient**		
	B	**STD Error**	**Beta**	**T**
Constant	17.551	3.074		7.519
Age	0.089	0.066	0.476*	3.411
Farming Experience	0.336	0.571	0.091*	0.782
Average Monthly Income	1.985E-9	0.000	0.512*	2.909
Educational Qualification	0.063	0.075	0.212	0.971
Marital Status	0.291	1.201	0.074	0.219
Flock Size	0.000	0.001	-0.197	1.000
Household Size	0.235	0.096	0.315	1.819
Membership of Social Group	0.014	0.079	0.184*	1.617

Dependent Variable: Biosecurity Score; Adjusted R. Square=0.75; F-value =8.11 $p \leq 0.05$*
Source: Field Survey, 2021.

CONCLUSION AND RECOMMENDATIONS

The research concluded that the youth poultry farmers are not abreast of the significance of these biosecurity practices and how they can be used on their farms to keep out AI attack. It is therefore recommended that adequate and periodic training should be done to the youth in the study area, developed partners, NGOs, agencies like AICP should be proactive in the study area to help the youth eradicate the negative effect of the zoonotic virus on their means of livelihood. Extension/veterinary officers should be more involved in the study area.

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