KNOWLEDGE, ATTITUDE AND PRACTICES TOWARDS AFRICAN SWINE FEVER AMONG EMERGING FARMERS IN UTHUKELA DISTRICT, KWAZULU NATAL PROVINCE, SOUTH AFRICA

BY

NICOL MBALI THUSI

DISSERTATION

Submitted in accordance with the requirements for the degree of

MASTERS IN AGRICULTURE

In the subject

ANIMAL HEALTH

COLLEGE OF AGRICULTURE AND ENVIRONMENTAL SCIENCE

at the

UNIVERSITY OF SOUTH AFRICA

Florida Campus

SUPERVISOR: Prof J.W Oguttu

CO-SUPERVISOR: Prof C.A Mbajiorgu

CO- SUPERVISOR: Dr K. S. Malepe

2023

DEDICATION

This dissertation is dedicated to the almighty God to whom I owe my being, my late mom Ms Nozipho Claudia Thusi, my grandmother Mrs Pauline Thusi; the pillar of my life, my siblings, all my aunties, uncles and lastly to my daughter Phililе Fanele Thusi. I am who I am because of you all.

ACKNOWLEDGEMENTS

It is a great pleasure for me to express my sincere appreciation and acknowledge the assistance, guidance and supervision accorded to me by my supervisor, Prof J. W. Oguttu and co-supervisors, Prof CA Mbajiorgu and Dr KS Malepe. Their patience, contributions, constructive criticism, and encouragement made it possible for me to realise the dream. I have learnt from the best.

My sincere thanks go to Mr Micah Moses Mayanja for the assistance with the data analysis, and Dr S Chisi for all the support he gave me. The management team in uThukela District is also appreciated for the support and assistance while working on my research. I also acknowledge the Agricultural Advisors and colleagues (Animal Health Technicians) for the support they offered me during the data collection. I will always feel indebted to the UNISA Masters & Doctoral bursary for granting me the study bursary that enabled me to get all the resources I needed to complete my studies. Lastly, I would like to acknowledge the Department of Agriculture and Rural development, KwaZulu Natal, for allowing me to conduct this research and awarding me the Bursary, without which this study would not have been possible.

DECLARATION

Name : Nicol Mbali Thusi

Student number : 48768642

Degree : Masters of Science in Agriculture (Animal health)

Exact wording of the title of the thesis as appearing on the electronic copy submitted for examination:

“Knowledge, attitudes and Practices towards African Swine Fever among emerging farmers in uThukela District, KwaZulu Natal, South Africa” I declare that the above dissertation is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the dissertation to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at UNISA for another qualification or at any other higher education institution.

SIGNATURE:  DATE: February 2023

Ms. Nicol Mbali Thusi
Email Address: 48768642@mylife.unisa.ac.za
Student number: 48768642

LIST OF ACRONYMS AND ABBREVIATIONS

ASF	AFRICAN SWINE FEVER
DARD	DEPARTMENT OF AGRICULTURE AND RURAL DEVELOPMENT
KAP	KNOWLEDGE ATTITUDE PRACTICES
VET	VETERINARY
KZN	KWAZULU NATAL
WTO	WORLD HEALTH ANIMAL ORGANIZATION
OIE	OFFICE INTERNATIONAL DES EPIZOOTIES
DNA	DEOXYRIBONUCLEIC ACID
AHT	ANIMAL HEALTH TECHNICIAN
AA	AGRICULTURAL ADVISOR
SPSS	STATISTICAL PACKAGE FOR SOCIAL SCIENCE
KZNDAEA	KWAZULU NATAL DEPARTMENT OF AGRICULTURE AND ENVIRONMENT AFFAIRS
DALRRD	DEPARTMENT OF AGRICULTURE, LAND REFORM AND RURAL DEVELOPMENT
PRA	PARTICIPATORY RURAL APPRAISAL

PUBLICATIONS

a) Abstracts from this Dissertation presented at conferences.

1. **Nicol Mbali Thusi**, Keleabetswe Malepe. Christian. A. Mbajiorgu. James Wabwire Oguttu. *Knowledge, attitude and practices towards African Swine Fever among emerging farmers in uThukela district, KwaZulu Natal, South Africa.* Bela Bela Limpopo, "18th Annual SASVEPM Congress", 25/08/2021-27/08/2021 (Oral presentation).
2. **Nicol Mbali Thusi**, Keleabetswe Malepe. Christian. A. Mbajiorgu. James Wabwire Oguttu. *Factors that are correlated with knowledge of African Swine Fever among emerging pig farmers in uThukela district, KwaZulu Natal, South Africa.* East London (Eastern Cape), "19th Annual SASVEPM Congress", 23/08/2022 - 26/08/2022 (Poster presentation).
3. **Nicol Mbali Thusi**, Keleabetswe Malepe. Christian. A. Mbajiorgu. James Wabwire Oguttu. *African Swine Fever in uThukela District, KwaZulu Natal Province, South Africa: A study of knowledge, attitude and practices among emerging farmers*. Durban AHA Gateway hotel, 14th SAAHT (South African Association) National Congress for Animal Health Technician, 24 May 2022 - 26 May 2022 (Oral Presentation).
4. **Nicol Mbali Thusi**, Keleabetswe Malepe. Christian. A. Mbajiorgu. James Wabwire Oguttu. *Factors that are correlated with knowledge of African Swine Fever among emerging pig farmers in uThukela district, KwaZulu Natal, South Africa.* Halifax Convention Centre, Canada, 16th International Symposium of Veterinary Epidemiology and Economics (ISVEE 16 or ISVEE2022), August 7-12, 2022, (Poster Presentation).

b) Full articles from the dissertation accepted for publication.

Nicol Mbali Thusi, Keleabetswe S. Malepe, Christian. A. Mbajiorgu. James W. Oguttu (Accepted for Publication). Knowledge, Attitude and Practices towards African Swine Fever in uThukela District, KwaZulu Natal, South Africa: A Community Based Cross-Sectional Study. Applied Ecology and Environmental Research.

ABSTRACT

The objective of the study was to investigate the knowledge, attitude and practices regarding African Swine Fever (ASF) among emerging pig farmers in uThukela District, KwaZulu-Natal. The study also identified factors associated with a high knowledge score for ASF among the respondents. All emerging farmers in the study area were invited to participate in the study, but only 426 agreed to voluntarily participate and signed the consent form. All statistical analyses including descriptive and inferential statistics were conducted using SPSS version 27. Statistical significance was assessed at P < 0.5%. More males (60.80%) than females participated in the study. The majority of the respondents (35.68%) were 36-53 years old, followed by 54-71 years old (34.74%). Respondents aged >71 were in the minority, making up only 9.15% of the study population. Most respondents (28.64%) did not have formal education, followed by 22.54% who had attended primary school, 22.07% who had completed matric and 21.83% who had not completed matric. The respondents who were unemployed and earned R0-R3 500 kept more pigs (85.92%) than employed respondents. Respondents who had >5 years of experience of farming with pigs were in the majority (42.02%), followed by those who had 2-5 years of experience. Most of the farmers (87.79%) indicated that they reared pigs as a source of meat for their family. Only 31.46% of the respondents described ASF as a contagious viral disease, with flu-like symptoms, 26.06% described ASF as a viral disease and 22.54% described the disease as a flu-like disease. Only 19.95% of the respondents said that ASF was a contagious disease. Pigs as spreaders of ASF were mentioned by 44.84% of the respondents. This was followed by 39.67% who said that wild pigs, pigs, and warthogs are responsible for spreading ASF. Very few respondents mentioned wild pigs (9.62%) and warthogs (5.87%) as the only animals that can spread ASF. The majority (39.91%) of the respondents mentioned that the illegal movement of pigs was the only way that ASF is spread. This was followed by 32.63% who said that the lack of a foot bath or biosecurity (19.25%) and feeding of swill (8. 22%) promoted the spread of ASF. Almost all farmers (97.18%) were aware that ASF can spread from one pig to another. Just over half (53.76%) of the respondents said that *Ornithodorus ticks* and wild boars were the source of the ASF virus. About 60% of the respondents said that the clinical signs of ASF include high fever, ocular discharge and death occurring at 15-45 days. This was followed by

12.44% who said that ASF symptoms include high fever and death occurring at 15-45 days, and 9.62% who said symptoms include ocular discharge only. Almost all the farmers (95.77%) indicated that ASF can be carried by pigs and in pork products. In addition, almost all farmers (96.48%) were aware that ASF is not a curable disease and that it is a notifiable disease (89.44%). All the respondents (100%) indicated that if they suspected a case of ASF, they would inform the nearest State Veterinary Office. Just over half of the respondents (57.28%) fed pigs with kitchen waste (swill), but 42.72% did not. The majority of the respondents (92.72%) mentioned that an outbreak of ASF would be disastrous from a financial point of view, with the remaining 7.28% indicating that it would not be disastrous. While 61.50% indicated that they did not hunt for wild/bush pigs, 38.50% admitted that they did. Residence, gender, reason for rearing pigs and age of respondents were significant ($p < 0.05$) predictors of a high knowledge score about ASF. Although farmers displayed a good attitude towards ASF, the majority had poor knowledge about ASF. Farmers engage in risky practices such as hunting of wild pigs, which has the potential to increase the spread of ASF. Socio-demographic characteristics of the respondents identified in this study should be considered when designing educational campaigns aimed at improving the knowledge of the respondents and enforcing a positive attitude and good practices that promote the prevention of ASF.

Key words: African Swine Fever, pigs, biosecurity, wild pigs, tampons, risk factors for ASF and warthogs.

KGUTSUFATSO

Sepheo sa phuputso e ne e le ho batlisisa tsebo, maikutlo le mekggwa e mabapi le African Swine Fever (ASF) hara dihwai tse ntseng di hola tsa dikolobe Seterekeng sa Thukela, KwaZulu-Natal. Phuputso e boetse e bontsha mabaka a amanang le dintlha tse phahameng tsa tsebo bakeng sa ASF hara ba arabelang. Dihwai tsohle tse ntseng di hlaha/thutuha sebakeng sa boithuto di ile tsa memelwa ho nka karolo thutong, empa ke ba 426 feela ba dumetseng ho nka karolo ka boithaopo le ho saena foromo ya tumello. Phetolelo ya bo 27 ya SPSS e ile ya sebediswa bakeng sa tshekatsheko tsohle tsa dipalopalo ho kenyeletsa le dipalopalo tse hlalosang le tse fokolang. Bohlokwa ba dipalo bo ile ba hlahlojwa ho P <0.5%. Banna ba bangata (60.80%) ho feta basadi ba nkile karolo phuputsong. Bongata ba ba arabetseng (35.68%) ba ne ba le dilemo di 36-53, ba latelwa ke dilemo tse 54-71 (34.74%). Ba arabetseng ba dilemo di >71 ba ne ba le palo e fokolang, e etsang 9.15% feela ya thuto ya palo ya batho. Bongata ba ba arabetseng (28.64%) ba ne ba se na thuto ya molao, ba latelwa ke 22.54% ba kenang sekolo sa thuto e tlase, 22.07% ba qetileng materiki le 21.83% ba neng ba sa qeta materiki.

Ba arabetseng ba neng ba sa sebetse mme ba fumana R0-R3 500 ba bolokile dikolobe tse ngata (85.92%) ho feta ba arabetseng ba sebetsang. Ba arabetseng ba nang le boiphihlelo ba dilemo tse >5 ba hwebang ka dikolobe boholo ba bona (42.02%), ba latelwa ke ba nang le boiphihlelo ba dilemo tse 2-5. Bongata ba dihwai (87.79%) ba bontshitse hore ba ruile dikolobe e le mohlodi wa nama bakeng sa malapa a bona. Ke 31.46% feela ya ba arabetseng ba hlalositseng ASF e le lefu la kokwanahloko e tshwaetsanang, e nang le matshwao a kang a feberu, 26.06% e hlalositse ASF e le lefu la kokwanahloko mme 22.54% e hlalosa lefu lena e le lefu le kang feberu. Ke 19.95% feela ya ba arabetseng ba boletseng hore ASF ke lefu le tshwaetsanang. Dikolobe e le tsona tse hasang ASF di ile tsa bolelwa ke 44.84% ya ba arabetseng. Sena se ile sa latelwa ke 39.67% ba boletseng hore dikolobe tse hlaha, dikolobe le dikolobemoru di ikarabella ho hasa ASF. Batho ba fokolang haholo ba arabetseng ba boletse dikolobe tse hlaha (9.62%) le dikolobemoru (5.87%) e le tsona feela diphoofolo tse ka hasang ASF. Boholo (39.91%) ba ba arabetseng ba boletse hore ho tsamaya ho seng molaong ha dikolobe ke yona feela tsela eo ASF e haswang ka yona.

Sena se ile sa latelwa ke 32.63% ya ba ileng a bolela hore ho haella ha ho hlapa maoto kapa thibelo ya kokwanahloko (19.25%) le ho fepa dikolobe masala a dijo (8. 22%) ho kgothalletsa ho ata ha ASF. Hoo e ka bang dihwai tsohle (97.18%) di ne di tseba hore ASF e ka hasana ho tloha kolobeng e nngwe ho ya ho e nngwe. Ka hodimo ho halofo (53.76%) ya ba arabetseng ba boletse hore diboseleise tsa Ornithodorus le dikolobemoru ke mohlodi wa kokwanahloko ya ASF. Hoo e ka bang 60% ya ba arabetseng ba boletse hore matshwao a tsa semeriana a ASF a kenyelletsa feberu e phahameng, ho tswa ha lero la mahlo le lefu le hlahang matsatsing a 15-45. Sena se ile sa latelwa ke 12.44% ba boletseng hore matshwao a ASF a kenyelletsa feberu e phahameng le lefu le hlahang matsatsing a 15-45, le 9.62% ba ileng ba re matshwao a kenyelletsa ho tswa ha mahlo feela. Hoo e ka bang dihwai tsohle (95.77%) di bontshitse hore ASF e ka tsamaiswa ke dikolobe le dihlahiswa tsa nama ya kolobe. Ho phaella moo, hoo e batlang e le dihwai tsohle (96.48%) di ne di tseba hore ASF ha se lefu le phekolehang le hore ke lefu le tsejwang (89.44%). Bohle ba arabetseng (100%) ba bontshitse hore haeba ba belaela taba ya ASF, ba tla tsebisa Ofisi e haufi ya Naha ya Kalafo ya diphoofolo. Ho feta halofo ya ba arabetseng (57.28%) ba ile ba fepa dikolobe ka masala a dijo tsa kitjhineng (swill), empa 42.72% ha ya ka ya etsa jwalo. Ditshobotsi tsa setjhaba le batho ba arabelang thutong ena di lokela ho nkwa ha ho etswa matsholo a thuto a reretsweng ho ntlafatsa tsebo ya ba arabelang le ho tiisa boikutlo bo botle le mekgwa e metle e kgothalletsang thibelo ya ASF.

Mantswe a bohlokwa: African Swine Fever, dikolobe, thibelo ya kokwanahloko, dikolobe tse hlaha, mabaka a kotsi bakeng sa ASF le dikolobemoru

OKUCASHUNIWE

Inhloso yocwaningo bekuwukuphenya ulwazi, isimo sengqondo kanye nokwenziwayo mayelana nesifo sezingulube esithathelwana kakhulu (ASF) phakathi kwabalimi bezingulube abasafufusa esifundeni sasoThukela, KwaZulu-Natal. Ucwaningo luphinde lwahlonza izici ezihlobene namaphuzu olwazi aphezulu e-ASF phakathi kwabaphenduli. Bonke abalimi abasafufusa endaweni yocwaningo bamenyiwe ukuthi babambe iqhaza ocwaningweni, kodwa bangama-426 kuphela abavuma ukuhlanganyela ngokuzithandela futhi basayina ifomu lemvume. Inguqulo engu-27 ye-SPSS isetshenziswe kukho konke ukuhlaziya kwezibalo okuhlanganisa nezibalo ezichazayo neziinganisela amanani. Ukubaluleka kwezibalo kuhlolwe ku-P <0.5%. Abesilisa abaningi (60.80%) kunabesifazane ababambe iqhaza ocwaningweni. Iningi labaphendulile (35.68%) lalineminyaka engama-36-53 ubudala, lilandelwa yiminyaka engama-54-71 (34.74%). Abaphendula abaneminyaka engu->71 babeyidlanzana, okwenza u-9.15% kuphela wabantu bocwaningo. Iningi labaphendulile (28.64%) alizange lifunde ngokusemthethweni, lilandelwe ngu-22.54% abafunde amabanga aphansi, 22.07% abaphothule umatikuletsheni no-21.83% abangawuqedanga umatikuletsheni. Abaphenduli ababengasebenzi nabahola u-R0-R3 500 babefuye izingulube eziningi (85.92%) kunabaphenduli abaqashiwe. Abaphenduli abaneminyaka engu->5 yesipiliyoni sokufuya izingulube babebaningi (42.02%), balandelwa yilabo abaneminyaka engu-2-5 yesipiliyoni. Iningi labalimi (87.79%) baveze ukuthi bafuye izingulube njengomthombo wenyama yomndeni wabo. Kuphela i-31.46% yabaphenduli bachaza i-ASF njengesifo esithathelwanayo segciwane, esinezimpawu ezinjengomkhuhlane, i-26.06% ichaze i-ASF njengesifo segciwane futhi i-22.54% ichaze lesi sifo njengesifo esifana nomkhuhlane. Bangu-19.95% kuphela abaphendulile abathi i-ASF yisifo esithathelwanayo. Izingulube njengabasabalalisi be-ASF zishiwo ngabaphenduli abangu-44.84%. Lokhu kwalandelwa yi-39.67% eyathi izingulube zasendle, izingulube, nezingulube zasendle zase-Afrika yizona ezisabalalisa i-ASF. Bambalwa kakhulu abaphendulile abakhulume ngezingulube zasendle (9.62%) kanye nezingulube zasendle zase-Afrika (5.87%) njengezilwane kuphela ezingasabalisa i-ASF. Iningi (39.91%) labaphendulile lithe ukuhamba okungekho emthethweni kwezingulube yiyona ndlela kuphela esabalalisa i-ASF. Lokhu kwalandelwa yi-32.63% eyathi ukuntuleka kokugeza kwezinyawo noma indlela esetshenziselwa ukunqanda isifo (19.25%) kanye

nokuphakela izingulube izinsalela zokudla (8. 22%) kukhuthaze ukusabalala kwe-ASF. Cishe bonke abalimi (97.18%) babazi ukuthi i-ASF ingasabalala isuka kwenye ingulube iye kwenye. Ngaphezulu nje kwengxenye (53.76%) yabaphenduli bathi *umkhaza wasebusuku* nezingulube zasendle zaziwumthombo wegciwane le-ASF. Cishe i-60% yabaphendulile bathi izimpawu zezempilo ze-ASF zihlanganisa ukushisa okukhulu, amafinyila amhlophe, nokufa okwenzeka ezinsukwini ezingu-15-45. Lokhu kwalandelwa u-12.44% owathi izimpawu ze-ASF zihlanganisa ukushisa okuphezulu nokufa okwenzeka ezinsukwini ezingu-15-45, kanye no-9.62% abathi izimpawu zihlanganisa amafinyela amhlophe kuphela. Cishe bonke abalimi (95.77%) babonise ukuthi i-ASF ingathwalwa yizingulube kanye nemikhiqizo yezingulube. Ukwengeza, cishe bonke abalimi (96.48%) babazi ukuthi i-ASF ayisona isifo eselaphekayo nokuthi yisifo esaziswayo (89.44%). Bonke abaphendulile (100%) baveze ukuthi uma besola icala le-ASF, bazokwazisa iHhovisi Lombuso Wezilwane eliseduze. Ngaphezulu nje kwesigamu sabaphenduli (57.28%) baphakele izingulube ngemfucuza yasekhishini (izinsalela zokudla), kodwa u-42.72% ayizange. Iningi labaphendulile (92.72%) lithe ukuqubuka kwe-ASF kuzoba yinhlekelele ngokombono wezezimali, kanti u-7.28% osele ukhombisa ukuthi ngeke kube yinhlekelele. Nakuba i-61.50% ibonise ukuthi ayizange izingele izingulube zasendle / zasehlathini, u-38.50% uvumile ukuthi wazingela. Indawo yokuhlala, ubulili, isizathu sokukhulisa izingulube kanye neminyaka yabaphenduli kwakuyizibikezelo ezibalulekile ($p < 0.05$) zamaphuzu olwazi oluphezulu mayelana ne-ASF. Nakuba abalimi babonisa isimo sengqondo esihle nge-ASF, iningi lalinolwazi oluncane nge-ASF. Abalimi bahlanganyela emisebenzini eyingozi njengokuzingela izingulube zasendle, ezinamandla okwandisa ukusabalala kwe-ASF. Izimpawu zenhlalo yabantu zabaphenduli abahlonzwe kulolu cwaningo kufanele zicatshangelwe lapho kwakhiwa imikhankaso yemfundo ehloselwe ukuthuthukisa ulwazi lwabaphendulayo kanye nokuphoqelela isimo sengqondo esihle kanye nemikhuba emihle ekhuthaza ukuvinjelwa kwe-ASF.

Amagama asemqoka: Isifo sezingulube esithathelwana kakhulu, izingulube, indlela esetshenziselwa ukunqanda isifo, izingulube zasendle, okusetshenziswa ukumunca uketshezi, izici eziyingozi ze-ASF nezingulube zasendle

OPSOMMING

Die oogmerk van die studie was om die kennis, houdings en praktyke van opkomende varkboere in die uThukela-distrik van KwaZulu-Natal te ondersoek ten opsigte van Afrika-varkkoors. Die studie het ook faktore geïdentifiseer wat met ’n hoë kennistelling vir Afrika-varkkoors onder die respondente geassosieer word. Alle opkomende boere in die studiegebied is uitgenooi om aan die studie deel te neem, maar slegs 426 het ingestem om vrywillig deel te neem en het die toestemmingsvorm onderteken. SPSS weergawe 27 is vir alle statistiese ontledings gebruik, insluitende beskrywende en inferensiële statistiek. Statistiese beduidendheid is geassesseer as P < 0.5%. Meer mans (60.80%) as vrouens het aan die studie deelgeneem. Die meerderheid van die respondente (35.68%) was 36–53 jaar oud, gevolg deur 54–71 jaar oud (34.74%). Respondente in die ouderdom van >71 was in die minderheid en het slegs 9.15% van die studiepopulasie opgemaak. Die meeste respondente (28.64%) het nie formele opvoeding gehad nie, gevolg deur 22.54% wat laerskoolopvoeding gehad het, 22.07% wat matriek voltooi het en 21.83% wat nie matriek voltooi het nie. Die respondente wat werkloos was en R0–R3 500 verdien het, het meer varke (85.92%) aangehou as werkende respondente. Respondente met >5 jaar ondervinding van varkboerdery was in die meerderheid (42.02%), gevolg deur dié met 2–5 jaar ondervinding. Die meeste van die boere (87.79%) het aangedui dat hulle met varke teel as ’n bron van vleis vir hul familie. Slegs 31.46% van die respondente het Afrika-varkkoors as ’n aansteeklike virussiekte met simptome soortgelyk aan dié van griep beskryf; 26.06% het Afrika-varkkoors as ’n virussiekte beskryf, en 22.54% het die siekte as griepagtig beskryf. Slegs 19.95% van die respondente het gesê dat Afrika-varkkoors ’n aansteeklike siekte is. Varke as verspreiders van Afrika-varkkoors is deur 44.84% van die respondente genoem. Dit is gevolg deur 39.67% wat gesê het dat wildevarke, varke en vlakvarke vir die verspreiding van Afrika-varkkoors verantwoordelik is. Baie min respondente het wildevarke (9.62%) en vlakvarke (5.87%) genoem as die enigste diere wat Afrika-varkkoors kan versprei. Die meerderheid (39.91%) van die respondente het die onwettige verskuiwing van varke genoem as die enigste manier waarop Afrika-varkkoors versprei word. Dit is gevolg deur 32.63% wat gesê het dat die afwesigheid van ’n voetbad of biosekuriteit (19.25%) en voer van varkkos (8. 22%) die verspreiding van Afrika-varkkoors bevorder. Byna al die boere (97.18%) was daarvan bewus dat Afrika-varkkoors van een vark na ’n ander

kan versprei. Net meer as die helfte (53.76%) van die respondente het gesê dat *Ornithodorus-bosluise* en wildevarke die bron van die Afrika-varkkoors-virus is. Sowat 60% van die respondente het gesê dat die kliniese tekens van Afrika-varkkoors ’n hoë koors, okulêre uitvloeiing, en dood wat op 15–45 dae intree, insluit. Dit is gevolg deur 12.44% wat gesê het dat die simptome van Afrika-varkkoors ’n hoë koors en dood wat op 15–45 dae intree, insluit, en 9.62% wat gesê het dat simptome slegs okulêre uitvloeiing insluit. Byna al die boere (95.77%) het aangedui dat Afrika-varkkoors deur varke en in varkprodukte gedra kan word. Boonop was byna al die boere (96.48%) bewus daarvan dat Afrika-varkkoors nie ’n geneesbare siekte is nie en dat dit ’n aanmeldbare siekte is (89.44%). Al die respondente (100%) het aangedui dat hulle die naaste Staat- veeartsenykundige kantoor sal inlig indien hulle ’n geval van Afrika-varkkoors vermoed. Net meer as die helfte van die respondente (57.28%) het kombuisafval (varkkos) vir die varke gevoer; 42.72% het nie. Die meerderheid van die respondente (92.72%) het genoem dat ’n uitbreking van Afrika-varkkoors rampspoedig sou wees vanuit ’n finansiële oogpunt, terwyl die oorblywende 7.28% aangedui het dat dit nie rampspoedig sou wees nie. Terwyl 61.50% aangedui het dat hulle nie vir wildevarke/bosvarke gejag het nie, het 38.50% erken dat hulle dit wel gedoen het. Woonplek, geslag, rede vir telery met varke, en die ouderdom van respondente was beduidende ($p < 0.05$) voorspellers van ’n hoë kennistelling vir Afrika-varkkoors. Hoewel boere ’n goeie houding teenoor Afrika-varkkoors getoon het, het die meeste van hulle gebrekkige kennis van Afrika-varkkoors gehad. Boere beoefen riskante praktyke soos om wildevarke te jag, wat die potensiaal het om die verspreiding van Afrika-varkkoors te bevorder. Die sosiodemografiese kenmerke van die respondente wat in hierdie studie geïdentifiseer is, moet in ag geneem word wanneer opvoedkundige veldtogte geloods word met die oog daarop om die respondente se kennis te verbeter en ’n positiewe houding te bewerkstellig tesame met goeie praktyke wat die voorkoming van Afrika-varkkoors bevorder.

Sleutelwoorde: Afrika-varkkoors, varke, biosekuriteit, wildevarke, watteproppe, risikofaktore vir Afrika-varkkoors, en vlakvarke

TABLE OF CONTENT

LIST OF TABLES

LIST OF PLATES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 Background

Rural farmers mostly keep livestock as a source of investment and income Brown et al., 2018). While these farmers are supported by the South African Government through extension services, more effort is needed so that farmers can improve livestock production and consequently contribute towards improving the food security status of the country (Penrith *et al.*, 2013).

Pig farming is one of the main sources of food and income in rural farming areas (Nuangmek *et al.*, 2018). However, pig farming in South Africa is faced with the challenge of African Swine Fever (ASF) (Beltrán-Alcrudo *et al.*, 2017). The disease is endemic in South Africa, more so in the following provinces: Limpopo, Mpumalanga, KwaZulu-Natal and North West Province (Penrith *et al.*, 2013).

An outbreak of African Swine Fever can negatively impact the whole country if it is not controlled adequately and timeously (Sargsyan *et al.*, 2018). This is because ASF can cause 100% mortality rate in pigs, and in addition, no vaccine or treatment for the disease exists (Dixon, Sun and Roberts, 2019a). Therefore, its control and prevention only depends on implementation of proper farm biosecurity (Dione *et al.*, 2020). It is for this reason that ASF is classified under the Animal Diseases Act 35 of 1984 as a Controlled Animal Disease. During outbreaks, movement of domestic and wild pigs in the affected areas is restricted to prevent the disease from spreading (Dione *et al.*, 2020). This usually has a devastating effect on the livelihood of farmers and the economy of the country (Penrith *et al.*, 2007).

Educating the farmers about the risk factors of ASF can help to reduce the risk of the disease spreading (Penrith *et al.*, 2007). In uThukela District of KwaZulu-Natal (KZN) Province, there is no evidence of studies that have assessed the knowledge, attitude and practices towards ASF among rural communal farmers. Therefore, there is a need for studies that investigate the knowledge of farmers, their attitude and practices with regards to ASF in the study area.

A study of Knowledge, Attitude and Practices (KAP) involves the collection of information and the identification of knowledge gaps, cultural beliefs and the behavioural patterns that may have an effect on disease control (Chenais *et al.*, 2017). The present study was conducted in uThukela District in KZN to determine the knowledge, attitude and practices towards ASF. Findings of the present study can contribute to improve understanding of knowledge gaps with regards to ASF among rural farmers, and to provide necessary inputs for developing sustainable control strategies.

1. 2 Problem Statement

According to (Penrith, 2013), there have been ASF outbreaks in several parts of South Africa. If people are not adequately informed about ASF, the risk of the disease spreading in the area is heightened. However, there is no evidence of studies that have been done in the study area to investigate the level of knowledge about ASF. Moreover, uThukela District is closer to the border of Free State where there have been outbreaks of ASF in the past years.

1.3 Aim and Objectives

1.3.1 Aim

The aim of the study was to assess the Knowledge, Attitude and Practices towards ASF among emerging pig farmers in uThukela District.

1.4 Objectives of the study

1.4.1 Specific objectives

i) Specific objective 1:

To determine the level of knowledge about ASF among emerging pig farmers in the uThukela District.

ii) Specific objective 2:

To determine the attitude and practices towards ASF among emerging pig farmers in uThukela District.

iii) Specific objective 3:

To assess the predictors of a high knowledge score about ASF among emerging pig farmers in uThukela District.

1.5 Research questions

i) What is the level of knowledge among farmers in uThukela District towards ASF?

ii) What proportions of farmers in uThukela District have a good attitude towards ASF?

iii) What practices have farmers in uThukela District adopted that have implications for the control and prevention of ASF?

iv) What factors are associated with the level of knowledge towards ASF among farmers in uThukela District?

1.6 Benefits arising from the study

This is the first study in the area, and hence provides baseline information about the knowledge, attitude and practices towards ASF in the study area. This information can also assist with planning, budget and resource allocation by the Department of Agriculture and Rural Development (DARD) to manage or to combat ASF. Adopting the findings of this study can contribute to improved pig production by rural communal farmers.

1.7 Ethical consideration

All the pig farmers who participated in this study were informed that their participation was voluntary, and that they had a right to withdraw at any time if they felt they could not continue with the study. All the information obtained from the study participants was kept confidential. The aim of the study was explained to all the participants before they completed the questionnaire. They signed the consent form to indicate that their participation in the study was voluntary. The study did not pose a risk to the pigs as it was only the human participants that were involved. In addition, the structured interviews were conducted at dip tanks and standard operating procedures for prevention of COVID-19 such as wearing of the mask and social distancing were strictly observed. The Ethical approval was obtained from the University of South Africa Ethics Committee (REF: 2020/ CAES_HREC/063) (Annexure B) and KwaZulu Natal Department of Agriculture and Environment Affairs (KZNDAEA) research committee (Annexure C).

CHAPTER 2

LITERATURE REVIEW

2.1 African Swine Fever disease

African Swine Fever (ASF) is a highly contagious haemorrhagic viral disease that affects pigs and other hosts belonging to the family *Suidae* (pigs, warthogs, European wild boar and American wild pigs) (Pautienius *et al.*, 2018). It is an important viral disease that can severely impact the whole country in event of an outbreak. Given the important role the pig industry plays worldwide, ASF is listed as a Notifiable disease by the World Organisation for Animal Health (WOAH) also known as the Office International des Epizooties (OIE) (Penrith and Vosloo, 2009).

2.1.1 Aetiology

African Swine Fever is caused by the ASF virus, a large double stranded DNA Virus, which belongs to the genus *Asfivirus* of the family *Asfarviridae*. The *Ornithodorus* ticks which are known as tampans, and the African wild suis, are the natural hosts of the ASF virus. The primary route of infection is the upper respiratory track which is the tonsils and the lymph nodes. Thereafter, the infection enters the bloodstream leading to the virus reaching all tissues (Sánchez-Vizcaíno, Mur and Martínez-López, 2012).

The ASF virus is highly stable and temperature resistant. It can survive in a suitable protein environment and in serum at room temperature for 18 months, and in blood at 37 degrees Celsius for a month. The ASF virus is stable in a pH range of 4-10. Domestic pigs may shed the virus for 24-48 hours before showing the clinical signs on the host after the infection with the ASF virus (Geering, Penrith and Nyakahuma, 2011). The uncooked pork meat and carcass meal from the infected pigs can be a source of the ASF virus if it's fed to the pigs.

2.1.2 Swine species susceptible to African Swine Fever

All the members of the pig family *Suidae* are susceptible to the ASF virus. Domestic pigs are more highly susceptible to ASF irrespective of breed or age. However, in central Africa there are certain pig breeds that have a high survival rate during outbreaks (Geering, Penrith and Nyakahuma, 2011). Meanwhile, although the African wild pigs are susceptible to the virus, they do not easily show signs of disease once infected (Sánchez-Vizcaíno, Mur and Martínez-López, 2012).

2.1.3 Clinical signs of African Swine Fever

African Swine Fever is a highly contagious haemorrhagic disease of domestic and wild pigs. Its clinical presentation depends on the host factors such as the swine species. The mortality rate can be 100%. On average the incubation period for ASF is 5-21 days after coming in direct contact with infected pigs. However, other species can take several weeks before they start showing symptoms. Depending on the clinical presentation, ASF can be divided into the acute, subacute and the chronic forms (Rodríguez and Salas, 2013):

i) **Acute form**: the incubation period takes 48-72 hours, the pig will have a high fever of 41 -.42°C The pigs vomit and exhibit ocular discharge, rapid breathing, bloody diarrhoea, reluctance to move, bleeding on the skin and loss of appetite. Pigs also show neurological symptoms and 100% mortality rates.

ii) **Subacute form**: In this form, death occurs within 15-45 days after infection. The pigs show the following symptoms: abortion, lethargy and pneumonia, heart failure that may result in death, foam in the mouth and blood in the skin as shown in **Plate 1**. The mortality rate in this form unlike the acute form, is 30-70%.

Plate 3 1: Pig with ASF showing a bloody red skin and the foam in the mouth (The Pirbright Institute ASF (National Hog Farmers)

iii) **Chronic form**: This form is characterised by emaciation, low fever, respiratory problems, chronic skin ulcers, and low mortality rate.

2.1.4 Transmission of ASF

The ASF virus can be transmitted by the soft tick (*Ornithodoros spp.)* and the warthogs or bush pigs. The soft ticks serve as the vector for the transmission of the disease when they feed on young warthogs or bush pigs. The *Ornithodoros spp.* transmit the virus through blood (Guinat et al., 2016). While warthogs are hosts for the ASF virus, it has been revealed that warthogs are not able to transmit the virus directly to the domestic pigs. But on the other hand, the African wild pigs can transmit the disease without showing any symptoms (Penrith and Vosloo, 2009).

African Swine Fever can be transmitted by direct and indirect contact with pigs (Sugiura and Haga, 2018). Transmission by direct contact occurs when there is contact between the infected and the susceptible pigs or by consuming meat from the infected pigs or feeding pigs with swill (kitchen waste) without it first being cooked or boiled. Indirect transmission takes place when pigs come into contact with contaminated materials or fomites such as transport vehicles, workers or visitors who do not change clothes when entering and leaving the farm (Khomenko and Kerba, 2018).

2.1.5 Treatment, prevention and control of African Swine Fever

Currently there is no effective vaccine available for the prevention of ASF. In addition, there is no effective treatment for ASF. The only way to prevent the introduction of ASF on a farm, is to restrict the movement of pigs in and out of the farm without first ascertaining if they are free from the disease. Movement of vehicles in and out of farms must also be restricted and vehicles must also be sprayed to prevent the spread of the disease. They must follow proper biosecurity, avoid feeding of swill on the farm, and entering of wild boars onto farms must be prohibited, especially in high ASF risk areas (Yoo et al., 2021).

When the outbreak of ASF is confirmed on the farm, all the pigs in that farm must be culled and the area where the pigs were kept disinfected, and for about 5-7 days there should not be any pigs kept on the premises. Furthermore, movement of pigs in and out of the farm should be restriction (Schulz, Staubach and Blome, 2017).

2.2 Historical aspects of ASF

2.2.1 History of African Swine Fever in South Africa

The first outbreak of ASF in South Africa was reported in Limpopo Province located in the Northern parts of the country in 1926 (van Rensburg *et al.*, 2020). Since 1926 there has been numerous reports of pigs dying due to the ASF. In the beginning, the disease mostly affected the free range pigs that roam around as opposed to those in the intensive farming system. In 1903, several outbreaks were reported which killed a huge number of pigs in areas of Cape Town and also in the Transvaal (i.e., Gauteng, North West, Limpopo & Mpumalanga), (Schulz, Staubach and Blome, 2017).

A large number of outbreaks were reported in the Witwatersrand area of Johannesburg in 1933, and in the Western area where there was a high mortality from the disease that was also reported in the same year at the Tulbagh District. There was an outbreak that took place in the Lombardy Estate where 30 pigs died. It was followed by outbreaks on other farms in that area such as the Cairngorn Estate. In this outbreak, the Veterinary officer mentioned reddening of skin from the ear and the abdomen, haemorrhage in the kidneys, and gastrointestinal organs as part of clinical signs and post-mortem findings (Mushagalusa et al., 2021).

During 1935 some provinces in South Africa were declared as controlled zones for the ASF. The provinces that were included, Limpopo, Mpumalanga, North West and KwaZulu Natal (Directorate: Animal Health, 2021).

During 1938, two (n=2) outbreaks were confirmed in the Pietersburg District. Actually since 1939, South Africa has only had sporadic outbreaks and these have been restricted to the controlled zones of the Limpopo and the Kruger National Park (Magadla, 2015).

In 1996, the first outbreak outside the control zone of Limpopo Province was reported (Thambidurai *et al.*, 2019). The disease spread due to illegal movement of domestic pigs to the controlled area, following contact between wild and domestic pigs in the area.

Between 1993 and 2012, there were 1309 cases of ASF that were reported from 71 outbreaks that occurred in South Africa. Mpumalanga and Gauteng Provinces recorded their first outbreaks of ASF in 2011. In January 2012, a total of 172 farms

were affected by the ASF. The last outbreaks were reported in 2020 on a communal pig farming area of the Amathole District Municipality in the Eastern Cape. Post-mortem examination was conducted by the Veterinary Services of Department of Agriculture. Five district areas were affected by the outbreak and 50 pigs died. The incident was reported to the World Organisation for Animal Health (WOAH) previously known as the Office International des Epizooties (OIE) on the 10th May 2020 (Makgopa, Bonsu and Reform, 2020). Since the affected area was a communal farming area, it was difficult to control and implement biosecurity measures. All infected pigs were put under quarantine and movement of pigs in and out of the area was prohibited. The latest outbreak was reported in Mqanduli area in King Sabata Dalindyebo local Municipality in Eastern Cape February 2021. It was reported in the free-roaming small holder pig sector (DALRRD 2021).

2.2.2 Historical and current distribution of ASF in Africa

The first outbreak of ASF on the African continent was first reported in Kenya in 1909 (Janse van Rensburg et al., 2020). This was followed by the first reports of ASF in South Africa reported 1928 (Steyn et al., 2019 & Angola, 1932). In Angola the indigenous pigs were the main source of the virus. There were also reports from Malawi and Mozambique in 1954 to the effect that the source of the infection for the disease could have been warthogs from the neighbouring countries (Mulumba-Mfumu et al., 2019).

The 1990s saw an increase in ASF in Sub-Sahara Africa. African Swine Fever was reported again in Mozambique in 1993 and in Kenya after more than 30 years in1994. Benin, Togo, Nigeria, Ghana and Burkina also registered cases between 1997 and 2003. An increase in the number of outbreaks was also reported in Senegal and also Madagascar for the first time in 1998 (Penrith *et al.*, 2013). African Swine Fever has also spread to other regions of Africa such as the West African countries: Nigeria in 1997, Togo in 1997, Ghana in 1999, Burkina Faso in 2003 and Chad in 2010. The disease also spread to some islands such as Madagascar in 1998 and Mauritius in 2007 until it was eradicated by 2008. There is no doubt that the number of outbreaks reported in Africa will grow as new countries become infected (Dixon, Sun and Roberts, 2019).

Based on the preceding discussion, between 1990 and 2000, they were changes in the epidemiology and the distribution of the disease throughout the sub-Sahara region. African Swine Fever has been reported in the Southern and East African regions. Countries where ASF has been confirmed include Kenya, Namibia, Botswana, Zimbabwe and Northern South Africa (Jori *et al.*, 2013). The disease has also been confirmed in domestic pigs in countries like Angola, Congo, Uganda, Zambia, Malawi, Northern Mozambique, and Congo.

2.2.3 Occurrence of African Swine Fever Worldwide

In Europe, ASF was reported after the virus spread from Angola to Portugal in 1957. It was the first time the disease was reported outside of the African countries. The Portugal outbreak was characterised 100% mortality rate. From 1960 ASF spread to the Iberian Peninsula and stayed for over 30 years (Sur, 2019). For more than 20 years, the disease spread through various countries in Europe including Spain (1960), France (1964), Italy (1967, 1969, 1993), Malta (1978), Belgium (1985), and the Netherlands (1986). However, disease control programs were able to eradicate the disease in 1995 (Geering, Penrith and Nyakahuma, 2011).

The ASF outbreak in Iberian Peninsula, European and American countries was caused by the movement of contaminated meat products from the affected pigs. Although the disease was eradicated in the other areas, in the Sardine it remains endemic since 1978 (Cwynar et al., 2019).

There were outbreaks in Brazil and Cuba in 1978 and 1980 respectively. From Brazil, the disease spread to the Dominican Republic in 1978 (Penrith and Vosloo, 2009). Later the disease entered different countries in South and Central America. However, it has since been eradicated in most of these countries (Schulz, Staubach and Blome, 2017).

In 2007 ASF was reported in many other European countries including George from where it spread into Armenia, Azerbaijan and the Russian Federation Republics ((Jori and Bastos, 2009) through the transportation of the contaminated slaughterhouse waste from ships. Both Ukraine and Belarus reported an outbreak of ASF during the years of 2012 - 2013. During 2014 ASF entered the European Union and the outbreak was confirmed in Lithuania, Latvia, Estonia, and Poland. The outbreaks were mainly in wild boars and also in domestic pigs (Couacy-Hymann *et al.*, 2019).

2.3 The socio-economic impact of African Swine Fever globally

The outbreaks of ASF have devastating effects on the pig industry and the economy of the country and negatively affects the livelihoods of numerous poor households that depend on pigs as a source of protein and income. In event of outbreaks, farmers lose their businesses because of ASF (Geering, Penrith and Nyakahuma, 2011).

Although the commercial pig industry in the country where outbreaks occur faces the highest impact and losses due to ASF, the greatest impact of the disease in sub-Saharan Africa applies to the poor smallholder farmers. When the outbreak starts, they lose their pigs due to poor biosecurity and this results in loss of income to support their families (Geering, Penrith and Nyakahuma, 2011). An outbreak of ASF, which occurred in Tanzania during 2011 killed 300,000 pigs which were approximately valued at US$240 million. In another outbreak that occurred during 2017 in Gairo District, Morogo, a total loss of 1725 pigs were lost in 10 villages from March to June and the farmers and businessmen incurred a financial loss of approximately to USD 182,320 (Exchange rate: 1 USD = 2200). During 2019 in Vietnam, there was an outbreak of ASF which result in the death and burying of approximately six million pigs. During February and June 2019 in Duc Thang commune, Tien Lu district, Hung Yen Province in the ten districts there were 154 outbreaks and 135.000 pigs were culled and buried (Geering, Penrith and Nyakahuma, 2011). In fact, all countries that experience ASF outbreaks confirmed that they do not only suffer from the resultant high mortality of pigs, but also due to the trade restriction and the high cost of controlling the disease. In Spain the cost of the eradication programme were estimated at USD 92 million and in the Russian Federation it was estimated to be one billion USD.

2.4 Knowledge and attitude towards ASF among small scale farmers

2.4.1 Knowledge of ASF among small scale farmers

Knowledge is "*The facts, feelings or experiences known by a person or group of people." (*Mohajan, 2016). *A* study conducted in South Africa by Amar et al., (2020) showed that the factors that promote the spread of ASF was feeding of swill, free roaming of pigs and hunting of wild pigs, which point poor knowledge of ASF. A study conducted in Angola by Chenais et al., (2017) showed that small holders ~~s~~ farmers had poor knowledge about the ASF as evidenced by the pig management practices they

adopted. However, their level of knowledge showed improvement following training. In Mozambique (Chilundo *et al.*, 2020) also showed that smallholders farmers had poor knowledge regarding ASF. This was manifested in the poor management practices they adopted. According to a study conducted in Northern Uganda by (Chenais *et al.*, 2017), although the majority of participant had good knowledge of ASF, their knowledge of practices related to ASF (PRA) control and prevention measures was poor.

The study conducted in Europe by showed that there were knowledge gaps regarding the transmission routes of the ASF to domestic pigs. For example, the farmers were not aware of the transmission of the disease that included movement of vehicles, equipment and the clothes when entering and leaving the premises where pigs are kept (Guinat, Gogin, *et al.*, 2016b). A similar study in Poland observed that there is still a lack of knowledge regarding the transmission of the ASF virus (Mazur-Panasiuk, Żmudzki and Woźniakowski, 2019).

A study conducted in England showed that most farmers would not notice if they saw ASF- like clinical signs. They preferred to wait for few days hoping the pig would recover. In another study conducted in Ukraine it was shown that the knowledge of ASF was not very common amongst the backyard pig farmers (Muñoz-Gómez *et al.*, 2021). In addition, risky practices that influence the spread of the disease were common among these farmers, which points to poor knowledge about the factors that influence the spread of the ASF.

2.4.2 Attitude towards African Swine Fever among small scale farmers

Attitude is a “a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour” (Mazur-Panasiuk, Żmudzki and Woźniakowski, 2019). A study conducted in South Africa by (Chenais *et al.*, 2017) showed that small holder farmers had poor knowledge about disease prevention and biosecurity measures as evidenced by the pig management practices they adopted. A similar study from South Africa by (Chenais *et al.*, 2017) showed that the attitude of the farmers was poor, as the majority of farmers do not report any symptoms of the disease to the nearest State Veterinary or local AHT (Animal Health Technician) and in addition, biosecurity on the farms was poor. In a study conducted in Nigeria by (Omowon *et al.*, 2020) following the outbreak of ASF, it was evident that the farmers

had not learned from the past outbreak, and as a result, the management and bio-security were still poor. A high risk of repeat outbreaks of the disease in such areas due to the poor attitude among the farmers is imminent.

In Bulgaria and Germany, (Vergne et al., 2014) observed that farmers would not immediately report if they suspect a case of ASF. There is a belief among farmers that if they reported to the veterinarian, their reputation in the community would be affected and if they send samples to the laboratory the results take long to come out. Therefore, they try and control the outbreak without consulting the Veterinarian.

In the study conducted in England, it was shown that the majority of farmers would immediately report to the veterinary surgeon and seek for their opinions (Guinat, Wall, *et al.*, 2016). However, generally pig farmers with poor knowledge about clinical signs of ASF and limited concern about ASF compared with other pig disease are less likely to consider the possibility of an outbreak of ASF on their farm.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Methods and Materials

3.1.1 Study Area

The study was conducted in uThukela District (co-ordinates: $28^0$33'S $29^0$46'E), which is located on the Western boundary of the KwaZulu Natal (KZN). UThukela District is made up of privately owned commercial farmlands, small holder settlements and urban areas. It is one of the 10 District Municipalities in the Province of KZN (as shown in (Figure 3.1 & 3.2), with 24 Local House of Traditional Authorities. uThukela District has an area of approximately 11500km^2 with a population of about 706,589 according to census (2016). The district shares the boundaries with three other districts which are Amajuba (North), uMzinyathi (East) and uMgungundlovu (South), (Figure 3.1).

uThukela District is made up of three local Municipalities, and these are: Inkosi Langalibalele, Okhahlamba and Alfred Duma Local Municipality. The biggest local municipality is Alfred Duma which is 3957.63 km^2 followed by Inkosi Langalibalele 2958.59 km^2 and Okhahlamba 3540.63 km^2. uThukela local municipality, is 75% rural, and it is named after one of the major rivers in the province called uThukela River. The river flows from the Drakensberg Mountains and supplies water to Gauteng and KZN provinces. It is located close to the N3 that runs in the direction of Durban and Johannesburg, and halfway between Johannesburg and Durban. Meanwhile, Okhahlamba is closer to the border with the Free State province. Okhahlamba was named as one of the World Heritage Sites, and is a tourist attraction. The Drakensberg Park attracts many travellers every year due to its natural beauty according to (The Office of the Municipal Manager: IDP Unit. 2021).

The majority of people who live in uThukela are black Africans, and they speak isiZulu. However, there are also Sotho speaking people especially in Okhahlamba due to its closeness to the border with the Free State Province. UThukela District has good climatic conditions. The mountainous areas of the northern part separate the uThukela District from Free State and Amajuba (KwaZulu Natal). Okhahlamba and Inkosi Langalibalele are the primary source of agriculture. Alfred Duma is dominated with beef cattle rearing, while Inkosi Langalibalele is the main area for chicken, sheep and

pig farming according to The Office of the Municipal Manager: IDP Unit (2021).

During the 2013 animal census, 2,643 pigs were counted in uThukela District. Alfred Duma/ Ladysmith local Municipality had 985 pigs, followed by Okhahlamba which had 387, Imbabazane (n=289) and Indaka (Inkosi Langalibalele) (n=885)(Sibongiseni, 2013)

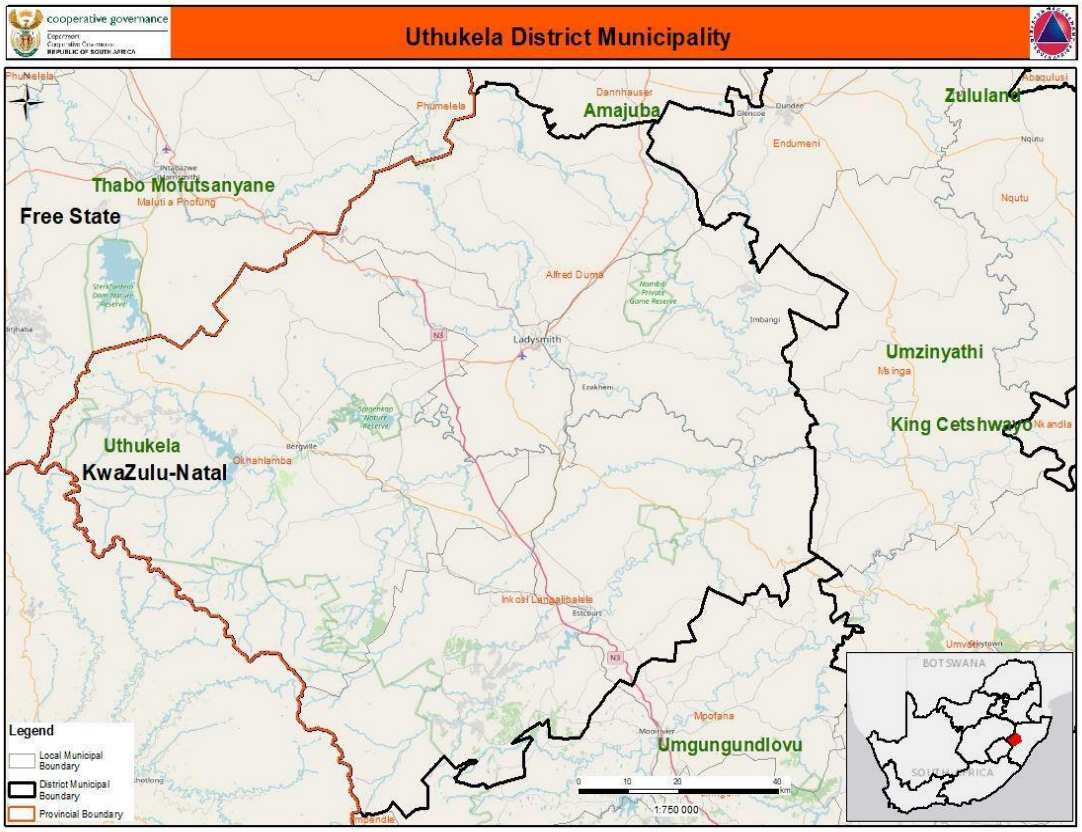


Figure 3 1: Map of the uThukela District, KwaZulu-Natal Province, South Africa showing the boundaries of the district (Retrieved from www.municipalities.co.za , April 2021)

Figure 3 2: Map of the uThukela District, KwaZulu-Natal Province, South Africa showing the municipalities (i.e., Okhahlamba, Inkosi Langalibalele and Alfred Duma) (Retrieved from www.municipalities.co.za, April 2021)

3.1.2 Study design

A cross sectional questionnaire-based study design was adopted to achieve the objectives of the study. A questionnaire was used to gather information from September to October 2020 in the three local Municipalities (i.e., Okhahlamba, Inkosi Langalibalele and Alfred Duma). Animal Health Technicians (AHT) and Agriculture Advisors (AA) with Diplomas and degrees in Animal Health and Agriculture Science respectively, were employed to assist with data collection.

3.2 Target population and sampling strategy

3.2.1 Target population

UThukela District is a communal area, and as of 2013, it had a total of approximately 2643 pigs and 533 communal pig farmers (Sibongiseni, 2013). However, the number of pig farmers could have reduced since the last census, and this is because some famers have since stopped keeping pigs. The pigs are kept both indoors and outdoors in the study area. Farmers who keep pigs in indoor use rudimentary structures such as the one in Plate: 3.1 below.

Plate 3 2: The type of structures used for keeping pigs in doors by smallholder farmers in the study area (Photo taken by Ms NM.Thusi).

3.2.2 Study population and sampling strategy

All the pig farmers were invited and only 426 pig farmers agreed to voluntarily participate in the study. The farmers should own pigs and willing to participate in the study. Pig farmers outside the study area were not included.

3.2.3 Data collection tool and data collection

The principal researcher drafted the Knowledge Attitude and Practices (KAP) questionnaire (Annexure A). To enhance internal validity of the questionnaire used in the study, a pilot study was conducted on 10 participants and results used to improve on the final questionnaire before data collection commenced. The questionnaire was written in English language and translated into isiZulu language by the interviewers since most pig farmers speak the indigenous local language.

The Knowledge, Attitude and Practice (KAP) survey questionnaire consisted of four (4) sections and 30 questions. The four sections included: the demographics, knowledge of ASF, attitudes and practices towards ASF. The questionnaire contained binary questions, multiple selection and open-ended questions. Respondents who answered the question correctly was given one mark and the incorrect and “don’t know” answer were given zero.

Two (n=2) Animal Health Technicians (AHT) and two (n=2) Agricultural Advisor (AA) from three (n=3) different local Municipalities participated in data collection. They were first trained by the principal researcher on how to conduct interviews using the structured questionnaire.

The pig farmers were interviewed at the dip tanks, and not their homes, due to the need to adhere to the then prevailing State of Disaster Regulations related to the COVID-19 pandemic. The semi structured interviews took place at the dip tanks nearest to where the farmers reside. In Okhahlamba Municipality 15 dip tanks were visited and 161 farmers were interviewed. In Alfred Duma 22 dip tanks were visited and 180 farmers were interviewed. Lastly, in Inkosi Langalibalele 18 dip tanks were visited and 85 farmers were interviewed. In total 55 dip tanks were visited in uThukela District, and a total of 426 small holder pig farmers were interviewed.

The summary of the activities that took place during the study are shown below in Table 3.1

Table 3.1: Activities related to data collection during the course of the study

Date of Activity	Activity	Purpose of event
March 2020	Meeting with the pig farmers	Informing participants about the study.
April 2020	Liaise with the AA & AHT	Planning how to administer the questionnaires
April 2020	Training of AA & AHT	They were trained on how to conduct interview and understanding of questions.
May 2020	Pilot study	Was conducted to check if there are any gaps and any questions that needed to be removed or modified.
June 2020- September 2020	Collecting data	Do face to face interview using and questionnaires.
October 2020- January 2021	Data Captured	Captured all the data from the questionnaires administered to the pig farmers.
February 2021- May 2021	Data Analysis	Analysed data
June 2021- January 2023	Writing of Report	Writing report and submission for examination.

3.3 Data collection and Analysis

3.3.1 Data collection using a structured questionnaire.

A structured questionnaire was used to collect data on the socio-demographic characteristics, knowledge, and awareness about ASF (means of transmission, sign of disease, cause of ASF, species affected by ASF, and attitudes and practices related to protecting pigs against ASF. Each interview lasted between 20-30 minutes, and the data was collected over a period of two (n=2) months.

3.4 Data management and Analysis

3.4.1 Data management

All the data collected, were monitored and reviewed daily by the principal researcher. All completed questionnaires were checked for completeness and accuracy and entered into a Microsoft Excel 365 (Microsoft Corp., Redmond 137, and USA). The data generated were analysed using the Statistical Package for Social Science

(SPSS) Version 27 (SPSS for Windows, version 27, SPSS, Inc, Chicago, Illinois, the USA). A binary variable was created from the knowledge score based on a score of 60% as the cut off for being knowledgeable (≥ 60%) or not knowledgeable (< 60%).

3.4.2 Data analysis

The data was captured into the Microsoft Excel 2010 Spreadsheet and imported into Statistical Package for Social Science (SPSS) Version 27 (SPSS for Windows, version 27, SPSS, Inc, Chicago, Illinois, the USA) before analysis commenced. Continuous variables were tested for normality.

Descriptive statistics were computed and presented as tables. Inferential statistics involved fitting binary logistic regression models to the data. In the first step, simple associations between each explanatory variable and the outcome (knowledge score) were assessed using the univariate logistic regression model. Variables with an alpha level ≤0.20 were selected for inclusion in the multivariate model. In the second step, multivariate analysis was performed to determine the factors significantly associated with a high knowledge score. The log likelihood-ratio test was used to compare models, and the model fit was assessed using the Hosmer Lemeshow goodness of fit test. Significance was set at a p-value of <0.05.

3.5 Limitations

This study was subject to limitations of cross-sectional surveys and recall biases. The study was only limited to uThukela, and hence the results cannot be generalised to other areas in South Africa. The study was conducted during the lockdown due to COVID-19 pandemic and so this could have led to selection bias. Nonetheless, this study presents baseline information on the knowledge, attitude and practices towards ASF, which has previously not been available in the study area. It also provides baseline information upon which future research can be developed.

CHAPTER 4

RESULTS

4.1 Descriptive statistics

4.1.1 Demographic profile of farmers

All the emerging pig farmers in the study area (N= 533) were invited to participate in the study. But only 426 pig farmers agreed to participate and signed the consent form. Majority of the respondents were from Alfred Duma Municipality (42.25%; n=180), followed by the Okhahlamba (37.79%, n=161) and Inkosi Langalibalele (19.92%; n=85) local Municipality (Table 1).

The majority of the respondents were males (60.80%, n=259), and most respondents (35.68%; n=152) were aged 36-53 years, followed by respondents who were aged 54-71 years old (34.74%; n=148). Respondents who were aged over 71 were the minority (9.15%, n=39).

Majority of the respondents (28.64%; n=122) in this study did not have formal education. About the same number of farmers indicated that they had completed Matric (22.07%; n=94) or Primary School (22.54; n=96). Whereas (21.83%, n=93) said that they had not completed high school. A high number of respondents were unemployed (47.89%, n=204). With regard to income, most respondents (85.92%; n=366) in this study earned 0-R3500 per month.

Respondents who had over 5 years of experience of keeping or rearing pigs, were the majority (42.02%; n=179), followed by those who had 2-5 years of experience. When asked why they rear pigs, majority (87.79%; n=374) of farmers indicated that they reared pigs solely as a source of meat for their family.

Table 4. 1: Demographic profile of respondents from the three municipalities who responded to the questionnaire

Variables	Level	Frequency (n)	%	95% CI	
				Lower	Upper
Residence	Alfred Duma	180	42.25	37.51	47.10
	Inkosi Langalibalele	85	19.95	16.26	24.07
	Okhahlamba	161	37.79	33.17	42.59
Age	18-35	87	20.42	16.69	24.57
	36-53	152	35.68	31.13	40.43
	54-71	148	34.74	30.22	39.47
	Over 71	39	9.15	6.59	12.30
Gender	Female	167	39.20	34.54	44.02
	Male	259	60.80	55.98	65.46
Education	Completed Matric	94	22.07	18.22	26.31
	Completed Primary School	96	22.54	18.65	26.80
	Completed Tertiary	21	4.93	3.08	7.44
	No Formal Education	122	28.64	24.39	33.19
	Not completed High School	93	21.83	18.00	26.02
Employment	Employed	50	11.74	8.84	15.18
	Other	5	1.17	43.06	52.75
	Pensioner/retired	167	39.20	34.31	43.78
	Unemployment	204	47.89	0.52	3.04
Income	Between 0-3500	366	85.92	82.25	89.08
	Between R3600-6000	26	6.10	4.03	8.82
	Between 6000-10000	21	4.93	3.08	7.44
	Between 11000-upwards	13	3.05	1.63	5.16
Experience	2-5 yrs.	172	40.38	35.68	45.21
	Less than 1yr	75	17.61	14.11	21.56
	>5 yrs.	179	42.02	37.28	46.87
Reason for rearing pigs?	Both as a source of income and meat for family	52	12.21	9.25	15.70
	Source of meat for family	374	87.79	84.30	90.75

4.1.2 Profile of famers by knowledge of African Swine Fever

When respondents were asked what ASF was, most (31.46%, n=134) described it as being a flu like, contagious and viral disease. This was followed 26.06% (n=111) who describe ASF as a viral disease and 22.54% (n=96) who only described it as being a flue like disease. Those who described AFS only as contagious disease were the minority (19.95%; n=85).

With regard to the animal species that can spread ASF, 44.84% (n=191) mentioned pigs, while 39.67% (n=169) indicated that all of the above (i.e., wild pigs, pigs and warthogs) can spread ASF. Only 9.62% (n=41) said only wild pigs and 5.87% (n=25) said that only warthogs can spread ASF.

With regard to how ASF is spread, 39.91% (n=170) of the respondent mentioned the illegal movement of pigs as the most common route through which ASF is spread. This was followed by 32.63% (n=139) who indicated that all of the above (i.e., no foot bath, feeding swill and illegal movement of pigs) help in spreading the disease. Only 19.25% (n=82) and 8.22% (n=35) indicated that only lack of the foot bath or biosecurity and feeding of swill respectively promote the spread of ASF.

In response to the question whether ASF can be transmitted from one pig to another, 97.18% (n=414) indicated that ASF can be transmitted from one pig to another. Only 2.82% (n=12) were not aware that ASF can spread from one pig to another.

Majority of the respondents (53.76%; n=229) stated that the source of ASF virus was all of the above (i.e., *Ornithodorus* tick and wild boars). Those who indicated that only *Ornithodorus* tick were the source of ASF, made up 22.30% (n=95) of the respondents, while those who indicated that only wild boars can be a source of ASF made up 21.13% (n=90) of the respondents.

Responding to the question “Which of the following clinical signs can be seen in a case of ASF, of the respondents 59.62% (n=254) indicated that all of the above (i.e., high fever, mortality in 15-45 days, ocular discharge) as clinical signs of ASF. A small number of respondents (12.44%; n=54) only identified a high fever and death occurring 15-45 days (12.44%; n=53) as clinical signs likely to be seen in a case of ASF. A small number of respondents (9.62%; n=41) only mentioned ocular discharge as a clinical sign in ASF. Those who were not aware of any of the clinical signs of ASF constituted only 2.35% (n=10) of the study population.

Base on the responses to the question on whether ASF can be spread by pigs and in pork products, the overwhelming majority of respondent (95.77%; n=408) responded in the affirmative (i.e., ASF can be spread by pigs and pork products). A very small percentage of farmers (0.70%, n=3) were not aware that the ASF virus can spread by pigs and in pork products.

When asked if ASF is a curable disease**,** majority of pig farmers (96.48%; n=411) were aware that ASF is not a curable disease, and a very small number of farmers (0.70%; n=3) indicated that they did not know whether ASF was curable or not. The participants were asked if ASF is a notifiable disease or not, and the majority of the farmers (89.44%; n=381) indicated that ASF was a notifiable disease. Only (7.75%, n=33) respondents said that ASF was not a notifiable disease (**Table 4 2)**.

Table 4. 2: Results of the assessment of the knowledge of the participants on ASF

Variable	Level	Frequency (n)	%	95% CI	
				Lower	Upper
What is ASF	A flue like disease	96	22.54	18.65	26.80
	All of the above	134	31.46	27.07	36.10
	Contagious disease	85	19.95	16.26	24.07
	Viral disease	111	26.06	21.95	30.50
According to you which one of the following animals might spread ASF?	Pigs	191	44.84	40.05	49.70
	Warthogs	25	5.87	3.83	8.54
	Wild pigs	41	9.62	7.00	12.83
	All of the above	169	39.67	34.99	44.49
Which factors promote the spread of ASF?	All of the above	139	32.63	28.19	37.31
	Feeding of swill	35	8.22	5.79	11.24
	No footbath/biosecurity	82	19.25	15.61	23.32
	Illegal movement of pigs	170	39.91	35.22	44.73
Can ASF be transmitted from one pig to another?	Yes	414	97.18	95.13	98.54
	Don't know	12	2.82	1.46	4.87
Which of these can be a source of ASF virus?	Both of the above	229	53.76	48.89	58.57
	N/A	12	2.82	1.46	4.87
	Ornithodorus tick	95	22.30	18.43	26.56
	Wild boars	90	21.13	17.35	25.31
Which of the following clinical signs can be seen in an ASF case?	High Fever	56	13.15	10.08	16.73
	Ocular discharge	41	9.62	7.00	12.83
	Death occurs in 15-45 days	53	12.44	9.46	15.96
	All of the above	254	59.62	54.79	64.32
	Don't know	10	2.35		
	N/A	12	2.82	1.46	4.87
Can ASF be carried in pigs and pork products?	Yes	408	95.77	93.40	97.48
	No	3	0.70	0.15	2.04
	Don't know	3	0.70	0.15	2.04
	N/A	12	2.82	1.46	4.87
Do you think that ASF is a curable disease?	N/A	12	2.82	1.46	4.87
	No	411	96.48	94.26	98.02
	Don't know	3	0.70	0.15	2.04
In your opinion, do you think the feeding of swills to pigs can reduce the transmission of ASF in the community?	Yes	4	0.94	0.26	2.39
	No	311	73.00	68.52	77.17
	Don't know	99	23,24	19,31	27,55
	N/A	12	2,82	1,46	4,39
Do you know if ASF is a notifiable disease or not?	Yes	381	89.44	86.12	92.19
	No	33	7.75	5.39	10.71
	N/A	12	2.82	1.46	4.87

4.1.3 Distribution of farmers by attitude and practices towards ASF

As shown in Table 4.3, all the respondents (100%; n=426;) mentioned that if they suspected that a pig had ASF, they would immediately call the nearest State Veterinary office. Just under 60% (57.28%; n=244) of the farmers confirmed that they do feed their pigs on swill (waste feed from the kitchen) and less than half 42.72% (n=182) indicated that they did not feed their pigs on the swill.

Most participants (87.09%, n=371), said that ASF is never discuss or talked about with family members or neighbours. A very small number (12.91%; n=55) mentioned that they do talk about ASF. Majority of the respondents (92.72%; n=395) were of the view that an outbreak of ASF would ruin their enterprises, while only 7.28% (n=31) were aware that an outbreak of ASF would not be disastrous for their pig farming enterprise (**Table 4.3**).

Table 4.3: The proportion of respondents based on their attitudes and practices towards ASF

Variable	Level	Frequency (n)	%	95% CI	
				Lower	Upper
In your opinion, if you suspect that your pigs have ASF. What will you do?	Immediately call your nearest State Vet office	426	100	99.14	1.000
Do you feed your pigs with swills (waste feed from your kitchen)?	No	182	42.72	37.97	47.57
	Yes	244	57.28	52.43	62.03
Do you usually talk or discuss with your family or neighbours about the ASF?	Yes	55	12.91	83.53	90.12
	No	371	87.09	9.88	16.47
An outbreak of ASF would be disastrous for pig farmers in this area?	Yes	395	92.72	89.83	95.00
	No	31	7.28	0.55	10.17

When respondents were asked if they had heard about the ASF in the previous year, 33.10% (n=141) said they had not heard about ASF in the previous year. However, the majority (66.90%, n=285) indicated that they had heard about the disease in the past year.

Majority of the respondents (93.66%; n=399), indicated that the best way to receive information about ASF was from the Veterinary Services officials. Other modes of

disseminating information such as broadcasting message on radio (2.82%; n=12), TV (2.58%; n=11), billboards (0.47%; n=2) and posters (0.47%; n=2) were not as popular with the respondents as the Veterinary Services officials.

Most respondent (58.69%; n=250) mentioned that they had never heard from the Department of Agriculture in the last 6 months. Meanwhile, slightly over 40% (41.31%; n=176) said that they had heard from the department of Agriculture.

In response to the question whether the farmer ever goes hunting for wild/bush pigs, only 38.50% (n=164) of the farmers indicated that they hunted wild/bush pigs, while the majority (61.50%; n=262) indicated that they did not hunt for wild/bush pigs. Further investigation revealed that 38.26% (n=163) of the respondents who hunted wild/bush pigs brought the whole carcass with its skin to the homestead. Very few respondents (0.47%; n=2) mentioned that the meat is first cooked in the bush before it is brought home.

With regards to the way they rare pigs, just over half (52.11%; n=222) indicated that they always kept their pigs in a sty/house/enclosure. This was followed by 16.67% (n=71) who kept their pigs in a sty/house/enclosure but at times let them to roam, 10.80% (n=46) who let the pigs roam around but at a times tied them with the rope, and 10.33% (n=44%) who always let their pigs to roam around and scavenge for feed. A very small number of farmers (5.87%, n=25) always kept the pigs tied with a rope near the homestead or in a house but at a times tied with a rope (4.23%; n=18).

With respect to the biosecurity measures farmers adopt on their farms, few farmers (12.44%, n=53%) did not feed swill or scrap to their pigs. Meanwhile, 31.46% (n=134) of the respondents indicated that they did not allow bush pig meat onto their farms. Slightly over half (53.05%; n=226) of the farmers mentioned that they did not allow their pigs to roam around in the area looking for the feed, while all farmers (100%, n=426) said that they had a closed herd (i.e., do not allow new animals into their herd of pigs).

Table 4.4: The proportion of respondents who adopted the different intervention measures that can help curb outbreaks of ASF on the farms

Variable	Level	Frequency (n)	%	95% CI	
				Lower	Upper
During the previous years, have you heard about the AFS outbreak on the radio, television,	Yes	285	66.90	62.21	71.36
	No	141	33.10	28.64	37.79
In your opinion, what are the best ways to receive information about AFS for you and your family?	Broadcast messages	12	2.82	1.46	4.87
	Billboards	2	0.47	0.06	1.69
	TV	11	2.58	1.30	4.57
	Posters	2	0.47	0.06	1.69
	Veterinary Services officials	399	93.66	90.91	95.78
	Others				
In the last 6 months has anybody from the department of Agricultural and rural development spoken to you	No	250	58.69	53.85	63.40
	Yes	176	41.31	36.60	46.15
Do you ever go hunting for wild/bush pigs?	No	262	61.50	56.70	66.15
	Yes	164	38.50	33.85	43.30
	Meat is first cooked in the bush	2	0.47	0.06	1.69
	Whole carcass with its skin is brought home	163	38.26	33.63	43.06
	Did not answer	261	61.27	56.46	65.92
Which of the following best describes the way your rare your pigs?	I always keep my pigs tied by a rope near homestead	25	5.87	3.83	8.54
	I always let my pigs to roam and look for food	44	10.33	7.61	13.62
	I keep pigs in a house but at times let them to roam	71	16.67	13.23	20.55
	I keep pigs in a house but at times tie them on a rope	18	4.23	2.52	6.60
	I let them roam but at times tie them with a rope	46	10.80	8.01	14.14
	My pigs are always kept in a pig sty/house	222	52.11	47.25	56.94
What biosecurity measures have you implemented on the farm to keep out ASF (tick all the applies to you)?	I have a closed herd	426	100	99.14	100
	I have a foot bath at entry to my farm or pig house	0	0	-	-
	I do not feed swill or scrap meat from outside	53	12.44	9.46	15.96
	I do not allow bush pig meat onto my farm	134	31.46	27.07	36.10
	I do not allow my pigs to roam in the area	226	53.05	48.19	57.87

4.2 Inferential statistics

4.2.1 Univariate analysis results

The results of the univariate analysis are presented in Table 4.5. Inkosi Langalibalele had more people (67.06%) who were knowledgeable about AFS, followed by the Alfred Duma (48.89%). Okhahlamba (43.48%) had the lowest number of people who were knowledgeable about the disease. The difference in knowledge between places of residence was significant (p=0.0018).

The 54 -71 age group had the highest number (60.14%) of people who were knowledgeable about ASF, followed by the 36-53 years old (50.66%), 18-35 years old (47.13%) and respondents aged over 71 (20.51%). There was a significant difference between the age groups in terms of their knowledge of the disease (p=0.0002).

Male respondents were significantly (p=0.0024) more likely to be more knowledgeable about ASF (56.37%) compared to their female counter parts (41.32%). Based on the educational status of respondents, farmers with no formal education (58.20%) were likely to be more knowledge followed by those who had completed tertiary (52%). The proportion of farmers who were knowledgeable about the disease was lowest among those who had completed primary (41.49%) followed by those who had completed high school (44.09%). However, the difference in knowledge based on educational level attained by the farmers was not statistically significant (p=0.0794). Employment status designated as “other” had more farmers (60%) who were knowledgeable followed by those who were employed (50.82%) and unemployed (52.94%). Farmers who identified themselves as pensioner/retired had the least number of farmers considered to be knowledgeable (46.71%). However, the difference in terms of people considered knowledgeable was not statistically significant.

Farmers who earned between R6000 - R10000 (61.90%) were more likely to be more knowledgeable compared to those who earned 0 - 3500 (50.82%) and ≥R1100- (53.85%). Farmers with an annual income of R3600 - R6000 had the least number (34.62%) of farmers where were considered knowledgeable. The difference between the proportions of groups based on income levels were not statistically significant (p=0.2850).

There was a significant difference between the number of farmers who were knowledgeable based on the experience of the farmer (p=0.0209), with more farmers (56.42%) who had over 5 years' experience of farming with pigs, being knowledgeable. This was followed by those who had 2-5 years (50%) experience of farming with pigs. Farmers who had less than 1-year experience of farming with pigs had the lowest number of farmers (37.33%) who were considered knowledgeable.

Table 4. 5: Results of univariate analysis showing the relationship between being knowledge and the different socio-demographic variables

Variable	Level	Total	[a]Nknow (%)	[b]Know %	P-value
Residence	Okhahlamba	180	56.52	43.48	0.0018
	Alfred Duma	85	51.11	48.89	
	Inkosi Langalibalele	161	32.94	67.06	
Age	18-35	87	52.87	47.13	0.0002
	36-53	152	49.34	50.66	
	54-71	148	39.86	60.14	
	Over 71	39	79.49	20.51	
Sex	Male	167	43.63	56.370	0.0024
	Female	259	58.68	41.32	
Education Level	No formal education	94	41.80	58.20	0.0794
	Completed primary school	96	58.51	41.49	
	Not completed high school	21	55.91	44.09	
	Completed matric	122	58.51	41.49	
	Completed tertiary	93	47.62	52.38	
Employment status	Employed	50	48.00	52.00	0.6429
	Unemployed	5	47.06	52.94	
	Pensioner/retired	167	53.29	46.71	
	Other	204	40.00	60.00	
Income	0-3500	366	49.18	50.82	0.2850
	R3600-6000	26	65.38	34.62	
	R6000-10000	21	38.10	61.90	
	≥11000	13	46.15	53.85	
Experience	< 1 year	172	62.67	37.33	0.0209
	2-5 years	75	50.00	50.00	
	>5 years	179	43.58	56.42	
Reason for farming	Source of income	0.00	0.00	0.00	0.0001
	Source of meat for the family	52	53.21	46.79	
	Both source of income/meat for family	374	23.08	76.92	

[a]Nknow (%)= Percentage not knowledgeable, [b]Know %=Percentage knowledgeable

There was also a statistically significant difference between number of farmers who were considered knowledgeable with respect to ASF based on their reason for keeping or rearing pigs (p=0.0001), with more farmers who reared pigs as a source of income

and meat for the family being knowledgeable (46.79%). This was followed by farmers who indicated that they reared pigs purely as a source of meat for the family (46.79%). (**Table 4.5**).

4.2.2 Multivariate analysis results

All variables that were significant at a generous p-value of ≤ 0.2 in the univariate model were included in the multivariate analysis. These included: residence, age, sex, years of experience of farming and reason for farming.

Results of the multivariate analysis are presented in **Table 4.6**. Considering Inkosi Langalibalele as the reference level, the coefficient estimates of Alfred Duma and Okhahlamba locations are negative values with an odds ratio of less than 1 (P= 0.524 & P= 0.383). Therefore, farmers from Alfred Duma and Okhahlamba locations were significantly (P= 0.0018) less likely to be more knowledgeable about ASF as compared to respondents/farmers from Inkosi Langalibalele (reference point).

With regards to sex, the coefficient estimates for male was 0.5577 with an odds ratio of 1.747. Therefore, the male respondents were significantly (P= 0.0024) more likely to be more knowledgeable about ASF as compared to their female counter parts (reference point).

With the category of aged over 71 years as the reference category, all other age categories had positive coefficient estimates, with odds ratios greater than 1 (Table 4.6), indicating that younger age groups were significantly (P < 0.05) more likely to be more knowledgeable about ASF as compared to older respondents (over 71 years).

Lastly, the coefficient of 'the variable "rear pigs for both income and as a source of meat for the family" was positive with an odds ratio of 4.061. Which means that farmers who reared pigs as a source of both income and meat for the family were significantly (P=0.0001) more likely to be knowledgeable compared to those who reared pigs as a source of meat only for the family.

Table 4. 6: Results of multivariate analysis for factors significantly associated with high knowledge score for African Swine Fever

Variable / Category	Coefficient	SE	OR	95% CI		P-value
				Lower	Upper	
Residence						
Inkosi Langalibalele	Ref					
Alfred Duma	-0.6457	0.2876	0.524	0.296	0.916	0.0247
Okhahlamba	-0.9604	0.2952	0.383	0.212	0.678	0.0011
Sex						
Female	Ref					
Male	0.5577	0.2187	1.747	1.140	2.689	0.0108
Age						
Over 71	Ref					
18-35	1.2313	0.4630	3.426	1.434	8.964	0.0078
36-53	1.1513	0.4412	3.162	1.386	7.965	0.0091
54-71	1.4205	0.4456	4.139	1.797	10.501	0.0014
Reason for rearing pigs						
Source of meat for family	Ref					
Both income and meat source for the family	1.4015	0.3577	4.061	2.073	8.513	0.0001

CHAPTER 5

DISCUSSION

This is the first Knowledge Attitude and Practices (KAP) study to be conducted in the three local Municipalities of uThukela District of KwaZulu Natal that assessed the KAP towards African Swine Fever (ASF). Mass media (i.e., radio and television) was identified as the main source of the information for the respondents in this study. Participants in this study tended to score low on knowledge about ASF. Generally, participants in this study displayed a good attitude towards ASF. On the other hand, farmers in the study area were involved in risky practices that promote the spread of ASF. The study identified residence, age, sex and reason for rearing pigs as the factors that predict a high knowledge score among emerging pig farmers in the study area.

5.1 Demographic profile of pig farmers in the study

Out of the three districts that were studied, Alfred Duma had the largest resident population of 356275 and was also the largest municipality in terms of size with an area of 3957,63 km^2. This explains why most farmers who responded or participated in the study came from Alfred Duma (42.25%) as compared to the other local Municipalities.

The results of this study show that the majority of the participants in the study were between the ages of 36-71 years of age. Similar results were reported in the Far Northern Kwa-Zulu Natal (KZN) by Ngoshe, et al., (2022), in which 48.8% of the respondents were 51-70 years old. It has been observed that in Africa, and South Africa specifically, older people, tend to relocate to the rural areas and start practising the farming (To et al., 2020), (Dione *et al.*, 2020). It is also possible that at that older people resort to farming so as to put food on the table given the high unemployment in South Africa. There is also a belief among certain African groupings such as the Zulu people, that all the livestock in the family belongs to the older people or the elders. Even if the actual owner is a young person, when asked who owns the animals in the family, the answer will be the elders. This could explain why few youth participate in agriculture. This notwithstanding, there is a need to involve the youth in Agriculture. Based on personal experience, as people get older, they tend not to want show up at

the dip tanks, where information dissemination takes place so to learn more about animal diseases. However, findings of this study contradicted findings of a Ugandan study, where the majority of farmers who participated in the study were between the ages of 21 – 40 years (Kabuuka *et al.*, 2014).

Majority of farmers in the present study were males (60.80%). According to cultural beliefs among rural African communities or societies, men are considered to be the custodians of the livestock by virtue of the fact that they are the heads of the family. This could explain results reported in this study that showed that most of the participants were males. Involvement of more males in pig farming as compared to females was also reported by (Omowon *et al.*, 2020), who observed that 70,7% of participants in their study were males. Other researchers such as (Thew *et al.*, 2015), (Chenais *et al.*, 2017) and (Dione et al., 2020)also reported a higher involvement of males in pig farming compared to females. However, findings of this study, contrast with the findings of the earlier study carried out in uThukela District, in which it was observed that more female farmers (60%) compared to males were involvement in pig farming (Sibongiseni, 2013). Similarly, findings of the present study contrast with those done in Bangladesh, in which it was showed that 100% of the participants in the study on pig rearing were females (Ritchil *et al.*, 2013).

The majority of participants in this study did not possess formal education and only few of them had completed matric and tertiary education. A study from Mpumalanga also reported low levels of education among pig farmers. This was evidenced by the fact that the minority of participants (<10%) had tertiary education (Munzhelele, *et al.,* 2017). It is common among folks in the rural areas to drop out of school as soon as they can read and write. In most cases, this is due to poverty, which forces them to leave school and go search for job opportunities to support their families. This could explain the low levels of education observed among respondents in the present study.

The majority of participant is this study were unemployed and/or were pensioners. Similar results were reported in a study conducted in uThukela District, KZN (Sibongiseni, 2013). These findings confirm that uThukela District has a high level of poverty and unemployment. Out of the three Districts, Langalibalele Municipality had the highest unemployment rate and hence experiences the highest levels of poverty. This could be due to the low level of education observed in the study area and could

also be due to the study area being far from cities where residents could seek job opportunities.

With regards to income, most participants earned R 0 –3500 per month. This was expected given that the study area is predominantly rural. Similarly, in Uganda low income was observed among farmers, with 24,5% of the population living in poverty and located in rural areas (Chenais *et al.*, 2017)).

The majority of farmers who participated in the study had five years of experience of keeping pigs. This contrasts with a study conducted in Nigeria that reported that majority of farmers who participated in the study had five - twenty years of experience (Nwachukwu *et al.,* 2020*)*. Findings of this study also contrast with findings of studies done in Nigeria that also showed that the majority of farmers in addition to keeping other livestock, and had 10 years or more of keeping pigs (Saka, Adesehinwa and Ajala, 2010)). Based on these findings it is clear that pig farming in the study area is recent development or that there is a high turnover of pig farmers, with new people coming into the field each year. Advantages of having experience in farming is the increased awareness of diseases and the associated symptoms gained from the many farmers days training attended by the farmer (Zhou and Li, 2022*)*.

The majority of pig farmers indicated that they reared pigs purely as the source of meat for their households. This could be explained by the fact that there are no formal abattoirs in uThukela District that slaughter pigs. The closest formal abattoir that slaughters pigs is in Standerton, Mpumalanga. In addition, it is difficult to transport pigs to the other Province as it requires farmers to declare the disease status of their herds. However, findings of this study contrasted with what was observed elsewhere. For example, a study done in Uganda stated that pig farming was the main sources of income for the households (Dione et al., 2020), meaning that pig rearing is majorly for commercial purposes. A study in Kakamega District, Western Kenya stated that “A home with a pig cannot complain”, due to income generation and faster growth rate compared to other livestock enterprises (Mutua *et al.*, 2010). This also suggests that pig farming in rural areas of Kenya unlike in the study area is mainly for income purposes. Furthermore, finding of the current study also contradicted those of a Bangladesh study in which only 31,5%, 10% and 5.5% of pigs were kept for family occasions and religious purposes.

5.2 Knowledge of the disease

Generally, participants in this study scored low on knowledge about ASF, in that they were not able to identify the correct answers to many of the questions about ASF. This has also been observed in other studies that reported insufficient knowledge about ASF among farmers (Vergne *et al.*, 2020). However, results of the present study contrast with findings of the study from Central–South Cameroon where 90% of pig farmers displayed good knowledge about ASF (Ngwa *et al.*, 2020). Furthermore according to studies conducted in Uganda, Ukraine, Madagascar and the United Kingdom, contrary to what was observed in the present study, the majority of farmers were knowledgeable about the disease (Muhangi *et al.*, 2014; Guinat, Wall, *et al.*, 2016; Randrianantoandro, Kubota and Kono, 2018; Muñoz-Gómez *et al.*, 2021). The high proportion of farmers who obtained a low knowledge score on ASF in the present study, could be attributed to lack of or low levels of awareness of the disease in the study area. The predominantly older participants observed in this could have contributed to the low proportion of participants who obtained a high knowledge score. This is supported by the finding that showed that age was negatively associated with a high knowledge score for ASF.

When asked about animals that might spread ASF, 44.84% indicated pigs, while 25% indicated warthogs and 9.62% said wild pigs However, a study conducted in Europe observed that the transmission was mainly through the wild pigs and warthogs (Guinat, Gogin, *et al.*, 2016b). Furthermore, wild pigs and warthogs are known to be a source of ASF infection for domestic pigs (Zani *et al.,* 2020). Therefore, the low number of participants in this study that identified the wild pigs and warthogs, is a source of concern. This points to the low level of awareness of the disease in the study area.

It was observed in the present study that many farmers fed swill to their pigs. This was expected because it is a common practice in rural areas. For example, up to 57.28% famers in a study done in Europe fed swill to pigs (Khomenko Sergei, Beltrán-Alcrudo Daniel, Rozstanlnyy Andriy, Gogin Andrey E, Kolbasov Denis, Pinto Julio, Lubroth Juan, 2013). Feeding swill is a risky practice that has potential to lead to outbreaks of ASF. Generally, the primary source of ASF infection in many outbreaks is through the contaminated swill. That is why it is recommended that swill be boiled for at least 60 minutes before feeding it to the pigs in order to minimize the risk associated with

feeding of swill (Geering, Penrith and Nyakahuma, 2011; Sibongiseni, 2013). However, it is not uncommon for farmers not to boil swill before feeding it to their pigs. For example, the majority of the household (95.2%) in a study by (Nantima *et al.*, 2016) conducted in Kenya were not aware that swill should be boiled before it is fed to pigs.

The findings of this study showed low levels of understanding regarding the factors that promote the spread of ASF. This contrasts with studies in which (Chenais *et al.*, 2017) observed that farmers in Uganda, were aware of the factors that promote the spread of ASF. Similarly, in a study conducted by (Vergne *et al.*, 2020) it was observed that the majority of the smallholder farmers were knowledgeable about the risk factors for the spread of ASF. The low level of understanding of the factors that promote the spread of ASF in the present study compared to other studies, could be attributed to differences in the ineffectiveness of the extension services offered to the farmers.

The findings of this study showed that some farmers were able to identify all the clinical sign of ASF such as a high fever, ocular discharge, and death in 15-45 days. Similarly, result of a study conducted in Uganda observed that farmers could describe the clinical signs of ASF and were equally aware of the clinical signs and the spread of the disease (Chenais et al., 2017).

5.3 The attitudes and practices towards ASF

It was evident that mass media (i.e., radio and television) was the main source of the information for the respondents. In view of this, as recommended by other authors, awareness campaigns should be carried out using all available media including mass media, posters, leaflets, radio and TV shows (Arias and Sánchez-Vizcaíno, 2008) (Production, 2020). In a similar study by (Tejler and Teijler, 2012) in Uganda it was observed that the main source of information in different villages was the radio.

The majority of participants indicated that if they suspected that pigs had ASF, they would immediately call the nearest State Veterinary office. In contrast, a study conducted in England, reported that the majority of farmers would not immediately seek the opinion of a veterinary surgeon if they suspected ASF (Guinat, Wall, *et al.*, 2016) They indicated that they would wait for a couple of days with a hope that the pigs would recover. However, in countries like Germany and the Western part of the Russian Federation, it was observed that if farmers suspected ASF, they would immediately report to the veterinarian (T Vergne et al., 2014). The observed

differences between different study populations could be due to differences in the knowledge and the effectiveness of the extension services of the respective countries.

The participants in the study indicated that they hunted wild or bush pigs. Moreover, majority said that they brought the whole carcasses home if they managed to kill a wild/bush pig. This practice is known to increase the risk of the spread of ASF. A study from Europe by(Khomenko and Kerba, 2018) showed that discovery of carcasses by hunters visiting the wild boar habitats, is the most likely way to introduce the disease in the free zone.,

Adoption of biosecurity in this study was very poor. In fact, few farmers adopted biosecurity, and this is problematic because it means that the disease can easily enter the farm (i.e., the purpose of biosecurity is to prevent introduction of the diseases to the farm). This is a problem that has also been observed in other African countries. For example, a similar study conducted in Nigeria by (Asambe, Sackey and Tekdek, 2019), showed that the respondents had very poor sanitary and biosecurity measures to help contain and prevent ASF. In another study conducted in Uganda, it was also observed that biosecurity measures were either poorly implemented or were not implemented at all by farmers (Dione *et al.*, 2017).

5.4 Results of the multivariable analysis

In this study if a pig farmer was resident in Alfred Duma (OR=0.524) and Okhahlamba (OR=0.383) Municipality, they were less likely to obtain a high knowledge score compared to farmers in Inkosi Langalibalele. It is not unusual to observe differences in knowledge level between areas. For example, in a study done by (Nejash *et al.*, 2017) in Ethiopia, it was observed that residents in Urban areas were less likely to obtain a higher score compared to those who resided in rural areas. This could be attributed to the difference between the extension efforts directed at the different areas by officials of the department responsible extension in the study area.

The male respondents were twice (OR=1.747) as likely to obtain a higher knowledge score compared to their female counter parts. This is in agreement with the study done in India by (Biswas *et al.*, 2015), that revealed that the knowledge score for males was significantly higher than for females (P=0.05). A similar study revealed that the male respondents tended to have higher knowledge than the females (OR=2.32) (Alhaji, Babalobi and Isola, 2018).

The odds of farmers who kept pigs as a source of both income and home consumption obtaining a higher knowledge score, was four times (OR=4.061) that of respondents who kept pigs for only home consumption. This could be due to the fact that farmers who kept pigs for purposes of selling, make effort to gain more knowledge about requirements for raising pigs sold on the commercial market.

Age was a significant predictor of a high knowledge score for ASF, it was observed that younger respondents were like to be more knowledgeable as compared to respondents aged >71 years. Education together with technologies that the current crop of youth is exposed to could explain the observation. This is an agreement with the study done by Kothalawala et al. (2018), in which it was observed that older farmers tend to have difficulties in acquiring knowledge of animal diseases.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusions

The findings that the majority of the participant in this study were aware that African Swine Fever (ASF) can be transmitted between pigs is encouraging. However, the low levels of knowledge about ASF and the identified gaps in the knowledge about certain aspects of ASF are a source of concern. This calls for efforts to improve the understanding of the farmers on aspects such as sources of ASF, clinical signs of ASF, and the way it spreads and transmitted to domestic pigs.

Practices related to the prevention and control of ASF need improvement. There is a need to curb practices like hunting wild pigs and warthogs, and feeding swill that are known risk factors for the spread of ASF. Biosecurity is another area of concern given the low numbers of farmers who indicated awareness of the need to implement biosecurity on their farms.

Generally, farmers in the study area had a good attitude towards ASF disease. This is a welcome finding in relation to control and prevention of ASF. The radio proved to be the most popular media in the study area for disseminating information about ASF. In addition, the study identified social demographic factors that predict a high knowledge score for ASF.

6.2 Recommendations

Based on the findings of the current study, it is recommended that:

i) Education should be directed at implementation of biosecurity measures on pig farm to help prevent and protect pigs from the ASF.
ii) Proper and the clear information on ASF should be provided in uThukela District to help improve on the knowledge among the farmers in the study area.
iii) Those in authority and policy makers need to take into consideration the findings of the present study when designing strategies to disseminate information about ASF and how it is controlled and prevented.
iv) Apart from the radio, other social media platforms can be adopted to assist in disseminating the information to people.

v) Adopting the findings of this study can contribute to the improvement of pig production among rural communal farmers and improved knowledge could help the government, development agencies, and farmers to curb the spread of the disease in order to improve the production of pigs in this farming sector.

REFERENCES

Alhaji, N.B., Babalobi, O.O. and Isola, T.O. (2018) 'A quantitative exploration of nomadic pastoralists' knowledge and practices towards Rift Valley fever in Niger State, North-central Nigeria: The associated socio-cultural drivers', *One Health*, 6 (September), pp. 16–22. Available at: https://doi.org/10.1016/j.onehlt.2018.09.001.

Amar, S., De Boni, L., de Voux, A., Heath, L. and Geertsma, P., 2021. An outbreak of African swine fever in small-scale pigs, Gauteng, South Africa, July 2020. *International Journal of Infectious Diseases*, *110*, pp. S44-S49.

Arias, M. and Sánchez-Vizcaíno, J.M. (2008) 'African Swine Fever Eradication: The Spanish Model', *Trends in Emerging Viral Infections of Swine*, (April), pp. 133–139. Available at: https://doi.org/10.1002/9780470376812.ch4c

Asambe, A., Sackey, A.K.B. and Tekdek, L.B. (2019) 'Sanitary measures in piggeries, awareness, and risk factors of African swine fever in Benue State, Nigeria', *Tropical Animal Health and Production*, 51(4), pp. 997–1001. Available at: https://doi.org/10.1007/s11250-018-1764-7

Beltrán-Alcrudo, D. *et al.* (2017). African Swine Fever: Detection and Diagnosis – A Manual for Veterinarians. 19th edition. Rome: Food and Agriculture Organization of the United Nations.

Biswas, S. *et al.* (2015) 'Awareness of farmers regarding hygienic handling of their cattle to prevent zoonotic diseases.', *Exploratory Animal and Medical Research*, 5(2), pp. 207–212.

Brown, A.A. *et al.* (2018) 'The African swine fever epidemic in West Africa, 1996–2002', *Transboundary and Emerging Diseases*, 65(1), pp. 64–76. Available at: https://doi.org/10.1111/tbed.12673

Census SA. 2016. Census: UThukela District.

Chenais, E. *et al.* (2017) 'Knowledge, Attitudes and Practices Related to African Swine Fever Within Smallholder Pig Production in Northern Uganda', *Transboundary and Emerging Diseases*, 64(1), pp. 101–115. Available at: https://doi.org/10.1111/tbed.12347

Chilundo, A.G. *et al.* (2020) 'Smallholder pig farming education improved community knowledge and pig management in Angónia District, Mozambique. *Tropical Animal Health Production. 52*, pp. 1447–1457. Available at: https://doi.org/10.1007/s11250-019-02148-x

Couacy-Hymann, E. *et al.* (2019) 'Re-emergence of genotype I of African swine fever virus in Ivory Coast', *Transboundary and Emerging Diseases*, 66(2), pp. 882–896. Available at: https://doi.org/10.1111/tbed.13098

Cwynar, P., Stojkov, J. and Wlazlak, K. (2019) 'African swine fever status in Europe', *Viruses*, 11(4), pp. 1–17. Available at: https://doi.org/10.3390/v11040310

Dione, M.M. *et al.* (2017) 'Risk Factors for African Swine Fever in Smallholder Pig Production Systems in Uganda', *Transboundary and Emerging Diseases*, 64(3), pp. 872–882. Available at: https://doi.org/10.1111/tbed.12452

Dione, M.M. *et al.* (2020) 'Impact of participatory training of smallholder pig farmers on knowledge, attitudes and practices regarding biosecurity for the control of African swine fever in Uganda', *Transboundary and Emerging Diseases*, 67(6), pp. 2482–2493. Available at: https://doi.org/10.1111/tbed.13587

Directorate: Animal Health (2021) *African swine fever outbreak and surveillance update report*. Pretoria: Department: Agriculture, Land Reform and Rural Development. Available at: http://www.dalrrd.gov.za/images/outbreaks/African%20Swine%20Fever/Reports/ASF%20update%202021-10-11.pdf (Accessed: 21 July 2023).

Dixon, L.K., Sun, H. and Roberts, H. (2019) 'African swine fever', *Antiviral Research*, 165(July), pp. 34–41. Available at: https://doi.org/10.1016/j.antiviral.2019.02.018.

Geering, W., Penrith, M.-L. and Nyakahuma, D. (2011) *Manual on the preparation of African Swine Fever contingency plans*, *Animal Production and Health*. Rome: FAO. Available at: https://www.fao.org/3/Y0510E/Y0510E00.htm#TOC%0Ahttp://www.fao.org/3/Y0510E/Y0510E00.htm .

Guinat, C., Wall, B., *et al.* (2016) 'English pig farmers' knowledge and behaviour towards African swine fever suspicion and reporting', *PLoS ONE*, 11(9), pp. 1–14. Available at: https://doi.org/10.1371/journal.pone.0161431

Guinat, C., Gogin, A., *et al.* (2016a) 'Transmission routes of African swine fever virus to domestic pigs: Current knowledge and future research directions', *Veterinary Record*, 178(11), pp. 262–267. Available at: https://doi.org/10.1136/vr.103593

Guinat, C., Gogin, A., *et al.* (2016b) 'Transmission routes of African swine fever virus to domestic pigs: Current knowledge and future research directions', *Veterinary Record*, 178(11), pp. 262–267. Available at: https://doi.org/10.1136/vr.103593

Janse van Rensburg, L. *et al.* (2020) 'Understanding African swine fever outbreaks in domestic pigs in a sylvatic endemic area: The case of the South African controlled area between 1977–2017', *Transboundary and Emerging Diseases*, 67(6), pp. 2753–2769. Available at: https://doi.org/10.1111/tbed.13632

Jori, F. *et al.* (2013) 'Review of the sylvatic cycle of African swine fever in sub-Saharan Africa and the Indian ocean', *Virus Research*, 173(1), pp. 212–227. Available at: https://doi.org/10.1016/j.virusres.2012.10.005

Jori, F. and Bastos, A.D.S. (2009) 'Role of wild suids in the epidemiology of African Swine Fever', *EcoHealth*, 6(2), pp. 296–310. Available at: https://doi.org/10.1007/s10393-009-0248-7

Kabuuka, T. *et al.* (2014) 'Drivers and risk factors for circulating African swine fever virus in Uganda, 2012-2013', *Research in Veterinary Science*, 97(2), pp. 218–225. Available at: https://doi.org/10.1016/j.rvsc.2014.07.001

Kerba Suzanne, G.V.K.S.M.M. (2019) *African swine fever in wild boar ecology and biosecurity*, *FAO Animal Production and Health Manual No. 22.* Rome: FAO, OIE and EC. Available at: https://doi.org/10.4060/ca5987en

Khomenko, S. and Kerba, S. (2018) 'GF-TADs Handbook on ASF in Wild Boar and Biosecurity during Hunting-Version Standing Group of Experts on African Swine Fever', in *Europe under the GF-TADs Umbrella Handbook on African Swine Fever in Wild Boar and Biosecurity during Hunting Vittorio Guberti*, pp. 1–111.

Khomenko, S*. et al.* (2013) *African swine fever in the Russian Federation: risk factors for Europe and beyond*, *Empres watch*. Available at: http://www.fao.org/docrep/018/aq240e/aq240e.pdf (Accessed: 26 March 2023).

Kothalawala, K.A.C.H.A. *et al.* (2018) 'Knowledge, attitudes, and practices (KAP) related to brucellosis and factors affecting knowledge sharing on animal diseases: a cross-sectional survey in the dry zone of Sri Lanka', *Tropical Animal Health and Production*, 50(5), pp. 983–989. Available at: https://doi.org/10.1007/s11250-018-1521-y

Magadla, N.R. *et al*. (2015). The African Swine fever control zone in South Africa and its current relevance. *Onderstepoort journal of Veterinary Research,* 83, a1034. https://doi.org/10.4102/ojvr.v83i1.1034

Mazur-Panasiuk, N., Żmudzki, J. and Woźniakowski, G. (2019) 'African swine fever virus - persistence in different environmental conditions and the possibility of its indirect transmission', *Journal of Veterinary Research*, 63(3), pp. 303–310. Available at: https://doi.org/10.2478/jvetres-2019-0058

Muhangi, D. *et al.* (2014) 'Practices in the pig value chain in Uganda; implications to African swine fever transmission', *Livestock Research for Rural Development*, 26(5), p. 18.

Mulumba-Mfumu, L.K. *et al.* (2019) 'African swine fever: Update on Eastern, Central and Southern Africa', *Transboundary and Emerging Diseases*, 66(4), pp. 1462–1480. Available at: https://doi.org/10.1111/tbed.13187

Muñoz-Gómez, V. *et al.* (2021) 'Supporting control programs on African swine fever in Ukraine through a knowledge, attitudes, and practices survey targeting backyard farmers', *Veterinary Medicine and Science*, 7(5), pp. 1786–1799. Available at: https://doi.org/10.1002/vms3.578.

Munzhelele, Priscilla, et al. (2017) 'Production constraints of smallholder pig farms in agro-ecological zones of Mpumalanga, South Africa', *Tropical animal health and production* 49 (2017): 63-69.

Mushagalusa, C.A., Etter, E. and Penrith, M.L. (2021) 'Review of African swine fever outbreaks history in South Africa: From 1926 to 2018', *Onderstepoort Journal of Veterinary Research*. AOSIS (pty) Ltd. Available at: https://doi.org/10.4102/OJVR.V88I1.1919

Mutua, F. *et al.* (2010) 'Farmer perceptions on indigenous pig farming in Kakamega district, Western Kenya. Nordic Journal of African Studies 19: 43-57, Available at: https://www.njas.fi/njas/article/view/213/201.

Nantima, N. *et al.* (2016) 'Enhancing Knowledge and Awareness of Biosecurity Practices for Control of African Swine Fever among Smallholder Pig Farmers in Four Districts along the Kenya–Uganda Border. Trop. Animal Health Production, 48, pp. 727–734. Available at: https://doi.org/10.1007/s11250-016-1015-8.

Nejash, A. *et al.* (2017) 'Knowledge, attitudes and practices towards rabies in Dedo district of Jimma zone, southwestern Ethiopia: A community based cross-sectional study', *International Journal of Medicine and Medical Sciences*, 9(5), pp. 61–71. Available at: https://doi.org/10.5897/ijmms2017.1302.

Ngoshe, Y.B. *et al* 2022. Knowledge, Attitudes, and Practices of Communal Livestock Farmers regarding Animal Health and Zoonosis in Far Northern KwaZulu-Natal, South Africa. *International Journal of Environmental Research and Public Health*, *20*(1), p.511.

Ngwa, V.N. *et al.* (2020) 'Epidemiology of African swine fever in piggeries in the center, south and south-west of Cameroon', *Veterinary Sciences*, 7(3), pp. 1–12. Available at: https://doi.org/10.3390/vetsci7030123

Nuangmek, A. *et al.* (2018) 'Knowledge, attitudes and practices toward antimicrobial usage: A cross-sectional study of layer and pig farm owners/managers in Chiang Mai, Lamphun, and Chonburi provinces, Thailand, May 2014 to February 2016', *Korean Journal of Veterinary Research*, 58(1), pp. 17–25. Available at: https://doi.org/10.14405/kjvr.2018.58.1.17

Omowon, A.A. *et al.* (2020) 'Knowledge, attitude and practices of pig farmers post African swine fever outbreaks in Ogun and Oyo states of Nigeria', *Sokoto Journal of Veterinary Sciences*, 17(4), pp. 14–24. Available at: https://doi.org/10.4314/sokjvs.v17i4.3

Pautienius, A. *et al.* (2018) 'Prevalence and spatiotemporal distribution of African swine fever in Lithuania, 2014–2017', *Virology Journal*, 15(1), p. 177. Available at: https://doi.org/10.1186/s12985-018-1090-8

Penrith, M.L. *et al.* (2007) 'African swine fever in Mozambique: Review, risk factors and considerations for control', *Onderstepoort Journal of Veterinary Research*, 74(2), pp. 149–160.

Penrith, M.L. *et al.* (2013) 'African swine fever virus eradication in Africa', *Virus Research*, 173(1), pp. 228–246. Available at: https://doi.org/10.1016/j.virusres.2012.10.011

Penrith, M.L. (2013) 'History of "swine fever" in Southern Africa', *Journal of the South African Veterinary Association*, 84(1). Available at: https://doi.org/10.4102/jsava.v84i1.1106

Penrith, M.L. and Vosloo, W. (2009) 'Review of African swine fever: Transmission, spread and control', *Journal of the South African Veterinary Association*, 80(2), pp. 58–62. Available at: https://doi.org/10.4102/jsava.v80i2.172

Rakgwale, T.J. and Oguttu, J.W., 2020. The impact of the 2014–2016 drought in Greater Letaba Local Municipality: How the farmers coped and factors that were significantly associated with loss of animals. *International Journal of Disaster Risk Reduction*, *50*, p.101869

Randrianantoandro, T.N., Kubota, S. and Kono, H. (2018) 'Farmers' knowledge and incentive in reporting infectious animal disease: The case of African Swine Fever in madagascar', *Journal of Animal and Plant Sciences*, 28(1), pp. 270–279.

van Rensburg, L.J. *et al.* (2020) 'Investigation of African swine fever outbreaks in pigs outside the controlled areas of South Africa, 2012-2017', *Journal of the South African Veterinary Association*, 76, pp. 1–9. Available at: https://doi.org/10.4102/jsava.v91i0.1997

Ritchil, C.H. *et al.* (2013) 'Socio-economic status of pig rearers and management system of native pigs in Bangladesh', *Indian Journal of Animal Sciences*, 83(11), pp. 1226–1228.

Rodríguez, J.M. and Salas, M.L. (2013) 'African swine fever virus transcription', *Virus research*, 173(1), pp. 15–28.

Saka, J.O., Adesehinwa, A.O.K. and Ajala, M.K. (2010) 'Incidence of African swine fever (ASF) disease and its associated implications on pig production in Lagos state, Nigeria', *Bulgarian Journal of Agricultural Science*, 16(1), pp. 80–90.

Sánchez-Vizcaíno, J.M., Mur, L. and Martínez-López, B. (2012) 'African Swine Fever: An Epidemiological Update', *Transboundary and Emerging Diseases*, 59(SUPPL. 1), pp. 27–35. Available at: https://doi.org/10.1111/j.1865-1682.2011.01293.x

Sargsyan, M.A. *et al.* (2018) 'Third wave of African Swine Fever infection in Armenia: Virus demonstrates the reduction of pathogenicity', *Veterinary World*, 11(1), pp. 5–9. Available at: https://doi.org/10.14202/vetworld.2018.5-9

Schulz, K., Staubach, C. and Blome, S. (2017) 'African and Classical Swine Fever: Similarities, differences and epidemiological consequences', *Veterinary Research*, 48(1), pp. 1–13. Available at: https://doi.org/10.1186/s13567-017-0490-x

Sibongiseni, T.G. (2013) *The untold story of the pig farming sector of rural Kwazulu-Natal: A case study of uThukela District*, *Masters dissertation*. MSc. University of South Africa. Available at: http://uir.unisa.ac.za/bitstream/handle/10500/14146/dissertation_gcumisa_st.pdf?sequence=1.

Steyn, D.G., 1928. *Preliminary report on a South African virus disease amongst pigs*. Pretoria: Government Printer and Stationery Office.

Sugiura, K. and Haga, T. (2018) 'A rapid risk assessment of African Swine Fever introduction and spread in Japan based on expert opinions', *Journal of Veterinary Medical Science*, 80(11), pp. 1743–1746. Available at: https://doi.org/10.1292/jvms.18-0543

Sur, J.H. (2019) 'How far can African Swine Fever spread?', *Journal of Veterinary Science*, 20(4), pp. 1–5. Available at: https://doi.org/10.4142/jvs.2019.20.e41

Tejler, E. (2012). Outbreaks of African swine fever in domestic pigs in Gulu district, Uganda. Uppsala, *Swedish University of Agricultural Sciences, Examensarbete inom veterinärprogrammet, ISSN 1652–8697*, p. 30

The Office of the Municipal Manager: IDP Unit. (2021). UTHUKELA DISTRICT UTHUKELA DISTRICT MUNICIPALITY DRAFT

Thew, R. *et al.* (2015) 'Evaluation of the production systems and constrains of smallholder pig farming in three agro-ecological zones of Mpumalanga province, South Africa', *Metrologia*, 53(5), pp. 1–116.

Vergne, T *et al.* (2014) '. Attitudes and beliefs of pig farmers and wild boar hunters towards reporting of African Swine fever in Bulgaria, Germany and the Western part of the Russian Federation. TBED, 6. Available at: https://doi.org/10.1111/tbed.12254.

Vergne, T. *et al.* (2020) 'Smallholder pig farming education improved community knowledge and pig management in Angónia district, Mozambique', *Transboundary and Emerging Diseases*, 64(5), pp. 1447–1457. Available at: https://doi.org/10.1002/vms3.578

Yoo, D.S. *et al.* (2021) 'Transmission dynamics of african swine fever virus, South Korea, 2019', *Emerging Infectious Diseases*, 27(7), pp. 1909–1918. Available at: https://doi.org/10.3201/eid2707.204230.

Zani, Laura, et al. "African swine fever virus survival in buried wild boar carcasses." *Transboundary and Emerging Diseases* 67.5 (2020): 2086-2092.

Zhou, D. and Li, L., 2022. Farming experience, personal characteristics, and entrepreneurial decisions of urban residents: Empirical evidence from China. *Frontiers in Psychology*, *13*, p.859936.

ANNEXURES

Annexure A: Questionnaire

Knowledge, Attitudes and Practices towards African Swine Fever among emerging Farmers in the uThukela District, KwaZulu Natal, South Africa

African Swine Fever KAP Community Assessment Survey Questionnaire

Interview Date:

Main Place:

DEMOGRAPHIC INFORMATION

1.1	Area of residence	OKhahlamba Alfred Duma Inkosi Langalibalele
1.2	What is your age?	18-35 36-53 54-71 Over 71
1.3	Sex of respondent	Males Female
1.4	What is the highest level of education you have completed?	No formal education Completed Primary School Not completed High School Completed Matric Completed Tertiary
1.5	What is your employment status?	Employed Unemployed Pensioner/retired Other (Explain)
1.6	What is your monthly household income?	Between 0-3500 Between R3600-6000 Between 6000-10000 Between 11000- upwards
1.7	How, long have you been farming pigs?	Less than one year 2-5 years >5 years
1.8	How may pigs do you own?	
1.9	What is the main reason for you to rare pigs?	Source of income Source of meat for the family

		Both as a source of income and meat for family other (explain)

KNOWLEDGE OF ASF

2.1	What is ASF (African Swine Fever)?	Contagious disease Viral disease A flue like disease of the pig All of the above
2.2	According to you which one of the following animals might spread ASF?	Pigs Warthogs Wild pigs All of the above Others (Specify)
2.3	What factors promote the spread of ASF?	Illegal movement of pigs/pork Feeding of swill No footbath/biosecurity All of the above
2.4	Can ASF be transmitted from one pig to another? {If "NO" or "Don't know", skip to 3.1)	Yes No Don't know
2.5	Which of these can be a source of ASF virus?	Ornithodorus tick Wild boars Both of the above
2.6	Which of the following clinical signs can be seen in an ASF case?	High Fever Ocular discharge Death occur 15-45days All of the above Don't know
2.7	Can ASF be carried in pigs and pork products?	Yes No Don't know
2.8	Do you think that ASF is a curable disease?	Yes No Don't know
2.9	In your opinion, do you think the feeding of swills to pigs can reduce the transmission of ASF in the community?	Yes No Don't know
2.10	Do you know if ASF is a notifiable disease or not?	Yes No

ATTITUDES AND PRACTICES TOWARDS ASF

3.1	In your opinion, if you suspect that your pigs have ASF. What will you do.	Try and get them treated Immediately call your nearest State Vet office Other (explain)

3.2	Do you usually talk or discuss with your family or neighbours about the ASF?	Yes No
3.3	Do you feed your pigs with swills (waste feed from your kitchen)?	Yes No
3.4	An outbreak of ASF would be disastrous for pig farmers in this area?	Yes No

INTERVENTIONS AGAINST ASF

4.1	During the previous years, have you heard about the AFS outbreak on the radio, television,	Yes No
4.2	In your opinion, what are the best ways to receive information about AFS for you and your family?	Broadcast messages Billboards TV Posters Veterinary Services officials Others
4.3	In the last 6 months has anybody from the department of Agricultural and rural development spoken to you about ASF?	Yes No
4.4	Do you ever go hunting for wild/bush pigs?	Yes No
4.5	If you answered yes to Q 4.4, in what form do you bring the carcass home?	The whole carcass with its skin The meat is cooked in the bush Other (Explain)
4.6	Which of the following best describes the way your rare your pigs?	My pigs are always kept in a pig sty/house I always let my pigs to roam and look for food I always keep my pigs tied by a rope near homestead I keep pigs in a house but at times let them to roam I keep pigs in a house but at times tie them on a rope I let them roam but at times tie them with a rope Others (Explain)
4.7	What biosecurity measures have you implemented on the farm to keep out ASF (tick all the applies to you)?	Q4.7a I do not practice a closed herd I have a closed herd Q4.7b I do not have a foot bath at entry to my farm/pig house I have a foot bath at entry

Q 4.7C	I do not feed swill or scrap meat from outside I feed my pigs on swill and scrap meat from..
Q4.7d	I do not allow my pigs to roam in the area I allow my pigs to roam in the area
Q4.7e	I do not allow bush pig meat onto my farm I allow bush meat onto my farm
Q4.7f	other (explain)-capture words

Annexure B: Ethics approval

UNISA university of south africa

UNISA-CAES HEALTH RESEARCH ETHICS COMMITTEE

Date: 16/03/2020

NHREC Registration # : REC-170616-051
REC Reference # : 2020/CAES_HREC/063
Name : Ms NM Thusi
Student #: 48768642

Dear Ms Thusi

Decision: Ethics Approval from 12/03/2020 to completion

Researcher(s): Ms NM Thusi
48768642@mylife.unisa.ac.za

Supervisor (s): Prof JW Oguttu
joguttu@unisa.ac.za; 011-471-3353

Dr K Malepe
malepks@unisa.ac.za; 011-471-2551

Working title of research:

Knowledge, attitude and practices towards African swine fever among emerging farmers in the Uthukela district, Kwazulu Natal, South Africa

Qualification: MSc Agriculture

Thank you for the application for research ethics clearance by the Unisa-CAES Health Research Ethics Committee for the above mentioned research. Ethics approval is granted until the completion of the project, **subject to submission of the relevant permission letter and yearly progress reports. Failure to submit the progress report will lead to withdrawal of the ethics clearance until the report has been submitted.**

Due date for progress report: 31 March 2021

Please note the points below for further action:

1. The researcher will make use of agricultural extension officers in the research and must therefore obtain permission from the KwaZulu-Natal Department of Agriculture. The letter must be submitted to the committee before data gathering may commence.

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

2. In section 4.7.1 (a) the researcher selected all of the options provided under points (iv), (v) and (vi). Which of these is a correct reflection? It cannot be all of the options.
3. The researcher indicates in section 4.7.2 of the application form that interviews will form part of the data collection. However, this is not reflected in the research proposal. Will interviews be held, or is the researcher referring to the administering of the questionnaire?

*The **low risk application** was **reviewed** by the UNISA-CAES Health Research Ethics Committee on 12 March 2020 in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data require additional ethics clearance.
7. No field work activities may continue after the expiry date. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

*The reference number **2020/CAES_HREC/063** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

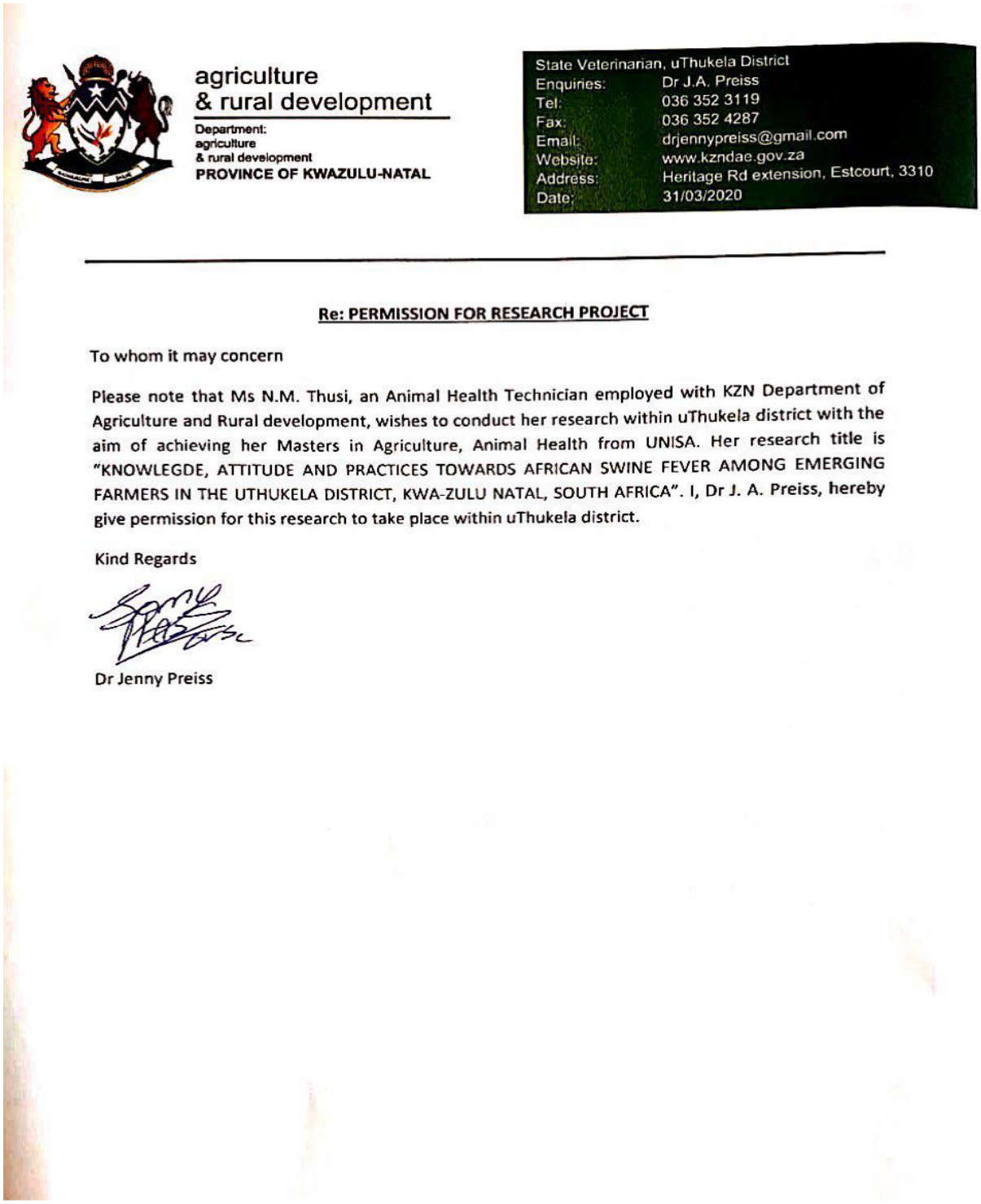
Yours sincerely,

Prof MA Antwi
Chair of UNISA-CAES Health REC
E-mail: antwima@unisa.ac.za
Tel: (011) 670-9391

Prof MJ Linington
Executive Dean : CAES
E-mail: lininmj@unisa.ac.za
Tel: (011) 471-3806

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

Annexure C: Permission from the Department of Agriculture and Rural Development to conduct research in the study area



agriculture
& rural development
Department:
agriculture
& rural development
PROVINCE OF KWAZULU-NATAL

State Veterinarian, uThukela District
Enquiries: Dr J.A. Preiss
Tel: 036 352 3119
Fax: 036 352 4287
Email: drjennypreiss@gmail.com
Website: www.kzndae.gov.za
Address: Heritage Rd extension, Estcourt, 3310
Date: 31/03/2020

Re: PERMISSION FOR RESEARCH PROJECT

To whom it may concern

Please note that Ms N.M. Thusi, an Animal Health Technician employed with KZN Department of Agriculture and Rural development, wishes to conduct her research within uThukela district with the aim of achieving her Masters in Agriculture, Animal Health from UNISA. Her research title is "KNOWLEGDE, ATTITUDE AND PRACTICES TOWARDS AFRICAN SWINE FEVER AMONG EMERGING FARMERS IN THE UTHUKELA DISTRICT, KWA-ZULU NATAL, SOUTH AFRICA". I, Dr J. A. Preiss, hereby give permission for this research to take place within uThukela district.

Kind Regards

Dr Jenny Preiss

Annexure D: Turnitin Digital Receipt

turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	Nm Thusi
Assignment title:	AAH 2023
Submission title:	MSc Agriculture dissertation
File name:	stly_final_Ms_NICOL_MBALI_THUSI_KNOWLEDGE___JWO_01_-1...
File size:	5.78M
Page count:	64
Word count:	15,934
Character count:	82,520
Submission date:	13-Feb-2023 08:44AM (UTC+0200)
Submission ID:	2012915695