

IMPACT OF INFECTIOUS DISEASE ON SUDANESE LIVESTOCK EXPORTS

Mohammed H. **Tabidi**, Hager A. **Alhafiz**, Bhagieli T. **Bhagieli**, Salah Eldein Sid Ahmed **Ahmed**

Department of Animal Production
Sudan University of Science and Technology - College of Agricultural Studies, Sudan
E-mail: mtabidi@hotmail.com

Abstract

This study was conducted to assess the effect of infectious disease (trans boundary animal disease) on livestock exports in Sudan where the data were collected: Sudan export livestock (Live) meat rejection of vessels, rejection of animals, the reasons of the rejection and check of brucellosis in each of the following years 2010, 2011, 2012 and 2013 from the ministry of livestock, fisheries and the Rangeland Khartoum State.

General Direction ate of Veterinary Quarantine and meat hygiene. Also information has been collected about livestock markets in Sudan from Animal resources Services Company in Omdurman.

In the statistical analysis the results showed that brucellosis pox suspicion of foot and mouth disease and external parasites are the most diseases that lead to the returned of vessels in 2010, 2011, 2012 and 2013. The correlation between diseases is moderate positive correlation.

Brucella examination showed that 16% 10% 7% 4% and 4% of the animals that have been tested were infected with brucellosis in 2010, 2011, 2012, 2013 and 2014 respectively the results were showed that 5%, 3%, 2% and 1% of the animals have been excluded in 2010, 2011, 2012 and 2013 respectively because of Brucella, mange, suspicion of foot and mouth disease, inflammation of lump nodes pneumonia, diarrhea. Suspicion pox, abscess lameness and others.

From this study animal disease especially Brucella disease and pox viruses play an important role for rejection of animal from export.

Keywords: Livestock, Animal Export, Infection Disease.

Submitted:28.03.2016

Reviewed:08.06.2016

Accepted:30.06.2016

1. INTRODUCTION

Before oil was discovered in Sudan export of livestock products was the countries most important foreign exchange earner. It is currently the second most important sources foreign exchange after oil (Animal Research Services Company 2014). Recent animal health emergencies have highlighted the vulnerability of livestock industry to epizootic episodes caused by infectious diseases (Anohes Cartin – Rojas, 2012). Infections disease such disease transmitted from animal to another animal or human by any means or various means of infectious diseases are caused by pathogenic microorganism, such as bacteria, viruses parasites or fungi.

More than 300 diseases can be transmitted from animals to human; only a limited number of zoonotic diseases can transmitted person to person. Animal disease represents an important threat to human health, Science. The emergency of human diseases is dominated by

zoonotic pathogens about 75% of recently emerging infectious diseases affecting humans are diseases of animal origin and approximately 60% of all human pathogens are zoonotic (The National Center of Emerging and Zoonotic Infectious Diseases, 2014).

Therefore, an infectious animal disease in agriculture and public health constitutes a serious limitation to export live animals and their products, as well for international trade. Moreover, they seriously compromised food security and caused a high socioeconomic impact on agricultural exporting nations (Rojas, 2012). According to reports of the General Directorate of Veterinary Quarantine and Meat hygiene (The Ministry of Livestock, Fisheries and Rangeland, 2014). There are some of the infectious diseases that have an impactation exports of animals in Sudan like brucellosis is one of most common zoonotic diseases in the present time in both developed countries a like according to the classification

of the global organization (WHO, FAW, OIE) Mohamed Refai, 2011). The important of this diseases is due to the high economic losses as well as the danger to human health fafty (General Administration of livestock – Kassala State, 2012).

Camel pox is an economically important contagious skin disease of camilids. It is common disease among the camels human (Zoonotic Disease) cause economic impact due considerable loss in terms of morbidity, mortality, loss of weight and reduction in milk yield (Bhanuprakash *et al.* 2010).

Foot and mouth disease (FMD) is a highly contagious viral disease of cloven hoofed domestic a wild animals. Because FMD is highly contagious it is arguably one of the most important livestock diseases in terms of economic impact throughout the world (Dustin, *et al.* 2007).

The most prevailing diseases in the Sudan are Brucella, pox foot and mouth disease and contagious Bovine pleura Pneumonia. They have negative impacts on the Sudanese livestock through affecting the production and reproduction qualities wise.

The Ministry of Animal Resources, Fisheries and Range (MARFR) and through its authorized department and referenced in situations for example Animal Research Corporation, Animal Central Research lab (ACR) and Scientific Research Center is doing utmost efforts to control and alleviate these diseases for the safety of the Sudanese people and for the sake of animal wealth export.

Trans boundary diseases are a permanent threat of livestock keepers they have major economic implications. Both through the private and public costs of the outbreak trans boundary animal diseases are defined as those that are of significance for a considerable number of countries, which can easily spread to other countries and reach epidemic prosperities and where control/management including exclusion requires cooperation between several counties, which this definition there are many diseases that cause damage or distraction of farmers, property may threaten food security, injure

rural economics and potentially disrupt trade relation (April 1999).

This research aims to study the impact of infectious diseases on livestock exports in Sudan.

2. MATERIALS AND METHODS

The collection of data:

Structured questionnaire was designed to complete the necessary information needed for this study. Four visited were carries to the General Directorate of veterinary Quarantine and Meat Hygiene (The Ministry of Livestock, Fisheries and the range land) to collect the data needed for this Work. It includes the following:

Rejection of vessels and the reasons of the reject in 2010, 2011, 2012 and 2013.

Rejection of animals and the reasons of the rejection in 2010, 2011, 2012 and 2013.

Check of brucellosis per head in 2010, 2011, 2012 and 2013.

Another visited to the Animal Research Services Company in Omdurman to find out information about the Livestock Market in Sudan.

Unfortunately the response to the structured questionnaire did not find any response from the departments and the companies of concern without justification for that. Such a atitual created constructions in finding real factual data from field, the matter which forced the researcher to find other means for collecting the necessary needed data to complement the initial data obtained from the Ministry of Livestock and its affiliated Center.

Data analysis:

The data was organized in a well setup tables and a proper statistical analysis applied (Correlations – Pearson).

3. RESULTS AND DISCUSSION

The present study showed the following facts: Table 1 and figure 1 illustrated that in the year (2010) is 13% of the rejected vessels were because of Brucella, 67% was due to Pox and

3% was because of suspicion cases of foot and mouth disease. But in (2011) 43% of the rejected vessels were due to pox, 14% Brucella and 43% suspicion of foot and mouth disease.

In (2012) 64% rejected due to Brucella, 18% pox and 18% external. Also in 2013, 60% rejected because of Brucella, 20% pox and 20% was due to external parasites.

Table1. The Reasons of Returned Shipment from 2010 to 2013

Diseases	2010	2011	2012	2013
Brucella	13%	14%	64%	60%
Pox	67%	43%	18%	20%
Suspicion of foot and mouth	3%	43%	0	0
Lack of health certificates	17%	0	0	0
External parasites	0	0	18%	20%

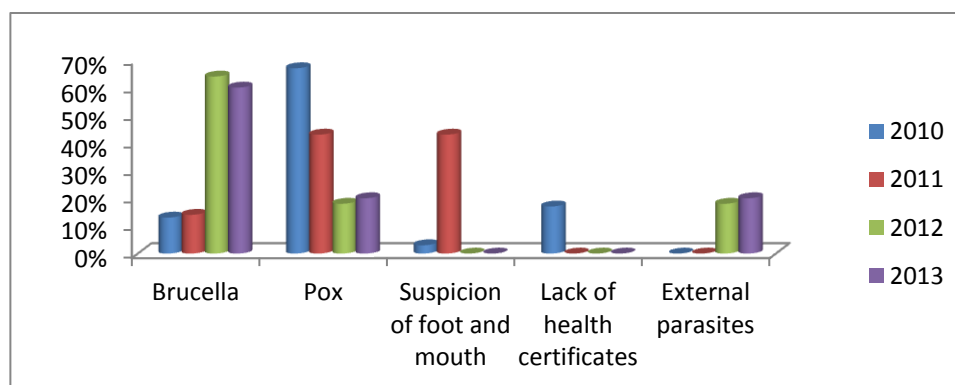


Figure 1. The Reasons of Returned Shipment in from 2010 to 2013

Results in table 2 and figure 2 showed that the percentage of Brucella in camel higher than sheep, goats and cattle with the knowledge of

the lack of information about the examination of Brucella in cattle in (2012), (2013) and 2014.

Table 2. The Check of Brucella from 2010 to 2014

Animals	2010	2011	2012	2013	2014
Goat	7.55%	0.26%	0.05%	0.40%	0.30%
Sheep	0.51%	0.26%	0.20%	0.10%	0.20%
Camel	7.93%	8.98%	6.90%	3.60%	3.20%
Cattle	0.20%	0.34%	-	-	-

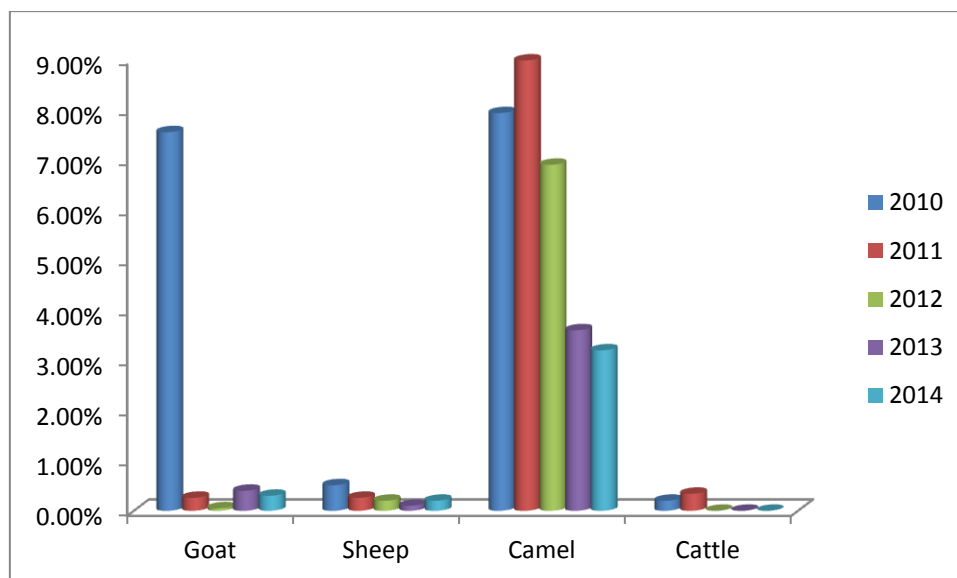


Figure 2. The Check of Brucella from 2010 to 2014

Results in figure 3 demonstrate that 16% of the animals tested were infected with Brucella in (2010), 10% in (2011), 7% in (2012), 4% in (2013) and 4% in (2014) taking into account

the incomplete information about the examination of Brucella in 2014.

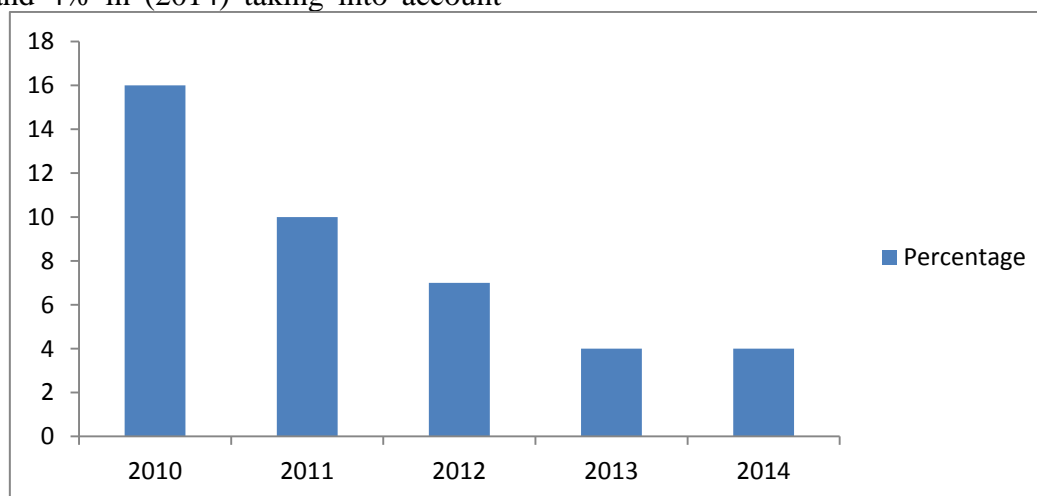


Figure 3. Percentage of Brucella in Different Years

Sheep constitutes about 86% of livestock exports in Sudan in 2010, 89% in 2011, 91% in 2012 and 92% in 2013 (Table 4), this means

that the Sudan one of the countries that depends heavily on sheep in livestock exports (Figure 4).

Table 4. The Percentage of export (sheep, goat, camel and cattle) from 2010 to 2014

Years	Sheep (%)	Goat (%)	Cattle (%)	Camel (%)
2010	86	6	0.2	8
2011	89	5	1	5
2012	91	4	1	4
2013	92	4	1	3
2014	85	3	1	4

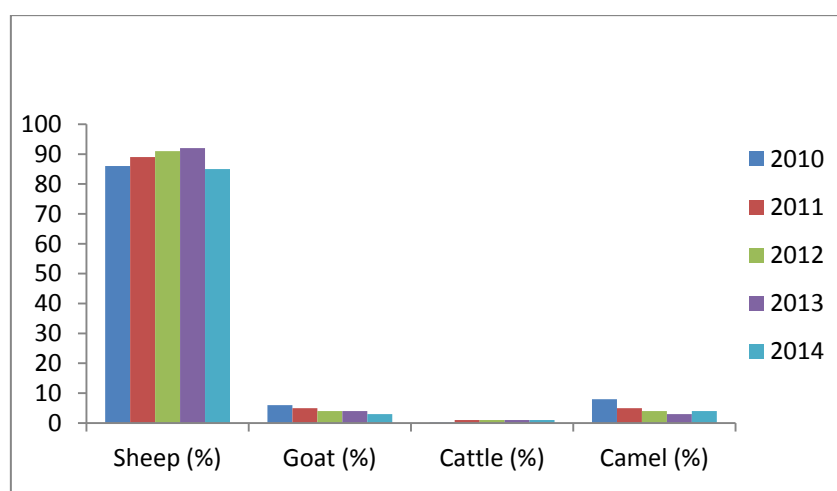


Figure 4. The Percentage of Export (sheep, goat, camel and cattle) from 2010 to 2013

Results in table 5 and figure 5 illustrated the percentage of animals excluded in 2010 was 5%, 3% in 2011, 2% in 2012 and 1% in 2013, the reasons for exclusions: Brucella, mange,

suspicion of foot and mouth disease, inflammation of lymph nodes, pox, pneumonia, diarrhea, suspicion pox abscess, lameness and others.

Table 5. The percentage of animals excluded and rejected from 2010 to 2013

Years	The total number of animal exported	Number of rejected animals	Percentage of rejected
2010	2.111.945	106884	5%
2011	3.063.547	103920	3%
2012	3.770.240	77530	2%
2013	4.096.170	51269	1%

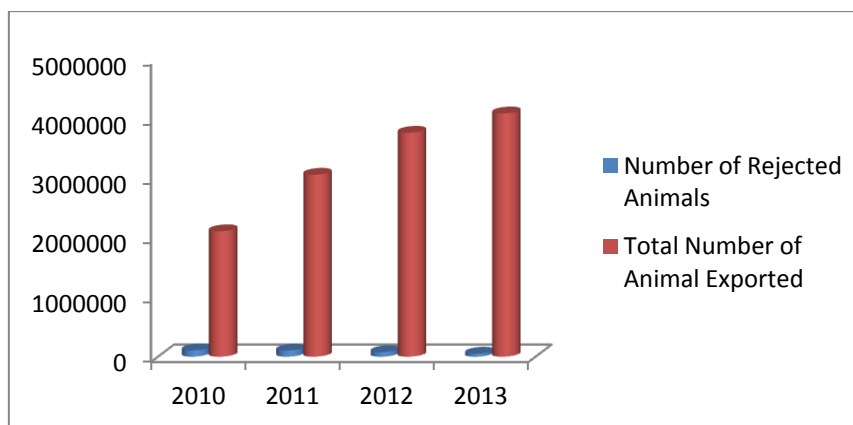


Figure 5. The percentage of animals excluded and rejected from 2010 to 2013

Other factors for the Sudan's relatively lower market share of fresh and frozen sheep meat is considered primarily due to differences in product characteristics, namely, shelf life, taste and average carcass weight (el Dirani *et al.*, 2009). The noncompliance with the SPS measures and international agreements followed by the Gulf market is another major reason for this lower market share. Sudan's market share and absolute exports to the Saudi market have declined in some years (2000–2001) giving way to other countries (Australia and New Zealand) increasing their share of the Middle East market. This decline in the country's share might be attributed to the outbreak of Rift Valley fever in the Horn of Africa.

The results of this study show that Brucellosis was the main cause of rejection of livestock vessels from Saudi port and that the percent of vessels' rejection increased from 13% in 2010 to 14% in 2011 and then a sharp increase (64%) occurred in 2012 and then 60% in 2013. These figures were also in agreement with (El Dirani *et al.*, 2009) who reported that the records from primary, secondary and port quarantines and port authorities during 1997–2005 show that, 30.7% of the animals offered for export were rejected at various points in the domestic portion of the export chain starting from the first quarantine' and another 2.1% were rejected at the Jeddah port once the shipment was made. Because of the strict quarantine measures at the Jeddah port, a

whole vessel is rejected even when only one or two animals with unacceptable disease symptoms are detected. Similar results were also reported by Aklilu *et al.* (2002) who stated that about 6% of the sheep may be rejected at Kadero quarantine due to nasal discharge, emaciation, broken legs and Brucellosis (the latter accounts for 2% of the sheep) and again a rejection of 5-10% of the sheep and 3-5% of the cattle at Port Sudan. Saudi Arabia also invariably rejects more animals (13- 25% of sheep in 1994-1996). The reason for these strict quarantine measures is attributed to the fact that the disease represents a public health hazard (WHO, 2006). It is also reported that freedom from this disease is a pre-requisite for exportation of live animals, especially the camels, because of the zoonotic nature of this disease (J. McDermott *et al.*, 2013). Also stressed the economical impact of brucellosis on the country's trade during the last few years. The authors reported that brucellosis emerged as one of the most important disease barriers to Sudan's international camel trade and that whole camel shipments were returned to Sudan from Saudi Arabia due to few animals being found sero-positive for brucellosis - despite all animals were tested negative before being shipped. The fact that brucellosis poses a barrier to trade of animals and animal products has also been reported by Fitch (2003).

The present study shows that abscess and inflammation of lymph nodes were among reasons for animal exclusion during the years 2010, 2011, 2012 and 2013. This result is in

line with that reported by Aklilu *et al.* (2002) who stated that out of the 936,415 sheep returned from Saudi Arabia between 1990-1998, 77% were rejected on the grounds of sheep abscess or Morel's disease and that at times, the Saudis may reject the whole shipment because of 1 or 2 abscess cases. The economic impact due to the rejection of shipments destination to Saudi Arabia because of Morel's disease amounted to several millions of US dollars (Aklilu *et al.*, 2002). Similar results were reported by Musa *et al.* (2012 a, b) who stated that the economic losses due to rejection of animals affected by Morel's disease (sheep abscess disease) and caseous lymphadenitis at veterinary quarantines and condemnation of carcasses of sheep in abattoirs were significant. The prevalence of abscess diseases in sheep at Alkadaro quarantine was reported by Rodwan *et al.* (2013) who found a percent of 3.4% (n=4167). Since abscesses involved mostly the lymph nodes in the head, the neck and the shoulder regions, such a mode of infection suggests small abrasions and self inflicted injuries or wounds caused by sharp ends of metallic feeding troughs as port of entry and the infection is also aided by the obvious overcrowding during feedlotting and transportation (Alhendi *et al.*, 1993).

This study has also revealed that 43% of the rejected vessels in 2011 are due to suspicion of foot and mouth disease. Small percent of the vessels were also rejected in 2010, 2012 and 2013. Earlier studies indicated that the Sudan is highly endemic for FMD (Abu Elzein, 1983, Abu Elzein *et al.*, 1987) and four of the seven FMD virus serotypes (O. A., SAT-1 and SAT-2) have been reported (Abu Elzein *et al.*, 1987). James and Rushton (2002) reported that if regular FMD outbreaks occur, the trade of livestock and livestock products will be restricted. The major reason behind vessels rejection may be attributed the fact that Foot and Mouth Disease is the most contagious of animal diseases with a great potential for causing heavy economic losses in susceptible livestock (El-Hussein and Daboura, 2012). This statement is also similar to that reported by Le Gall and Leboucq (2004) who mentioned

that in Africa it has been estimated that more is spent controlling FMD than any other veterinary disease.

As shown in the present study, Sheep and goat pox percent of the excluded vessels in 2010 accounted for 65% and it declined to slightly above 40% in 2011 and to slightly above 15% in 2012 and increased again to slightly below 20%. The reason for exclusion might be attributed to the fact that the disease is considered as a major obstacle in the intensive rearing of sheep and goats and also greatly hampers international trade (AU-IBAR, 2015). Sudan is not free from the disease since it has reported 29 outbreaks of sheep pox and goat pox in 2011 (AU-IBAR, 2015).

4. CONCLUSIONS

In order to increase Sudan's share in livestock and meat export market, strict welfare, hygiene, and disease control regulations in livestock sector must be considered.

In view of the high rejection rates of livestock along the chain and at importing ports, the capacity to screen and test animals at the primary inspection stage must be improved and the systems of inspection and certification for live animals and meat should be applied more rigorously and adequately to meet the importing countries requirements.

A reliable system for disease diagnosis, reporting and control should be built by regular complementary serological studies and examination of clinical records for validation. Strategies for veterinary health services, staff capacity building in addition to well equipped laboratories need to be set and implemented.

5. REFERENCES

- [1] A M El-Hussein and A Daboura. Economic impact of an outbreak of Foot and Mouth Disease in Khartoum State, Sudan. *Vet. World*, 2012, Vol.5(4): 219-222
- [2] AbuElZein, E.M.E. (1983). Foot and mouth disease in the Sudan. *Rev.Tech.Off. Int.Epiz.*2:177-188.
- [3] AbuElZein, E.M.E., Newman, J, Gr o w t h e r, J .E., Barret I.T., and McGrane, J.J. (1987). The prevalence of antibodies against foot and mouth disease in various species of Sudanese livestock

- following natural infection. *Rev. Elev. Med. vet. Pays. trop.* 40:7–12.
- [4] African Union. Interafrican Bureau for Animal resources (AU-IBAR) 2015 Sheep and Goat Pox.
- [5] Aklilu, Y. (2012). An Audi of the livestock Marketing status in Kenya Ethiopia and Sudan African union, Interafrican Bureau for Animal Resources, Nairobi.
- [6] Alhendi, A. B., El Sanousi, S. M., Al- Ghasnawi, Y. A. and Madawi, M., (1993). An outbreak of abscess disease in goats in Saudi Arabia. *Journal of Veterinary Medicine (A)*, 40:646-651.
- [7] Animal Resources Services Company, (2014). Statistics for Livestock Markets in Sudan.4.
- [8] Bhanuprakash, V. Prabha, M. Venkatesan G. Balamurugan V. Hosamani M. Pathak M. and Singh R. K (2012). Camel Pox epidemiology diagnosis and Control measures. *Exper Rew Anti Infect Ther.* 10. 1187.
- [9] Daniel, J. Salkeld, Kerry Apadgetl and James Holland Jones (2013). Ameta-analysis suggestion that the relationship between biodiversity and risk of zoonotic pathogen transmission is idiosyncratic *Ecology Letters Vol (16)* 679-680.
- [10] Dustin, L. Pendell, John Leatherman, Ted C. Schroeder and Gregor, El Dirani OH, Jabbar MA and Babiker IB. 2009. *Constraints in the market chains for export of Sudanese sheep and sheep meat to the Middle East*. Research Report 16. Department of Agricultural Economics, University of Khartoum, Khartoum, the Sudan, and ILRI (International Livestock Research Institute), Nairobi, Kenya. 93 pp.
- [11] El Dirani OH. (2007). Potential of Sudanese exports of sheep and sheep meat to the Middle East. Master's thesis, University of Khartoum, Sudan.
- [12] Ficht, T.A. (2003). Acid tolerance and intracellular survival of *Brucella*. *Bru Net Pub.* http://www.fao.org/ag/aga/agah/id/brunet_main/brunet/public_sub5_p1.ht
- [13] General Administration of livestock, Kassala State, Sudan. Zoonotic Diseases, (2012). <http://sudaproduct.sudanforums.net/t82-topic> , <http://www.cdc.gov>.
- [14] Ibrahim A. (2004). *Sudanese livestock export marketing and competitiveness*. Unpublished report submitted to the Ministry of Agriculture and Forestry for FAO and WTO.
- [15] J. McDermott, D. Grace and J. Zinsstag. (2013). Economics of brucellosis impact and Control in Low- income Countries. *Rev. Sci. Tech. off. Int. Epiz* 32, (4) 249-261.
- [16] James A.D. & Rushton J. (2002). The economics of foot and mouth disease. *In Foot and mouth disease: facing the new dilemmas* (G.R. Thomson, ed.). *Rev. sci. tech. Off. int. Epiz.*, 21 (3), 637-644.
- [17] Khalid Rodwan, Abdulkhalig Babiker, Kamal H. Eltom, Nasreen O. Musa, Babiker Abbas2 and Suleiman M. El Sanousi. Abscess Disease in Pastoral and Feedlot Sheep in The Sudan. *Sudan Journal of Science and Technology* (2013) 14(2): 45-53.
- [18] Le Gall F.L., & Leboucq N. (2004). – The role of animal disease control in poverty reduction, food safety, market access and food security in Africa. *OIE*.
- [19] Musa N. O., Babiker, A., Eltom, K., Rodwan, K. and El Sanousi, S. M., (2012b). Prevalence of *S. aureus* subsp. *anaerobius* in sub-clinical abscess cases of sheep. *British Microbiology Research Journal*, 2: 131-136.
- [20] Musa N. O., Eltom, K., Awad, S. and Gameel, A. A., (2012a). Causes of condemnation of sheep carcasses in abattoirs in Khartoum. *Tropentag Book of Abstracts* (www.tropentag.de, date of access: 06.04.2013)
- [21] Nazar Ahmed, Nasreen O. Musa, Salaheddin Hassan, Hanan Elsheikh, Kamal Eldin Hassan Ali Eltom. 2013. Camel Brucellosis: A Disease Barrier to Sudan's Camel International Trade due to Slight Differences in Testing Results. *Tropentag*, September 17-19, 2013, Stuttgart-Hohenheim "Agricultural development within the rural-urban continuum"
- [22] Rojas, Niedbalki, W. Kesy A. Erkiert- Polguy A. Polguy M. (2006). Foot and Mouth disease as a zoonosis. *Med Water* 62: 374-376.
- [23] The Ministry of Livestock, Fisheries and the rangeland. General Directorate of Veterinary Quarantine and meat hygiene, 2014.
- [24] The National Center for Emerging and zoonotic Infectious Diseases, 2014.
- [25] World Health Organization (WHO), 2006. Brucellosis in human and animals. World Health Organization 20 Avenue Appia, 1211 Geneva 27, Switzerland. WHO Press, WC310
- [26] Yacob Aklilu, Patrick Irungu and Alemayehu Reda 2002. An Audit of the Livestock Marketing Status in Kenya, Ethiopia and Sudan. Community-Based Animal Health and Participatory Epidemiology Unit Pan African Programme for the Control of Epizootics Organization of African Unity/Interafrican Bureau for Animal Resources.
- [27] Zinsstage, J.; Roth, F. Orkhon, D. Chimed-Ochir, G.; Nansalmaa, M.; Kolar, J. and Vounatsou, P. (2005). A model of animal- human brucellosis transmission in Mongolia. *Preventive. Veterinary. Medicine*. Pp. 1-19.