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Full Length Research

Community based assessment of the importance of Newcastle disease in village chickens in Bauchi State, Nigeria

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A study on the importance of Newcastle disease (ND) in village chickens was conducted among farmers, poultry traders and community leaders using a focus group discussion (FGD) on village chicken production in eight communities of Bauchi State, Nigeria. Participatory epidemiologic tools of proportional piling and pair wise ranking were used by all the participants of FGD to rank by importance common diseases of village chickens in their communities. Disease and predation were identified by all the participants in each community as major constraints affecting village chicken production. Among the common diseases listed in each community, ND received the highest proportional piling scores of 146/249 (69.9%) in Chinade, 35/105 (32.4%) in Jalam, 183/261(70.1%) in Udubo, 149/244 (61.1%) in Kafin Madaki, 80/183 (43.7%) in Gongoro, 175/270 (64.8%) in Dass, 126/243 (50.8%) in Kutaru and 173/288 (60.1%) in Toro. ND also received the highest pair wise ranking scores of all the listed diseases of 3/4 in Dass, 4/5 in Chinade, Gongoro and Toro respectively; 5/6 in Jalam and Udubo and 6/7 in Kafin Madaki. ND which locally was known as *Farin Kashi or Mai kere* occurs between November and February with symptoms of snick/rales, greenish/ whitish diarrhoea and mortality in the neighbourhood. The results identified ND and predation as the major constraints to village chickens production with ND being ranked as the most important disease affecting village chickens in Bauchi State. The study recommends the prioritization of ND by Bauchi State Government and other Non-Governmental Organization for the purpose of disease control.

Key words: Newcastle disease, Nigeria, village chickens, focus group discussion, proportional piling exercise, pair wise ranking.

INTRODUCTION

Nigeria has about half of its population living in poverty (NBS, 2012). As at 2016, a total of 4.6 million people

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in the north-eastern Nigeria are faced with acute food insecurity, about 55,000 were faced with the threat of famine with over 1.8 million living as internally displaced people due to, violent conflict in connection with Boko Haram insurgency (RCPA, 2016). To reduce the level of poverty and hunger and to empower women as contained in the sustainable development goals of the United Nation, it require an increase in the income of people beyond $1.25 and doubling of agricultural productivity (SDG, 2015).

Village chicken also known as indigenous domestic fowl constitute the majority of rural poultry (FAOSTAT, 2012) and have been reported to play a role in the improvement of income, nutritional status and women empowerment (Dolberg, 2003; Magetho et al., 2012). These have also reportedly aided resuscitation of victims of conflicts in Uganda (Sonaiya, 2009); are owned by resource poor people and have short cycle of production with low production cost, due to minimal input required in terms of housing, nutrition and labour (Sonaiya, 2009). The meat and eggs arising from these chickens appears to be in great demand due to their flavour and toughness (Adene and Oguntade, 2006). Surplus chickens could be sold to bring income or consumed to enhance the nutrition of its owners (Sonaiya, 2009).

Disease, predators, poor nutrition and environmental stress are constraints reported to hinder the production of these chickens (Bell, 2009). Newcastle disease (ND) has been considered as a principle factor limiting village chicken production (Spradbrow, 1993-94). Wherever ND was controlled, a boost in village chicken production has been recorded due reduced chicken mortality and increase in egg production that results in the hatching of more chickens (Alders et al., 2009; Sonaiya, 2009).

ND virus belongs to the family *Paramyxoviridae*, sub family *Paramyxovinae* and genus *avulavirus* (Lamb and Knipe, 2007). The virus has a worldwide distribution and infects over 200 species of birds through inhalation or ingestion of the virus (OIE, 2012). It has become mandatory to report Newcastle disease because of the notifiable disease that could result in trade restriction among nations (OIE, 2012). Information about ND is also required because this disease is associated with high mortality in chickens (Abdu et al., 1992). The observation that disease were under reported in all the states of Nigeria necessitates the need for an alternative means for obtaining baseline information on ND, that will be useful in identifying problems associated with rearing of village or rural poultry and planning control strategy geared towards eradication of ND in village chickens.

The use of Participatory epidemiological (PE) tools-which have been considered as cost effective, timely and complimentary to monthly disease report (Mariner et al., 2011), could provide such information about the importance of ND in village chickens. The objective of this study was to determine the importance of ND in Bauchi State, Nigeria using some participatory epidemiologic tools.

MATERIALS AND METHODS

Study area

This study was carried out in Bauchi State, Nigeria which occupies a land mass of 48,382 sq km that is located within latitudes 7^{o} 52'N and 8^{o} 56'N and longitudes 7^{o} 25'E and 9^{o} 37'E. The state lies on the Bauchi plateau with dry and wet season and has rivers Hadejia in its northern part and Gongola in the south, shares boundary with Kaduna, Benue, Yobe, Gombe, Plateau, Taraba, Kano and Jigawa States (INEC, 2008). The state has twenty Local Government Areas (LGAs), a human population of 5,515,300 (NPC, 2011), that belong to many ethnic groups whose occupation is mainly farming and a poultry population of about 5,832,750 (Adene and Oguntade, 2006).

Sample area

From the 20 LGAs of the state, eight LGAs were randomly selected out of which Chinade, Dass, Gongoro, Jalam, Kafin Madaki, Kutaru, Toro and Udubo communities were selected with one community being selected from each of the eight LGAs.

Participatory epidemiology

The materials used include: white chalk board, marker, eraser, felt pen, flip chart and beans. To conduct this study, Community animal health workers (CAHW) residing in the study communities were used as key informants. All the key informants were identified and contacted with the aid of the Director Veterinary Services, Bauchi State. The duty of the key informant was to arrange a meeting with community leaders, livestock farmers and traders. Discussion with this group of people is referred to as focus group discussion (FGD). All persons invited by the key informant that were in attendance were engaged in FGD, to generate information on the importance of ND in village chicken.

To rank by importance among common diseases in each community, a proportional piling exercise and a pair wise ranking exercise was used (Mariner et al., 2011). To undertake proportional piling exercise, 15 to 30 beans were shared among participants to pile for important disease among common diseases of village chicken, prevailing in each community. A pair wise ranking on common diseases of village chickens was done among participants of FGD, to compare in pairs which disease receives the highest score of importance. Participants of FGD were also asked about the seasons their chickens commonly suffer from ND.

Data analysis

Results were summarized into tables according to themes. Simple percentage was used to weigh the scores given to common diseases by the members of FGDs.

RESULTS

Participants who were engaged in FGD in all the communities commonly mentioned disease, predation and poor housing as major challenges encountered in village chicken production (Table 1). ND received the highest scores from proportional piling exercise among common diseases of village chickens listed in each of the studied communities (Tables 2, 3 and 4). Similarly, the

Table 1. Common challenges encountered by farmers while raising village chickens in Bauchi State, Nigeria.

Challenge	Community							
	Chinade	Dass	Gongoro	Jalam	Kafin Madaki	Kutaru	Toro	Yana
Disease	XX	XX	XX	XX	XX	XX	XX	XX
Predators	XX	XX	XX	XX	XX	XX	XX	XX
Lack of housing	XX	XX	X	XX	XX	XX	XX	XX
Lack of drugs	X	XX	XX	XX	X	XX	XX	X
Lack of feed	X	XX	X	XX	X	XX	XX	X
Theft	XX	X	X	XX	X	X	X	X
Lack of extension services	X	X	X	X	X	XX	X	X
Poor hatch	XX	X	X	X	X	XX	X	X
Lack of vaccination	X	X	X	XX	X	XX	X	X

X=Not mentioned as a problem, XX=mentioned as a problem.

highest score by pair wise ranking among important disease of village chickens was also giving to ND by, members of the FGD (Tables 2, 3 and 4).

The respective proportional piling scores for ND in Chinade, Jalam and Udubo were 146/249 (69.9%), 35/105 (32.4%), and 183/261(70.1%) (Table 2); in Kafin Madaki and Gongoro were 149/244 (61.1%) and 80/183 (43.7%), respectively; while, in Dass, Kutaru and Toro were 175/270 (64.8%), 126/243 (50.8%) and 173/288 (60.1%), respectively.

The respective scores of pair wise ranking for ND in Chinade, Jalam and Udubo were four out of five (4/5), five out of six (5/6) and five out of six (5/6) (Table 2). The scores in Kafin Madaki and Gongoro were six out of seven (6/7), and four out of five (4/5), respectively (Table 3). The score in Dass, Kutaru and Toro were three out of four (3/4), five out of six (5/6) and four out of five (4/5), respectively (Table 4).

All the FGDs had associated the period between November to February with major outbreaks of ND. A second lower period of ND occurrence was said to occur in May which coincides with the hot and early rainy season. The occurrence of ND was observed all year round in Kutaru and Toro (Table 5). The local Hausa names used to describe ND in the studied communities were *Mai Kere, Farin Kashi. Kore* and *Jonga*. The commonly mentioned symptoms for identification of ND by the communities were: whitish (*Farin Kashi*) or greenish (*Kore*) diarrhoea, death of chickens in the neighbourhood (*Mutuwan kajin unguwa*), huddling (*Takura*) and groaning/choking/snick or rales (*Ket/Kwat/Kirit*) (Table 6).

DISCUSSION

That members of the focus group discussion mentioned ND, predators and housing as a common problem of village chicken production seem to suggest the need for improvement in these areas.

The highest ranking received by ND among common diseases of village chickens by both, proportional piling exercise and pair wise ranking exercise in all the eight communities, shows how important ND is among the diseases of village chickens in these communities. The ranking of ND as the most important disease of village chickens in the studied communities was similar to the works of Ndahi and Kwage (2011) and Ndahi et al. (2012) in the neighbouring Plateau State; Bala et al. (2012) in Nasarawa State; Anzaku et al. (2014) in Abuja, Jibril et al. (2015) in Zamfara State and Waziri et al. (2016) in Bauchi town and Katagum LGA of Bauchi State.

Given that, the proportional piling scores of the next ranked disease in each of the studied community did not reach half of the scores awarded to ND; this further indicate how important ND was to village chickens farmers. The knowledge that ND was the most important disease of village chickens in these communities appears to show the extent of the problem in these communities. The control of ND in village chickens could bring great relief to owners of these chickens through, reduction of mortality associated with ND. Such knowledge may be useful to the Department of Veterinary Services in the State and could enable it to prioritize ND for the purpose of planning disease control in village chickens in Bauchi State. The control of ND amongst village chickens through a strategic control programme will boost interest in village chicken or rural poultry production practice and may pave way for sustainability of other rural poultry disease control programmes.

In Nigeria, ND is generally well-recognized by farmers in both local and exotic breed (lawal et al., 2015). The existence of local names for ND in each community further highlights how important the disease is in all the studied communities. The local names for ND were *Mai Kere Jonga*, *Farin Kashi* (whitish diarrhoea), or *Haukan Kaji* (madness of chickens). *Farin Kashi,* and *Haukan Kaji* are local names of ND in the Hausa land; *Mai Kere* refers to the stick used by hunters to kill wild animals quickly; and has similarity to *Fakat* which is another local Hausa

Table 2. Ranking of common diseases/symptom of village chickens in Chinade, Jalam and Udubo in Bauchi State, Nigeria.

Chinade			Jalam			Udubo		
Common disease /clinical signs	**Proportional piling scores (%)**	**Pair wise ranking scores**	**Common disease /clinical signs**	**Proportional piling scores**	**Pair wise ranking scores**	**Common disease /clinical signs**	**Proportional piling scores**	**Pair wise ranking scores**
Newcastle disease	146(69.9)	4	Newcastle disease	34 (32.4)	5	Newcastle disease	183 (70.1)	5
Cold	23 (11)	3	Cold	17 (16.2)	4	Fever	9 (3.7)	4
Fowl pox	13 (6.2)	0	Fowl pox	12 (11.4)	1	Fowl pox	16 (6.1)	2
Lice	14 (6.7)	1	Lice	11(10.5)	2	Lice	16 (6.1)	0
Diarrhoea	13 (6.2)	2	Worms	15 (14.3)	0	Mites	10 (3.8)	1
-	-	-	Coccidiosis	16 (15.2)	3	Paralysis	27 (10.3)	3
Total scores	209 (100)	-	-	105 (100)	-	-	261 (100)	-
Number of participants	7	-	-	6	-	-	9	-

*Pair wise ranking was done in ascending order of magnitude.

Table 3. Ranking of common disease of village chickens in Kafin Madaki and Gongoro, Bauchi State, Nigeria.

Kafin Madaki			Gongoro		
Common disease/ clinical signs	**Proportional piling score (%)**	**Pair wise ranking score**	**Common disease/clinical signs**	**Proportional piling score (%)**	**Pair wise ranking score**
Newcastle disease	149(66.4)	6	Newcastle disease	80 (43.7)	4
Mite	15 (6.1)	2	Hatching	33 (18)	0
Soft tick	35 (14.3)	5	Lice	27 (14.8)	2
Fowl pox	16 (6.6)	4	Fowl pox	27 (14.8)	1
Yellowish diarrhoea	11(4.1)	3	Cold	16 (8.7)	3
Pile (prolapse)	0 (0.0)	0	-	-	-
Head swelling	5 (2.0)	1	-	-	-
Total score	244 (100)	-	-	183 (100)	-
Number of Participants	8	-	-	12	-

by members of the FGD were similar to classical clinical signs of ND (Chakrabarti, 2007; Cynthia and Scott, 2010; Young et al., 2012).

The implication of these finding is that, local people have good knowledge of the clinical signs of ND.

Obtaining information from local people about diseases of livestock is foundational to participatory epidemiology. Such knowledge could

Table 4. Ranking of common diseases of village chickens in Dass, Kutaru and Toro communities, Bauchi State, Nigeria.

Dass			Kutaru			Toro		
Common Disease/ clinical signs	**Proportional piling scores (%)**	**Pair wise ranking scores**	**Common disease/clinical signs**	**Proportional piling scores (%)**	**Pair wise ranking scores**	**Common Disease/ clinical signs**	**Proportional piling scores (%)**	**Pair wise ranking scores**
Newcastle disease	175 (64.8)	3	Newcastle disease	126 (50.8)	5	Newcastle disease	173 (60.1)	4
Cough	42 (15.6)	2	Cold	22 (8.9)	5	Cold	37 (12.8)	3
Ectoparasite	17 (6.3)	0	Lice	16 (6.5)	0	Lice	26 (9.0)	1
Fowl pox	36 (13.3)	1	Fowl pox	42 (16.9)	3	Fowl pox	37 (12.8)	2
-	-	-	Poor hatching	20 (8.1)	2	Worms	15 (5.2)	0
-	-	-	Pasting of vent	20 (8.1)	1	-	-	-
Total scores	270	-	-	248	-	-	288	-
Number of participants	18	-	-	8	-	-	19	-

Table 5. Seasonal occurence of Newcastle disease in village chickens in eight communities of Bauchi State, Nigeria.

Community	Months											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
	Season											
	***Cold**	**Cold**	**Cold/ Hot**	**** Hot**	**Hot/ Raiy**	**** Rainy**	**Rainy**	**Rainy**	**Rainy**	**Rainy**	**Cold**	**Cold**
Chinade	XX	XX	XX	XX	XX	X	X	X	X	X	X	X
Dass	XX	XX	X	X	X	X	X	X	X	X	XX	XX
Jalam	XX	XX	X	X	X	X	X	X	X	X	XX	XX
Kutaru	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
Gongoro	XX	XX	XX	XX	XX	X	X	X	X	X	XX	XX
Kafin Madaki	XX	XX	XX	X	X	X	X	X	XX	XX	XX	XX
Toro	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
Udubo	XX	XX	X	X	X	X	X	X	X	X	XX	XX

*Cold season is locally called *Sanyi*, **Hot season is called *Zafi,* while, ***Rainy season is called *Damina.* X means ND is common while XX mean ND is common during such season.

be harnessed to, enhance our understanding of the epidemiology of ND in village chickens and to evaluate efficacy of a control programme due to presence or absence of defined symptoms. This will ultimately strengthen our disease surveillance much similar to the observation by Mariner et al. (2011).

That, ND was reported by the communities to mostly occur between the months of November to

Table 6. Case definition of Newcastle disease in eight communities in Bauchi State, Nigeria.

Local name of symptom	Sign	Community							
		Chinade	Dass	Gongoro	Jalam	Kafin Madaki	Kutaru	Toro	Udubo
Farin Kashi/Koren kashi	Whitish/greenish diarrhea	XX	XX	XX	XX	XX	XX	XX	XX
Tari	Coughing	X	X	XX	XX	X	XX	X	X
Kumburin kai	Swelling of the head	X	X	X	X	X	XX	X	X
Shakewa/gurnani/	Chocking/groaning/	-	-	-	-	-	-	-	-
Ket/Kwat/Kirit	Snick/rales	X	XX	XX	XX	XX	XX	XX	XX
Tattara/Takura	Huddling	X	XX	XX		XX	XX	XX	XX
Hauka/Bori	Madness	X	XX		XX	XX		XX	X
Rashin kuzari	Weakness	X	X	X	XX	X	X	X	X
Tashin gashi	Raised feathers	X	X	XX	XX	X	X	X	X
Mutuwan kajin unguwa	Chicken mortality in the neighbourhood	XX	XX	XX	XX	XX	XX	XX	XX
Zazzabi	Fever	XX	X	X	XX	X	X	X	X
Sanyi	Cold	XX	X	X	X	XX	X	XX	XX
Yawu	Salivation	X	XX	X	X	X	XX	X	X
kin cin abinci	Inappetance	X	X	X	X	XX	XX	XX	X

*X=not mentioned among the symptom of Newcastle disease; XX=commonly mentioned symptom of Newcastle disease.

February, appears to suggest seasonality in the occurrence of outbreak of ND. Knowledge of seasonal occurrence of ND could be used in planning vaccination programme that will lead to the control of the disease. Planned intervention should be undertaken before October which is, the period when ND outbreaks is likely to start.

Although, October to March were the months most communities encounter ND, the disease was observed to occur throughout the year in Kutaru and Toro, perhaps reflecting a changing pattern of the disease that could possibly be due to active trading of chickens, as a result of gradual urbanization of such communities. Changing patterns of disease are of epidemiological importance which has the potential to affect the design and timing of disease control programmes (Févre et al., 2006).

Conclusion

ND and predation were mentioned in all communities as constraints to village chicken production. ND received the highest of importance by both the proportional piling and pair wise ranking in all the studied communities because of its association with high mortality.

ND mostly occurs between November, February and May. The local names mostly used to describe ND were *Mai kere, Farin Kashi and Kore* and the most common symptoms mentioned by FGD in all the communities were: diarrhoea, death of chickens in the neighbourhood and snick or rales.

The study recommends a collaborative effort by farmers, government and non-governmental organization to prioritize and institute measures for the control of ND in Bauchi State, Nigeria.

CONFLICTS OF INTERESTS

The authors have not declared any conflict of interests.

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Full Length Research Paper

Characteristics of small-scale sheep production systems in some communal areas of the Eastern Cape Province, South Africa

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The objective of this study was to examine the characteristics of small-scale livestock production systems in some communal areas of the Eastern Cape Province, South Africa. The parameters surveyed include sex, age, educational and marital status of the farmers, types of livestock raised and production system practiced. The study revealed that mixed crop-livestock production systems were dominant in the study area. Majority of the respondents (72.4%) were male and approximately 59% of the older male farmers were more than 70 years old with the highest mean flock size of 86. A total of 62% of these farmers had basic education and a mean family size of 5.9±3.0. Most of the sheep farmers (70.9%) bought their foundation stock, but 6.5% of them obtained theirs through bride price (lobola). Generally, livestock species owned by the respondents were sheep (71.8%), poultry (12.9%), cattle (7.7%), goats (4.4%), dogs (1.3%), pigs (0.6%) and others (1.3%). Family labour is mostly used for animal management and herding, being done by men (65%) and boys (30%), respectively. The natural veld provides highest feed resource base for the animals and almost all the respondents provide night shelter for their sheep, in the kraal that is adjacent to the main family house. The prevalence of gall sickness was ranked the highest (22.1%) among the diseases and parasites affecting sheep. While 80% of the respondents treated their animals with stock remedies, a very low proportion of them (3.4%) adopts an integrated approach of using commercial drugs and local herbs or call animal health technicians to treat sick animals.

Key words: Gall-sickness, herd size, characteristics, sheep farming.

INTRODUCTION

Livestock farming is one of the most viable agricultural activities in South Africa where approximately 69% of the agricultural land are being used for extensive grazing on natural veld (Department of Agriculture, Forestry and Fisheries (DAFF) (2012), Fayemi and Muchenje, 2014). The Eastern Cape Province (ECP) consists of rural areas with more than 80% of its population involved in livestock integrated production systems (Braker et al., 2002; Perret

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and Mercoiret 2003). Livestock farming in communal grazing areas of the ECP of South Africa is mostly subsistence in nature and characterised by low inputs. In the communal areas of the ECP, it is fully integrated mixed units consisting of cattle, sheep and goats. Farmers generate income from the sale of livestock and their by-products: wool, meat and dung for fuel or manure, thus contributing to farm household livelihood, poverty alleviation and food security (Miao et al., 2005; FAO, 2009; Yitayew et al., 2013). Crop-livestock integration is a means of risk avoidance during crop failure and cultural functions during festivals (Kosgey et al., 2008).

Despite the importance of livestock husbandry, both at household and national economic levels, production and productivity within the sheep sub-sector has been quite low in the Eastern Cape Province (Bembridge, 1989), and in other countries in Africa (Gizaw et al., 2010; Mengesha and Tsega, 2012). Communal sheep farming reflects a high level of mortality, a low reproduction rate, a low weaning percentage and low turnover (Bembridge, 1989). The major problems of low livestock productivity in the communal areas include housing, health and inadequate feed and nutrition (Kusina and Kusina, 1999). However, according to Ajala (2004) and Ben and Smith (2008), the high incidence of diseases is another major constraint associated with small ruminant production. The objective of the study was to establish the characteristics of small-scale sheep production systems in the rural areas of the Eastern Cape.

MATERIALS AND METHODS

Description of study areas

The study was conducted in two villages of the Engcobo Local Municipality under the Chris Hani District Municipality of the Eastern Cape. The two villages (Tora and Ntibane) are situated within 28°9'22"E and 31°53' 44"S 70 km East of Ngcobo and 28°04'35"E and 31°39' 53"S 50 km North. The mean annual rainfall for Tora and Ntibane was ±620 mm and ±750 mm, respectively. The vegetation on the plain is described as Mthatha, a moist grass growing along mountain slopes of the Drakensberg foothill grassland (Mucina and Runderford, 2005). The most common grass species are *Themeda triandra* (Iqunde), *Sporobolus africanus* (Msuka), *Eragrostis plana* (Umtshiki) and *Digitaria eriantha* (Injica).

Data collection and analysis

The farmers were selected based on their interest in sheep farming and willingness to be interviewed. The questionnaires were pre-tested and modified prior to its actual administration. This was done with the assistance of an Animal Scientist from Dohne Agricultural Development Institute and Extension Officers as enumerators. Samples were collected from 29 households consisting of 21 males and 8 females from the two villages. Variables investigated included demographic characteristics of sheep owners, sheep distribution by households, management practices, problems associated with current management systems and disease‒profiles. Simple descriptive statistics (percentages, frequency and mean) was used to analyse data.

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

A summary of characteristics of household heads in the study areas is shown in Table 1. It was observed that the majority (72.4%) of sheep farming households were headed by married persons. A further analysis of gender and marital status of the sample showed that 60% of the male farmers and 12.4% of the female respondents were married. The household heads of most respondents were predominantly males (72.4%). Few cases of female-headed households were found with 5.2% of them being single mothers and 10.3%, as widows. The results on the dominance of male farmers in livestock activities may be due to the privilege accorded them as heads of families and cultural values that make farmland easily accessible to them. Sometimes, the transfer of animals by virtue of inheritance to the male heads of the households from the parents contributed to the male-dominant livestock ownership in the study area. These findings are in agreement with previous studies where livestock farming was found to be a male dominated business (Garoma, 2006; Kunene and Fossey 2006; Taye, 2006; Mapiliyao et al., 2012). The lower proportion of female farmers could be attributed to their inability to get their own farmland as head of a family if they are not married. This is in contrast with a survey by Anaeto et al. (2009) on sheep farming, where the majority of the farmers were females (70%). In another survey, Modise (2004) showed that more women (84%) participated in poultry farming than men. It was noted that in certain households when the husband passed away, women cannot take ownership of the sheep. The reasons could be due to social and cultural factors as well as a lack of capital.

The mean age of interviewees was 66.1±15.1 years (range from 33 to 89 years). The majority (76%) of respondents were within the age bracket 51 to 89 years (Table 1). A possible reason for this may be that farming is mostly considered as an alternative for people retiring from their jobs, or cultural issue. This implies that young and active people migrate to urban areas to seek better opportunities and do not consider farming as a potential business while some are involved in other farming enterprises such as crop production. Dercon and Krishman (1996) reported that age can affect the rate of household adoption of innovations, that in-turn affects household productivity and livelihood strategies. In the population surveyed, about 24% of household heads were in the active and productive age range of 18 to 65 years. According to BPS (2000), productive age was considered to be to those 15 to 64 years of age. In addition, unproductive labour was assigned to those younger than 15 or those older than 64 years of age

Table 1. Socio-economic characteristics of the livestock farmers in Engcobo Local Municipality.

Gender			Age (years)		Household size		Marital status	
	No.	%	Category	%	Category	%	Category	%
Male	21	72	31-50	24	<5	72.4	Single	17.2
Female	8	28	51-70	17	6-10	17.2	Married	72.4
			71-90	59	≥11	10.3	Widow	10.3

Number of male = 72; Number of female = 28.

(BPS, 2000). Increasing the involvement of active and productive age can have a direct bearing on increased agricultural productivity and production, and hence for improving household livelihood and reducing poverty in rural areas. Such findings have also been reported by Senthilkumar et al. (2005) where nearly half (48%) of urban dairy farmers belonged to the older age group (> 65 years). Contrary to our findings, Pushpa (2006) reported that 50% of livestock owners in rural and peri-urban livestock production systems belonged to middle age group. The majority (72.4%) of the respondents had smaller household sizes of 1 to 5 members followed by 6 to 10 and more than ten, 17.2 and 10.3%, respectively. The mean family size was 5.9 members per household with a standard deviation of 3.0. The figure obtained in this survey was higher than the provincial and national average family size of 3.9 and 3.6 respectively (Statistics South Africa, 2011). Contrary to our findings, FAO (2010) reported that the average family size in Vietnam was between 4.0 and 5.2. In general difference in family size may be attributed to the low level of awareness in family planning in the rural areas. It was also found that the majority (62%) of small-scale farmers in Engcobo local municipality acquired at least basic school education (Figure 1). This can be used as an opportunity for improvement of sheep production by extension services through training of farmers and provision of extension materials such as leaflets and hand-outs, which can be used to transfer knowledge to the farmers to easily adopt new technology. Similar findings were reported by Karimuribo et al. (2011).

Livestock species and gender role in the study area

The production system in the study area is characterised by mixed crop-livestock production. Almost all respondents in the study area reared indigenous breeds of livestock. In Table 2, the distribution of livestock species composed of cattle (7.7%), sheep (71.8%), goat (4.4%), chicken (12.9%), pigs (0.6%), dogs (1.3%) and other livestock species (1.3%). Very few of respondents had crosses (Bonsmara, Dohne Merino, Boer Goat, and Large White) and exotic bred animals (Brahman). Most of the farmers kept indigenous animals because they are well adapted to the local environment. The study revealed that sheep are the most important species of livestock in the study area. Studies conducted by Karimuribo et al. (2011) in Tanzania and Ayalew et al. (2013) in Ethiopia had similar findings to the current study. The total flock size (sheep) in the investigated households was 2291 head, which consisted of 110 rams, 1289 ewes, 265 castrated animals and 627 lambs (Figure 2). The mean flock size observed during the study was 79±53.9 sheep per household. Female animals made up the largest proportion (56.3%) of the flock followed by lambs, castrates and rams (27.4, 11.5 and 4.8%) respectively. This finding is in agreement with results of other studies in South Africa (Musemwa et al., 2008). Majority (47.2%) of roles in the study area were mainly done by men followed by people, boys and women who were hired 26.7, 18.2 and 7.9% respectively (Table 3). Although the roles are shared amongst gender, women have fewer roles to play in sheep husbandry as compared to men and boys. Men, women and children (family) perform a large number of tasks related to animal husbandry, with some degree of variation in involvement from household to household. These tasks include feeding of animals, herding, tail docking, castration, milking, cleaning of kraals, ear-notching, draught power, transportation, vaccination, purchasing and sale of live animals and animal products through formal and informal marketing channels. Contrary to our findings, Belay et al. (2011) reported that less than 34% of labour used for animal management in Ethiopia was hired labour.

The results of the survey indicated that all of the respondents provided housing to their sheep, most preferred stone (89.7%) and some processed wood (10.3%). Natural veld (82.8%), natural veld + supplement with commercial diet (10.3%) and natural veld + brewer's grain (6.9%) were mainly used as this may be due to the fact that natural veld remains the cheapest and most accessible feed source.

Flock size and classes

Figure 3 illustrates that about 70.9% of the respondents bought their foundation stock;, some inherited them (22.6%) and others obtained theirs from "Lobola" (6.5%). Similar findings have also been reported in Southern Kalahari where the majority of Karakul sheep farmers

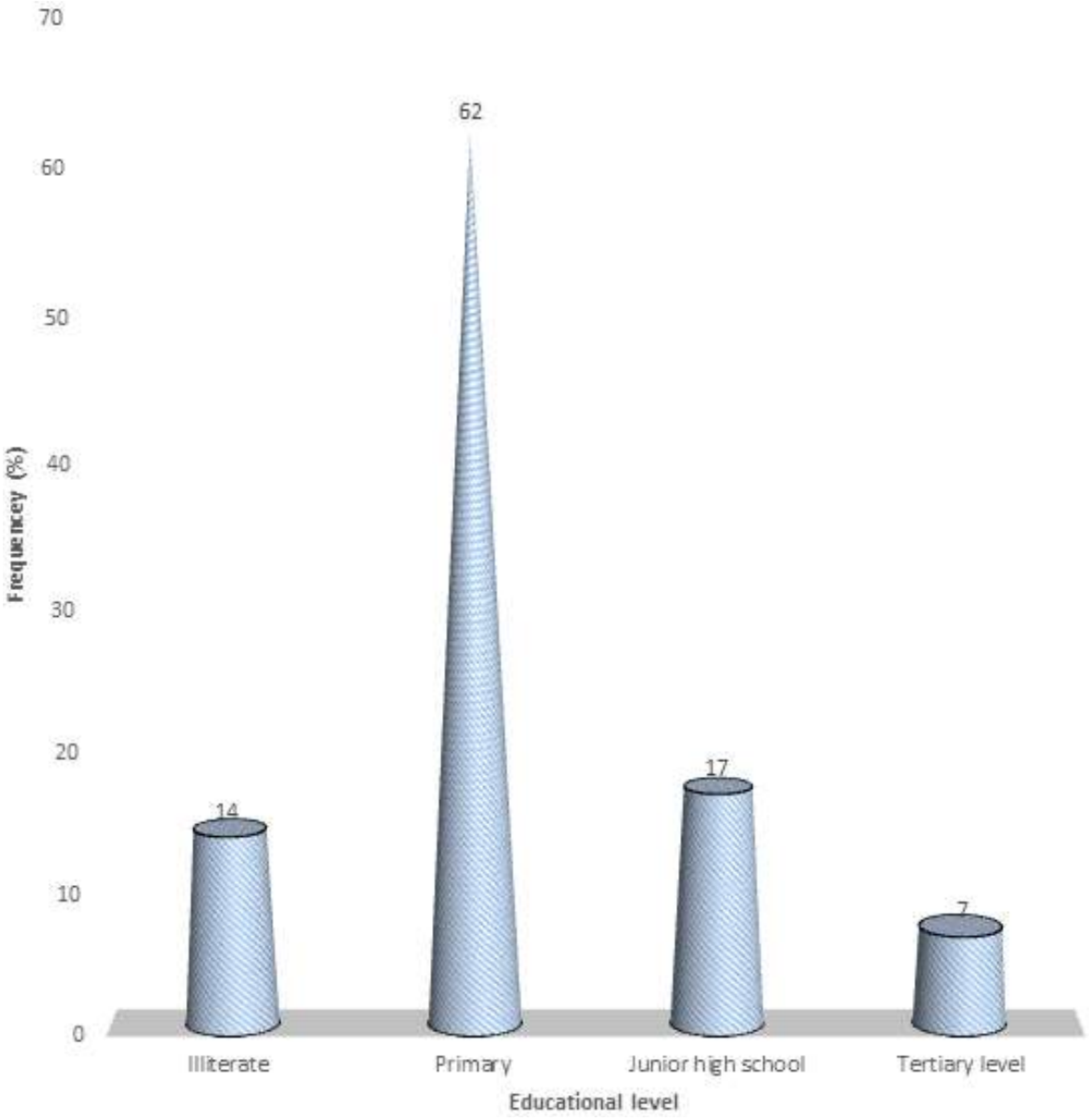

Figure 1. Educational levels of the livestock farmers in Engcobo local municipality.

Table 2. Livestock composition and breeds owned by farmers within the Engcobo local Municipality.

Livestock type	Breeds owned	Proportion (%)
Cattle	N, BR, I, B	**240 (7.7)**
Sheep	I, M, DM	**2291 71.8)**
Goats	BG, I	**140 (4.4)**
Chicken	I	**413 (12.9)**
Pig	LW, I	**22 (0.6)**
Dogs	I	**40 (1.3)**
Others	**I**	**43 (1.3)**

B= Bonsmara, BR= Brahman, BG= Boar Goat, DM= Dohne Merino, I= Indigenous, LW= Large White, M= Merino and N= Nguni

Table 3. Farmers' response regarding housing materials and involvement in routine and occasional management practices at the Engcobo local Municipality.

Routine feeding practices			Housing materials	
NV (%)	**NV+CFS (%)**	**NV+BG (%)**	**Stone (%)**	**Processed wood (%)**
82.8	10.3	6.9	89.7	**10.3**

Activities	**Men**	**Women**	**Boys**	**Hired Labour**
Herding (%)	22.89	8.33	28.13	**-**
Selling (%)	25.30	66.67	-	**-**
Tail docking (%)	10.84	-	34.37	**19.15**
Castration (%)	25.30	-	-	**57.45**
Ear-notching (%)	25.30	-	15.63	**6.38**
Vaccination (%)	**13.25**	**25.00**	**21.88**	**17.02**

*NV: Natural Veld; CFS: Commercial Feed Supplement and BG: Brewers Grains.

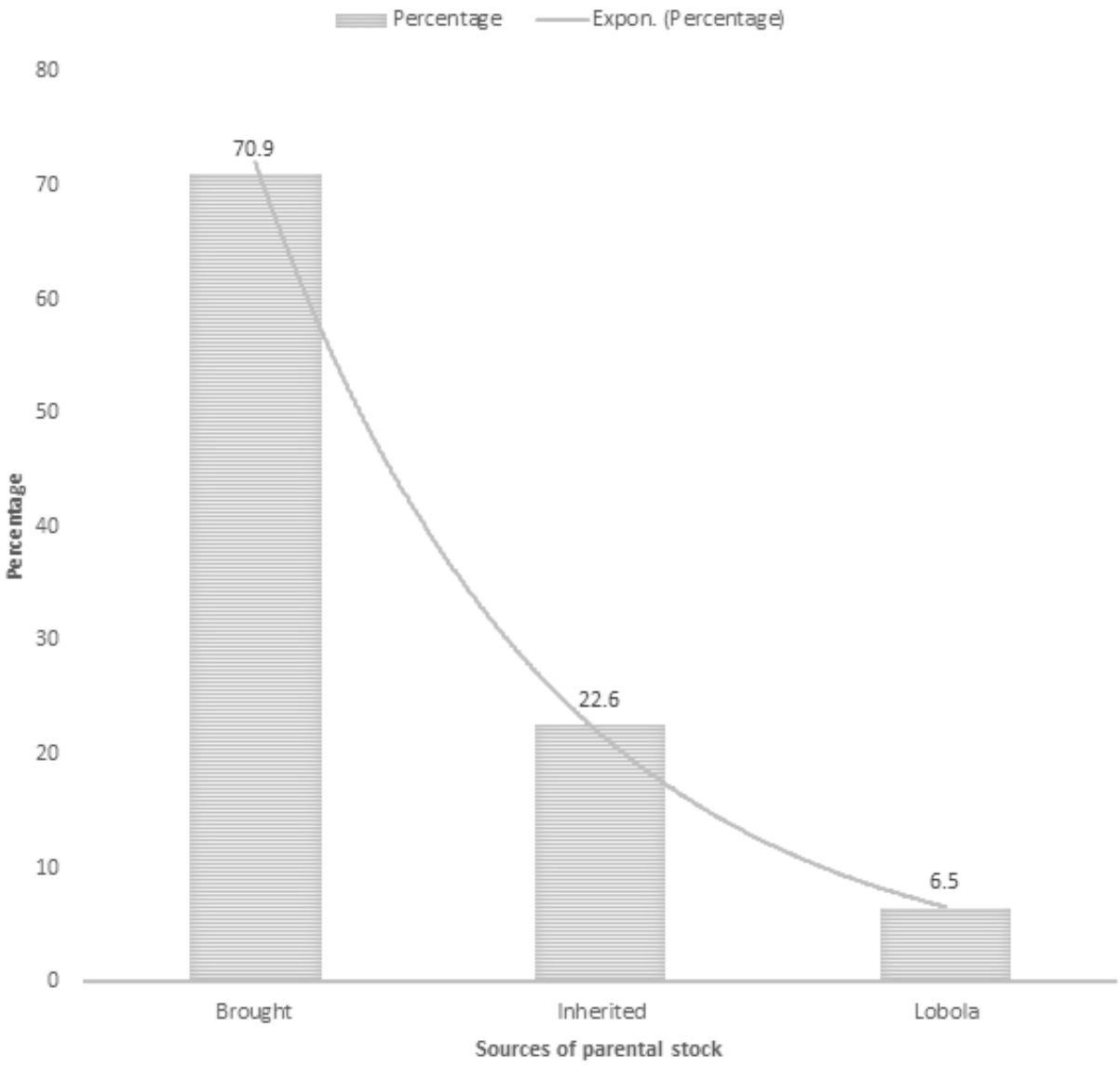

Figure 2. Sources of parental stock of the animals raised within the Engcobo local municipality.

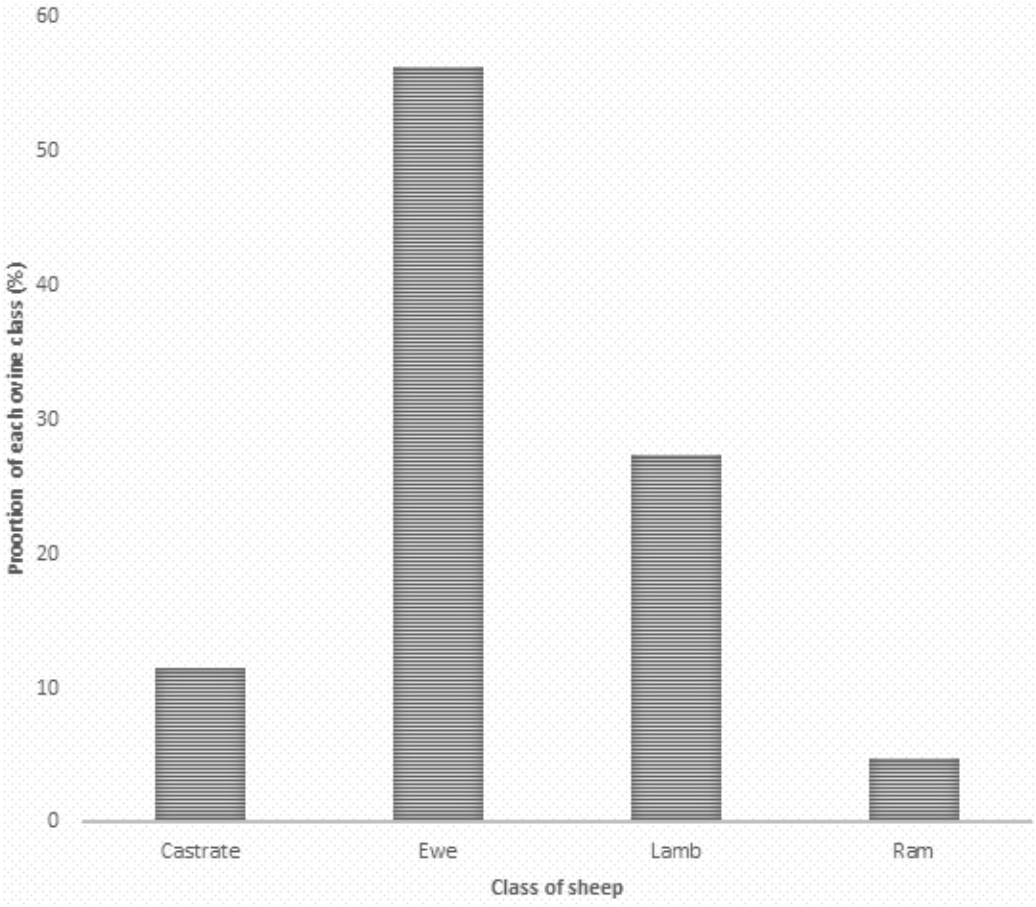

Figure 3. Flock structure of ovine species in Engcobo local municipality.

obtained their parental stock from sale (Nsoso and Madimabe, 2003).

Findings further indicated that most (66.1%) of the farmers depends on social grants, support from other family members and employment as source of income (Figure 4). Farming (35.6) was another source of income mentioned in the study areas (Figure 4). The findings from this study show that small-scale farming is not the only source of income in the two villages. It also shows that small-scale sheep farmers do engage in other activities, especially pension, social grants, crop farming (maize) keeping other livestock species such as poultry, goats and cattle. Such findings have also been reported by Mapiliyao et al. (2012), Kunene and Fossey (2006) and in other countries in Africa (Costales et al., 2007; Kariga et al., 2010; Karimuribo et al., 2011). Different animal health problems were reported and the majority of health-related concerns were associated with gall-sickness (22.1%), sheep scab (17.6%) and internal parasites (14.7%) were observed to be the most common diseases in the flocks followed by malkop (13.2%), pulp kidney (10.3%), blue tongue (8.8%), mouth disease (5.9%), foot rot (4.4%) and diarrhea (2.9%). Although there is no evidence due to lack of resources, scab and internal parasites infestation are also prevalent and commonly reported by Mapiliyao et al. (2012). The high prevalence of internal and external parasites could be attributed to an uncontrolled communal grazing management system where flock from different households graze together and mate irrespective of their health status.

Conclusion

The study has shown that the most of the respondents involved in livestock production in the study area were males, above 70 years of age. The average family size was 5.9 members per household. The majority of the respondents in the study area had basic education. Of the livestock species owned by the respondents, sheep constituted the major species because it is easy to manage as compared to cattle. Pension and social grants were a major source of income. Farming labour dominated by men was the major source of labour used for sheep management. It is concluded that farmers'

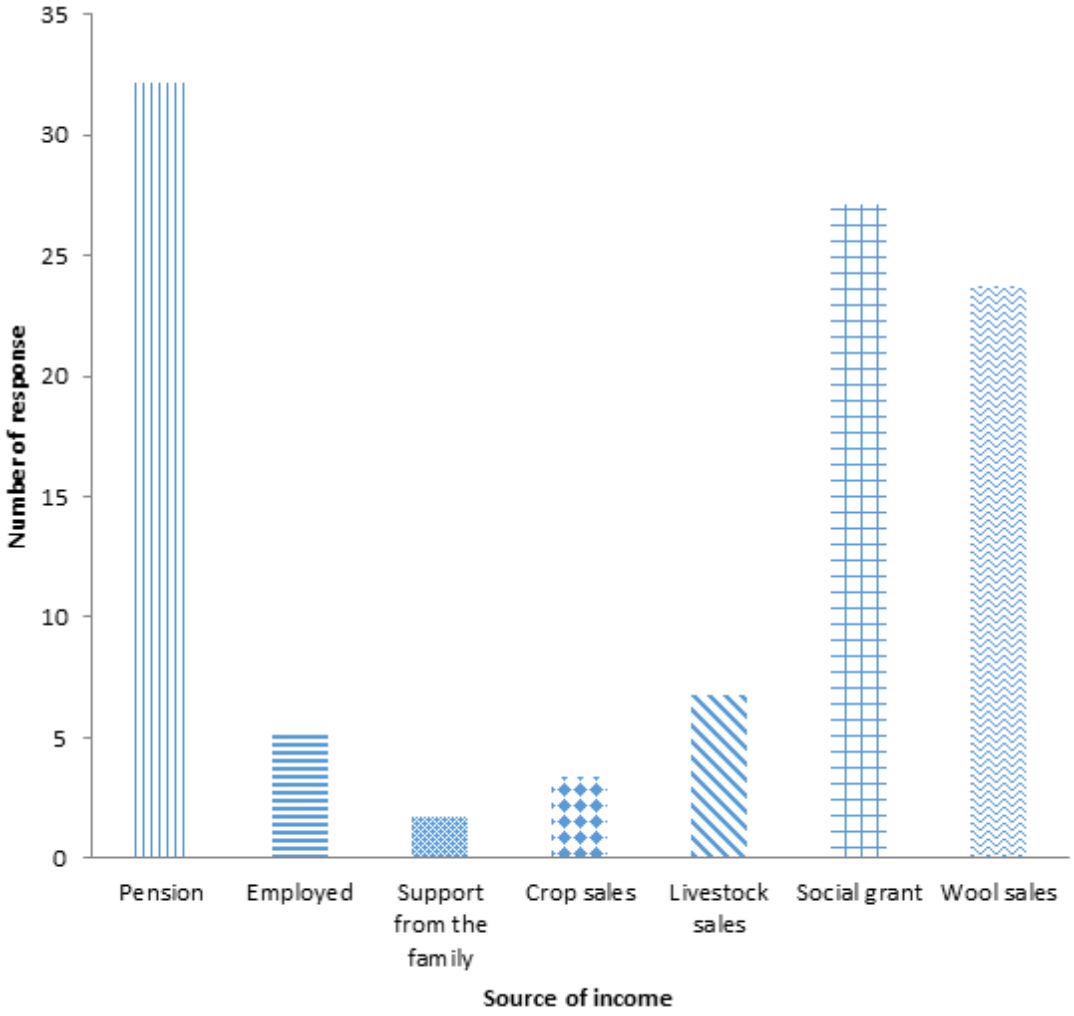

Figure 4. Farmers sources of income for self and livestock husbandry in Engcobo local municipality.

socio-economic characteristics should be considered as a key factor when planning strategies for sustainable sheep production in communal areas. It would be advisable to consider these socio-economic characteristics prior to introducing an intervention.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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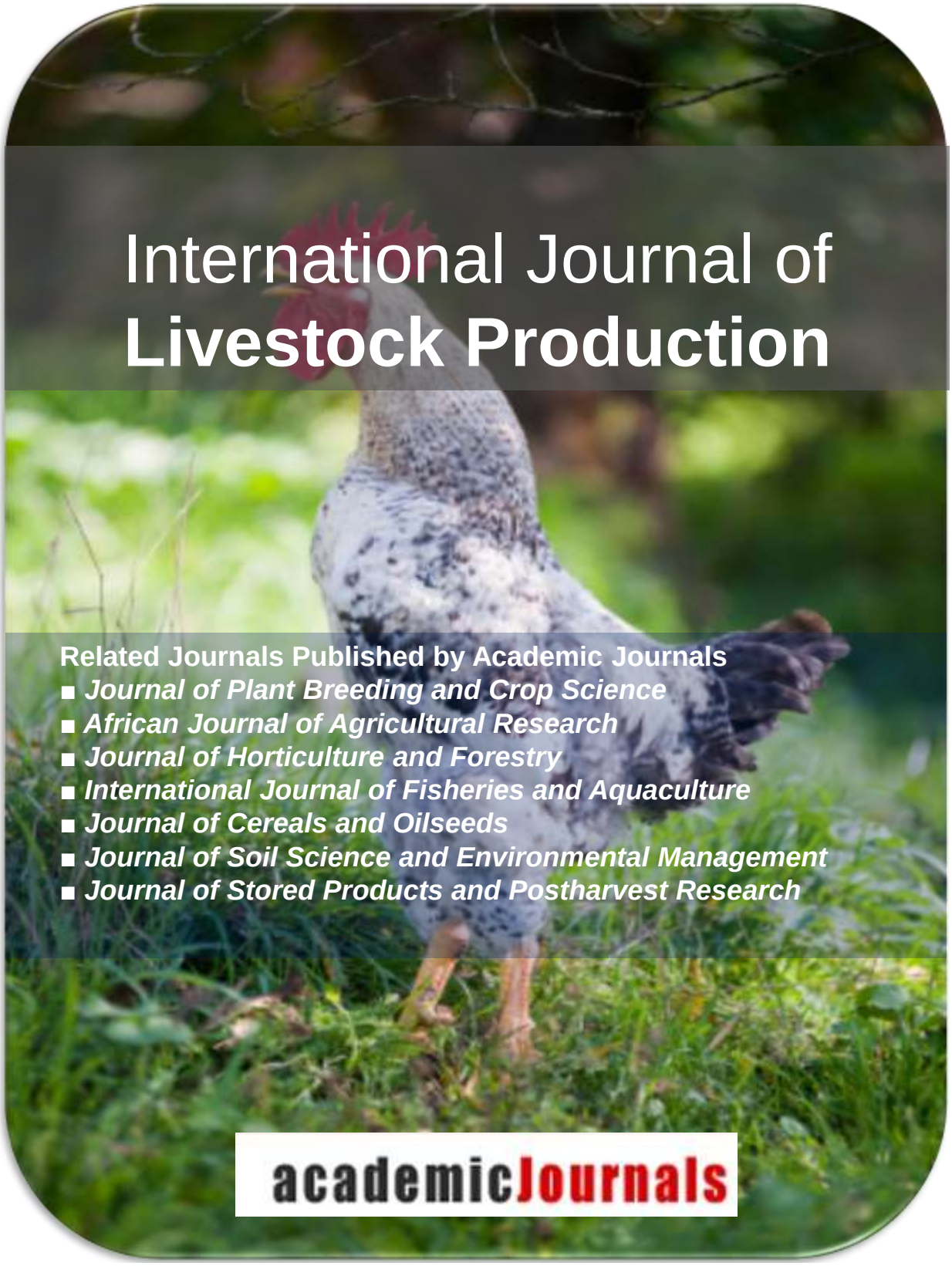

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