Animal health care delivery to small ruminants in peri-urban Ghana

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ABSTRACT

The study aimed at defining the problems of small ruminant keepers in peri-urban areas of Ghana regarding animal health care (AHC), and assessing the quality of the structure and process of the AHC system. Small ruminant keepers in four regions were surveyed using a questionnaire. In all 244 respondents in the Central (35.2%), Western (35.2%), Greater Accra (26.2%), and Ashanti (3.3%) regions were interviewed. Feeding animals was the major problem (31%) identified, followed by housing, diseases, destruction of crops by animals, lack of knowledge on management and high mortality, in decreasing importance. Most animal health needs of respondents were met by veterinarians and technical officers (59%), and by animal owners (34%). The majority (61%) said they had experienced no difficulty in getting help from government veterinarians or technical officers. Most services provided by the Veterinary Services Directorate, except meat inspection, were used by most respondents. The indicators of quality of delivery of veterinary services showed significantly higher proportions of respondents finding accessibility or equity to be poor; drug costs being expensive; services, vaccines and drugs being unavailable; and service charges being unaffordable. These are indicative of weaknesses in the AHC delivery system, which ought to be addressed.

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Introduction

Small ruminants are important in the agricultural economies of many developing countries by contributing to meat production. Small ruminants are kept as a source of meat, milk, skin, and fibre (Ademosun, 1989). Josserand (1985) noted that throughout Africa, but particularly in humid West Africa, small ruminants were primarily the sources of meat and meat products. Meat production from sheep and goats accounted for about 35 per cent of internal meat supplies in Ghana, and increased from 13,645 metric tonnes in 1983 to 18,817 metric tonnes in 1989 (Aryee *et al.*, 1991). Small ruminants perform important socio-cultural functions in many societies (Oppong, 1965).

In spite of their low productivity, relative to their high genetic potential, the local breeds of small ruminants in West Africa are highly efficient in terms of the objectives of the livestock keepers (Charry, Humbert & Levif, 1992). They are reared primarily to supplement income and provide meat, and may be slaughtered on special occasions or ceremonies such as Christmas and Moslem festival of Eid ul Adha (Mack, Sumberg & Okali, 1985). In peri-urban areas, sheep are fattened for sale for ceremonial feasts, generating income for the family. Odoi & Amevor (2003) observed that high fecundity, early maturity, greater turnover

rates, smaller space requirements, simple housing, and relatively cheaper supplemental feeding make peri-urban small ruminant keeping attractive.

The nature of small ruminant production in Ghana varies from an extensive, low-input scavenging type with free-roaming animals not being provided with housing or veterinary care to a more intensive system involving total confinement (Oppong, 1973; Ockling, 1987). Generally, there is high mortality and morbidity (Opasina, 1984; Adeoye, 1985). Ockling (1987) noted that the absence of or poorly constructed shelters exposed animals to environmental stresses and inclement weather, resulting in high prevalence of diseases, especially pneumonia and diarrhoea, during the rainy season. Pneumonias, including *Peste des petits ruminants,* are the most common diseases with high mortality, accounting for over 35 per cent of deaths in small ruminants (Opasina, 1984; Tuah *et al.*, 1988). Sheep and goats of all ages are affected, but lambs are more susceptible (Adeoye, 1985). Yet, the technology to control these diseases is available through provision of veterinary services. Adam *et al.* (1995) reported that a major constraint to small ruminant production in coastal Ghana was lack of veterinary services.

Rischkowsky, Bednarz & Jahn (2006) reported that it was unknown, in practice, if smallholders used opportunities to intensify and improve their production; and if livestock services to small ruminants were adequate. They noted that government services, such as vaccination campaigns, disease control and laboratory diagnosis, were unavailable to urban sheep keepers in Cameroon. The services available for peri-urban sheep keepers were prevention of parasites, sale of drugs, meat inspection, and castration. They concluded that the potential contribution of sheep production to income and food security was limited by access to services and general lack of organisation. They argued that an extended supply of services and better support for urban and peri-urban sheep keepers could help build the knowledge and organisational support needed for preventing and treating diseases. Whether a similar situation prevails in Ghana is yet to be reported.

The findings reported here were part of a larger study involving livestock and poultry keepers published elsewhere (Turkson, 2008, 2009). The objectives of this paper were to define the problems of small ruminant keepers in peri-urban areas of Ghana regarding animal health care (AHC), and to assess the quality of the structure and process of the AHC system provided to small ruminants, while identifying steps for improvement. It is envisaged that the findings will help improve delivery of AHC to small ruminants.

Materials and methods

Study areas

Peri-urban areas in four regions of Ghana were chosen purposively: Ashanti Region (Kumasi Metropolitan Area and surrounding districts), Greater Accra Region (Accra and Tema Metropolitan Areas and Ga District), Central Region (Awutu-Efutu-Senya District), and Western Region (Shama-Ahanta East Metropolitan Area and surrounding districts). These regions are in the middle and southern parts of Ghana. They were selected for being the major peri-urban areas in Ghana.

Animal health care was provided officially in Greater Accra Region by graduate veterinarians and veterinary technical officers who were staff in the Veterinary Services Directorate (VSD) of MOFA, and seven private veterinary practices. The technical officers were products of the Pong Tamale Animal Health and Production College with certificates in animal health. In Ashanti Region, AHC was provided by VSD staff and two private practices. In Western and Central regions, AHC was provided officially by staff of VSD. In all these areas, it was common knowledge that VSD staff were "moonlighting"; that is, providing private services unofficially (Turkson & Brownie, 1999).

Sampling procedure

Livestock or poultry keepers visiting government or private veterinary clinics for assistance, or to purchase vaccines were chosen purposively to be interviewed, in the absence of or unreliable list of animal owners in the study areas to serve as sample frames for structured sampling design. Others were identified with the help of staff of Ministry of Food and Agriculture in the chosen areas. The snowball technique was adopted in which farmers who were visited on their farms identified other livestock or poultry keepers in the area who were then visited and interviewed. The targeted numbers were 150 each for Ashanti and Western regions, and 300 each for Greater Accra and Central regions. These were set on the basis of availability of enumerators (one each for Ashanti and Western regions, and two each for Greater Accra and Central regions, each targeting 150 respondents).

Survey instrument and administration

The instrument used was a questionnaire developed and tested in Cape Coast on 15 livestock and poultry keepers. The questionnaire had 25 questions (14 close-ended, 11 open-ended) covering socio-economic profile of respondents, animal demographics and management, services used and the providers, and quality of animal health care service indicators (effectiveness, efficiency, accessibility, quality, equity, affordability and availability of services, staff attitude, technical competence of staff, charges for services, and availability and cost of drugs). Effectiveness was defined as how effective the veterinary services were in reducing mortality, disease, discomfort and dissatisfaction. Efficiency was defined as how well the available resources were used to achieve desirable results. Accessibility was defined as the ability of the individual to reach and obtain services. Quality of services was defined as degree to which services met the client's expectations. Equity was the fairness of distribution of services. Staff attitude dealt with interpersonal relations shown by staff. Technical competence was defined as the knowledge, skills and actual performance of professionals. Affordability was the ability of client to pay for services, whilst availability of services was defined as services being provided when needed. Likert-scale types of answers were adopted for the indicators.

Six enumerators were trained to administer the questionnaire. Pre-testing was done in Cape Coast after which two questions were dropped for lack of clarity. The questionnaires were administered in English for those who were literate, and in the local languages (Twi, Fante or Ga-Adangme) for those with difficulties in the English language. The questionnaires were administered between June and August 2005. Each questionnaire took on average 45 min to administer.

Data analysis

The analysis presented in this paper involved only those respondents identified as small ruminant keepers. The responses to the closed questions were coded and stored using Microsoft Excel software. These were imported into Statistix® software (Version 3.5, Analytical Software Inc., St Paul, MN, USA) and analysed using descriptive statistics. The open-ended responses were tallied manually and proportions calculated. Significance testing was done at 95 per cent confidence level.

Results

A total of 244 respondents identified themselves as small ruminant keepers. They were located as follows: Ashanti Region (3.3%), Greater Accra Region (26.2%), Western Region (35.2%), and Central Region (35.2%). The management systems used were extensive (0.4%), semi-intensive (88.1%), and intensive (11.5%).

The educational backgrounds and proportions in each category were as follows: no education, 19.7 per cent; basic (primary, middle or junior secondary school), 34 per cent; secondary (secondary, senior secondary, technical or

vocational schools), 33.2 per cent; and tertiary (post-secondary, polytechnic or university), 12.7 per cent.

Table 1 shows the animal holdings for the respondents.

TABLE 1

Descriptive Statistics of Animal Holdings for Small Ruminant Keepers in Peri-urban Ghana (n=244)

Species	*Mean*	*SD*	*Median*	*Range*	*95% CI*
Cattle	0.3	2.9	0	0-39	-0.02-0.70
Goats	16.8	15.1	15.0	0-120	14.9-18.7
Sheep	17.4	17.5	14.0	0-100	15.2-19.6
Pigs	1.0	12.9	0	0-200	-0.6-2.7
Poultry	5.1	27.0	0	0-300	1.7-8.5
Dogs	0.9	1.6	0	0-7	0.7-1.1

A higher proportion (30.7 per cent) identified feeding of animals as the foremost problem. The others (in decreasing proportions) were housing (23.0%), diseases (18.0%), animals destroying crops (13.5%), lack of drugs to treat animals (2.0%), lack of knowledge on management of animals (2.0%), and high mortality (1.6%); with no or non-specific problem being reported by 9.0 per cent of the respondents.

Table 2 shows the animal health services used by the respondents and the providers. Table 3 shows the frequency of use of veterinarians, veterinary staff, laboratory, or clinic over a 6-month period.

Asked who treated most sick animals in the community, 36.5 per cent of the respondents said veterinarians, 32.0 per cent said nobody in particular, 22.5 per cent said the owner, 4.1 per cent mentioned Community Livestock Workers (CLW), and 3.7 per cent said extension agent or technical officer, whilst the remainder (1.2%) stated staff of non-governmental organizations or others. Most needs of the respondents for animal health care were reported to have been met by veterinarians (56.1%), animal owners (34.0%), veterinary technical officers (2.9%), CLW (1.6%), other livestock farmers (1.2%), veterinary drug sellers (1.2%), or by no one in particular (2.9%).

Most (61.1%) respondents stated that they had no difficulty in getting help from a government veterinarian or technical officer. The ease of getting help was stated as follows: very easy, 10.7 per cent; easy, 53.7 per cent; difficult, 30.3 per cent; and very difficult, 5.3 per cent.

Table 4 shows the distances covered and times used in seeking animal health care.

Asked if they were willing to use a private provider if a private clinic was set up in their locality, the majority (85.2%, n=244) said "Yes".

As to how satisfied they were with delivery of veterinary services to their farms and homes, the proportions were as follows: very dissatisfied, 8.2 per cent; dissatisfied, 15.2 per cent; fairly satisfied, 29.5 per cent; satisfied, 39.8 per cent; and very satisfied, 7.4 per cent. The difference between the proportions dissatisfied (combining those very dissatisfied, dissatisfied and fairly satisfied, 52.9%) and satisfied (comprising those satisfied and very satisfied, 47.1%) was not significant.

Table 5 gives the proportions for the indicators of quality used in this study.

Discussion

Most (70%) of the respondents were from the Central and Western regions, with very few from

TABLE 2

Services Used and Providers as Indicated by Small Ruminant Keepers in Peri-urban Ghana (n=244)

Service	*Advice*	*Castration /Surgery*	*Deworming*	*Diagnosis*	*Meat inspection*	*Medicine*	*Spraying/ Bathing*	*Treatment*	*Vaccination*
% using service	63.9	62.7	83.2	68.0	3.7	84.8	68.9	73.4	68.0
Provider									
Not done at all (%)	36.1	37.3	16.8	32.0	96.3	15.2	31.1	26.6	32.0
Farmer (%)	6.6	41.4	50.4	31.1	1.2	2.0	56.1	33.2	9.4
Veterinarian (%)	51.2	17.6	30.3	34.0	2.5	44.3	12.3	36.9	56.6
Vet. staff (%)	1.6	0.4	0	0	0	0.4	0	0.4	0.4
Vet. shop (%)	0	0	0.8	0.4	0	22.1	0.4	0.8	0.4
Chemical seller (%)	0.4	0	0.4	1.2	0	15.2	0	1.6	0
Others (%)	4.1	3.3	1.2	1.2	0	0.8	0	0.4	1.2

the Ashanti Region. These two areas have relatively lower proportions of poultry producers (Turkson, 2007, unpublished data); therefore, small ruminants could have been preferred or used as alternatives to poultry production.

The semi-intensive system of management was more popular, similar to other reports (Turkson, 1992; Adam *et al.,* 1995; Odoi & Amevor, 2003). Local government bye-laws restricted free-roaming of animals, and theft of free-roaming animals was a primary cause of stock losses in peri-urban and urban areas (Odoi & Amevor, 2003). The semi-intensive system involved confinement for the night in shelters provided by owners, with the animals being released in the morning to be herded or left to roam on their own. Reports indicate death due to ruminal impaction from swallowing of plastic bags found on rubbish dumps in urban and peri-urban areas as a result of animals roaming about (Ademosun, 1992; Addo-Kwafo *et al.*, 2000).

The educational level of the respondents was varied. However, as high as one in five had no formal education and were, therefore, considered illiterates. This could hamper effective delivery of veterinary services as lack of education could serve as a barrier to effective communication and decision-making (Chilonda & Huylenbroeck, 2001; Ensor & Cooper, 2004). Odoi & Amevor (2003) noted that illiteracy constituted a strong barrier to easy acceptance and diffusion of innovation in production and management.

The mean animal holdings of 17 goats or sheep were high compared to those reported by Turkson (1992) or the World Bank (1992) for Ghana. This might be due to the popularity of small ruminant meat in urban areas, especially during festive occasions.

The three major problems identified as constraints were feeding of the animals, housing, and diseases. These were similar to findings reported by Adam *et al.* (1995) and

TABLE 3

Frequency of Use of Veterinarians, Veterinary Staff, Laboratory, or Clinic Over a 6-month Period by Small Ruminant Keepers in Peri-urban Ghana (n=244)

Veterinary activity	*Number of times used*				
	0	*1-5*	*6-10*	*11-15*	*> 15*
Advice	36.5	36.1	5.3	13.9	8.2
Spraying/bathing	88.9	9.0	0.4	0.8	0.8
Castration	85.7	13.5	0.8	0	0
Diagnosis	62.3	32.8	4.1	0.4	0.4
Meat inspection	96.7	2.9	0.4	0	0
Post-mortem	92.6	6.6	0	0.8	0
Purchase of vaccines	41.8	52.5	3.7	0.4	1.6
Medicine	35.7	36.9	2.5	5.3	19.7
Surgery	96.7	3.3	0	0	0
Vaccination	40.2	56.1	3.3	0.4	0

TABLE 4

Distances Covered and Times Used by Small Ruminant Keepers in Seeking Animal Health Care in Peri-urban Ghana (n=244, Except for Help Where n=240)

Distance/Time	*Mean*	*SD*	*Median*	*Range*	*95% CI*
Veterinary clinic (km)	6.3	8.6	2.0	0-50	5.3-7.4
Technical Officer (km)	4.2	18.6	1.0	0-200	1.9-6.5
Medicine (km)	4.8	8.2	2.0	0.50	3.8-5.8
Help (h)	15.3	26.4	7.5	0-232	11.9-18.6
Medicine (h)	1.0	1.7	1.0	0-24	0.8-1.2

Turkson & Amakye-Ansah (2005). Destruction of crops or properties by animals was high on the list, being associated with practices in which animals are released unherded.

Most of the services provided by the Veterinary Services Directorate in Ghana, apart from meat inspection, were used by most respondents (Table 2). However, high proportions of keepers did castration, deworming, diagnosis, spraying, and treatment by themselves. Although slightly more than half of the respondents had their needs met by veterinarians, one in three of the respondents used self-medication to meet their needs. Self-medication is a practice whereby clients purchase drugs and administer them to their animals without consulting veterinary staff (Turkson, 2004). As to who treated most animals in the community, there was no significant difference between those saying nobody in particular (32%) and those mentioning veterinarians and technical officers (40%). Apart from purchase of drugs for which about 28 per cent of the respondents used veterinarians or veterinary facilities over five times in a 6-month period, all the other services were either not used or were used on few occasions (five or less times) by most respondents.

TABLE 5

Indicators of Quality of Veterinary Services as Assessed by Small Ruminant Keepers in Peri-urban Ghana

Indicator	*Good*		*Poor*		*z-score*	*p*
	n	*%*	*n*	*%*		
Effectiveness	149	61.1	95	38.9	4.81	<0.01
Efficiency	167	68.4	77	31.6	3.38	<0.01
Accessibility	96	39.3	148	60.7	4.64	<0.01
Quality of services	146	59.8	98	40.2	4.26	<0.01
Equity	61	25.0	183	75.0	10.95	<0.01
Staff attitude	165	67.6	79	32.4	7.70	<0.01
Technical competence	160	65.6	84	34.4	6.69	<0.01
	Reasonable		Expensive			
Service charge	124	50.8	120	49.2	0.27	0.79
Drug costs	155	63.5	89	36.5	5.88	<0.01
	Available		Unavailable			
Services	96	39.3	148	60.7	4.62	<0.01
Vaccines	97	39.8	147	60.2	4.44	<0.01
Veterinary drugs	107	43.9	137	56.1	2.63	0.01
	Affordable		Unaffordable			
Services	107	43.9	137	56.1	2.63	0.01
	Met		Unmet			
Client needs	124	51.0	119	49.0	0.36	0.72
	Easy		Difficult			
Getting help	157	64.4	87	35.6	6.25	<0.01

These findings raise questions about the impact of veterinarians and veterinary services in AHC delivery in peri-urban Ghana; because although services were provided, patronage was low, as explained by the significantly higher proportion of respondents (66%) perceiving services to be unavailable. Possibly, the range of services available had not been well publicised, leading to perceptions of unavailability and therefore, low patronage. In contrast to the finding in this study, a study in a part of Accra reported that most respondents (60%, n=30) used veterinary services (Odoi & Amevor, 2003).

When asked if they had difficulties in getting help from government services, the majority (61%) said no. It is, therefore, necessary to investigate why the majority did not use veterinarians or were not using services frequently. This may point to disaffection with government services. When asked if they were willing to use private providers, most respondents (85%) said yes. The private sector is said to be more efficient in providing services than government services (Leonard, 1993), raising the expectation of clients. However, the agreement between having difficulty in getting help from government veterinary services and being willing to use private providers was slight (kappa statistic of 0.085), and does not provide support for an argument that the respondents were more willing to use private providers because they had difficulty in getting help from the public AHC delivery system.

In general, most respondents (64%) found getting help when needed to be easy or very easy. The mean distances travelled to get to a veterinarian, technical officer, or for medicine varied from 4 to 6 km, which was reasonable. Whereas it took a mean time of about 1 h to get medicine, it took about 15 h to get help for sick animals. Physical distance did not seem to be a major constraint, although it is said to influence transaction cost and may be a deterrent to the veterinary help-seeking process if distances are unreasonable or communication networks (roads or transport) are poor (Woods, 2000; Woodford, 2004).

The indicators of quality of delivery of veterinary services showed significantly higher proportions of respondents finding accessibility or equity to be poor; drug costs being expensive; services, vaccines, and drugs being unavailable; and service charges being unaffordable. These point to weaknesses in the delivery system, which ought to be addressed.

Conclusion

The study identified challenges in the delivery of AHC to small ruminant keepers in peri-urban Ghana, which need to be addressed to improve client satisfaction or to meet the needs of clients satisfactorily. The challenges included poor accessibility and equity of services, unavailability of services, high cost of drugs, and service charges perceived to be unaffordable. These call for a thorough evaluation of the delivery system as provided by the VSD, making it more responsive to the needs of the clients. The VSD needs to be better funded to meet its mandate of preventing and controlling diseases affecting animals to increase livestock production and productivity and protect humans from zoonotic diseases.

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REFERENCES

Adam, I., Turkson, P. K., Apori, S. O., Agbesinyale, P., Awuma, K. S. & **Micah, J. A**. (1995) *Study of traditional small ruminant production systems in 2 districts of Central Region of Ghana. Phase I. Diagnostic survey.* Report to National Agricultural Research Project, Ghana.

Addo-Kwafo, A., Bruce, J., Gaari-Kweku, J. & **Teye, G.** (2000) *The socio-economic impact of small ruminants and guinea fowls on poverty alleviation in the Northern Region*. NLSP Appraisal Report 2000.

Ademosun, A. A. (1989) Achievements, difficulties and future prospects in small ruminant development in the tropics. *Proceedings of the 6th International Conference of Institutes for Topical Veterinary Medicine*, Wageningen, The Netherlands pp. 39-42.

Ademosun, A. A. (1992) Constraints and prospects of small ruminant research and development in Africa. In *Proceedings of 2nd Biennial Conference of the African Small Ruminant Network* (ed. S. H. B. Lebbie, B. Rey and E. K. Irungu), Arusha, Tanzania.

Adeoye, S. A. O. (1985) Disease profiles of sheep and goats in two groups of villages in southwest Nigeria. In *Sheep and goats in humid West Africa: Proceedings of Workshop on Small Ruminant Production Systems in Humid Zone of West Africa*, pp. 13-21. ILCA, Addis Ababa, Ethiopia.

Aryee, A. K., Vordzorgbe, S. D., Allotey, J. A., Kutame, K. & **Obuobi, E.** (1991) *Ghana National Livestock Development Project. Phase II. Preparation Project Paper.* Submitted to the Government of Ghana/MOFA and the World Bank.

Charry, J., Humbert, J. M. & **Levif, J.** (1992) *Manual of sheep production in the humid tropics of Africa.* Vol. **111**. CRED, University of Michigan, Ann Arbor, Michigan, USA.

Chilonda, P. & **Van Huylenbroeck, G.** (2001) A

conceptual framework for the economic analysis of factors influencing decision-making of small-scale farmers in animal health management. *Rev. sci. tech. Off. Int. Epiz.* **20**, 687-700.

Ensor, T. & **Cooper, S.** (2004) Overcoming barriers to health service access: Influencing the demand side. *Health Policy and Planning* **19**, 69-79.

Josserand, H. P. (1985) A strategy for small ruminant development in Africa. In *Sheep and goats in humid West Africa. Proceedings of Workshop on Small Ruminant Production Systems in the Humid Zone of West Africa* (ed. J. E. Sumberg and K. Cassaday). ILCA, Addis Ababa. pp. 6-10.

Leonard, D. K. (1993) Structural reform of the veterinary profession in Africa and the new institutional economics. *Dev. Change* **24**, 227-267.

Mack, S. D., Sumberg, J. E. & **Okali, C.** (1985) Small ruminant production under pressure: The example of goats in south-east Nigeria. In *Sheep and goats in humid West Africa* (ed. J. E. Sumberg and K. Cassaday). ILCA, Addis Ababa. pp. 47-52.

Ockling, S. (1987) Position paper on sheep and goat production in Ghana. *FAO Animal Production and Health Paper* **70**, 208-214.

Odoi, F. N. A. & **Amevor, E. K.** (2003) Peri-urban small ruminant production: A case study of the Okaikoi-North District of Accra. *Proceedings of 13th Biennial Conference of the Ghana Society of Animal Production.* pp. 65-69.

Opasina, B. A. (1984) *Disease constraints in village goat production in southwest Nigeria* (unpublished M Phil Thesis). University of Reading, UK.

Oppong, E. N. W. (1965) A note on goats in Ghana with reference to the need to develop goat husbandry to improve the nation's diet. *The Ghana Farmer* **9,** 144-149.

Oppong, E. N. W. (1973) Diseases of sheep in Ghana. *Ghana Jnl agric. Sci.* **6**, 3-7.

Rischowsky, B., Bednarz, K. & **Jahn, G.** (2006) Peri-urban sheep production in West Africa: Do smallholders benefit from proximity of the urban centres? *Small Ruminant Research* **66**, 22-31.

Tuah, A. K., Osei Amaning, E., Owusu-Aduonu & **Asare, K.** (1988) Mortality rates of sheep in the Lake Bosomtwe District in Ashanti Region of Ghana. In *Proceedings of the 18th and 19th Animal Science Symposia*, pp. 30-40. UST, Kumasi, 24th to 27th August 1988.

Turkson, P. K. (1992) The practices and problems of rural women involved in small ruminant production. *Proceedings of West African Commonwealth Veterinary Association/Ghana Veterinary Medical Association Conference,* Accra. pp. 20-30.

Turkson, P. K. (2004) Perceptions of livestock owners of private veterinary practice in Ghana. *Tropical Animal Health and Production* **36**, 427-434.

Turkson, P. K. (2008) Client's assessment of animal health care delivery in peri-urban Ghana. *Revue scientifique et technique. OIE* **27**, 731-740.

Turkson, P. K. (2009) Client's satisfaction with delivery of animal health services in peri-urban Ghana. *Preventive Veterinary Medicine* **90**, 153-159.

Turkson, P. K. & **Brownie, C. F.** (1999) Perceived constraints to privatisation of delivery of veterinary services in Ghana. *Tropical Animal Health and Production* **31**, 103-114.

Turkson, P. K. & **Amakye-Ansah, J.** (2005) Comparison of veterinary needs of ruminant livestock owners in livestock and non-livestock-producing areas in Ghana. *Ghana Jnl agric. Sci.* **38**, 19-38.

Woodford, J. D. (2004) Synergies between veterinarians and para-professionals in the public and private sectors: Organisational and institutional relationships that facilitate the process of privatising animal health services in developing countries. *Rev. sci. tech. Off. int. Epiz.* **23**, 115-135.

Woods, P. S. A. (2000) The importance of proximity, transport and gender as transaction costs in the use of veterinary services in Zimbabwe. In *Africa's changing markets for health and veterinary services: The new institutional issues* (ed. K. A. Leonard), pp. 67-92. MacMillan Press Ltd, London.

World Bank (1992) Staff appraisal report. Republic of Ghana. National Livestock Services Project. Report No.11058-GH. The World Bank, Washington DC.