

Questionnaire survey on urban and peri-urban livestock farming practices and disease control in Kisumu municipality, Kenya

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ABSTRACT

To characterise the urban livestock keeping practices and constraints in Kisumu municipality, Kenya, a questionnaire survey was carried out. Thirty-four contact farmers were interviewed on general farm characteristics and production constraints. The farming activities were categorised as either livestock only (41 %), or mixed crops and livestock (59 %). The surveyed farmers kept mainly cattle (100 %), chickens (82 %) and goats (74 %). Most (94 %) of the farmers had kept livestock for prolonged periods mainly for income generation (97 %) and domestic consumption (59 %). These data show that livestock keeping was popular and could be harnessed to increase food security, although the farmers kept mainly low-producing indigenous cattle (98 %) which were grazed on unutilised land. The main production constraints mentioned by farmers included diseases (100 %), poor fertility (68 %) and lack of feed (56 %). The diseases varied with species of ruminants and included lumpy skin disease (71 %), diarrhoea (65 %) and helminthosis (62 %). The source of advice on management and treatment of the livestock was almost equally from private and government veterinary personnel. To improve livestock productivity, it is recommended that key stakeholders address the constraints mentioned in this study and in particular that the occurrence of diseases should be investigated with a view to developing sustainable control strategies.

Keywords: constraints, diseases, Kisumu, Kenya, livestock, production, urban farming.

Kagira J M, Kanyari P W N **Questionnaire survey on urban and peri-urban livestock farming practices in Kisumu municipality, Kenya.** *Journal of the South African Veterinary Association* (2010) 81(2): 82–86 (En.). Trypanosomiasis Research Centre, Kenya Agricultural Research Institute, PO Box 362, Kikuyu, Kenya.

INTRODUCTION

The poverty rate as well as undernourishment is increasing in most sub-Saharan African countries¹⁶. It is expected that by the year 2015, about half of the African population will be living in urban centres and poverty will have increasingly moved from rural to urban areas^{14,16,17}. With the declining purchasing power in the urban areas, many urban households have responded with diversification of income sources, the most notable one being urban agriculture². Rapid expansion of urban farming has been noted in cities such as Dar es Salaam, where there was an increase from 18 % of the families engaged in agriculture in 1967 to 67 % in 1991, of which 74 % kept livestock⁶.

In most cities, the development of urban

livestock production is unplanned and in densely populated neighbourhoods. There is a growing concern that it is creating health and environmental hazards^{17,18}. Therefore, urban livestock keeping is often declared illegal, although enforcement of this has not been successful⁷. The local by-laws frequently date back over 100 years (Kisumu municipality by-laws on livestock were last reviewed in 1907) and forbid all agricultural activity within the boundaries of urban centres⁷. In spite of the illegality, urban livestock keeping is usually tolerated as long as it does not become a nuisance. Indeed, in some urban cities, for example Dar es Salaam and Kampala, authorities are encouraging the practice of Urban Agriculture (UA) in order to raise food-supply levels^{4,6}. The purpose of the current study was to characterise the urban livestock keeping practices and constraints in Kisumu municipality, Kenya. Such information is important in assessing the needs of the farmers, the importance of livestock in improving the household and urban livelihoods, and also to inform policy.

MATERIALS AND METHODS

Study area

Kisumu, the 3rd-largest city in Kenya, is a regional capital and an administrative, commercial and industrial centre for the Lake Victoria basin. The population of the Municipality rose from 32 431 in 1969 to 322 734 in 1999^{12,13}. Currently, the population is estimated at 500 000 people with a growth rate of 2.8 % per annum. About 60 % of Kisumu's population lives in slums and a further 60 % of the population residing in the municipality are involved in some form of urban agriculture and livestock keeping^{17,18}. In fact, almost 80 % of Kisumu's municipal land area is rural in nature⁷.

Selection of study sites and farms

Field visits were undertaken between July and August 2007. The study sites and farms were purposively selected in collaboration with the government extension and administration officers. The visited sites were headed by a village/ward chairperson and were selected on the basis of having a higher concentration of livestock keeping in urban and peri-urban areas. These sites included Nyamasaria, Nyalenda, Obunga, Manyatta, Mamboleo and Otonglo, located in Chiga, Nyalenda, Kanyakwar, Manyatta and Kolando sub-locations respectively. The Nyalenda, Obunga and Manyatta sites were within urban areas while Nyamasaria, Mamboleo and Otonglo were in a peri-urban area of Kisumu city. Nyalenda and Obunga were densely populated and are mainly regarded as slums¹⁸. At each study site, the farmers were randomly selected from a list prepared from the previous vaccination campaigns by the veterinary office in Kisumu. Of 150 listed farmers, 40 were randomly selected, of whom 34 were interviewed as the others were not available.

Questionnaire survey

A structured questionnaire was prepared and pre-tested before administration to the selected households. The questionnaire addressed the following: demogra-

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Received: July 2008. Accepted: April 2010.

phy, size of land and ownership, livestock kept on the farm, production system, management practices, milk production, production constraints and common diseases at farm level. The questionnaire was administered to the household head or any other mature person (if the household head was not available) using the *Kiswahili* language, which is common in the area. For farmers who were unable to understand *Kiswahili*, the questionnaire was administered in the *dholuo* language by one of the extension officers.

Data entry and analysis

The responses to the questionnaires were entered into a computer spreadsheet, Microsoft Excel® (Microsoft Corporation, USA) followed by descriptive analysis undertaken using Statview® Version 5.0.1 (SAS Institute Inc., 1995–1998, Cary, NC, USA).

RESULTS

Origin of households sampled and their characteristics

A total of 34 farmers were interviewed in the following sub-locations: Nyalenda (18 %), Obunga (32 %), Korando (15 %), Manyatta (9 %), Wathorego (9 %), Nyamasaria (18 %) (see Fig. 1). Most of the livestock farmers were from Obunga where there are large open areas of pastures. Male-headed households (79 %) were more common than those headed by females (21 %). The mean age of the farmers was 57.7 years (range = 35–83), with the majority (85 %) being more than 45 years old. The mean household size was 9.3 (range = 1–28) persons, with the majority of the homesteads having a size ranging from 1–12 persons. The level of education of the household head (HH) ranged from none (15 %), lower primary (21 %), upper primary (35 %), secondary (24 %) and tertiary level (9 %).

The farming activities involving the HH were categorised as either livestock (41 %), or both crops and livestock (59 %). The HH also involved themselves with other activities including shop/kiosk selling (18 %), livestock trading (12 %), building houses (masonry and carpentry) (15 %), fishing (6 %), formal employment (15 %). Eleven household heads (32 %) did not engage in other enterprises and were purely involved in livestock keeping. All the land was privately owned and in the majority of cases (56 %) the farm size (plot or allotment size) was less than an acre. Those whose farm size ranged between 1 and 2 acres were 9/34 (26 %), while 6/34 (18 %) farmers had a farm size of more than 6 acres. The targeted farmers were those keeping mainly cattle but in

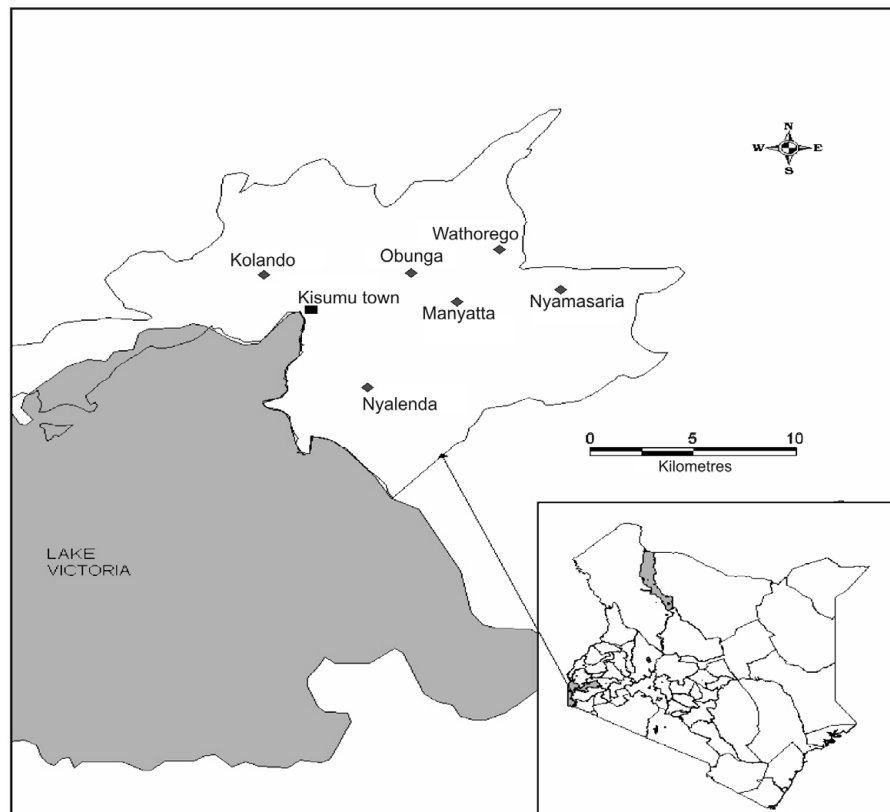


Fig. 1: Map of Kisumu Municipality showing the study sites.

descending order the number of livestock kept by the farmers included cattle, chicken, goats, ducks, sheep and pigs (Table 1). Most (98 %) of the cattle were of the indigenous type, with farmers indicating that the exotic animals (2 %, Holstein and Ayreshire breeds) were capital- and labour-intensive and therefore undesirable to keep.

Most (94 %) of the farmers had been keeping livestock on their farms for a period of more than 5 years. The reasons for keeping the livestock (cattle, sheep and goats) included: source of income (97 %), domestic consumption (59 %) and cultural considerations (funerals, dowry etc.) (29 %). Cattle and small ruminants were mainly owned by the male spouse (97 %). The ownership of pigs was by the male spouse (67 %) and son (33 %), while that of poultry was by both the male (59 %) and female (41 %) spouse.

Most farmers (94 %) grazed their rumi-

nants in the free open spaces in the municipality. These open spaces included unutilised government/municipal lands, roadsides, undeveloped private lands (mainly plots) and rubbish dumping sites. A small proportion (6 %) of farmers undertook zero-grazing where exotic animals were kept in stalls and fed on fodders and commercial feeds. The reasons given by farmers for the preference for a specific farming system included increased productivity (68 %), availability (27 %) and reduction in disease challenge (6 %). The source of labour for grazing and milking the cattle was mainly hired help (76 %) rather than family members (24 %). Housing (night boma for ruminants) that was surrounded by timber was provided by 76 % of the farmers (Table 2). Only the zero-grazing shed had concrete floors, while the rest of the night-bomas had floors of natural earth. The majority (59 %) of the farmers did not

Table 1: Distribution of the number of livestock kept by the farmers (n = 34) in Kisumu municipality.

Livestock	Total livestock	Mean of livestock per farmer (range)	Frequency (%)
Cattle	510	15.0 (2–45)	34 (100 %)
Pigs	39	1.2 (0–30)	3 (9 %)
Sheep	92	2.7 (0–17)	16 (47 %)
Goats	317	9.3 (0–80)	25 (74 %)
Chicken	414	12.2 (0–50)	28 (82 %)
Ducks	118	3.4 (0–20)	17 (50 %)

supplement their ruminants with feeds other than natural grazing (Table 2). The rest of the farmers supplemented the animals with left-overs from the markets (18 %), brewers waste (*machicha* in Kiswahili), commercial feed (9 %) and self-grown Napier grass (6 %). The water sources for the livestock included local rivers (59 %), local wells (41 %), tap water (35 %), floodwater/pans (18 %) and lake water (12 %) (Table 2).

In total, 33 farmers were milking their animals, and primarily used the milk for domestic consumption (91 %). The average volume of milk produced per cow per day was 2.7 l, while the average volume of milk consumed at household level was 2 l (range = 0.3–5 l). Seventeen (50 %) farmers sold milk to hotels and neighbours. The mean selling price milk was US\$ 0.4 per litre (range = 0.14–0.6) and the average quantity sold was 10.1 l (range = 0.6–56) daily.

Constraints to livestock production

In descending order, the production constraints mentioned by farmers included: diseases (100 %), poor fertility/low genetic potential (68 %), lack of feed (56 %), conflict with local authorities and neighbours (53 %), inadequate veterinary services (41 %), stock theft (18 %), lack of water (9 %) and lack of labour (3 %). Most of the farmers obtained replacement cattle either from other farmers (79 %) or local markets (21 %). The purchased cattle were walked to and from the local markets, which were close to the farms (5–10 km). The marketing constraints were categorised as: low prices (35 %), inadequate markets (32 %) and presence of middle men (29 %) who often dictated the prices to the farmers. Other marketing constraints included lack of credit (9 %) and poor infrastructure (3 %).

The farmers mentioned that the most common diseases in cattle were lumpy skin disease (LSD) (71 % of the farmers), diarrhoea (65 %), helminthosis (62 %), foot-and-mouth disease (FMD) (32 %), and respiratory conditions (32 %) (Table 3). The farmers identified these diseases using either local names or by clinical signs, whose real name was interpreted by veterinary extension officers. The disease vectors which were mentioned by farmers included tsetse flies (12 %) and ticks (24 %).

Twenty-five (25) farmers were keeping small ruminants. The main diseases included diarrhoea (68 %), intestinal worms/flukes (64 %), unthriftiness (referred to as 'thin-shoats disease' by the farmers) (20 %), respiratory conditions manifesting as coughing and pneumonia (20 %), heartwater (16 %) and sudden

Table 2: Distribution of the type of housing, supplemented feed and water source amongst urban farmers ($n = 34$) in Kisumu municipality.

Variable	Frequency	Percentage
Type of housing		
Wooden shed	26	77
None	8	24
Type of supplemented feed		
No supplement	20	59
Commercial supplement	3	9
Market and kitchen left-overs	6	18
Brewer's waste (<i>Machicha</i>)	4	12
Hay/Napier grass fodders	2	6
Water source (livestock)		
Tap water	12	35
Local well/borehole	14	41
Local rivers	20	59
Floodwater/water pans	6	18
Lake water	4	12

Table 3: Distribution of diseases common in cattle as mentioned by farmers ($n = 34$).

Diseases/parasites	Frequency	Percentage
Lumpy skin disease	24	71
Trypanosomosis	4	12
Helminthosis	21	62
Diarrhoea	22	65
Footrot	8	24
Foot-and-mouth disease	11	32
Mastitis	3	9
Redwater (<i>Alemo</i> in local dialect)	8	24
Anaplasmosis	3	9
East Coast fever	3	9
Heartwater	3	9
Respiratory conditions	11	32
Plastic consumption/impaction	7	21
Wounds	3	9

death (12 %). Other conditions that were mentioned by the farmers included wounds (8 %), footrot (8 %), abortion (4 %), FMD (4 %) and impaction of stomach by polythene bags (4 %).

Only 3 pig farmers were interviewed in the study, owing to the decimation of the pig population by a recent (November 2006 – February 2007) African swine fever epidemic in Kisumu municipality and neighbouring districts⁹. The common diseases mentioned by farmers were African swine fever (100 %), respiratory distress manifesting mainly as coughing (100 %), mange (67 %), worms (33 %), diarrhoea (33 %) and FMD (33 %). The farmers mentioned that the most common diseases in chickens were Newcastle disease (100 % of the farmers) and respiratory distress, which mainly manifested as coughing (40 %).

The farmers sought advice on management and treatment of the livestock from private veterinarians (56 %), government

veterinary officers (50 %) and Agro-veterinary shops (6 %). The distance to the nearest veterinary services was categorised as 3–5 km (91 % of the farmers) and less than 2 km (9 %). Twenty-seven percent (27 %) treated the animals on their own, mainly using stock remedies sourced from chemists and Agro-veterinary shops. Fifteen percent (15 %) used unidentified ethno-veterinary products. Sixteen (47 %) farmers were able to describe the cost of treatment for their livestock. The mean cost of treatment per year for these 16 farmers was US\$ 31.2 (range: 0–171.4).

DISCUSSION

Kisumu city experiences exceptionally high food poverty (53 %), which is defined as the percentage of the population that is unable to afford or have reasonable access to food which provides a healthy diet^{3,17}. In Kenya, other cities and towns that have lower food poverty include

Nairobi (8 %), Mombasa (30 %) and Nakuru (30 %) ¹⁷. Most of the food consumed in Kisumu city comes from neighbouring provinces, which is in contrast to other cities in Africa (e.g. Dar es Salaam and Nairobi) where urban and peri-urban agriculture has contributed to urban food security ¹⁷. In contrast to peri-urban areas where land sizes are larger, the majority of the urban farmers, especially in slums, had small land sizes (plots) and some claimed to be 'squatters', which could complicate planning interventions. This is similar to a study undertaken in Kumasi city in Ghana, where 85 % of the livestock enterprises were on small plot-sized parcels of land ¹¹. The majority (94 %) of the farmers in the current study grazed their animals in open land spaces, especially government and municipal lands. The presence of unfenced open land often serves as encouragement for urban livestock keeping. Grazing of livestock by the roadsides and in rubbish dumps is not only a nuisance, but also poses a risk of transmission of zoonotic diseases.

As in other African societies, most of the families in the current study were male-headed ^{6,8}. In the current study, most farmers were more than 45 years old and had been keeping livestock for a period of more than 5 years. The majority of the farmers had an educational level ranging from lower primary to tertiary, which might make it easier to educate them on improved livestock production. The types of animals kept by the farmers included ruminants, pigs, chicken, ducks, dogs and cats. A similar range of animals has been reported in other urban studies ^{6,8}. Ownership of the animals was mainly due to their economic value and the results of this study are similar to others in Africa where men mainly owned cattle, sheep and goats, while women mainly owned the backyard poultry ^{6,11}.

Most of the farmers kept indigenous cattle, which is in contrast to Nairobi and Nakuru in Kenya, where small-scale dairy farming with exotic breeds (mainly Holstein and Ayreshire) is common ⁵. In other African cities like Maseru in Lesotho, 94 urban producers contributed 40 % of the city's overall milk production ². In the current study, only 6 % of the farmers undertook zero-grazing, and this lack of intensive farming could be associated with lack of farmer education and transfer of technology. Exotic livestock is also severely affected by diseases which could deter farmers from keeping them ¹¹. On the other hand, indigenous livestock are often hardy and require low inputs ^{10,11,15}. Several market constraints could also be hindering livestock trading, including

low prices and the presence of middlemen. As suggested elsewhere, it would be important to determine the feasibility of micro-financing programmes in reducing poverty amongst the local people ¹⁷.

The main constraints to livestock production were animal diseases, poor fertility, lack of feed, conflict with local authorities and inadequate veterinary services. These constraints have been cited by other studies conducted in cities in developing countries ^{11,17}. Since the area is tropical, animals in Kisumu city are bound to suffer from a variety of parasitic diseases. The poor fertility can be addressed through better management and crossbreeding with improved breeds. Conflicts with local authorities and inhabitants are a common problem amongst livestock farmers in the cities ⁵. This arises from the fact that livestock keeping in the cities is illegal, although the government veterinary officers nevertheless attend to livestock when they are sick, in accordance with the control of notifiable and transboundary diseases.

Farmers indicated that the main diseases affecting cattle are LSD, diarrhoea, helminthosis, FMD and respiratory conditions. The LSD response was probably influenced by recollection of a recent outbreak of LSD in the area (Dr Makori, pers. comm. 2008). The local veterinarians indicated that LSD and FMD are endemic in the area and the spread of these diseases through illegal animal movements to local markets and abattoirs was suspected. The consumption of rubbish predisposes to sub-lethal poisoning and bacterial infections such as salmonellosis, all of which may lead to the reported diarrhoea. The farmers indicated that the main diseases affecting sheep and goats included diarrhoea, worms/flukes, unthriftiness and respiratory conditions. The high frequency (64–68 %) of farmers who indicated diarrhoea, helminthosis as well as unthriftiness ('thin sheep and goat disease') shows that the diseases should be further investigated.

The farmers interviewed mainly relied on both private (56 %) and government veterinary officers (50 %) for advice and treatment. In Kumasi, Ghana, 39 % of livestock keepers reported that they used the government veterinary service for animal health problems but they also carried out many treatments themselves ¹¹. In the current study, most of the extension service providers were located at a distance of 3–5 km from each farm and thus farmers would be able to walk to their premises and seek their services. This scenario is in contrast to that in Busia in rural Kenya, where farmers have to walk long distances to reach the veterinary ser-

vices ². The extension services in Kenya were privatised in late 1980s as part of the World Bank structural adjustment programmes ¹⁰. This led to a negative impact on veterinary service extension as most resource-poor farmers were unable to pay for the services of either government or private veterinarians ¹⁰. With the high level of poverty amongst the urban livestock farmers (average income in people living in slums in Kisumu is US\$30–40 per month ¹⁷), free or subsidised veterinary extension services could improve the control of major livestock diseases and thus improve food supply in the cities.

ACKNOWLEDGEMENTS

This work was funded by Lake Victoria Research Initiative (VICRES). The authors are grateful for technical assistance provided, Mary Wambui of the Department of Veterinary Pathology, Microbiology and Parasitology, University of Nairobi. Field logistics were provided by personnel of the Kisumu District Veterinary office, for which the authors are most grateful.

REFERENCES

- Bett B, Machila N, Gathura P B, McDermott J J, Eisler M C 2004 Characterization of shops selling veterinary medicines in a tsetse-infested area of Kenya. *Preventive Veterinary Medicine* 63: 29–38
- Greenhow T 1994 *Urban agriculture: can planners make a difference?* CFP Series Report 12, International Development Research Centre, Ottawa, Canada
- Greer J, Thorbecke E 2002 A methodology for measuring food poverty applied to Kenya. *Journal of Development Economics* 24: 59–74
- Ishagi N, Ossiya S, Aliguma L, Aisu C 2002 *Urban and peri-urban livestock keeping among the poor in Kampala City*. Ibaren Consultants, Kampala, Uganda
- Ishani Z, Gathuru P K, Lamba D 2002 *Scoping study of urban and peri-urban poor livestock keepers in Nairobi*. Mazingira Institute, Nairobi, Kenya
- Lupala A 2002 *Scoping study on urban and peri-urban livestock keepers in Dar es Salaam City*. University College of Lands and Architectural Studies, Dar es Salaam, Tanzania
- Mireri C, Atekyereza P, Kyessi A, Mushi N 2007 Environmental risks of urban agriculture in the Lake Victoria drainage basin: a case of Kisumu municipality, Kenya. *Habitat International* 31: 375–386
- Nugent R 2000 The impact of urban agriculture on the household and local economies, In Bakker N, Dubbeling M, Gündel S., Sabel-Koschella U, de Zeeuw H (eds). *Growing cities, growing food*. Deutsche Stiftung für Entwicklung, Eurasburg: 76–97
- OIE/WAHD 2007 ASF outbreak in Kenya. WAHID interface, OIE World Animal Health Database. Online at: <http://www.oie.int/wahid/> (accessed March 2009)
- Oruko L O, Upton M, McLeod A 2000 Restructuring of animal health services in Kenya: constraints, prospects and options. *Development Policy Review* 18: 123–138

11. Poynter G 2001 Findings into a survey of urban livestock in Kumasi Ghana. Msc thesis, University of Edinburgh, Edinburgh, UK
12. Republic of Kenya 2001 *Population and housing census*, 1999. Government Printer, Nairobi
13. Republic of Kenya 2004 *Kisumu municipality strategic plan*. Kisumu Municipal Council, Kisumu
14. Satterthwaite D 1997 *Urban poverty: reconsidering its scale and nature*. Background paper for the series of workshops on poverty reduction in urban areas organized by the International Institute for Environment and Development (IIED). IIED, UK
15. Touré Fall S, Cisse I 2000 Urban livestock systems in the Niayes zone in Senegal. *Urban Agriculture Magazine* 1: 17–19
16. UN 2007 *Millennium development goals of United Nations*. Online at: <http://www.un.org/millenniumgoals/> (accessed March 2009)
17. UNDP 1996 *Urban agriculture, food, jobs and sustainable cities*. United Nations Development Programme, New York
18. UNDP 2005 *Situation analysis of informal settlements in Kisumu. Cities without slums sub-regional programme for eastern and southern Africa. Kenya slum upgrading programme*. United Nations Development Programme, New York

Book review – Boekresensie

Veterinary education for global animal and public health

Coordinated by D A Walsh

2009. *Scientific and Technical Review of the World Organisation for Animal Health* 28(2): 439–872, OIE, Paris, France. Price €60. ISBN 978-92-9044-761-0

This 28th annual volume published by the World Organisation for Animal Health (OIE), addresses the need for a global shift in the way veterinary students are taught veterinary public health (VPH). As well as taking the lead in prevention and control of animal diseases, the OIE develops health and welfare standards to promote food security and equitable international trade in animals and animal products. It considers veterinary education to be a key component in the quality of veterinary services globally. Professor R E W Halliwell, from the University of Edinburgh, suggests that curricula in most veterinary colleges are conservative and traditional and slow to respond to societal demands. Thus it has taken two decades to recognise that there is a lack of expertise in VPH and training in this area has remained a low priority. Change is also impeded by overcrowded curricula. Another major challenge highlighted by Professor P G Wall, from the University of Dublin, which echoes what is happening in South Africa, is how to stimulate interest and make VPH relevant to undergraduate students, who may see their future only in clinical medicine and surgery. He includes the whole of EU regulation number 854/2004 as an appendix to his paper. This document lists the professional qualifications required for an official (state) veterinarian. As the EU is an important trade partner these competencies are relevant to South African graduates.

In line with the direction that has been taken by the OIE, this compendium of 49 papers aims at encouraging and facilitating curricular change in VPH, so as to include food safety and security, livestock welfare, wildlife and aquatic animal health,

ecosystem health, zoonotic diseases, global trade and risk analysis, epidemiology and veterinary management of disasters and emergencies. Donald Walsh, the coordinator of the *Review*, suggests that there is good evidence that a successful curriculum should be based on a defined set of competencies in knowledge, understanding, skills and professional attributes that all veterinary students should have attained and demonstrated by the time they graduate. A 2nd level of competency, is seen as that level required by those who devote their careers to global veterinary public health issues and would be considered specialists. The interdependence of humans, animals and the environment has prompted a view of VPH that is more holistic and collaborative, with an action-based approach to solutions for global problems. These include the rapid spread of animal disease due to global transport, emerging zoonoses and climate change, which is linked both to intensification of production systems and also causes habitat changes for livestock and wildlife. One of the great challenges facing those veterinarians qualifying today will be to produce safe food for the nine billion people who will inhabit the planet by 2050, without compromising the environment. This *Review* would be of considerable interest as a guide and reference, not only to academics but also to veterinarians working for the state veterinary services.

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