

Livestock In Development

Improving the Delivery of Animal Health Services in Developing Countries

A Literature Review

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of the United Kingdom

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Summary

The effective delivery of veterinary services to smallholder farmers is considered a key factor influencing the productivity of the livestock sector. Privatisation has been promulgated as a way of improving the availability and quality of animal health inputs to the livestock sector. An analysis of the economic properties of veterinary services suggests, however, that due to the 'public good' nature of certain services, the presence of externalities, unequal access to market information, and the economies of scale required to provide cost-effective services in rural areas, responsibility for providing many veterinary services is likely to remain under public jurisdiction. New approaches, beyond market-dependent privatisation, are therefore needed to improve the quality of service delivery.

This report describes alternative approaches to the delivery of veterinary services. It considers institutional reform measures to improve the performance of the public sector and reviews the potential role of the 'third sector', *i.e.* membership organisations (MOs), such as producers' associations, and non-membership organisations (NMOs), in providing services that might otherwise be considered the preserve of the state. Institutional reform measures designed to enhance the capacity of the state are compared and contrasted with the quality of services provided by the third sector.

The literature suggests that MOs and NMOs can provide a range of 'public good' veterinary services, including the control of some diseases with externalities, research and extension services. They are also able to provide clinical veterinary health care, drugs, vaccines and diagnostic services to small-scale producers in rural areas where, due to economies of scale, such services are not provided by the 'market-dependent' private sector. Although examples are given of the reported success of the third sector in different physical and economic environments, there is a lack of empirical evidence to quantify its relative merits.

A number of public-sector reform measures, including the introduction of cost-recovery measures, the subcontracting of government-funded programmes to the private sector and decentralisation, have been used to improve the performance of state veterinary services. In the absence of quantitative measures of performance, it is difficult to compare the relative effectiveness of these measures against alternative options for delivery presented by MOs and NMOs.

Certain services, such as drug quality control, the maintenance of food safety standards and the provision of disease surveillance and quarantine stations, do not appear to be provided by either the private or the third sector. The state is therefore likely to retain these important regulatory functions.

The review concludes that there is no panacea for the improvement of service delivery in the livestock sector. The relative capacity of the public and third sectors to deliver varies widely according to circumstance and environment.

The authors suggest that there are some areas that have received relatively little attention but that possibly represent important barriers to change. A lack of empirical evidence of the success of alternative service delivery systems, and the heavily regulated environment in which veterinary services operate, have inhibited moves towards a more liberal approach to veterinary service delivery. There is also a need to understand better the multiple priorities of the institutions and individuals that determine national veterinary policies before advocating policies for change.

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1 Introduction

The reform of animal health services in developing countries has received much attention in recent years. In many countries veterinary services have been provided almost exclusively by the state, but growing fiscal pressures have commonly reduced the availability and quality of these services to a low level. The re-emergence of readily controlled diseases such as Rinderpest in Africa and a widening gap between domestic production and demand are considered indicative of a weak public sector that is unable to deliver adequate services to livestock producers.

Privatisation has been widely advocated as a means of improving the supply of veterinary services (Leonard, 1985; de Haan & Bekure, 1991). Initial enthusiasm for privatisation has, however, been tempered by the recognition that in many situations veterinary services require some form of public management (Umali et al., 1994a). The availability and quality of animal health services is therefore unlikely to improve unless public sector performance can be strengthened. This is an area of reform that has received comparatively little attention.

This report evaluates some of the opportunities for improving the supply of those animal health services that require public management. Such services include veterinary research and extension, the control of infectious disease through quarantine and vaccination, and regulation to maintain drug quality and food safety standards. In addition, economies of scale and equity considerations may cause the public sector to become involved in the supply of 'private good' services such as clinical treatment and the production and distribution of drugs and vaccine to rural small-scale livestock producers.

The review begins with a brief outline of some of the factors that have led to the reform of veterinary services. It uses economic theory to specify those services and situations in which public sector intervention can be justified, and identifies possible means by which public sector performance can be enhanced. Prospects for improvement are hypothesised to rest either (i) in measures that improve the capacity of the state to manage the supply of 'public' services, or (ii) in the 'third sector', *i.e.* organisations which are able to provide collective goods for the common benefit of their members.

The available English language literature is then reviewed for empirical evidence of the relative merits of each approach. The impact of institutional reform measures designed to enhance the capacity of the state are compared and contrasted with the quality of services provided by the third sector. Four criteria of quality (impact on production, costs of delivery, financial sustainability, and coverage) are used as a basis for objective comparison. The experiences presented in the literature are analysed to distil key lessons regarding the respective roles of the state and the third sector in service delivery.

The report concludes with an analysis of some of the barriers to change that may need to be addressed before a more liberal approach to service delivery can be adopted.

2 Why Veterinary Services ?

2.1 Performance of the livestock sector

Livestock play an important role in the economies of most developing countries (Box 1 and Table 1). The efficient performance of the livestock sector contributes towards the overall development of agrarian-based economies.

Box 1 Economic significance of the livestock sector

Anteneh (1989) estimates that the value of commodity output of livestock in sub-Saharan Africa is equivalent to 25% of total food production. In Europe, North America and Australia livestock represent over half of the agricultural sector, but contribute less than 3% towards the total GDP. In contrast, in Asia and Africa, livestock play a less important role in the agricultural economy, but contribute over 8% of GDP (Umali et al., 1994a).

The calculations of GDP usually ignore the contribution of livestock to sustainable agriculture. By providing draught power and manure for crop production, livestock reduce the demand for imported mechanical equipment and artificial fertilisers. If these products were included in the calculation of GDP, then livestock's share of agricultural domestic production would increase by half (Anteneh et al., 1988).

Table 1 Average contribution of livestock to the economy of different regions in 1988

Region	Livestock as a % of	
	Agriculture	GDP
Asia	20.86	8.64
Africa	29.08	8.21
Latin America	47.50	8.08
N. America, Australia, Europe	53.90	2.81

Source: World Bank data base, cited Umali et al., 1994a

Most of the world's livestock is reared by subsistence farmers. Small-scale farmers and the landless, including women, are responsible for rearing most livestock in Africa (Mlangwa and Kisaui, 1994; McIntire et al., 1992) and over 90% of livestock in Asia (Randhawa and Sundaram, 1990; Devendra, 1993).

Levels of production tend to be low (Table 2) (FAO, 1989), and represent only a fraction of the biological potential which can be achieved (Walshe, 1987). For instance, Africa, with about 14% of the world bovine population, produces 16% and 3% of the world beef and milk output. In contrast, developed countries have about 30% of the world bovine population and yet produce over 70% of the world beef and milk output (Anteneh, 1989).

Table 2 Average productivity of animals in developing and developed countries

Country Group	Meat (kg)		Milk (kg)
	Bovine	Sheep and goats	Per animal in herd
Developed	79	6.5	900
Less developed	15	4.6	90
Africa	14	3.7	40

Source: Anteneh, 1989

Many developing countries, with their rapidly expanding populations and growing economies, require increasing quantities of livestock products to satisfy domestic demand.¹ Although livestock production has steadily increased, in general the rate of growth has been unable to match rising domestic requirements (Anteneh, 1985; Jahnke, 1982; Winrock, 1992; Cunningham, 1989).

- *In sub-Saharan Africa, Jahnke (1982) estimates that annual demand is increasing by 4.2%, 3.8% and 5.2% for meat, milk and eggs respectively, whereas the annual average growth rate for these products is only 2%.*

Widespread regional deficits are predicted. A study by IFPRI (Sharma and Yeung, 1985) predicts shortfalls in livestock products in all developing regions of the world by the end of the century (Table 3).

Table 3 Projected net surpluses and deficits by region in the year 2000

Region	Meat	Milk	Eggs
Asia	- 6.7	- 26.7	- 0.1
North Africa/Middle East	- 6.8	- 20.6	- 0.4
Sub-Saharan Africa	- 4.7	- 13.6	- 0.7
Latin America	- 2.6	- 3.5	- 1.0

Source: Sharma and Yeung, 1985

Many countries have seen a rapid rise in imports to compensate for the widening domestic deficits (Table 4).

Table 4 Value of meat and milk imports and exports (US \$000)

	Meat		Milk	
	1973	1983	1973	1983
From LDCs to LDCs	386,313	1,109,807	41,650	126,547
From DCs to DCs	548,724	874,408	874,408	3,298,783
From LDCs to DCs	2,046,965	1,853,021	15,317	37,630
From DCs to LDCs	8,322,356	14,467,436	2,718,598	6,947,656

DC: Developed countries
LDC: Less developed countries

Source: Brumby, 1988

- *In Nigeria beef and milk imports have risen by 115% and 146% between 1972 and 1981 (Williams, 1989). Many countries have had to introduce import bans to conserve scarce foreign exchange.*
- *The sub-Saharan region has reverted from being a minor net exporter of meat, milk and eggs in the 1960s to a major net importer in the early 1980s (Anteneh et al., 1988).*

2.2 The role of veterinary services

The availability and quality of animal health services can play a key role in increasing the productivity of the livestock sector (Anteneh, 1989; Umali et al., 1994a). Disease-induced losses in the livestock sector represent a major constraint to productivity. Disease constraints are estimated to cause losses of up to 30% of annual livestock output in developing countries, twice that estimated for developed countries (FAO, 1990a).

- *In sub-Saharan Africa the control of tsetse fly, a vector for trypanosomiasis, could lead to a 16% and 18% increase in meat and milk production respectively (Tacher et al., 1988).*
- *During 1983–85 Africa is estimated to have incurred a loss of more than US\$300 million due to Rinderpest (Anteneh, 1989).*

In many cases disease losses can be avoided through the use of existing disease control technology. Reliable vaccines and drugs exist against many livestock diseases (Sollod, 1981; Halpin, 1981), and there is a strong demand for these products even within the subsistence livestock sector (Young, 1993a). However, despite the fact that disease control technology exists and is in demand, animal diseases continue to cause widespread losses (CTA, 1987).

- *A variety of methods already exists for controlling tsetse fly and yet approximately 10 million square kilometres of land in sub-Saharan Africa cannot be adequately used by livestock because of the prevalence of tsetse fly (de Haan and Bekure, 1991).*

Diseases such as Rinderpest (Box 2), once nearly eradicated from the African continent, continue to plague livestock producers, with devastating consequences for production (de Haan and Nissen, 1985; de Haan and Bekure, 1991).

Box 2 The case of Rinderpest in Africa

In the early years of this century, Rinderpest was a major scourge to livestock production in Africa, allegedly causing up to 90% of previously uninfected animals to die (Anon., 1983). Widespread vaccination campaigns brought the disease under control and by 1959 its impending eradication was anticipated (Beaton, 1959). However, full eradication could not be obtained without movement control between countries. Between 1962 and 1976 a major international campaign (JP15) succeeded in significantly decreasing the incidence of the disease and eradicated it from many countries in East and West Africa. This situation persisted for 10 years or more (Taylor, 1986) before the disease re-emerged in West Africa in 1979 (Rossiter et al., 1983). Despite massive emergency vaccination campaigns, the disease remained endemic and repeated outbreaks occurred through the late 1980s (Wamwayi et al., 1992). A major epidemic in 1983 caused the mortality of hundreds of thousands of animals in many countries (Cheneau, 1985), with a value of \$300–\$400 million (de Haan and Nissen, 1985). A Pan African Rinderpest Campaign (PARC) has been now been initiated in 34 countries to control and eradicate Rinderpest. The campaign aims to strengthen animal health delivery systems by restructuring national livestock services so that they become more financially self-sustaining and effective in the field (Villet, 1994).

Many argue that the presence of readily controlled diseases and the consequent poor performance of the livestock sector is indicative of weak delivery systems that have failed to provide the necessary advice and drugs to livestock producers (FAO, 1988; Mlangwa and Kisauzi, 1994; Schillhorn van Veen, 1984; Walshe, 1987). The state has typically assumed almost sole responsibility for the delivery of animal health services in developing countries (Walshe, 1987; Umali et al., 1992; Leonard, 1993). The inadequate supply of veterinary services has therefore commonly been attributed to poor public sector performance that could be resolved through programmes of privatisation (Umali et al., 1992; Anteneh, 1984a; CTA, 1987; IEMVT, 1980; de Haan and Nissen, 1985; Walshe, 1988; Cheneau, 1985; de Haan and Leonard, 1985; de Haan and Bekure, 1991; Huhn, 1991).²

Despite several years of privatisation, there is little readily available evidence to indicate that the market-dependent

private sector is any more capable of delivering services than the state. Where programmes of privatisation have been pursued, private practices have tended to avoid rural constituencies and locate instead in the more lucrative urban markets (Anon, 1992a; Odeyemi, 1994a). A study of private practices in Nigeria, for example, found that the majority (92%) operated in urban and peri-urban areas (Odeyemi, 1994a). In Senegal, privatisation has left many pastoral regions without veterinary services (Anon., 1992a). Given these patterns of distribution, there is a danger that the transfer of private-good services to market-dependent operators will leave the many subsistence livestock producers without access to animal health services.

There is now a recognition that many veterinary services require some form of public management (Umali et al., 1994a). New approaches, beyond market-dependent privatisation, are required to improve the delivery of animal health services.

3 A Theoretical Basis for Reform

Economic theory has commonly been used to rationalise the role of the state and the private sector in the supply³ of different types of veterinary services (Umali et al., 1992; Leonard, 1993). The theory provides a basis for identifying the appropriate sector (*i.e.* public or private) for the economic optimum provision of a given service. It has been used to identify opportunities for privatisation (Umali et al., 1992) or, as in the case of Leonard (1993), to provide greater insight into the organisational features required to supply those services that will not otherwise be provided by the private sector.

This section examines the theory that underpins veterinary service reform programmes. It identifies the characteristics of different veterinary services which, in theory, renders them unsuitable for private-sector provision. These features provide a basis for exploring institutional reform measures that might enhance the effectiveness of the state. Various non-conventional 'private-sector' institutes are also examined in more detail to see if they have the requisite organisational features that would enable them to provide services that might otherwise be considered the preserve of the state.

3.1 The respective roles of the public and private sectors

The economic theory that has implicitly guided structural reform is based on the premise that the private sector can outperform the state in virtually any circumstance (Leonard, 1993). In economic terminology, the theory states that, under perfect competition, the private sector is a more efficient means of providing services than the state.⁴ State intervention is only justified under those circumstances when markets do not perform efficiently (Umali and Schwartz, 1994; Smith and Thomson, 1991). In the context of veterinary services, Umali et al. (1992) argue that this occurs when:

- the service in question is a **public good**;
- there are **externalities** associated with the production or consumption of the service;
- producers and consumers have unequal access to information (known as **asymmetries of information**) that can lead to a **moral hazard** problem;

- there are increasing **economies of scale** that deter private sector activity.⁵

The meaning of each of these economic concepts and their relevance to the debate on the role of the state in veterinary services is examined in more detail as follows:

(i) Public goods

Veterinary services can be classified in economic terms as either private or public goods. A 'public good' is one to which everyone benefits and from which no-one can be denied access.⁶ Private firms are unwilling to supply services with public good characteristics because they are unable to restrict the benefits of that service to people who pay for them (the 'free-rider' problem). Because individuals cannot be excluded from receiving public goods they have no incentive to pay for that service. Public goods therefore need a mechanism to ensure that everyone contributes towards the cost of the programme. This is commonly achieved through the state which is able to use powers of taxation to compel payment by all beneficiaries.

Veterinary services display varying degrees of public and private good characteristics. A service such as disease surveillance, for example, is considered a public good (one farmer cannot benefit from the results of disease surveillance while another farmer is excluded) and is therefore best provided by the public sector. Research and extension are also public goods unless, in the case of research, property rights (for example patents) are upheld or, in the case of extension, advice is specifically targeted towards the needs of an individual farmer.

On the other hand, the production and distribution of vaccines and drugs, the treatment of individual animals and associated diagnostic support are considered private goods and theoretically are best supplied by the private sector.

(ii) Externalities

Externalities (otherwise known as spill-over effects) occur when, in the provision or use of a service, others are coincidentally

affected. This spill-over effect may be negative, as in the case of excessive use of acaricides leading to drug resistance and environmental contamination, or positive: a farmer vaccinating animals will confer positive benefits to others by reducing the risk of disease to their livestock.

An essential characteristic of an externality is that the costs associated with a negative externality (or conversely the benefits associated with a positive externality) are not realised by the individual consuming or producing the service (Umali et al., 1992). For example, a farmer who sells eggs contaminated with salmonella does not bear the consequences of the subsequent infection those eggs cause in those that consume them. Likewise, a farmer who elects to vaccinate his or her stock against foot-and-mouth disease is not rewarded by others who benefit from this course of action.

Typically, the individual responsible for the externality will not consider the positive or negative effect on others when deciding whether to use a service. In the case of negative externalities this will lead to services being over-used. Excessive use of drugs, for example, can arise because the individual does not bear the full costs of drug resistance caused by over-use. Conversely, positive externalities can cause a service to be under-used: an individual may not be willing to pay for a service such as vaccination even though the total benefit of that service (to others) is considerably greater than the costs of vaccination.

Where significant externalities exist, collective decision-making is needed to ensure that the benefits to all those affected by an action can be balanced against the cost to the individual responsible for the action.⁷ An appropriate course of action that is in the best interests of all those affected can then be selected. Such decisions may have to be accompanied by penalties that enforce compliance with the collective decision (Box 3). A mechanism for collecting payment from those that have benefited from the externality or compensating those who have been negatively affected by the externality may also be required. For this reason the state, with its unique powers of law enforcement and taxation, is usually vested with the responsibility for controlling diseases with significant externalities (Leonard, 1993).

Box 3 The case of foot-and-mouth disease in the UK

Foot-and-mouth disease (FMD) is a highly infectious viral disease of cloven-hoofed animals. The disease is rarely fatal among adult animals but it does cause weight loss and reduce milk yields whilst the animals are infected.

The United Kingdom is free of FMD, but if the disease were to enter the country, it would quickly infect the national herd. On average, individual herd losses would be relatively small, but because a large proportion of farmers is likely to contract the disease, the total national loss would be high.

There have been several outbreaks of FMD in the UK. When these occur, the state veterinary services immediately implement a stamping-out policy to contain infection and avoid widespread losses. If a farm becomes infected, all livestock on that farm are immediately slaughtered and neighbouring farms are kept under strict surveillance in case the disease has spread. The cost of containing and eradicating the disease is relatively high for those farmers whose animals initially contract the disease. However, these costs are more than justified by the savings in national production that are made by eradicating the disease before it has spread across the country.

The policy is hard on those first few farms that are unlucky enough to contract the infection. Despite the fact that they are compensated for their losses, many farmers do not wish to see their herd slaughtered and would prefer to tolerate the disease. These farmers would not participate in the programme unless they were forced to do so by the law. For this reason FMD control programmes in the UK have to be executed by the state as it is only the state that can force compliance with the programme.

(iii) Asymmetries of information

The private sector is only assumed to be a more efficient means of delivering goods and services if 'perfect competition' exists. Perfect competition requires, among other things, that

consumers are well informed about the availability, price and quality of a given commodity. This condition is not always met in the delivery of veterinary services. In some cases there is 'asymmetry of information'.⁸ For example, consumers may not always be able to judge the quality of the veterinary drugs or the advice that they are purchasing. This asymmetry of information can lead to a 'moral hazard'⁹ problem (Umali et al., 1992), whereby the supplier of the product or service is able to provide a sub-standard product without the consumer being aware of the difference in quality at the time of purchase.

To overcome the moral hazard problem the state may impose regulations governing quality standards (for example, the compulsory assay and labelling of drugs) so that consumers can judge the quality and value themselves. In more critical areas, the state may itself assume responsibility for delivering the services (for example, meat inspection at abattoirs).

(iv) Economies of scale

Economies of scale exist when the cost of providing a service falls as the scale of operation increases. This usually occurs when the provision of the service has a high fixed cost, as in the case of research, diagnostic laboratories or the production of veterinary pharmaceuticals. The provision of clinical services can also have high fixed costs in the form of travel costs to points of service delivery.¹⁰ This is particularly the case in sparsely populated areas. Private sector provision of services can be inhibited if there are significant economies of scale associated with the delivery of service. The state, on the other hand, is usually able to achieve sufficient economies of scale to provide services at a price that consumers can afford.

3.1.1 Classification of veterinary services according to their economic properties

Umali et al. (1992) classified various veterinary services according to their 'economic properties' and thus identified the appropriate sector for their delivery (Table 5).

Table 5 Classification of animal health services according to the appropriate sector for delivery

Livestock service	Economic optimum sector for delivery		Economic characteristic
	Private	Public	
Clinical intervention	Yes	No	Mainly private good
Production of vaccines and drugs	Yes	No	Mainly private good
Distribution of drugs	Yes	No	Mainly private good
Vaccination and vector control	Yes	Yes*	Private good with externalities
Diagnostic support	Yes	Yes*	Private good with minor externalities
Veterinary research	Yes	Yes	Private and public good depending on whether clear property rights (e.g. patents) have been defined
Extension	Yes	Yes	Private and public good depending on the medium of communication and specificity of advice
Disease surveillance	No	Yes	Public good
Quarantine and internal movement control	No	Yes	Policy measures to contain externalities
Drug quality control	No	Yes	Policy measure to avoid moral hazard
Food hygiene/Inspection	No	Yes	Policy measure to avoid moral hazard

Yes*: can be provided by the private sector if mechanisms exist to 'internalise' the externalities

Source: Derived from Umali et al., 1992

Umali et al. (1992) compared this theoretical rationalisation against actual patterns of delivery to see if there was scope for transferring responsibility from the state to the private sector. They surveyed over 40 developing countries to

Table 6 The role of private and public sectors in the delivery of various animal health services in 45 developing countries

Livestock service	Theoretical sectoral delivery		Actual sectoral delivery in 45 developing countries (per cent of countries surveyed)		
	Private	Public	Private	Mixed	Public
Clinical intervention	Yes	No	2%	87%	11%
Production of vaccines	Yes	No	12%	9%	79%
Distribution of drugs	Yes	No	15%	75%	10%
Production of drugs	Yes	No	98%	0 %	2%
Vaccination and vector control	Yes	Yes*	5%	60%	35%
Diagnostic support	Yes	Yes*	0%	5%	95%
Veterinary research	Yes	Yes	0%	5%	95%
Extension	Yes*	Yes	0%	80%	20%
Disease surveillance	No	Yes			100%
Quarantine and internal movement control	No	Yes			100%
Drug Quality control	No	Yes			100%
Food hygiene/inspection	No	Yes		5%	95%

Yes* : economically justified under special circumstances

Source: Derived from Umali et al., 1992

determine the degree of public and private sector participation in the delivery of veterinary services. Their findings (summarised in Table 6) suggest that the state has played an excessively dominant role in the delivery of animal health services in many countries and that there are opportunities for transferring some veterinary services from the public to the private sector.

For example:

- Although services such as clinical intervention, vaccine production and drug distribution should theoretically be exclusively provided by the private sector, in over 85% of the countries surveyed these services are provided by the public sector.

- Services such as vaccination, vector control and diagnostic support that should theoretically be provided primarily by the private sector are, in the majority of countries, provided by the public sector.

The authors hold that privatisation of some services would enable state services to be replaced by more efficient market-dependent operators (Umali et al., 1992), as is the case in Latin America, where, it is argued, clinical services are much better because they are provided by private practitioners (Walshe, 1988).

Initial enthusiasm for privatisation has, however, been tempered by the realisation that even those services deemed to be private goods may not, in practice, be provided by private entrepreneurs. Economies of scale have proved to be a significant factor that has discouraged professional market-dependent operators from providing private goods to many small-scale farmers in rural areas (Umali et al., 1994b; Odeyemi, 1994a; Anon., 1992a). In such regions farmers are unable to exert sufficient aggregate demand to sustain financially viable professional private practices.

3.1.2 Other reasons for state intervention: equity considerations

There is another reason, beyond economic efficiency considerations, why governments might intervene in the delivery of veterinary services. Although the private sector may provide services more efficiently (in economic terms) than the state, they may not do so in an equitable manner. Poorer farmers, for example, may not be able to afford the services provided by private veterinary clinics (Sims and Leonard, 1990; Jarvis, 1986).¹¹ Some argue that, even where privatisation is justified on efficiency grounds, social development objectives may warrant public sector involvement to ensure that all farmers have equal access to veterinary services (Ross, 1992; Haq, 1992; Antholt, 1994).¹²

3.1.3 Implications for the role of the state

Economic theory maintains that public sector intervention is justified for those services that:

- are public goods, *i.e.* of benefit to everyone, such as research, extension, disease surveillance, quarantine services, and veterinary legislation;

- have negative or positive externalities, *i.e.* spill-over effects, such as the control of infectious disease or vectors;
- have moral hazard problems associated with their consumption, *i.e.* when the quality of the drug or vaccine cannot be assessed by the consumer;
- have high costs of delivery which could be reduced through economies of scale, such as the provision of clinical veterinary care and diagnostic support to smallholder farmers in rural areas; or when,
- for social welfare reasons, it is considered desirable that all farmers have access to certain services.

As can be seen in Table 7, for each type of veterinary service a case can be made for state intervention. The theory suggests that policy reform measures based on privatisation alone are unlikely to improve significantly the delivery of veterinary services. A more sophisticated policy of reform is therefore likely to be required that recognises the economic complexities of the veterinary services in question.

Table 7 Services that require public sector intervention

	Economies of scale	Externality	Public good	Moral hazard
Clinical intervention	Yes			
Distribution of drugs and vaccine	Yes			
Diagnostic support	Yes			
Vaccination		Yes		
Quarantine		Yes		
Research			Yes	
Extension			Yes	
Disease surveillance			Yes	
Drug quality control				Yes
Food hygiene/inspection				Yes

3.2 Strategies for improving the supply of veterinary services

A review of some of the economic principles that underlie structural adjustment and reform of veterinary services suggests that the economic properties of veterinary services are such that they are likely to require some degree of public provision. Privatisation alone is therefore unlikely to resolve perceived problems of inadequate delivery. Prospects for improvement are more likely to rest with measures that strengthen the performance of the public sector. This may occur by either (i) improving the capacity of the state to manage the supply of 'public' services, or (ii) using the 'third' sector, *i.e.* organisations which are able to provide collective goods for the common benefit of their members to deliver some 'public good' services.

3.2.1 Strengthening institutional capacity

Economic theory suggests that many veterinary services require some form of public intervention. The improved delivery of veterinary services is therefore unlikely to take place without commensurate improvement in state capacity to deliver.

Many doubt the institutional capacity of the public sector. Indeed, some go so far as to suggest that 'state failure' is worse than the 'market failure' that the state seeks to redress (Leonard, 1993). Such condemnation does not mean that the 'public sector' should be abandoned altogether. The failings of the state are not universal: there may be some activities that it performs better than others and these should be retained and strengthened. Measures that strengthen planning capacity (through, for example, the use of economic cost-benefit analysis), that bring government in closer proximity to users, or that enable direct cost-recovery should also be considered as options for improving service delivery.

A number of authors point out that whilst there may be a case for state intervention, the state need not necessarily assume responsibility for delivering that service (Smith and Thomson, 1991; Umali and Schwartz, 1994; Beynon et al., 1995). Rather than provide the service itself, the state can alternatively directly finance the delivery of certain services through the private sector. In other cases, the optimum supply of a service can be insured through appropriate regulation or a mix of taxes and subsidies that influence private behaviour. Such options open the way for a different kind of state intervention, which, by

making greater use of the private sector, may lead to the more economically efficient delivery of veterinary services.

3.2.2 The role of the third sector

There are a number of organisations within the private sector that are capable of assuming some of the roles of the public sector. Economic theory that is used to identify the appropriate sector for service delivery assumes that there are marked institutional differences between the public and private sector. This is not always the case. The private sector includes a range of organisations, from market-dependent firms to co-operatives. Some of these organisations, such as producer associations, co-operatives, community-based organisations, grass-root organisations and customary institutions, bear a closer resemblance to the public sector, *i.e.* the state, than they do to the market-dependent operators with whom they share the title 'private sector'. Known collectively as common-benefit organisations (Curtis, 1991) or the 'Third Sector' (Farrington et al., 1993a), these organisations have certain attributes that enable them to collectively supply services that might otherwise be considered the preserve of the state (Curtis, 1991).

Farrington et al. (1993a) divide common-benefit organisations into:

- Membership Organisations (MOs), such as co-operatives and associations, which are financed and managed by the people they serve and represent; and
- Non-Membership Organisations (NMOs), sometimes called Non-Government Organisations, which are financed and managed by non-beneficiaries.

Farmers may be members of the former, but are usually clients of the latter.

Membership organisations can achieve economies of scale in the provision of pure private goods (Smith and Thomson, 1991). They can also, through a sharing formula that distributes costs as well as benefits among the membership, provide a mechanism for the delivery of public goods (Curtis, 1991). Whether they do so or not depends on their capacity to

prevent free-riders, *i.e.* non members, from benefiting in the same way as members from the organisation's activities. If all members perceive a clear advantage in co-operating, they may also control diseases with externalities.

Non-membership organisations usually rely on donations from outside the community to finance services. They provide an alternative means to the state for redistributing wealth within a country, or between countries. They are able to finance public services without having to secure the financial participation of the beneficiaries and can reduce the costs of delivery of programmes by subsidising their delivery.

A failure to distinguish between such institutions within the private sector means that their role in the delivery of 'public goods' is likely to be overlooked in a conventional analysis of the role of the private sector.

3.3 A way forward It is hypothesised that prospects for improvement are likely to rest with measures that:

- enhance the capacity of the state to meet its core responsibilities; or
- distinguish between the provision and delivery of services by the state, thereby opening the way for partnerships with the private sector in the delivery of services; or
- seek to transfer some state responsibilities to the third sector, *i.e.* 'common-benefit' organisations which, because they share common organisational features with the state, are possible candidates for supplying public-good services.

The impact of reform based on these measures is examined in the remainder of the report. The literature is reviewed for evidence that describes (i) state performance and the impact of measures designed to improve the quality of services it provides, and (ii) the role of the third sector in providing services which would not otherwise be provided by the market dependent private sector.

4 Empirical Evidence: A Framework for Comparison

4.1 Introduction As Thompson (1991) notes: 'Institutional reform can only be planned and implemented if it is undertaken in the context of an objective assessment of how a system actually functions, rather than how it is meant to function.'

In the following sections the relative strengths of the state and the third sector are evaluated by assessing, comparing and contrasting the quality of different services provided by the state, membership organisations, and non-membership organisations.

4.2 A framework for comparison An objective evaluation of the merits of alternative reform programmes and institutional arrangements to provide veterinary services requires a definition and measure of quality. The quality of service embodies many elements, including various financial, political, management, economic, social and technical parameters. Carney (1994) defines quality in terms of efficiency, effectiveness and accountability, where efficiency refers to the way in which goals are met, effectiveness is the ability to meet goals, and accountability is the institutional responsiveness to those affected by one's actions. Garforth (1993) divides impact into five components: efficiency, effectiveness, demand orientation, equity and empowerment. Bebbington (1989) considers that community coverage, the volume of product distributed, and training are key indicators of quality.

Many of these measures can in fact be encompassed by four key indicators. These are:

- **Impact** Disease constraints are argued to reduce the economic efficiency of the livestock sector. Better delivery systems are justified because they enable livestock producers to increase the value of their livestock production.¹³ Disease control can increase the volume of production or enable producers to gain access to higher-priced markets. A measure of impact, in terms of the increase in value of production, would therefore help distinguish between effective and ineffective systems.
- **Cost** A measure of the cost of providing a service is also needed before its relative merits of service can be evaluated. An improved livestock service is one that

achieves the greatest impact on the value of production¹⁴ per unit cost of delivery.

- **Financial sustainability** The ability to finance the services through domestic resources, is a valid long-term aim of all development efforts and is therefore a criterion against which veterinary services should be judged.
- **Coverage** The type of farmer who benefits from the services is also relevant. An evaluation of services should distinguish between those provided on the basis of economic efficiency and those supplied to fulfil a specific welfare objective, *i.e.* to alleviate poverty. Services provided to poorer farmers are likely to be more expensive (as small-scale farmers are often harder to reach) and yield smaller gains in production than those provided to commercial farmers. There is, therefore, a need to specify the number and type of beneficiaries who have access to a given service. For a given target group, programmes that are most desirable are those which lead to services that are financially sustainable and achieve the greatest impact per unit cost of delivery.

These four indicators of quality are used as a basis for objectively evaluating the relative merits of (i) the state, and reform measures designed to enhance its capacity and (ii) the third sector (membership organisations and non-membership organisations), in the delivery of veterinary services.

5 Assessment of the Performance of State Veterinary Services

Although economic theory suggests that the public sector is the most appropriate means of supplying many veterinary services, the state is alleged to have performed so badly in practice that some now argue that it is better to let the private sector supply these 'public services', even if this means they will be provided at an 'economic sub-optimum' level (Leonard, 1993). Such arguments imply that the state has universally failed in the delivery of veterinary services and overlook the fact that there are opportunities for improving public sector performance.

This section critically assesses the delivery of veterinary services through the state. It begins with a review of some of the historical forces that have contributed to the current level of state involvement in the supply of veterinary services and then goes on to describe the relative strengths and weaknesses of the state in supplying different types of veterinary services. It evaluates, where appropriate, the impact of reform measures on the quality of those services.

5.1 Historical forces that have shaped contemporary state veterinary services

The first veterinary services in the English-speaking world were often established by the British army (West, 1961), when veterinarians were needed to protect the health of cavalry and pack horses against disease. Military services have been described in South Africa as early as 1795 (Wilkins, 1961), India in 1799 (Ware, 1961), Burma in 1874 (Rippon, 1961) and Sudan in 1902 (Jack, 1961).

Civilian veterinary services only emerged at the turn of the century when it became apparent that the exotic breeds that accompanied colonists were particularly susceptible to indigenous diseases in the new colonies (Henderson, 1986; Leonard, 1993). Many settlers experienced massive livestock losses as a result of disease epidemics (Walshe, 1973). Growing trade between the colonies also increased the risk of introducing new diseases (Falconer, 1973) and provided further impetus for the establishment of civilian veterinary services.

Colonial veterinary officers were confronted with tropical diseases whose causes were unknown and for which methods of prevention and treatment had not yet evolved. In the absence of vaccines, services relied on quarantine, import restrictions, movement control and the slaughter of infected

stock and wildlife reservoirs, to prevent or contain the spread of major contagious and infectious diseases (West, 1961; Thrusfield, 1986; Leonard, 1993). At the same time research institutes were established to investigate their causes, treatment and prevention.

Given the externalities associated with infectious diseases such as Rinderpest, and the public-good characteristics of research and quarantine services, these roles would appear entirely consistent with those defined by economic theory as outlined in section 3.

The early state veterinary services achieved some measure of success. Strict quarantine measures kept some countries free from major epizootics (Marshall, 1960). The development of disease control technology, such as the safe and effective attenuated Rinderpest vaccine in 1927, enabled many animal plagues to be brought under control (Provost, 1991). At the same time improved vaccines increased the confidence of livestock keepers in veterinary medicine, which in turn facilitated control campaigns (Beaton, 1959).

Following these early achievements the services began to shift their attention towards programmes that could improve the productivity of livestock and raise standards of food hygiene and public health. The services expanded their remit to include services such as:

- the provision of clinical treatments to all livestock-keepers, irrespective of their wealth or location;
- the production and distribution of vaccine;
- the provision of diagnostic laboratories in livestock producing areas;
- research and extension on animal production and health;
- the control of non-epidemic diseases;
- meat inspection, food hygiene and public health;
- breed improvement programmes that used imported bulls and Artificial Insemination.

These foundations of modern state veterinary services were passed over to the governments of new countries at independence and continue to dictate the range of services they provide (Table 6, page 23). With the exception of drug production, the state retains a significant role in the delivery of most types of veterinary services.

5.2 Quality of services provided by the state

There have been numerous allegations of the failure of the state to provide adequate services to smallholder farmers (Umali et al., 1992; Anteneh, 1984a; CTA, 1987; de Haan and Nissen, 1985; Walshe, 1988; Cheneau, 1985; de Haan and Bekure, 1991; Huhn, 1991; Provost, 1991; Grandin et al., 1991; Williams, 1989), especially in sub-Saharan Africa.

5.2.1 Impact

In some cases the degeneration of state veterinary services has been associated with a deterioration in the performance of the livestock sector. In Uganda, a 30% decline in the national livestock population between 1985 and 1990 has been attributed in part to the inability of state veterinary services to contain disease outbreaks (Umali et al., 1994b). More usually, however, claims of inadequate performance have not been substantiated with evidence of a decline in productivity.

Widespread allegations of failure are examined in more detail by examining the record of achievement in providing different types of veterinary services, grouped here from (i) to (iv) according to their particular economic properties, and reviewing the impact of reform measures designed to improve the performance of the state.

(i) Clinical intervention, the distribution of drugs and vaccines, and diagnostic support

Clinical veterinary services, the distribution of drugs and vaccines, and diagnostic support are considered private goods. In many countries economies of scale and equity considerations have led the state to assume responsibility for their supply to the rural smallholder sector. Despite state involvement, it is claimed that many smallholder farmers do not have access to animal health advice or veterinary drugs (Leonard, 1985; Khan et al., 1993; Swift et al., 1990; de Haan and Nissen, 1985).

Measures to improve state services have included (a) sub-contracting government work to private practitioners (FAO, 1992a; Leonard, 1993; de Haan and Umali, 1992); (b) subsidising private clinics (Odeyemi, 1994a); and (c) using para-veterinarians (Box 4) (Leonard, 1993; Juengling et al., 1993; Bamhare, 1992).

- *In the UK, the government has subsidised private practitioners in remote parts of Scotland under the Highlands and Islands Scheme. It has been shown that such private practice subsidy schemes are more cost effective than maintaining full-time government veterinary staff in such areas (Odeyemi, 1994a).*
- *In Thailand, the state veterinary services trained over 20,000 village 'keymen' (para-veterinarians) to provide animal health services to village animals. The services now employ seven times more keymen than veterinarians and have been*

Box 4 Para-veterinarians

Para-veterinarians are members of the community who have been trained in the basics of animal health care. They live locally, do not require transport and have lower income expectations than professional veterinarians. They are therefore able to provide some clinical services at a much lower cost than comparable services delivered by professional veterinarians. In contrast to livestock workers from urban or other-culture backgrounds, local para-veterinarians speak the native language, know the stockowners and ethnoveterinary system and are much more accessible than formal livestock services (Grandin et al., 1991; Almond, 1991; Peters, 1993). They usually are able to win farmers' confidence more easily than outsiders, especially when the local community has had a direct hand in their selection (McCorkle and Mathias-Mundy, 1990; Odeyemi, 1994a; Ibrahim, 1993; Stoufer and Ojha, 1993). The use of para-veterinarians can greatly increase the supply of drugs and vaccines to rural areas that might otherwise not have benefited from a veterinary service.

able to reach significantly greater numbers of farmers (Juengling et al., 1993).

(ii) Control of diseases with externalities, and quarantine services

Services that incur externalities usually warrant state intervention to ensure that they will be provided at their economic optimum level. State veterinary services have typically undertaken to control diseases with positive or negative externalities. Vaccination, vector control and movement restrictions through the use of quarantine services are three common means of controlling diseases with externalities.

Despite a widespread perception of the inefficiencies of state services, some appear to have retained a capacity to control disease with externalities. Kenya and Tanzania, for example, acted effectively in the face of outbreaks of Rinderpest in the early 1980s (Cheneau, 1985; Rossiter et al., 1987; Wamwayi et al., 1992).

The early detection and prevention of epizootic disease is economically more efficient than the subsequent control of infection. Effective disease surveillance is therefore critical if state veterinary services are to fulfil this important role. A capacity for outbreak detection can be strengthened by placing greater emphasis on the use of para-veterinarians to provide information on the early detection of disease (Zessin and Carpenter, 1985; Sollod and Stem, 1991) and by focusing more carefully on the detection of those diseases that are potentially explosive, *i.e.* have very large externalities (Holden, 1994).

- *In Indonesia, of 13 notifiable diseases only two had significant externalities that warranted national state intervention. Rationalisation of the disease list is in hand to allow resources to be focused on fewer diseases.*

The control of infectious disease through the use of vaccination campaigns has been another area where state veterinary services have in the past achieved some measure of success (Schwabe, 1982). Early veterinary services successfully

eradicated a number of diseases and were able to substantially reduce the impact of others.

- *In The Gambia massive losses from Rinderpest were controlled and the national cattle population, which had fallen to 35,000 in 1931, rose to 70,000 by 1943. A colonial administrator at the time commented, 'seldom can money have been better spent than in carrying out this campaign and in creating a veterinary department in The Gambia' (Sir Kenneth Blackburne, cited in Walshe, 1973).*
- *Foot-and-mouth disease has been eradicated in Indonesia, Mexico, all of Central America, Chile and some other smaller Latin American countries (Jarvis 1991).*
- *Many countries have successfully eradicated bovine brucellosis and tuberculosis, whilst also avoiding re-introduction (Bazeley, 1993).*

In some countries disease control programmes may not have a significant impact on production because disease control policies have been biased towards:

- **Diseases of exotic livestock** belonging to commercial producers as opposed to the health constraints of indigenous livestock populations (Umali et al., 1992). For example, babesiosis, a tick-borne disease that often has a relatively minor impact on indigenous cattle raised in endemic areas but can cause significant losses to imported stock, is controlled by the state in the majority of infected countries in South America, Asia and Africa (Table 8).

Table 8 Regional disease control policies against selected diseases

Region	Foot-and-mouth disease		Babesiosis		Rabies	
	*	**	*	**	*	**
Africa	56	90	89	59	58	52
Asia	96	96	84	81	68	65
S. America	34	100	84	93	72	83

* Percentage of countries in each region reporting the presence of disease

** Percentage of countries in each region that have control programmes

Source: FAO/OIE/WHO, 1994

A focus on diseases specific to the commercial sector may not be the best use of state resources in those countries where smallholder production predominates.

- **Meeting international health standards to facilitate trade** Foot-and-mouth disease (FMD), for example, is highly infectious and many uninfected countries safeguard their domestic herds by prohibiting imports from infected countries. Although the disease may not represent a major source of loss to domestic production (Beaton, 1959; Hutabarat and Holden, 1991; Anon., 1992b) it can significantly reduce exports. Botswana, for example, lost nearly 30% of its target export earnings in 1980 because the presence of FMD denied its cattle access to certain international markets (Ellis, 1982).

Whilst the control of trade-limiting diseases may be appropriate for countries that export significant quantities of livestock and livestock products, such policies are of questionable value to countries that are net importers. Most countries in Asia and Africa export negligible quantities of livestock products (Table 9) and yet nearly all control FMD (Table 8) (Williams, 1989; Henderson, 1986; Mulvany, 1991; Blajan et al., 1987; OECD, 1994).

Table 9 Proportion of regional domestic beef production exported

Region	Domestic beef production (metric tonnes)	Exports (metric tonnes)	Percentage of total beef production
Asia	8,416,000	171,969	2.0
S. America	7,940,000	260,397	3.3
Africa	3,737,000	183,131	4.9

Source: FAO, 1994a

- **Zoonotic disease control** Although diseases that affect human health (zoonotic disease) can also have a huge effect on market prices because of consumer fears that they might contract the disease, many are controlled purely on the basis of their assumed impact on public health. Programmes within the remit of veterinary public health are often undertaken without reference to the relative impact of public health risks beyond the livestock sector.

Many state services now acknowledge that it is no longer acceptable for veterinary administrations to eradicate a disease simply because it is present (Blajan et al., 1987). Efforts to improve the impact of disease control programmes have been attempted through the use of economic and epidemiological tools that enable better targeting of resources (Morris and Leidl, 1993; FAO, 1990a; OIE, 1987). Cost-benefit analysis can, however, only improve efficiency if there is sufficient quality data to support meaningful economic analysis.

In some cases state capacity to implement vaccination programmes is inadequate to reach sufficient animals to achieve widespread immunity (Umali et al., 1992; Zessin and Carpenter, 1985).

- *In Bangladesh certain vaccines are provided free by the government. Livestock usually need more than one vaccination. Many households do not bring their cattle a second time and vaccinators frequently do not maintain*

the routine vaccination programme. Therefore many 'vaccinated' cattle are not immune and the government programme has failed to have an impact in controlling disease (Khan et al. 1991).

Performance can be enhanced by sub-contracting vaccination programmes to the private sector.

- *In Bolivia and Chile state services are using private-sector contractors to complete FMD campaigns (FAO, 1992a).*
- *In Morocco, sub-contracting state vaccination programmes to private practitioners reduced vaccination costs by 34%, increased the proportion of animals vaccinated from 52% under public sector programmes to 66% under private schemes and provided a valuable source of income to private practitioners who might otherwise not have been able to remain in practice (de Haan and Umali, 1992).*

Some claim that the state cannot always ensure that the private sector will complete vaccination programmes, although hypothetically, compliance can be monitored through the issuance of vaccination certificates and inspection of vaccination receipts.

Para-veterinarians have commonly been used to increase the coverage of vaccination programmes.

- *Experiences in Chad show that para-veterinarian programmes have improved government vaccination programmes and that the number of epidemic diseases (Rinderpest and anthrax, for example) has decreased considerably (Peters, 1993).*

(iii) Research and extension

Research and extension services may under certain circumstances be classified as public goods, and are usually provided by the state. Research and extension services are also commonly used as a means of ensuring equitable development.

The early achievements of the state veterinary services in disease control were largely made possible by research successes that led to the discovery and production of new drugs and vaccines for the prevention and treatment of animal diseases (Beaton, 1959; Nissen, 1983). It is argued that latterly services have become biased towards the needs of commercial farmers and have neglected to address the production constraints of smallholder farmers who are responsible for producing the bulk of livestock products in Asia and Africa (McIntire et al., 1992; Winrock, 1992; Sims and Leonard, 1990).

Decentralisation and the use of bottom-up planning may enable more demand-led research and extension compared to centralised planning (Box 5), as it is argued that the supply of public goods generally improves the closer their governance is to the user (Ostrom, 1990; Curtis, 1991).

Box 5 Limitations of centralised planning

Centralised planning makes good use of scarce technical resources and is particularly appropriate for the control and prevention of epidemic disease that requires co-ordinated, top-down management. As Chambers (1992) notes, 'standard solutions require standard programmes and are best provided through centralised structures', a point that has been well illustrated by the early success of state services in disease eradication. However, when livestock services attempt to address the needs of smallholder farmers a different approach is required. The production systems of small-scale farmers are typically complex, diverse and risk-prone. They therefore require diverse choices that enable them to exploit a varied and unpredictable ecosystem (Chambers, 1993; Scoones and Graham, 1994). Centralised planning procedures can find it difficult to accommodate the many different needs of a diverse farming community. The programmes they plan are unable to respond to spatial and temporal variations in farming needs.

Not all services are appropriate for decentralisation – the livestock services have to retain a central capacity to provide services such as quarantine and drug legislation that are of benefit to the whole nation (FAO, 1991a) – but where extension and research programmes have decentralised, it has been found that the closer proximity of planners to farmers has resulted in programmes that have greater impact on production compared to centrally planned programmes (Bazeley, 1993).

5.2.2 Cost There is very little evidence upon which to base an assessment of the costs of state service delivery. Many argue that delivery costs are likely to be high because staff costs absorb a disproportionate amount of the budget (Anteneh, 1995a). Countries of East and West Africa for example spend less than 15% of their budget on operational costs (de Haan and Nissen, 1985; Tber, 1995). Anteneh (1991) argues that if operational budgets are low then staff are in effect being paid for providing little or no service, in which case unit costs of delivery will be inordinately high. However, these costs have to be offset against the advantages gained through the very large economies of scale that state services can achieve. Providing funds are available, large-scale veterinary campaigns or national disease surveillance services may benefit a large number of livestock-keepers at a relatively low cost per producer compared to smaller, privately sponsored schemes.

5.2.3 Financial sustainability

Financial shortages have been argued to be one of the root causes of state failure (Box 6). Financial sustainability has therefore become a key issue governing the successful delivery of state services.

Box 6 Funding crisis of state veterinary services

The world recession in the 1970s and 1980s and the ensuing debt in developing countries led to structural adjustment policies that advocated sharp reductions in government expenditure on state-funded services (Leonard, 1993). State veterinary services could no longer afford to provide the type and quality of services that they had done in the past, but, despite being faced with declining budgets, state services proved reluctant to reduce the extent of their responsibilities or the number of their civil servants. The commonly observed policy of guaranteeing employment to veterinary graduates (de Haan and Nissen, 1985) meant that savings were sought instead by reducing operational budgets whilst retaining, or even expanding, staff numbers (Anteneh, 1991; Winrock, 1992; Leonard, 1993; Carruthers, 1985).

It was this reduction in operational funds in favour of staffing that was alleged to have led to a decline in efficiency (Anteneh, 1985a; CTA, 1987). Drug shortages, lack of transport and failure to maintain equipment were symptomatic of the funding crisis (Anteneh, 1991). Treatment drugs were no longer available for distribution. Since less work could be done, people were found sitting in offices, willing but unable to work (FAO, 1991a). Staff morale declined and efficiency deteriorated further (Odeyemi, in press; Moris, 1991; CTA, 1987). Diseases once nearly eradicated, such as Rinderpest, re-emerged in Africa to cause widespread losses.

State veterinary services are theoretically financed through revenues raised by taxation. In some countries livestock are taxed directly: in sub-Saharan Africa, for example, livestock taxes represented on average 33% of the livestock budgets of the 1970s (Anteneh, 1991).

Services should be financially sustainable providing they are able to adjust their activities (and hence funding requirements) in line with tax revenues. Financial stabilisation has, however, been jeopardised by:

- Donor support that has removed incentives to raise revenues through taxation and allowed the services to grow beyond a

Box 7 History of donor support

State-delivered services have been considered the principal catalyst for development. Fuelled by the wealth generated from booming exports in natural products (Odeyemi, in press) and by donor support, veterinary services expanded rapidly during the post-colonial era (Winrock, 1992). Funding for national research in 42 sub-Saharan countries increased from US\$ 149.5 million in 1961–5 to US\$ 372.3 million in 1981–5, and in 1981–5, 29% of research workers were expatriates (Winrock, 1992; Pardey et al., 1991). There was a rise in staff numbers and facilities. For example, in sub-Saharan Africa the number of veterinarians increased from an estimated 2,500 in 1964 to 42,000 two decades later (Odeyemi, in press) the number of research workers increased from 1,323 to 4,941 (Pardey et al, 1991). The number of veterinary faculties in Africa rose from three to twenty-eight within two decades of independence (Odeyemi, in press).

This expansion caused budgetary burdens that could not be sustained from the existing tax base. In a review of animal agriculture in sub-Saharan Africa, Winrock (1992) states that 'even when economic and sectoral growth rates improve, most governments will not be able to afford the number of extension, animal health and other support service workers they now employ' (Winrock, 1992).

In many countries state services were increasingly dependent on donor funding. In 1981–5 it amounted to 35% of total expenditures for research in sub-Saharan Africa (Pardey et al., 1991; Lele and Goldsmith, 1989). In West Africa donor support accounted for 34% of the national livestock budget (Anteneh, 1991). Abundant donor support removed an incentive for government to fund services through taxation. It also meant that state veterinary services were vulnerable to changes in donor policy.

level that could be sustained through domestic revenues (Blarcom et al., 1993). When donor funding has been withdrawn, services have experienced financial crises (Box 7).

- A policy of automatic recruitment of veterinary graduates that has led to a rise in the ratio of staff to operational costs (de Haan and Nissen, 1985) and a decline in real wages, leaving staff demoralised and ineffective (Blarcom et al., 1993).
- A tendency for national policy to discriminate against the livestock sector when allocating central finances. In the Sahelian countries of sub-Saharan Africa, livestock services do not receive an allocation proportionate to the contribution of the subsector to GDP (de Haan and Nissen, 1985; Anteneh, 1991).
- Fluctuating national growth.

Many services are said to be in financial crisis (Antholt, 1994), although some would argue that the problem is one of poor allocation rather than insufficient quantity (Blarcom et al., 1993).

Cost-recovery programmes are one way of facilitating financial sustainability by transferring some or all of the costs of the services to the producers. Services become less vulnerable to budgetary fluctuations (Anteneh, 1991) and the introduction of market-driven incentives can improve efficiency (Blarcom et al., 1993).

- *In the UK, the government-funded Agricultural Development and Advisory Service (ADAS) has successfully started charging for extension services. Within four years 30% of the costs were being met through fees (Ingram, 1992).*

Experiences in sub-Saharan Africa suggest that cost-recovery measures may actually only contribute towards a small proportion (2-5%) of the livestock budget (Tber, 1995). In some cases cost-recovery programmes have failed because the veterinary services have been obliged to return revenues to the treasury, thereby negating any incentive to charge fees (de Haan and Bekure, 1991; CTA, 1987).

5.2.4 Coverage A key advantage of state services is their capacity to serve a large number of farmers. Some services, such as disease surveillance and quarantine, for example, will benefit the whole livestock sector. Epidemic disease control, research and extension may similarly have widespread benefits.

The state may also choose to target certain services towards specific sectors of the population. 'Private good' services such as clinical health care may be provided by the state in rural areas where economies of scale deter private sector activity. Where equity considerations are important, the state may provide certain services to poorer members of the livestock sector.

In practice disease control programmes, the delivery of clinical services and veterinary pharmaceuticals, extension and research have tended to be biased towards more commercial farmers (Anteneh, 1991; Winrock, 1992; Antholt, 1994; Sims and Leonard, 1990, Merrill-Sands and Collion, 1993; Khan et al., 1993; Leonard, 1985) or special interest groups such as ranching or intensive dairying (Umali et al., 1992). Commercial farmers may be easier to reach and are more inclined to adopt new technologies than isolated small-scale producers and as such probably give a greater 'return' to state investment than the smallholder sector. However, for those services where state intervention is justified on the basis of equity considerations, a bias *against* poorer farmers is clearly counterproductive.

State veterinary services can address this bias by adopting a strong poverty focus in the design and delivery of services. Decentralisation and bottom-up planning can also ensure that state services are orientated towards the needs of small-scale producers.

- *Government policy in Indonesia is to use state services as a means of alleviating poverty. State veterinary services are being decentralised and participatory planning procedures adopted to ensure that state-financed services address the needs of poorer members of the farming community (ODA, 1992).*

6 The Third Sector

A review of economic theory (section 3) concluded that the economic properties of most veterinary services are such that, under certain circumstances, public intervention is required to ensure their economic optimal supply. However, such analysis failed to recognise the existence of the 'third sector' which, with its capacity to supply 'collective goods' and ability to achieve economies of scale, could theoretically supply some services that might otherwise be considered the preserve of the state.

This section examines the role of the third sector in supplying different types of veterinary services and evaluates the quality of the services it provides. It distinguishes between those services provided by membership organisations (MOs) and those by non-membership organisations (NMOs).

6.1 Assessment of the performance of membership organisations

Membership organisations include producer associations, co-operatives and community-based organisations. Unlike non-membership organisations, they are financed and managed by their members.

Livestock producers' associations or co-operatives are frequently associated with dairy marketing. The best-known example is that of the 'Anand Model' dairy co-operatives in India, which formed the basis of a national milk production and marketing programme known as Operation Flood (Banerjee, 1994). Similar co-operatives have been established in Bangladesh (Ali and Saha, 1980), Indonesia (Uotila and Dhanapala, 1994) and Kenya (De Haan and Bekure, 1991), and other dairy co-operatives following a different model have been set up in several Latin American countries (Jarvis, 1986; Umali et al., 1992).

Examples of producers' associations which are not exclusively involved in dairying include the pastoral associations in Mongolia (FAO, 1991b), FNEC in the Central African Republic (Umali et al., 1992), a livestock owners' co-operative in Zaire which provides veterinary drugs (Cheneau, 1985), Ethiopian peasant associations (De Haan and Bekure, 1991), AOCACH in Ecuador, which trained some of its own members as para-veterinarians (Bebbington, 1989) and producers' associations in the Philippines (Tomboc and Reyes, 1993) which provide veterinary medicines.

6.1.1 Roles The types of veterinary services which membership organisations have provided are summarised in Table 10 (page 48).

Membership organisations are able to provide sufficient economies of scale to enable the supply of inputs such as clinical veterinary services, veterinary drugs and diagnostic services to farmers who are relatively expensive to serve.

- *The Anand Milk Union is a milk marketing co-operative in India originally organised by a group of producers to obtain a better price for milk and gain access to the Bombay market. Now, in addition to milk collection and marketing, the co-operative provides veterinary health care services and training programmes for its members.*

Some associations also provide services such as research and extension.

- *Dairy co-operatives in Indonesia provide livestock health and artificial insemination services to their members. In addition, they offer extension services covering animal nutrition and feeding (Uotila and Dhanapala, 1994). More recently they have expanded their activities to include a herd health and production monitoring service to members. This programme offers individual and group advice on ways of improving yields, for example, through the improved management of reproductive performance.*
- *SANCOR, a dairy co-operative in Argentina, was initially established to provide extension advice to members, although it now provides other inputs such as artificial insemination (Umali et al., 1992).*

Table 10 Summary of services provided by membership organisations

Name	Country	Described by	Clinical service	Distribution of drugs and vaccines	Control of diseases with externalities	Extension	Diagnostic support	Research
Village clinic	India	Wade, 1988	Yes					
Anand dairy co-operatives	India	Bannerjee, 1994	Yes	Yes	Yes	Yes	Yes	Yes
Pastoral collectives	Mongolia	FAO, 1991b	Yes		Yes			
FNEC	Central African	Umali et al., 1992						
		Republi	Yes	Yes	Yes	Yes		
Limuru dairy co-operative	Kenya	de Haan and Bekure, 1991	Yes	Yes	Yes			
Dairy co-operatives	Bangladesh	Ali and Saha, 1980	Yes	Yes		Yes		
San Francisco Liv. Raisers Ass.	Philippines	Tomboc and Reyes, 1993	Yes	Yes				
AOCACH	Ecuador	Bebbington, 1989	Yes			Yes		
Dairy co-operatives	Indonesia	Uotila and Dhanapala, 1994	Yes			Yes		
Dairy co-operatives	Peru	Claxton et al., 1993	Yes				Yes	
Peasant associations	Ethiopia	de Haan and Bekure, 1991	Yes	Yes				
UCASAJ	Ecuador	Bebbington, 1991						
Livestock owners' co-operative	Zaire	Cheneau, 1985		Yes				
Community tsetse control	Kenya	Otieno and Dransfield, 1990						
Community tsetse control	Zaire	Gouteux et al., 1989						
CREA	Latin America	Jarvis, 1986						
SANCOR dairy co-operative	Argentina	Umali et al., 1992						

Providing the consequences of control or infection do not extend beyond the membership of the association, then associations have also been known to control diseases with externalities. Some co-operatives provide dipping facilities to protect against ticks, or undertake certain vaccination programmes – programmes that are usually considered the preserve of the state.

- *In Kenya, community-based self-help collectives, or Harambees, have provided (among other things) facilities for dipping cattle against ticks (Leonard, 1987; Ngau, 1987) and cattle crushes (Ngau, 1987).*
- *Community-based associations have sometimes been established solely for the purpose of controlling a disease with externalities, such as the control of tsetse fly using traps or insecticide-impregnated targets (for example Dransfield et al., 1991; Okoth et al., 1991; Laveissiere et al., 1989; Gouteux et al., 1989).*

6.1.2 Impact Producers' associations and co-operatives have been a means of providing a range of veterinary services to members in areas that might otherwise not receive such services (Leonard, 1993; Umali et al., 1992; Ali and Saha, 1980; Dransfield et al., 1991; Tomboc and Reyes, 1993; De Haan and Bekure, 1991) and it is therefore assumed that production is likely to have benefited.

- *The National Federation of Central African Livestock Owners (FNEC) in the Central African Republic is often cited as an example of an association that has effectively supplied drugs and vaccines to a large number of producers who previously were unable to receive these from the state services (de Haan and Bekure, 1991).*
- *Community-based associations established to control tsetse fly using traps have successfully reduced levels of infections within the areas covered by traps (Dransfield et al., 1991).*

In some cases co-operatives have had a demonstrable impact on production. For example:

- *Milk yields of members of dairy co-operatives in India were higher than those of non-members (Umali et al., 1992).*

Because the membership of the associations or co-operatives dictates the type of services provided, there is a greater chance that the services are more relevant to livestock keepers' needs – and hence have a greater impact on production – compared to those provided under centralised government control, which is less aware of the key production constraints that farmers face.

Farmers' organisations may, however, lack professional resources, and this may reduce the effectiveness of their work (Bebbington, 1989; Umali et al., 1992). Community-based disease control programmes have, for example, failed due to inadequate knowledge. So whilst Kenyan community groups showed themselves to be good at financing construction of dips (for the protection of cattle against ticks), they lacked sufficient technical knowledge to operate them (Leonard, 1987).

Associations have also run into difficulties when they have been unable to exercise powers of exclusion and as a result the whole population living in an area have benefited from provision of the association's services. This has proved a particular problem in the community-managed tsetse control programmes (Echessah et al., in press; Swallow and Woudyalew, 1994).

6.1.3 Cost Associations and co-operatives are able to provide economies of scale that should reduce costs of delivery. They are also assumed to be able to reduce costs of delivery of public goods such as research and extension by combining their delivery with veterinary treatments. In some cases co-operation has enabled cheaper forms of disease control technology to be used.

- *Community-based associations can be used to control tsetse fly using traps. Community-managed tsetse traps are cheaper than individually administered drug-based alternatives. By co-operating, farmers are able to reduce the cost of controlling disease (ODA/KETRI, 1991).*

There is, however, a lack of data to support these assumptions. It is therefore not clear whether costs of delivery are any lower than those of comparable state-delivered services.

6.1.4 Financial sustainability

A clear advantage of associations is their ability to finance a range of services through membership subscriptions, levies on products sold (such as milk) or charges for consumables such as veterinary drugs. The services provided by associations should therefore be fully financially sustainable (Umali et al., 1992; de Haan, 1993; Okoth et al., 1991).

- *The veterinary services provided to members of Indian Operation Flood dairy co-operatives are financed by the milk producers' union, which recovers the funds from individual village milk societies through a levy on the price paid for milk.*
- *FNEC's drug sales are completely self-financing (de Haan and Bekure, 1991).*

Not all membership organisations are, however, financially sustainable (Bebbington, 1989). Some have received subsidies from the state or from NMOs to encourage their formation.

- *Many community initiatives to control tsetse fly are partly dependent on external funding (Dransfield et al., 1991; Otieno and Dransfield, 1990; Laveissiere et al., 1989).*
- *In Kenya, the community-based self-help Harambees receive from the government an equal sum to that raised by the community.*
- *In Latin America none of the organisations reviewed by Bebbington et al. (1993) were self-financing.*

Some communities are more successful than others in enforcing charges and this can lead to variations in the quality of service provided. In Kenya, for example, the provision of community managed dips was uneven because of variable success of fee collections in different areas (Leonard, 1987).

6.1.5 Coverage

Membership organisations can range in size from individual villages to nation-wide programmes (de Haan, 1993).

- *Over 60% of herders in the Central African Republic are fee-paying members of the producer association FNEC (Umali and Schwartz, 1994).*

Many associations are, however, localised and may cater for only a small proportion of farmers. This may be because they are unable to compete with fully subsidised state services, or because their capacity to provide veterinary services is constrained by government regulations that prohibit the supply of certain drugs and vaccines through non-government operators (de Haan and Bekure, 1991).

Co-operatives tend to form only in areas where their activities are financially viable (Ali and Saha, 1980) and may not be sustainable in areas where production is marginal or where farmers are widely dispersed. Membership of associations may be biased against poorer farmers (Sims and Leonard, 1990; Jarvis, 1986; Doornbos and Gertsch, 1994). Some associations, for example, require ownership of land as a condition of membership (Mitra, 1990, cited in Sims and Leonard, 1990).

- *Co-operatives in South America are felt to be successful for owners of larger livestock-holdings, but are considered unsuitable for the poor (Jarvis, 1986).*

There are, however, other examples of co-operatives that are relatively equitable (Ali and Saha, 1980). Operation Flood, for example, claims that more than 70% of its dairy co-operative members are small-scale and marginal farmers and the landless (Farrington et al., 1993b).

6.2 Assessment of the performance of non-membership organisations

Non-membership organisations or NMOs (sometimes called Non-Government Organisations) rely on voluntary donations from non-beneficiaries to sustain their activities. These donations are a means of transferring wealth from one sector of society to another and may occur either within a country or between countries. NMOs may have a political agenda in addition to a more charitable function of poverty alleviation.

- 6.2.1 Roles** A large number of NMOs around the world are involved in the livestock sector, and animal health in particular. A summary of the services that they provide is presented in Table 11. A review of the literature suggests that in general NMOs have focused on the delivery of clinical veterinary services and the supply of veterinary pharmaceuticals. A few have provided public-good

services as extension and research. BAIF (Bharatiya Agro-Industries Foundation), the largest NMO in India, produces its own vaccine, has its own disease surveillance programme and conducts leading-edge technical research (Satish and Farrington, 1990).

Many NMO programmes seek to strengthen indigenous capacity to provide veterinary services, either by training local para-veterinarians who then establish their own private practices (Box 8), or by forming associations which are capable of collectively financing the delivery of public goods (Young, 1993a).

Box 8 The United Mission to Nepal

Many farmers in Nepal did not have access to the government animal health care services. In response to demands for veterinary health care, the United Mission to Nepal trained village animal health workers (VAHW) in simple animal health care techniques. VAHWs were nominated for training by the community and, on completion of a short course, returned to their communities to provide animal health services, sometimes on a fee-paying basis, to their neighbours. A wide range of diseases which otherwise would not have been treated have been cured through the training of VAHWs (Young et al., 1994).

NMOs may also seek to enhance the ability of local organisations to manage new technology, to draw on the government services they require and to negotiate with the commercial sector (Farrington et al., 1993a).

6.2.2 Impact Through the establishment of para-veterinary programmes and associations, some NMOs aim to provide veterinary services to farmers who do not otherwise have access to veterinary drugs and expertise (Grandin et al., 1991).

- *Intermediate Technology's programme in Kenya has operated training programmes and opened shops that sell veterinary drugs to expand poorer people's access to at least some form of veterinary advice (Grandin et al., 1991).*

Table 11 Summary of services provided by non-membership organisations

Name	Country	Described by	Clinical service	Distribution of drugs and vaccines	Control of diseases with externalities	Extension	Diagnostic support	Research
BAIF	India	Satish and Farrington 1990, 1993		Yes	Yes	Yes	Yes	Yes
FIVDB	Bangladesh	Nahas, 1993	Yes	Yes	Yes	Yes		
BRAC	Bangladesh	Mustafa et al., 1993	Yes		Yes	Yes		Yes
Proshika	Bangladesh	Khan et al., 1991, 1993	Yes	Yes	Yes	Yes		Yes
Oxfam	Sudan	Almond, 1991	Yes	Yes	Yes			
Oxfam	Chad	Peters, 1993	Yes	Yes				
Agraria	Chile	Bebbington et al., 1993			Yes			
CESA	Ecuador	Farrington et al., 1993a			Yes			
ITDG Women Poultry	Kenya	Grandin et al., 1991			Yes			
ITDG	Kenya	Grandin et al., 1991	Yes	Yes				
Vetaid	Afghanistan	Leyland, 1993	Yes	Yes	Yes			
Wam Enuk	Indonesia	Smith, 1993	Yes	Yes				
Farm Africa	Kenya	Farm Africa, 1992						
Aga Khan Foundation	Pakistan	Farrington et al., 1993a						
AHITP	Nepal	Stoufer and Ojha, 1993						
Chiapas University	Mexico	Perezgrovas et al., 1993a,b						

By building on local knowledge they have in some cases been more successful at introducing new concepts of health care than more conventional approaches (Perezgrovas et al., 1993b).

- *Perezgrovas et al. (1993a) designed an animal health and production programme for Indian sheep-rearers in Mexico that was based on local understanding of disease, indigenous treatment and local calendars. The programme has been increasingly used, rather than completely rejected as previous 'top-down' attempts have been.*

Few, however, have measured their impact on production (Farrington et al., 1993a; Bazeley, 1993).

NMOs argue that their programmes are likely to have a greater impact on production than equivalent state services because they are initiated in response to clearly identified needs (Mustafa et al., 1993; Mulvany and Njeru, 1993; Villet, 1994). By adopting participatory planning procedures NMOs are able to target their resources on the most serious perceived constraints. However, as Farrington et al. (1993a) point out, farmers' requests are often based on short-term perspectives that may not always be sustainable.

The impact of NMO programmes is likely to be limited in those countries where government regulations prohibit private veterinarians and para-veterinarians from using certain drugs and vaccinations. Several NMO para-veterinary programmes report that legislation of this kind limits the impact of their programme (Grandin et al., 1991; Khan et al., 1993; Mustafa et al., 1993; Lewis, 1993; Mulvany, 1991; Sikana et al., 1992).

- *In Bangladesh, Mustafa et al. (1993) note: 'Although the government appears convinced of the viability of the BRAC approach to poultry production, a number of administrative procedures need to be agreed before BRAC can safely move on. One area is access to vaccines, which is currently controlled by the government.'*

Without access to essential drugs and vaccines, para-veterinarians are unlikely to have a significant impact on production (Sikana et al., 1992). NMOs may also lack specialist skills and facilities to support para-veterinarians and

associations. In the long term, projects will require institutional and technical support which can probably be provided only by government veterinary services (Young, 1993b).

6.2.3 Cost It is often argued that NMOs are able to deliver services more cheaply than state alternatives (Farrington et al., 1993a; Satish and Farrington, 1990; Bebbington, 1989) but in general these claims have not been substantiated with an analysis of costs.

Associations can provide economies of scale that lower costs. BAIF's work in India has demonstrated how AI delivery systems incorporating routine vaccinations, advice on health and nutrition, and progeny monitoring could be established more cost-effectively than comparable services provided by government (Satish and Kumar, 1993).

Many NMO programmes place special emphasis on participation and the use of local delivery systems which may reduce the cost of their programmes. The use of para-veterinarians in particular is likely to reduce costs of delivery, but there is no evidence to suggest that these costs are lower than government 'para-veterinary' schemes.

6.2.4 Financial sustainability Although NMOs usually place special emphasis on financial participation of beneficiaries in their programmes, most still rely on donations from outside the community to fund their activities. A review by Riddell and Robinson (1993, cited in Farrington et al., 1993a) concluded that out of the 16 projects examined, 12 had limited or no potential to be financially sustainable.

Some NMOs insist that services are provided on a fee-paying basis (Almond, 1991, Young, 1993a) so as to secure the long-term financial sustainability of these programmes. In Bangladesh, for example, para-veterinarians in BRAC's poultry initiative, FIVDB's duck production and Proshika's livestock work are paid by the recipients of their services. Once fees are charged, the initiatives develop elements of community-based or private organisations (Farrington et al., 1993a).

Efforts to secure sustainability are mixed. Young (1993b) reviewed experience in a number of para-veterinarian

programmes, mainly run by NMOs, and reports that the services were used enthusiastically even when the full market price was charged. Others have experienced difficulties. Sometimes only a proportion of para-veterinarians are able to remain operational once subsidies are removed (Moktan et al., 1990) and many continue to rely on financial and technical support from NMOs (Ibrahim, 1993; Bradstock, personal communication; Peters, 1993).

6.2.5 Coverage NMOs are selective in the areas in which they operate, often choosing to concentrate on marginal areas where no other services are available. They frequently direct their programmes towards the needs of relatively disadvantaged groups, including women and the poor (Carney, 1994; Khan et al., 1993; Nahas, 1993; Mustafa et al., 1993; Winrock, 1992).

- *Half of the groups with which Proshika works in Bangladesh are specifically women's groups, and FIVDB have programmes that have helped mainly poor women. Services by FIVDB, BRAC and Proshika focus on livestock species and systems appropriate for marginal farmers, typically poultry or backyard rearing systems. (Mustafa et al., 1993; Khan et al., 1993; Tomboc and Reyes, 1993).*

The use of para-veterinarians has probably made animal health services available to the poorer sections of society.

- *The use of village vaccinators against Newcastle Disease in Burkino Faso, and Pest des Petits Ruminants in Nigeria and Cote d'Ivoire, for example, has made animal health care available to poorer sectors of society (Winrock, 1992).*

Some, however, question whether clinical animal health care programmes are able to reach the poorest, who may still be unable to afford services provided on a cost-recovery basis (Mulvany and Njeru, 1993; Young et al., 1994). There is also concern that associations formed by NMOs are dominated by middle-income farmers (Farrington et al., 1993a). Although NMOs would appear to have a potentially significant impact on the rural poor, in general their activities are localised. Even in Bangladesh, a country with a high density of NMOs, it has been estimated that only 20% of the rural poor are reached by NMOs (Lewis, 1993).



7 Prospects for Improvement

This section compares and contrasts the type and quality of services provided under reform programmes within the state, and by NMOs and MOs of the Third Sector, so as to distil key lessons for the improved delivery of veterinary services.

7.1 Respective roles Although there are considerable variations in the roles of different organisations, certain patterns nonetheless emerge from the review of available literature. These are summarised in Table 12, and discussed under headings (i) to (iv).

Table 12 Summary of the activities currently carried out by different organisations in the delivery of veterinary services

	State veterinary services	MOs	NMOs
Clinical intervention	Provided by most organisations	Provided by most organisations	Provided by most organisations
Distribution of drugs and vaccines	Provided by most organisations	Provided by most organisations	Provided by most organisations
Diagnostic support	Provided by most organisations	Provided by some organisations	Provided by some organisations
Vaccination	Provided by most organisations	Provided by most organisations	Provided by most organisations
Research	Provided by most organisations	Provided by some organisations	Provided by some organisations
Extension	Provided by most organisations	Provided by most organisations	Provided by some organisations
Disease surveillance	Provided by most organisations	Provided by most organisations	Provided by most organisations
Quarantine	Provided by most organisations	Provided by most organisations	Provided by most organisations
Drug quality control	Provided by most organisations	Provided by most organisations	Provided by most organisations
Food hygiene/inspection	Provided by most organisations	Provided by most organisations	Provided by most organisations

Key  Provided by some organisations
 Provided by most organisations

(i) Clinical veterinary services, distribution of drugs and vaccines, and diagnostic support

There are numerous examples where NMOs and MOs have provided clinical veterinary services, veterinary pharmaceuticals and diagnostic support to farmers. The key advantage of these organisations is their ability to provide services to farmers who have not previously received veterinary services from the government. Associations have been able to achieve sufficient economies of scale to provide fully qualified veterinary services to their members. In contrast NMOs have reduced the delivery costs of clinical services to rural producers by training local para-veterinarians to provide low-cost 'private practices' in rural communities.

State services have also attempted to improve the delivery of clinical services, drugs and vaccines through para-veterinary programmes and by subsidising professional private operators.

(ii) Control of diseases with externalities including quarantine services

When disease risks are perceived to be high, membership organisations have provided a mechanism for controlling diseases with externalities. Problems have arisen where communities have been unable to enforce collective decisions.

State veterinary services commonly control diseases with externalities, either through vaccination programmes or by containing outbreaks. The state has been able to achieve some success in the early control of epizootic and potentially explosive disease. This role should be strengthened through the use of economic and epidemiological tools that ensure national resources are targeted towards those diseases that have the greatest potential cost to national production and are amenable to control under the prevailing circumstances.

Quarantine services and the association regulations required to enforce compliance are generally provided by the state. This is an activity that neither associations nor NMOs are qualified to provide.

(iii) Research and extension

Membership organisations have been able to use membership fees or producer levies to finance public-good services such as research, extension and diagnostic support. Because these are demand-led it is possible that their relevance and hence impact is greater than those provided by centrally planned state services.

Some NMOs may engage in research, but with the exception of BAIF in India, NMOs do not in general provide 'public-good' services, preferring instead to establish associations among farming communities which are then capable of providing a wider range of services on a financially sustainable basis.

Some state veterinary services are improving their capacity to deliver demand-led research and extension through programmes that decentralise services to a local level and incorporate participative, bottom-up planning procedures.

(iv) Disease surveillance

In general, disease surveillance appears to be provided only by the state. There are opportunities to strengthen disease surveillance capacity by making use of para-veterinarians to report disease outbreaks. Further improvement may be gained by focusing resources on the detection of highly infectious diseases.

7.2 Comparative advantages

There is insufficient quantitative data to evaluate the quality of service provided by each type of organisation, although some relative strengths and weaknesses have emerged. In summary:

- NMOs are not financially sustainable, but play a valuable role by encouraging formation of membership organisations (Farrington et al., 1993a; Winrock, 1992) and establishing para-veterinary private practices based on local knowledge systems (Ashdown, 1994) in areas that might not otherwise be covered by state services or associations. Their particular focus on the poor and on women farmers suggests that NMOs may have a role to play in assisting the government in providing veterinary services to marginalised, smallholder farmers.

- MOs such as associations and co-operatives are widely perceived as a promising means of providing veterinary services (Umali et al., 1994b; de Haan and Bekure, 1991). They achieve sufficient economies of scale to enable professional veterinary services and an improved supply of drugs and vaccines to be provided to their members. Through their collective financing mechanisms they are also able to provide public good services such as research and extension, or the control of diseases with externalities, on a financially sustainable basis. Because the services are demand-led their impact on production is likely to be higher than that of centrally designed programmes of state services, although in some cases membership has been found to discriminate against poorer marginal farmers.

Box 9 Example of successful collaboration: the case of Proshika in Bangladesh

Proshika's livestock programme has provided the government with a well-networked distribution system for its scarce inputs. This collaboration has served the interests of both government and NGO, allowing the government to distribute vaccines and services more widely, and strengthening Proshika's group-based activities by giving members proper access to inputs and support facilities through which they can generate income from livestock rearing. Adapted from Khan et al., 1993

- The impact of associations and para-veterinary programmes is compromised by inadequate technical resources and restricted access to scheduled drugs. The success of many para-veterinarians and associations is therefore dependent on their ability to integrate within existing government and private systems (Young, 1993a; Mulvany and Njeru, 1993), although in many cases this has not been achieved.
- Whilst the state may be able to deliver clinical veterinary care successfully through subsidy schemes and para-veterinarian programmes, and improve the impact

of public-good services such as extension and research through decentralisation, it is likely that its comparative advantage rests elsewhere. Only the state appears qualified to provide services such as quarantine, disease surveillance, emergency disease control measures and veterinary and public health legislation (FAO, 1992a), and indeed these are areas in which many state services have achieved some measure of success.

7.3 Prospects for improved delivery

There are opportunities for improving the delivery of veterinary services by encouraging associations and NMOs to provide a range of services to smallholder farmers including disadvantaged groups. This would allow the state to focus its resources on those services it does best, without necessarily having to compromise national productive capacity.

State performance can be enhanced by strengthening capacity to detect and control epizootic and potentially explosive disease at an early stage. An ability to regulate services in a manner that is conducive to safe supply of drugs and vaccines is also needed.

Linkages between different organisations would improve the quality of their respective programmes. This would allow the state to improve the early detection of epizootic diseases by making use of para-veterinarian networks. A closer association with the government would enable para-veterinary programmes, NMOs and associations to benefit from better access to the specialist skills, veterinary pharmaceuticals and diagnostic facilities of government services.

The improved delivery of veterinary services is therefore likely to require an integrated approach that capitalises on the relative strengths of different organisations and establishes mutually supportive relationships between different institutions so as to enhance their respective performance (Farrington et al., 1993b; Mulvany and Njeru, 1993). The final section of this report examines some of the barriers that might prevent a more liberal approach to service delivery.

8 Barriers to Change

This review has identified a number of organisations and reform measures that can improve the delivery of veterinary services to smallholder farmers. Although the relative merits of each have not been quantified, it is likely that there is some potential for the state to establish synergistic relationships with other organisations that would enable more efficient animal health services to be provided to a wider range of livestock keepers. Despite these opportunities, state veterinary services have on the whole strongly resisted moves towards a more liberal approach to veterinary service delivery (de Haan and Umali, 1992; Mpelumbe, 1993; Leonard, 1992).

This reluctance to liberalise the supply of services has manifested itself in two ways:

- **The continued provision of free or subsidised livestock services** which undermines programmes that aim to be financially sustainable (Anteneh, 1991; de Haan, 1993; Khan et al., 1993; Odeyemi, 1994b). By monopolising the delivery of veterinary services the state has effectively discouraged any private sector development, especially that of the traditional sector (Box 10, see page 64) and in doing so has significantly reduced the opportunity for privatisation in the future.

Box 10 The history of traditional medicine

Wherever farmers and livestock have coexisted there has been a tradition of animal healing (Schwabe, 1982; Blancou, 1994). Healers, who did not always differentiate between the treatment of animals and people, specialised in services such as bone setting, religious medicine, midwifery or fortune telling (Mesfin and Obsa, 1994), in acupuncture, vaccination, surgery and herbal treatment (McCorkle and Mathias-Mundy, 1990).

The oldest form of animal health services were those that provided prophylactic, therapeutic and curative treatments to individual farmers. In keeping with their private-good characteristics, these early clinical services were traditionally provided on a fee-paying basis. They remain even today an important (and often only) source of advice and treatment for farmers (Mesfin and Obsa, 1994).

More recently, advances in disease diagnosis and treatment have introduced a new set of skills to animal health care. In some cases the 'indigenous' clinical services have absorbed this new knowledge and have evolved into modern-day veterinary practices. More often, however, divided by differences in education, modern veterinary science has remained distinct from traditional health care (Allen, 1993) and two parallel services have emerged: one, based on traditional medicine, found in rural areas; the other, the urban graduate, found in urban areas.

- **Restrictive legislation** that prohibits private practice or layman application of veterinary drugs (Umali et al., 1992). Government monopoly over the importation and distribution of supplies has proved particularly damaging to the development of the non-government sector (FAO, 1994b), especially when these policies discriminate against private para-professionals who offer the cheapest means of reaching smallholder farmers (de Haan, 1993). The net effect is to deny the majority of the population access to the drugs and vaccines that they need to tackle their livestock disease constraints (Walshe, 1987; Mulvany, 1991; de Haan, 1993; Beaton, 1959; de Haan and Bekure, 1991). Given governments' poor performance in the delivery of clinical services and veterinary pharmaceuticals to smallholder farmers, restricting non-government access to drugs severely limits prospects for improving the supply to smallholder farmers through non-government channels (Box 11).

Box 11 Impact of regulation on private sector activity

The negative effect of regulation on drugs supply can be illustrated by the cases of Afghanistan and the Central African Republic. In both countries governments have collapsed. In their place alternative arrangements for the delivery of veterinary services have proliferated. In Afghanistan, despite on-going civil war, most smallholders have better access to veterinary drugs and treatment than under civil rule (Schreuder et al., 1994). In the CAR, herders used a revitalised co-operative to deliver the needed veterinary services on a private and fully self-financing basis (Leonard, 1992).

The activities of para-professionals in particular are viewed with some concern by the veterinary profession (Tber, 1995), leading Odeyemi (1994a) to conclude that: 'The para-veterinarians are a group of participants in the animal health delivery system whose role is often misunderstood and underestimated' (Box 12).

Box 12 Resistance to para-professionals

'The idea of allowing para-veterinarians to sell veterinary drugs or open clinics must be totally eliminated' (Tber, 1995).

'One must guard against a situation developing whereby technicians posing as pseudo-veterinarians are able to gain an advantage over professionals in private practice. They are able to do this because of their lower charges and the fact that they live in close proximity to producers. Appropriate legislation and vigilance of the national veterinary associations should prevent this tendency from occurring' (Mpelumbe, 1993).

These reservations are based on justified concerns regarding the quality of the services para-professionals are able to provide. They may also reflect fears of the competition para-veterinarians pose to the established veterinary profession and to private practices (FAO, 1994b; Ashdown, 1994).

8.1 Regulation State services have good reasons for retaining control over the supply and distribution of drugs and vaccines. The moral hazard problems associated with pharmaceuticals mean that there is a justified need to regulate these products so as to ensure quality and avoid misuse. National services are also under international pressure to ensure that their livestock products are not contaminated with drug residues (OIE, 1993).

Regulation was traditionally required in the early days of veterinary science when some drugs contained ingredients that were toxic to humans and improper use produced serious side effects (de Haan and Bekure, 1991). Many of these drugs have now been superseded by safer products, but there is still a danger that non-professional operators may incorrectly dose animals, creating problems of drug resistance and in some cases a risk to human and animal health.

Further impetus for drug regulation comes from the fact that drug residues are increasingly used as a barrier to trade. Major importers of livestock products have stringent standards for antibiotic residues in meat. The misuse of antibiotics by even

small groups of farmers can lead to a ban against all livestock exports from a country. International sanitary standards can exert a disproportionate influence on domestic policy and are a source of pressure for even higher standards of drug control.

Where regulation has been ineffectively enforced, then substandard, date-expired products become commonplace (Odeyemi, 1994a). As in the case of pesticides and human medicine, unregulated markets can quickly lead to misuse (World Bank, 1993).

State services sometimes argue that a government monopoly over importation and distribution is necessary to protect the producers against receiving inferior drugs at black market prices offered by unscrupulous traders (Odeyemi, 1994a). Restricting distribution through veterinarians supposedly ensures that the right dose is administered and that drug resistance induced by under-dosing is precluded (OIE, 1987). Such caution may, however, be misguided. A survey of veterinarians in the Central African Republic in 1984 found that 80% of the state veterinarians could not calculate the correct drug dosage against trypanosomiasis (Umali et al., 1992). When FNEC, a producers' association, took over the distribution of drugs and vaccines and trained farmers to vaccinate their own animals, a subsequent survey showed that the majority of herders were able to dose their animals correctly against internal parasites, trypanosomiasis and piroplasmosis (Umali et al., 1994b).

Given the impact of regulation on the supply of veterinary services to smallholder farmers, there is a need to strengthen government capacity to regulate the private sector in a manner that is sensitive to both the positive and negative effects on drug supply (World Bank, 1993; Mlangwa and Kisauzi, 1994).

8.2 Political caution There may, however, be other reasons why governments do not wish to adopt a more liberal attitude towards the non-government sector. Policy makers may believe that the political risks incurred by encouraging farmers to form organisations may outweigh the economic benefits, a sentiment echoed by Brattan (1989) who notes that: 'the amount of space allowed to NMOs in any given country is governed first and foremost by political considerations, rather than by any calculation of the contribution

of NMOs to economic and social development.' In some cases these suspicions of NMO motives are justified: many NMOs do indeed have a political agenda that may rule out any form of co-operation with the government (Farrington et al., 1993b).

8.3 Lack of evidence Whilst there has been no shortage of vigorous advocates for privatisation, there have been very little hard data and analysis to guide policy makers (Leonard, 1993; Anteneh, 1991; de Haan, 1993; Umali et al., 1994a). This review was unable to find any real evidence to support assertions that alternative organisations are able to offer better services than those provided under government reform schemes.

A cursory review of the World Bank Development Report on investing in human health (World Bank 1993) suggests that, in contrast to the veterinary sector, the reform of public health services has been guided by quantifiable indicators of the relative merits of different types of delivery. For example, policy makers are informed that the activities of community health workers in Nepal have led to a 28% reduction in the risk of death from all causes by the third year of the project; that delivery systems based on training traditional healers are able to lower maternal mortality rates by 60% over a 10-year time period in Bangladesh; that programmes of reform in The Gambia have led to a reduction in the cost of immunisation from \$19 in 1982 to \$6 in 1988. Faced with such information, rational choices can be made; in its absence policy makers are left with conflicting ideologies and poorly understood economic theories. Who then can blame the state services for sticking with what they know?

8.4 The political economy of change Given the reluctance of state veterinary services to liberalise the supply of veterinary services, it is becoming increasingly obvious that reform is contingent upon securing the participation and commitment of the state towards the improvement of the quality of a country's veterinary services (Sims and Leonard, 1990; Gros, 1994; Lewa, 1995; Carney, 1994). State participation in furthering the cause of privatisation in western history has been very significant (Gros, 1994; Sims and Leonard, 1990) but is conspicuously absent in many of the privatisation programmes in developing countries (de Haan and Nissen, 1985; Gros, 1994).

Box 13 Trade barriers

Recent changes in non-tariff trade barriers may have far-reaching implications for domestic production in developing countries. Trade in livestock and their products, especially milk and dairy products, is distorted by a range of producer subsidies and trade barriers. The combined value of these protection measures to the producers is measured by Producer Subsidy Equivalent (PSE) which measures the value of monetary transfers from taxpayers and consumers to the producer. On average, producers in OECD countries each receive US\$ 14,000 per year in the form of measures designed to enhance production and protect markets.

These measures reduce world market prices by artificially raising domestic production in countries that would otherwise import products (such as the US and EC), and by increasing the volume of subsidised products on the world market. For example, nearly every industrialised country isolates and protects its dairy farmers with import barriers and domestic market intervention. In OECD countries, average domestic prices are roughly twice those of world prices, but because such large quantities of dairy products are 'dumped' in international trade the world market price is greatly depressed.

Although cheaper world prices are of benefit to developing countries who import livestock products, they inhibit domestic production and prevent countries that have a comparative advantage in livestock production from exporting as they are unable to compete with the subsidised world market (Jarvis, 1991).

The recently completed Uruguay-Round Agreement on Agriculture, as part of the General Agreement on Tariffs and Trade (GATT), has made several measures to liberalise world trade. One such measure is the Sanitary and Phytosanitary Agreement whereby all governments must justify the use of sanitary measures on the basis of evidence that they do in fact significantly reduce the risk of disease.

These measures, although modest, are predicted to increase world meat prices by 3.7% and improve self sufficiency ratios in meat and dairy products by 4.2 and 5.2% respectively (OECD, 1994). The domestic production of dairy products in Africa and India in particular is thought to benefit from these more liberal trade measures.

Pressure for liberalisation has often been precipitated by donor pressure (Anteneh, 1991; Gros, 1994), often without consultation with all the stakeholders (Lewa, 1995; Gros, 1994). This has led to misconceptions concerning the role of the non-government sector – privatisation tends to be viewed as an ‘evil necessity’ driven by fiscal crises rather than as an opportunity to improve efficiency (Tber, 1995) – and programmes have consequently received poor support (Odeyemi, 1994b; Gros, 1994).

How then can state support for change be secured? Lewa (1995) argues that there is a need to create a culture of reform in order to enlist the support of key political interest groups. This will mean going beyond issues of economics, and addressing the fears and aspirations of those who lead the state veterinary services (Ross, 1992; Gros, 1994; Anteneh, 1991).

State services are under considerable pressure to raise efficiency and are aware of the need to justify programmes in terms of impact (Anteneh, 1989). At the same time they face new responsibilities and challenges that need to be accommodated (Bazeley, 1993). Recent changes in non-tariff trade barriers to international trade (Box 13, page 69) mean that state services must achieve greater transparency in the use of sanitary measures to facilitate safe trade. This in turn will require improved disease prevention and surveillance capabilities (OIE, 1993) and the strict enforcement of sanitary regulations. To secure international credibility many developing countries are therefore under pressure to raise the quality of their services at the very time that they are being encouraged to scale down their operations as part of an overall structural adjustment programme.

To help the state meet these challenges, veterinary planners require more and better information on the policy options that are available to them (Gros, 1994; Anteneh, 1991; OIE, 1995). In his analysis of grain marketing reform in Kenya, Lewa (1995) concludes that ‘if the architects and managers of reform had taken the trouble to provide adequate information on the expected benefits of reform, they would have found that some of the reforms had much support’ (Lewa, 1995.)

8.5 Conclusion An analysis of the economic properties of animal health services concluded that the public sector was likely to continue to play a significant role in the provision of services to smallholder farmers. Public good services (such as disease surveillance and quarantine) or services that either have externalities or are subject to asymmetries of information require state financing through taxation and/or enforcement of law. State services are able to achieve large economies of scale and thus can also be an appropriate vehicle for providing private goods to farmers under certain circumstances.

Nonetheless, there is good evidence to suggest that other organisations can more effectively deliver certain services that might otherwise be considered the preserve of the state. Associations and NMOs have successfully provided research and extension services, clinical interventions and preventive health care to marginal smallholders. These are usually demand-led and meet locally defined needs. They are therefore likely to be more relevant than centrally planned state services. However, there are very few quantitative data to substantiate claims of their relative merits. If such alternative delivery systems are to reach their full potential, then governments will need to liberalise veterinary policy. In many countries government policies prohibit the use of certain drugs and vaccines by private operators and para-veterinarians. As a result the activities and impact of non-government operators have been curtailed. In some cases competition from state-subsidised services has also undermined the activities of non-government organisations.

Policy makers may be reluctant to liberalise as they lack sufficient evidence upon which they can base policy decisions. More information could allay some of their reservations, but would this be sufficient? The reluctance to move towards a more liberal approach to service delivery suggests that there is a need to set institutional reform within the context of the political economy of institutional change. The focus of debate in the past has concentrated on defining the appropriate roles for the state and private sectors in the delivery of veterinary services along economic principles; much less attention has been given to the question of how governments can be encouraged to manage change. There remains a need to address empathetically the fears and aspirations of state veterinary services, which undoubtedly extend beyond purely economic arguments.

Notes

2 Why Veterinary Services?

¹ In low income countries livestock products are usually considered luxury products that are consumed in relatively small quantities. As consumers' incomes rise so too does their consumption of livestock products (Jahnke, 1982).

² Privatisation is defined as the process by which governments divest certain responsibilities to non-government organisations, *i.e.* the private sector. The private sector includes market-dependent private enterprises (firms or individuals) as well as producers' associations, co-operatives and charity organisations (Anteneh, 1985).

3 A Theoretical Basis for Reform

³ A distinction is made between the provision and delivery of a service. Although the state may have responsibility for ensuring the supply of a service, it may do so by financing its delivery through the private sector.

⁴ Where efficiency is defined as 'Pareto optimality': a resource allocation is Pareto optimal if no-one can be made better off without someone else being made worse off (Beynon et al., 1995), *i.e.* under perfect competition, markets will maximise social welfare for a given set of resources and given initial income distribution.

⁵ There are other reasons for market failure but these do not appear to have featured in the literature regarding the privatisation of veterinary services.

⁶ In economic parlance a public good is said to be non-excludable (*i.e.* non-paying consumers cannot be prevented from using public goods) and non-subtractable (*i.e.* the consumption of a public good by one individual does not reduce its supply to others) (Beynon et al., 1995).

⁷ Collective responsibility in effect 'internalises' the spill-over effects.

⁸ Asymmetries of information occur where one side of any potential transaction has less information than the other side (Smith and Thomson, 1991).

⁹ A moral hazard is defined as when one party to a transaction undertakes certain actions that (a) affect the other party's valuation

of the transaction but that (b) the second party cannot monitor and/or enforce perfectly (Smith and Thomson, 1991).

¹⁰ The more the 'units of service' provided at each point of delivery, the lower the cost per unit.

¹¹ Evidence on this point is mixed. A study by Leonard (1985) in Kenya concluded that poorer farmers made greater use of veterinary services once privatised than when these were supplied by the state, whereas a more recent study of the privatisation programme in Cameroon found that low-income farmers reduced their use of veterinary services once privatised (Gros, 1994). Private services in Brazil and Argentina have proved to be similarly biased towards large and medium scale farmers (Carney, 1994).

¹² Providing this is the most efficient means of redistributing wealth: paradoxically, in the longer term any production gains associated with widespread access to services are likely to benefit the consumer in the form of lower prices. There may be more effective ways of addressing poverty than the provision of veterinary services (Blarcom et al., 1993; Beynon et al., 1995).

4 Empirical Evidence: A Framework for Comparison

¹³ Production includes all livestock outputs irrespective of whether they are sold.

¹⁴ Strictly speaking, this should be the change in value of net production, *i.e.* the extra production less the extra costs, such as feed, that might be required to achieve that additional output.

9 Literature Used to Compile the Report

- Acha, P. and Crosnier, J. (1987) *Animal Health Planning*, paper presented at the Economic Development Institute Seminar on Organisation of African Livestock Services, Paris 25–27 May 1987.
- Acha, P. N. (1987) 'A Strategy for Veterinary Services to Meet the Requirements of a Changing World,' *Revue Scientifique et Technique, Office International des Epizooties* 6 (4).
- Ali, M. and Saha, G. C. (1980) *Clinical Veterinary Services for Small Farmers – The Bangladesh Milk Producers Co-operative Union Ltd*, paper presented at the Commonwealth Secretariat meeting, 1980.
- Allen, D.E. (1993) 'Herbs for Herbivores: The Prehistory of Veterinary Medicine,' (ed. A.R. Michell) *History of the Healing Professions: Parallels between Veterinary and Medical History*, The Advancement of Veterinary Science, The Bicentenary Symposium Series, 3.
- Almond, M. (1991) 'Pastoral development and the Use of Paravets in Southern Sudan', *Development in Practice* 1 (1).
- Anderson, J. R. and de Haan C. (eds) (1992) *Public and Private Roles in Agricultural Development*, Proceedings of the 12th Agricultural Sector Symposium, The World Bank, Washington DC.
- Anon. (1983) 'The Resurgence of Rinderpest', *World Animal Review Special Supplementary Issue on Rinderpest*.
- Anon. (1992a) 'Winners and Losers in the Privatisation Game', *Spore* 41.
- Anon. (1992b) *Bulletin Epidemiologi Veteriner*, 52 (1), Direktorat Bina Kesehatan Hewan, Jakarta, Indonesia.
- Anteneh, A. (1984) Financing Animal Health Services in Some African Countries, *ODI Pastoral Development Network Paper 17b*, ODI, London.
- Anteneh, A. (1984) 'Trends in Sub-Saharan Africa's Livestock Industries', *ILCA Bulletin* 18.
- Anteneh, A. (1985a) Financing Livestock Services in some countries of East and Southern Africa, *ILCA Livestock Policy Unit Working Paper 6*, ILCA, Addis Ababa.
- Anteneh, A. (1985b) Financing Livestock Services: Do Directors

of Veterinary Services Have a Distinct Role in Policy-Making?, *ALPAN Paper 6*, ILCA, Addis Ababa.

- Anteneh, A. (1989) 'Livestock and Food Production in Africa: Challenge and Opportunity for the National Livestock and Veterinary Services', *Revue Scientifique et Technique, Office International des Epizooties 8* (3).
- Anteneh, A. (1991) The Financing and Staffing of Livestock Services in sub-Saharan Africa: A cross-country analysis, *ILCA Livestock Economic Division Working Document 16*.
- Anteneh, A., Sandford, S. and Anteneh, B. (1988) 'Policy, finance and technology in livestock development in sub-Saharan Africa: some critical issues', *ILCA Bulletin*, 31.
- Antholt, C.H. (1994) Getting ready for the twenty-first century. Technical change and institutional modernization in agriculture, *World Bank Technical paper no. 217*, The World Bank, Washington DC.
- Aronson, D. (not dated) 'Implementing local participation: the Niger range and livestock project', *Nomadic People* 18.
- Ashdown, S.F. (1994) *Participation, order and ideology*, MSc Thesis, School of Development Studies, University of East Anglia.
- Attwood, D.W. and Baviskar, B.S. (1988) *Who Shares? Cooperatives and Rural Development*, OUP, Delhi.
- Awogbade, M.O. (1979) 'Fulani Pastoralism and the Problems of the Nigerian Veterinary Service', *African Affairs*, 78.
- Bamhare, C. (1992) 'The Role of Animal Management and Health Centres in the Future Delivery of Animal Health Services to Communal Areas', *Zimbabwe Veterinary Journal* 23 (1).
- Bannerjee, A. (1994) 'Dairying Systems in India', *World Animal Review* 79 (2).
- Baxter, M., Slade, R. and Howell, J. (1983) Aid and Agricultural Extension: Evidence from the World Bank and Other Donors, *World Bank Technical Paper 87*, The World Bank, Washington DC.
- Bazeley, P. (1993) 'Improving Livestock Services in Indonesia', *Appropriate Technology* 19 (4).
- Beaton, W.G. (1959) 'Veterinary Affairs in Africa South of the

- Sahara', in (W.A. Pool) *The Veterinary Annual*, John Wright and Sons, Bristol.
- Beaton, W.G. (1962) 'Veterinary Affairs in Africa South of the Sahara', in (W.A. Pool) *The Veterinary Annual*, John Wright and Sons, Bristol.
- Bebbington, A. (1989) 'Institutional Options and Multiple Sources of Agricultural Innovation: Evidence from an Ecuadorean Case Study', *Network Paper no. 11*, Agricultural Research and Extension Network, ODI, London.
- Bebbington, A. and Farrington, J. (1992) 'Private Voluntary Initiatives: Enhancing the Public Sector's Capacity to Respond to Nongovernmental Organisation Needs', in (J.R. Anderson and C. de Haan) *Public and Private Roles in Agricultural Development*, Proceedings of the 12th Agricultural Sector Symposium, The World Bank, Washington DC.
- Bebbington, A., Merrill-Sands, D. and Farrington, J. (1994) Farmer and Community Organisations in Agricultural Research and Extension: Functions, Impacts and Questions, *Network Paper 47*, Agricultural Administration Research and Extension Network, ODI, London.
- Bebbington, A., Thiele, G., Davies, P., Prager, M. and Riveros, H. (1993) *NGOs and the State in Latin America*, Routledge, London.
- Bebbington, A.J. (1991) Farmer Organizations in Ecuador: Contributions to Farmer First Research and Development. *Gatekeeper Paper 26*, Sustainable Agriculture Programme, IIED, London.
- Beynon, J., Duncan, A., Jones, S. and Watkins, B. (1995) *Seeking Cost-Effective Quality in Rural Services*, overview paper presented at the ODA Natural Resources Advisers' Conference, July 1995
- Biggs, S.D. (1990) 'A multiple source of innovation model of agricultural research and technology promotion', *World Development* 18 (11).
- Blajan, L., Gee, R.W. and Gimeno, E. J. (1987) 'Organisation of Veterinary Services for the Future', *Revue Scientifique et Technique, Office International des Epizooties* 6 (4).

- Blancou, J. (1991) 'Conclusions', *Revue Scientifique et Technique, Office International des Epizooties*, 11 (1).
- Blancou, J. (1994) 'Preface', *Revue Scientifique et Technique, Office International des Epizooties*, 13 (2).
- Blarcom, B. van, Knudsen, O. and Nash, J. (1993) The reform of public expenditures for agriculture, *World Bank Discussion Paper 216*, The World Bank, Washington DC.
- Brattan, M. (1989) 'The Politics of NGO-Government relations in Africa', *World Development* 17 (4).
- Bruggeman, H. (1992) 'Experiences with a para-vet programme, a practical example from Chad', *Netherlands centre for training on animal resources management*, 2 (2), January 1992.
- Brumby, P.J. (1988) *The Role of International Organisations in Promoting Animal Production in Developing Countries*, paper presented at World Conference for Animal Production, Helsinki 1988.
- Butcher, C. (1994) *Nomadic pastoralism and extension: a review of the literature* (draft), ODI, London.
- Carney, D. (1994) *Changing public and private roles in agricultural service provision* (draft), ODI, London.
- Carruthers, I. (1985) 'Factors influencing agricultural recurrent budget problems in developing countries', in (J. Howell) *Recurrent Costs and Agricultural Development*, ODI, London.
- Carvalho, S. and White, H. (1994) Indicators for monitoring poverty reduction, *World Bank Discussion Paper 254*, The World Bank, Washington DC.
- Chamber, R. (1992) *ODA Animal Health Project Indonesia*, Internal Report, ODA.
- Chambers, R. (1983) 'Farmer First: The Professional Revolution', in (P.W. Daniels, S. Holden, E. Lewin and Sri Dadi) *Livestock Services for Smallholders: A critical evaluation of the delivery of animal health and production services to the small-scale farmer in the developing world*, Proceedings of an International Seminar, Yogyakarta, Indonesia, 15–21 November 1992.
- Cheneau, Y. (1985) 'The organisation of veterinary services in Africa', *Revue Scientifique et Technique, Office International des Epizooties* 5 (1).

- Cheneau, Y. (1985) 'Prevalence of Rinderpest and Strategy of the Pan-African Campaign', *Revue Scientifique et Technique, Office International des Epizooties* 4 (2).
- Claxton, J., Vaughan, L.M. and Windsor, R.S. (1993) 'Delivering self-financing veterinary services in the south of Peru', in (P.W. Daniels, S. Holden, E. Lewin and Sir Dada) *Livestock Services for Smallholders: A critical evaluation of the delivery of animal health and production services to the small-scale farmer in the developing world*, Proceedings of an International Seminar, Yogyakarta, Indonesia, 15–21 November 1992.
- Commonwealth Secretariat (1980) *Clinical Veterinary Services for Small Farmers*, Report of Regional Commonwealth Expert Consultation, Anand, India, 27 October–1 November 1980.
- Commonwealth Secretariat (1982) *Report of the International Workshop for Trainers of Animal Health Auxiliary Personnel*, Peredeniya, Sri Lanka, 16–26 February 1982.
- COPAC (1984) *The Anand Dairy Cooperatives in India – A Cooperative Success Story*, mimeo.
- Crimella, M.C. (1993) 'Animal Diseases as factors limiting livestock development in Africa', *Medit* 4 (2).
- CTA (1987) *Primary Animal Health Care in Africa*, synopsis of a seminar held at Blantyre, 25–28 September 1985.
- Cunningham, E.P. (1989) 'The World Livestock Scene', in *Proceedings of the Seminar on Animal Health Administration and Economics*, Buenos Aires, 26–28 June 1989, 29–42, IICA/EDI/OIE/SENASA.
- Curry, J. (1992) 'The Human Dimension of Livestock Disease Control in Small Scale Farming Systems', *Zimbabwe Veterinary Journal* 23 (1).
- Curtis, D. (1991) *Beyond Government: Organisations for Common Benefit*, Macmillan, London.
- DAG (1994) *The role of government in adjusting economies, Paper 1 – Literature Review*, Proposal for ODA Contract no. CNTR 942117A, Development Administration Group, School of Public Policy, University of Birmingham, 30 June 1994.
- Dahal, Dev Raj. (1994) Decentralisation and development in Nepal, *Nepal Foundation Paper 2*, NEFAS.

- Daniels, P.W., Holden, S, Lewin, E. and Sri Dadi (1993) *Livestock Services for Smallholders: A critical evaluation of the delivery of animal health and production services to the small-scale farmer in the developing world*, Proceedings of an International Seminar, Yogyakarta, Indonesia, 15–21 November 1992.
- Dash, M. (1991) 'Mongolian Traditional Veterinary Science', in *Proceedings of the International Workshop on Pastoralism and Socio-Economic Development*, Mongolia, 4–12 September 1990.
- Davenport, M. (1995) 'Changes in the pattern of world trade in agricultural products', in (Marshall and Miller) *Priorities for a new century - agriculture, food and rural policies in the European Union*, CAS Paper 31, Centre for Agricultural Strategy, Reading.
- de Haan, C. (1993) 'The Delivery of Livestock Services to Smallholders', in (P. W. Daniels, S. Holden, E. Lewin and Sri Dadi) *Livestock Services for Smallholders: A critical evaluation of the delivery of animal health and production services to the small-scale farmer in the developing world*, Proceedings of an International Seminar, Yogyakarta, Indonesia, 15–21 November 1992.
- de Haan, C. and Bekure, S. (1991) Animal Health Services in Sub-Saharan Africa: Initial Experiences with Alternative Approaches, *World Bank Technical Paper 134*, The World Bank, Washington DC.
- de Haan, C. and Nissen, N.J. (1985) Animal Health Services in Sub-Saharan Africa: Alternative Approaches, *World Bank Technical Paper 44*, The World Bank, Washington DC.
- de Haan, C. and Umali, D.L. (1992) 'Public and Private Sector Roles in the Supply of Veterinary Services', in (J.R. Anderson and C. de Haan) *Public and Private Roles in Agricultural Development*, Proceedings of the 12th Agricultural Sector Symposium, The World Bank, Washington DC.
- de Janvry, A and Sadoulet, E. (1993) 'Market, state and civil organizations in Latin America beyond the debt crisis: the context for rural development', *World Development* 21 (4)
- de Mello and Moura (eds) (1991) *Selected Proceedings of the 24th World Veterinary Congress*, Rio de Janeiro, 18–23 August 1991, WVA/WVC.

- Devendra, C. (1993) Sustainable Animal Production from Small Farm Systems in South-east Asia, *FAO Animal Production and Health Paper 106*, FAO, Rome.
- Dieckmann, (1994) 'The integration of Social and Gender Issues in Smallholder Dairy Production', *World Animal Review* 79 (2).
- Dina, O.A. and Arowolo, R.O.A. (1991) 'Some considerations on veterinary drug use and supply in Nigeria', *Rev Elev Med Vet Pays Trop* 44 (1).
- Diskett, P. and Nickson, P. (1991) 'Financing Primary Health Care: an NGO Perspective', *Development In Practice* 1 (1).
- Doornbos, M. and Gertsch, L. (1994) 'Sustainability, Technology and Corporate Interest: Resource Strategies in India's Modern Dairy Sector', *Journal of Development Studies* 30 (3).
- Doornbos, M. et al. (1990) *Dairy Aid and Development*, Sage, New Delhi.
- Dransfield, R.D., Williams B.G. and Brightwell R. (1991) 'Control of Tsetse Flies and trypanosomiasis: Myth or Reality', *Parasitology Today* 7 (10).
- ECA - UN Economic Commission For Africa (1985) Comprehensive Policies and Programmes For Livestock Development in Africa: Problems, Constraints and Necessary Future Action, *ALPAN Paper 5*, ILCA, Addis Ababa.
- Echessah, P.N., Swallow, B.M., Kamara, D.W. and Curry, J.J. (in press) 'Willingness to contribute labour and money to tsetse control: application of contingent valuation in Busia District, Kenya', *World Development* (in press).
- EDI-BIRD/OIE (1987) 'Report on the EDI-BIRD/OIE Seminar on Animal Health Services in Africa', *Revue Scientifique et Technique, Office International des Epizooties* 6 (4).
- Ellis, P.R. (1982) 'The Economic Impact of Disease on Livestock Development in Developing Countries', in (T.J. Davis) *Increasing Agricultural Productivity*, Proceedings of the Third Annual Agricultural Sector Symposium, The World Bank, Washington DC.
- Ellis, P.R. (1994) 'Information Systems in Disease Control Programmes', in (J. Copland) *Diagnosis and Epidemiology of FMD in South-east Asia*,

Proceedings of a workshop at Lampang, Thailand, 6–9 September 1993.

- Falconer, J. (1973) 'Bechuanaland Protectorate', in (D.H.L. Rollinson and J.F.F. Callear) *A History of the Overseas Veterinary Services: Part Two*, British Veterinary Association.
- FAO (1983) 'The resurgence of Rinderpest', *World Animal Review*, special supplementary issue.
- FAO (1988a) 'Annex V. Crops, Livestock, Fisheries and Forestry', *Potentials for Agricultural and Rural Development in Latin America and the Caribbean*, FAO, Rome.
- FAO (1988b) Regional decentralization for agricultural development planning in the Near East and North Africa, *FAO Economic and Social Development Paper 73*, FAO, Rome.
- FAO (1990a) *Cost/Benefit Analysis for Animal Health Programmes in Developing Countries*, FAO Expert Consultation, 10–14 September 1990, FAO, Rome.
- FAO (1990b) Decentralization of agricultural planning systems in Latin America, *FAO Economic and Social Development Paper 92*, FAO, Rome.
- FAO (1990c) Toward improved multilevel planning for agricultural and rural development in Asia and the Pacific, *FAO Economic and Social Development Paper 52*, FAO, Rome.
- FAO (1990d) *Strengthening Animal Health Services in Developing Countries*, FAO Expert Consultation, FAO, Rome.
- FAO (1991a) *Guidelines for Strengthening Animal Health Services in Developing Countries*, FAO, Rome.
- FAO (1991b) *Proceedings of the International Workshop on Pastoralism and Socio-Economic Development*, Mongolia, 4–12 September 1990.
- FAO (1992a) *Report of the round table on privatization of the veterinary services in Latin America and the Caribbean*, Santiago, Chile, 12–14 November, 1991.
- FAO (1992b) Organization and management of agricultural development for small farmers, *FAO Economic and Social Development Paper 20*, Rev.1., FAO, Rome.
- FAO (1993a) *Production Yearbook*, 47, FAO, Rome.

- FAO (1993b) Rural Poverty Alleviation: Policies and Trends, *FAO Economic and Social Development Paper 113*, FAO, Rome.
- FAO (1993c) The State of Food and Agriculture 1993, *FAO Agriculture Series 26*, FAO, Rome.
- FAO (1993d) *Trade and Commerce Yearbook*, 47, FAO, Rome.
- FAO (1994a) *Trade and Commerce Yearbook 1993*, FAO, Rome.
- FAO (1994b) *Study on Privatization of Veterinary Services in the Near East Region*, FAO Regional Office for the Near East, Cairo.
- FAO (1994c) *Production Yearbook 1993*, FAO, Rome.
- FAO (1994d) *Structural Adjustment and the Provision of Agricultural Services in Sub-Saharan Africa*, FAO, Rome.
- FAO/OIE/WHO (1994) *Animal Health Yearbook 1993*, FAO, Rome.
- Farm Africa (1992) *Project Summary: Kenya Pastoral Development Project*, mimeo.
- Farrington, J. (1994) 'Public Sector Agricultural Extension: Is There Life After Structural Adjustment?', *Natural Resource Perspectives 2*, ODI, London.
- Farrington, J., Bebbington, A., Wellard, K. and Lewis, D. (1993a) *Reluctant Partners? Non-governmental organizations, the state and sustainable agricultural development*, ODI, London.
- Farrington, J., Lewis, D., Satish, S. and Miclat-Teves, A. (eds) (1993b) *Non-governmental Organizations and the State in Asia*, ODI, London.
- Gaiha, R. (1993) Design of Poverty Alleviation Strategy in Rural Areas, *FAO Economic and Social Development Paper 115*.
- Garforth, C. (1993) Sustainable extension for sustainable agriculture, *Rural Extension Bulletin 3*, AERDD, Reading.
- Gass, G.M. and Farrington, J. (1994) Livestock Development Policy and the Potential for Improved Interventions in South Asia, *Working Paper 12*, Renewable Resources Management Group, ODI, London.

- Gebreab, F. (1987) 'Veterinary Education in Africa: Present Status', in *Proceeding of the 23rd World Veterinary Congress*, 1987.
- Gouteux, J-P., Noireau, F., Sinda, D. and Frezil, J.L. (1989) *The Use of the Pyramidal Trap by Rural Communities in the Control of Sleeping Sickness*, paper presented at meeting of ISC TRC, Mombasa, 1989.
- Grandin, B., Thampy, R. and Young, J. (1991) *Village Animal Healthcare: A community based approach to livestock development in Kenya*, IT publications, London.
- Gros, J. (1994) 'Of cattle, farmers, veterinarians and the World Bank: the political economy of veterinary services privatization in Cameroun', *Public Administration and Development*, vol. 14.
- Halpin, B. (1981) Vets – Barefoot and Otherwise, *Pastoral Network Paper no. 11c*, ODI, London.
- Haq, M. (1992) 'The Myth of the Friendly Markets', in (J.R. Anderson and C. de Haan) *Public and Private Roles in Agricultural Development*, Proceedings of the 12th Agricultural Sector Symposium, The World Bank, Washington DC.
- Henderson, Sir W.M. (1986) 'Organisation of Veterinary Services', *Revue Scientifique et Technique, Office International des Epizooties* 5 (3).
- Holden, S.J. (1994) *Rationalising Indonesia's Disease Control Policy*, ODA Animal Health Project, Indonesia.
- Huhn, J.E. (1991) 'Present situation and constraints of Animal Health Services in the Tropics', *Seminar for Tropical Veterinary Medicine*, Free University of Berlin.
- Hutabarat, T.S.P.N and Holden, S.J. (1991) 'Inclusion of economic information in national animal health planning in Indonesia', *Proceedings of the 6th International Symposium on Veterinary Epidemiology and Economics*, Ottawa, Canada, 12–16 August, 1991.
- Ibrahim, M.D. (1993) 'Sudanese Paravets Show the Way', *Appropriate Technology* 19 (4).
- ILCA (1994) *Improving Livestock Production in Africa*, ILCA, Addis Ababa.

- ILCA (1995) *Improving Livestock Production in Africa: Evolution of ILCA's Programme 1974–94*, ILCA, Addis Ababa.
- Ingram, P. (1992) 'The United Kingdom Experience in the Privatisation of Extension', in (J.R. Anderson and C. de Haan) *Public and Private Roles in Agricultural Development*, Proceedings of the 12th Agricultural Sector Symposium, The World Bank, Washington DC.
- Jack, J.M.D. (1961) 'The Sudan', in (G.P. West) *A History of the Overseas Veterinary Services: Part One*, British Veterinary Association, London.
- Jahnke, H. (1982) *Livestock production and livestock development in tropical Africa*, Weltforum Verlag, Munich.
- James, A. and Upton, M. (forthcoming) *Cost Recovery for Veterinary Services*, mimeo, University of Reading.
- Jarvis, L.S. (1986) *Livestock Development in Latin America*, The World Bank, Washington DC.
- Jarvis, L.S. (1991) 'Livestock Policy and Development in Latin America', *World Animal Review* 69 (4).
- Jasiorowski, H.A. (1973) 'Twenty Years with no Progress', *World Animal Review* 5.
- Juengling, S., Meemark, N. and Morris, R. (1993) 'Regional Management of a System for Distributing and Selling Veterinary Treatments in Thai Villages', in (P.W. Daniels, S. Holden, E. Lewin and Sri Dadi) *Livestock Services for Smallholders: A critical evaluation of the delivery of animal health and production services to the small-scale farmer in the developing world*, Proceedings of an International Seminar, Yogyakarta, Indonesia, 15–21 November 1992.
- Kaimowitz, D. (ed.) (1990) *Making the link: agricultural research and technology transfer in developing countries*, Westview Press Boulder, San Francisco and London.
- Khan, M., Lewis, D., Sabri, A. and Shahabuddin, M. (1993) 'Proshika's livestock and social forestry programmes', in (J. Farrington, D. Lewis, S. Satish, and A. Miclat-Teves) *Non-governmental Organizations and the State in Asia*, ODI, London.
- Khan, M., Lewis, D.J., Sabri, A.A. and Shahabuddin, M. (1991) *NGO Interactions with the Public Sector: The Experience*

- of Proshika's Livestock and Social Forestry Programme, *Network Paper no 26*, Agricultural Research and Extension Network, ODI, London.
- Laveissiere, C., Grebaut, P. and Lemasson, J.-J. (1989) *Sleeping Sickness: Peasants in Charge of Vector Control*, paper presented at meeting of ISCTRC, Mombasa, 1989.
- Lele, U., and Goldsmith, A.A. (1989) 'The development of national agricultural research capacity: India's experience with the Rockefeller Foundation and its significance for Africa', *Economic Development and Cultural Change* 33.
- Leonard, D.K. (1985) 'African Practice and the Theory of User Fees', *Agricultural Administration* 18.
- Leonard, D.K. (1987) 'The supply of veterinary services: Kenyan lessons', *Agricultural Administration and Extension* 26.
- Leonard, D.K. (1992) Why is it rational for structural reform to be delayed an irrationally long time?, *IDS Discussion paper 302*, IDS, Sussex.
- Leonard, D.K. (1993) 'Structural Reform of the Veterinary Profession in Africa and the New Institutional Economics', *Development and Change* 24.
- Lewa, P.M. (1995) *Kenya's Cereal Sector Reform Programme: Managing the Politics of Reform*, mimeo, Development Administration Group, School of Public Policy, University of Birmingham.
- Lewis, J. (1993) 'NGO–Government interactions in Bangladesh', in (J. Farrington, D. Lewis, S. Satish and A. Miclat-Teves) *Non-governmental Organizations and the State in Asia*, Routledge, London and New York.
- Leyland, T. (1993) 'Animal Health Care in Afghanistan', *Appropriate Technology* 19 (4).
- Maina, A. (1980) 'Clinical Veterinary Services for Small Farmers. Country Report – Kenya', *Commonwealth Secretariat*.
- Mannathoko, M. and Blajan, L. (1989) 'International trade in Animal Products: the African Case', *Revue Scientifique et Technique, Office International des Epizooties* 8 (3).
- Marshall, R.S. (1960) 'Veterinary Affairs in British Colonial Territories', in (W.A. Pool) *The Veterinary Annual*, John Wright and Sons, Bristol.

- McClintock, J. (1983) 'Factors Affecting Output Levels from African Livestock Sectors: An Analysis of Available Data', *ILCA Bulletin*, 1983.
- McCorkle, C.M. (1989) 'Veterinary Anthropology', *Human Organisation* 48 (2).
- McCorkle, C.M. and Mathias-Mundy, E. (1990) 'Ethnoveterinary Medicine in Africa', *Africa* 62 (1).
- McDermott, J.J., Gitau, G.K., O'Callaghan, C.J., Omere, A.O., Odima, P.A., Kyule, M.N. and Kilungo, J.K. (1993) 'Field Research Project to Assess Health and Production Indices on Kenyan Smallholder Dairy Farms', in (P.W. Daniels, S. Holden, E. Lewin and Sri Dadi) *Livestock Services for Smallholders: A critical evaluation of the delivery of animal health and production services to the small-scale farmer in the developing world*, Proceedings of an International Seminar, Yogyakarta, Indonesia, 15–21 November 1992.
- McIntire, J., Bourzat, D. and Pingali, P. (1992) *Crop-livestock interaction in sub-Saharan Africa*, World Bank Regional and Sectoral Studies, The World Bank, Washington DC.
- Merrill-Sands, D. and Collion, M. (1993) 'Making the Farmer's Voice Count in Agricultural Research', *Quarterly Journal of International Agriculture* 32 (3).
- Mesfin, T. and Obsa, T. (1994) 'Ethiopian Traditional Veterinary Practices and their Possible Contribution to Animal Production and Management', *Revue Scientifique et Technique, Office International des Epizooties* 13 (2).
- Mlangwa, J.E.D. and Kisauzi, D.N. (1994) 'Systems Approach to Animal Health Services Delivery in Sub-Saharan Africa: The Case of Privatisation', *Revue Scientifique et Technique, Office International des Epizooties* 13 (3).
- Moktan, D. et al. (1990) 'Village Animal Health Workers in the Koshi Hills: an Evaluation Report', *Working Document no 4*, Pakhribas Agriculture Centre, Pakhribas, Nepal.
- Moris, J. (1991) Extension Alternatives in Tropical Africa, *Agricultural Administration Unit Occasional Paper 7*, ODI, London.
- Moris, J. and Copestake, J. (1993) *Qualitative enquiry for rural development*, Intermediate Technology Publications Ltd, London.

- Morris, R.S. and Leidl, K. (1993) 'Structured Data Collection for Animal Health and Production in Smallholder Livestock Production', in (P.W. Daniels, S. Holden, E. Lewin and Sri Dadi) *Livestock Services for Smallholders: A critical evaluation of the delivery of animal health and production services to the small-scale farmer in the developing world*, Proceedings of an International Seminar, Yogyakarta, Indonesia, 15–21 November 1992.
- Moura, J. de A. (1991) 'Animal Health State Regulation at the Pan-American level and Recommended actions', in (de Mello and Moura) *Selected Proceedings of the 24th World Veterinary Congress*, Rio de Janeiro 18–23 August 1991, WVA/WVC.
- Mpelumbe, I.S. (1993) 'Perspectives on the privatisation of veterinary practice in the context of livestock production in Africa', in *Comprehensive reports on technical items presented to the International Committee or to Regional Commissions*, OIE, Paris.
- Mulvany, P. (1991) *Options for Poor Livestock Farmers in Low-income Countries*, paper for a conference on Sustainable Livestock Farming into the 21st Century, Farm Animal Care Trust/CAS.
- Mulvany, P. and Njeru, F. (1993) 'Makueni's Wasaidizi: Care in the Community', *Appropriate Technology* 19 (4).
- Mustafa, S., Rahman, S. and Sattar, G. (1993) 'Bangladesh Rural Advancement Committee (BRAC): Backyard Poultry and Landless Irrigators Programmes', in (J. Farrington, D. Lewis, S. Satish and A. Miclat-Teves) *Non governmental Organizations and the State in Asia*, ODI, London.
- Nahas, F. (1993) 'Friends in Village Development, Bangladesh (FIVDB): Improved Duck-Rearing Practices', in (J. Farrington, D. Lewis, S. Satish, and A. Miclat-Teves) *Non-governmental Organizations and the State in Asia*, ODI, London.
- Ngau, P.M. (1987) 'Tensions in Empowerment: The Experience of the Harambee (Self-Help) Movement in Kenya', *Economic Development and Cultural Change* 35 (3).
- Nugent, J.B. (1993) 'Between state, markets and households: a neo-institutional analysis of local organizations and institutions', *World Development* 21 (4).

- O'Hara, P.J. (1993) 'Chief Veterinary Officer's Annual Report, 1993', *Surveillance* 21 (3).
- Oba, G. (1991) 'Local participation Guiding extension programs: a practical proposal, *Nomadic People* 18.
- ODA (1992) *Our client the smallholder: meeting the needs of Indonesia's livestock farmers*, Overseas Development Administration, London.
- ODA (1993) *Policy Information Marker System*, Statistics Department, ODA, London.
- ODA/KETRI (1991) *Tsetse and Trypanosomiasis control in Kenya for farmers with limited resources*, proceedings of a workshop at Nguruman, Kenya, 12–15 June 1991.
- Odeyemi, I.A. (1993) 'Modelling area viability for private veterinary practices in Africa: a conceptual approach', *Proceedings of the Regional Commonwealth, and Tanzanian Veterinary Medical Association conference*, Arusha, Tanzania, 1993.
- Odeyemi, I.A. (1994a) *A review of the policy to privatise animal health delivery services in Nigeria*, Centre for Tropical Veterinary Medicine, University of Edinburgh.
- Odeyemi, I.A. (1994b) *Analysis of the Current Situation of Animal Health Services in Africa, and the Strategy for Change*, paper presented at OAU/IBAR/PARC Regional Workshop on Privatisation of Animal Health Services, 21–23 November 1994, Kampala, Uganda.
- Odeyemi, I.A. (in press) *The Evolution of the Institutions of Delivery of Animal Health Services in the Tropics*, mimeo, CTVM, Edinburgh.
- OECD (1994) *Agricultural Policies, Markets and Trade. Monitoring and Outlook, 1994*, OECD, Paris.
- OIE (1987) 'Report on the EDI-BIRD/OIE Seminar on Animal Health Services in Africa', *Revue Scientifique et Technique, Office International des Epizooties* 6 (4).
- OIE (1993a) *Import Risk Analysis*, meeting of the OIE International Animal Health Code Commission, 18–22 January 1993, OIE, Paris.
- OIE (1993b) *Comprehensive Reports on Technical Items Presented to the International Committee or to Regional Commissions*, OIE, Paris.

- OIE (1993c) 'Guidelines for the evaluation of veterinary services', *Revue Scientifique et Technique, Office International des Epizooties* 12 (4).
- OIE (1994) Special Issue on Early Methods of Animal Disease Control, *Revue Scientifique et Technique, Office International des Epizooties* 13 (2)
- OIE (1995) *11th Conference of the OIE Regional Commission for Africa*, Rabat (Morocco), 24–27 January 1995.
- Okoth, J.O., Kirumira, E.K. and Kapaata, R. (1991) 'A New Approach to Community Participation in tsetse control in the Busoga Sleeping Sickness Focus, Uganda. A Preliminary Report', *Ann Trop Med Parasit* 85 (3).
- Ostrom, E. (1990) *Governing the commons: the evolution of institutions for collective action*, Cambridge University Press, Cambridge.
- Otieno, L. and Dransfield, R.D. (1990) 'Towards Community Based and Sustainable Tsetse Management – A Report by the ICIPE Tsetse Research Programme', *Rural Development in Practice* 2 (1).
- Oxby, C. (1989) *African Livestock Keepers in Recurrent Crisis. Policy Issues Arising From the NGO Response*, IIED, London.
- Pardey, P.G., Roseboom, J. and Anderson, J.R. (1991) *Agricultural Research Policy: International Quantitative Perspectives*, Cambridge University Press, Cambridge.
- Perezgrovas, R. (1993a) 'The Woollen Souls of Chiapas', *Appropriate Technology* 19 (4).
- Perezgrovas, R., Pedraza, P., and Peralta, M. (1993b) 'Indigenous knowledge as the basis for sheep management programmes in southern Mexico' in (P.W. Daniels, S. Holden, E. Lewin and Sri Dadi) *Livestock Services for Smallholders: A critical evaluation of the delivery of animal health and production services to the small-scale farmer in the developing world*, Proceedings of an International Seminar, Yogyakarta, Indonesia, 15–21 November 1992.
- Perry, B.D. (1994) *Disease control programmes in developing countries: prospects and constraints*, Guest lecture to the pre-ISVEE course in Animal Health Economics, Nairobi, 12 August 1994.
- Peters, H. (1993) 'Chad's Ishtirak Paravets', *Appropriate Technology* 19 (4).

- Pillai, E.T.S. (1982) *Meeting the Challenges of Animal health Services in Developing Countries*, Commonwealth Secretariat.
- Provost (1991) *Animal health today in sub-Saharan Africa*, Esy-sur-Eure, France.
- Putt, N., Holmes, P. and Viegas, T. (eds) (1993) *Socio-economic and organizational determinants of the efficiency of animal health and production services in sub-Saharan Africa*, Proceedings of a Workshop sponsored by the Commission of the European Communities DGXII held on 25–26 January 1993 at the University of Glasgow, *Veterinary Research Communications*, 17.
- Rademacher, A. (1993) 'Democracy, development and NGOs', *SEARCH*, December 1993.
- Randhawa, N.S. and Sundaram, K.V. (1990) *Small Farmer Development in Asia and the Pacific: Some Lessons for Strategy Formulation and Planning*, *FAO Economic and Social Development Paper 87*, FAO, Rome.
- Rippon, S.R. (1961) 'Burma' in (G.P. West) *A History of the Overseas Veterinary Services: Part One*, British Veterinary Association, London.
- Roling, N. (1990) 'The agricultural research-technology transfer interface: a knowledge systems perspective' in (D. Kaimowitz) *Making the Link: Agricultural Research and Technology Transfer in Developing Countries*, Westview Press, Boulder, San Francisco and London.
- Rollinson, D.H.L. and Callear, J.F.F. (eds) (1973) *A History of the Overseas Veterinary Services: Part Two*, British Veterinary Association, London.
- Ross, R.L. (1992) 'The Art of Privatizing After Decades of Central Planning' in (J.R. Anderson and C. de Haan) *Public and Private Roles in Agricultural Development*, Proceedings of the 12th Agricultural Sector Symposium, The World Bank, Washington DC.
- Rossiter, P.B., Jessett, D.M., Wafula J.S., Karstad, L., Chema, S., Taylor, W.P., Rowe, L., Nyange, J.C., Otaru, M., Mumbala, M., and Scott, G.R. (1983) 'Re-emergence of Rinderpest as a Threat in East Africa Since 1979', *The Veterinary Record* 113.
- Rossiter, P.B., Jessett, D.M., Wafula J.S., Karstad, L., Chema, S., Taylor, W.P., Rowe, L., Nyange, J.C., Otaru, M.,

- Mumbala, M., and Scott, G.R. (1987) 'Continuing Presence of Rinderpest Virus as a Threat in East Africa, 1983–1985', *The Veterinary Record* 120, 59-62.
- Sandford, S. (1983) *Management of Pastoral Development in the Third World*, John Wiley and Sons, Chichester.
- Satish, S. and Farrington, J. (1990) A Research-Based NGO in India: The Bharatiya Agro-Industries Foundation's Cross-Bred Dairy Programme, *Network Paper no. 18*, Agricultural Research and Extension Network, ODI, London.
- Satish, S. and Farrington, J. (1993) 'Bharatiya Agro-Industries Foundation (BAIF): Research Programmes in Livestock Production, Health and Nutrition', in (J. Farrington and D. Lewis) *NGOs and the State in Asia: Rethinking Roles in Sustainable Agricultural Development*, Routledge, London.
- Satish, S. and Kumar, P. (1993) 'Are NGOs more cost-effective than government in livestock service delivery? A study of artificial insemination in India', in (J. Farrington and D. Lewis) *NGOs and the State in Asia: Rethinking Roles in Sustainable Agricultural Development*, Routledge, London.
- Schillhorn van Veen, T.W. (1984) 'Observations on animal health, especially on approaches to identify and overcome constraints in the subhumid zone of West Africa', in (J.R. Simpson and P. Evangelou) *Livestock Development in Sub-Saharan Africa: Constraints, Prospects and Policy*, Westview Press, Boulder, San Francisco and London.
- Schillhorn Van Veen, T.W. and de Haan, C. (1994) 'New trends in the organisation and financing of livestock and animal health services', in (G.J. Rowlands, M.N. Kyule and B.D. Perry) Proceedings of the 7th International Symposium on Veterinary Epidemiology and Economics. Nairobi, 15–19 August, 1994, *The Kenya Veterinarian* 18 (2).
- Schreuder, B.E.C., Moll, H.A.J., Noorman, N., Halimi, M., Wassink, G. (1994) 'Livestock mortality in Afghanistan in districts with and without a veterinary programme; a cost-benefit analysis', in (G.J. Rowlands, M.N. Kyule and B.D Perry) Proceedings of the 7th International Symposium on Veterinary Epidemiology and Economics, Nairobi, 15–19 August, 1994. *The Kenya Veterinarian* 18 (2).

- Schwabe, C. (1982) 'The Current Epidemiological Revolution in Veterinary Medicine. Part 1', *Preventive Veterinary Medicine* 1.
- Schwabe, C.W. (1991) 'History of the Scientific Relationships of Veterinary Public Health', *Revue Scientifique et Technique, Office International des Epizooties* 10 (4).
- Scoones, I. and Graham, O. (1994) 'New Directions for Pastoral Development in Africa', *Development in Practice* 4 (3).
- Senock, R.S. (1987) 'Education and extension: the corner stones of range development in the west African sahel', in (J.T. O'Rourke) *Proceedings of the 1987 International Rangeland Development Symposium, Feb, 12, 1987*.
- Sharma, J.S. and Yeung, P. (1985) *Livestock Products in the Third World: Past Trends and Projects to 1990 and 2000, IFPRI Research Report No 49*, 1985.
- Sikana, P., Bazeley, P., Kariuki, D. and Zeremariam, F. (1992) *The Kenya Livestock and Pastoral Programme: Some Observations and Recommendations*, internal document, Intermediate Technology Development Group.
- Sims, H. and Leonard, D. (1990) 'The political economy of the development and transfer of agricultural technologies', in (D. Kaimowitz) *Making the Link: Agricultural Research and Technology Transfer in Developing Countries*, Westview Press, Boulder, San Francisco and London.
- Smith, L.D. and Thomson, A.M. (1991) *The role of public and private agents in the food and agricultural sectors of developing countries, FAO Economic and Social Development Paper 105*, FAO, Rome.
- Smith, P. (1993) 'Wam Eruk: A Village Animal Health Care Programme', in (P.W. Daniels, S. Holden, E. Lewin and Sri Dadi) *Livestock Services for Smallholders: A critical evaluation of the delivery of animal health and production services to the small-scale farmer in the developing world*, Proceedings of an International Seminar, Yogyakarta, Indonesia, 15–21 November 1992.
- Sollod, A.E. and Stem, C. (1991) 'Appropriate animal health information systems for nomadic and transhumant livestock populations in Africa', *Revue Scientifique et Technique, Office International des Epizooties* 10 (1).
- Stamper, P. (1989) *The farmer feed us all: a short history of Shropshire agriculture*, Shropshire Books, Shrewsbury.

- Steyn, G.J. and Tapson, D.R. (1993) 'Farming systems research and extension (FSR/E) approach to livestock development in parts of sub-Saharan Africa', *Development Southern Africa*, 10 (3) August 1993.
- Stoufer, K. and Ojha, N. (1993) 'An Animal Health Programme in Nepal', *Appropriate Technology* 19 (4)
- Subnis, M.R. (1980) *Programmes for Animal Health Cover in the Kaira District Cooperative Milk Producers Union Ltd*, paper presented at the Commonwealth Secretariat meeting 1980.
- Swallow, B.M. and Kamara, D.W. (1995) *Using contingent valuation to assess the prospects for community participation in public good provision: the case of trypanosomiasis control*, paper presented at the Rockefeller Foundation/ILCA Social Science Fellows Research Workshop, ILCA, Addis Ababa, 14–18 November 1994 (revised draft 1995).
- Swallow, B.M. and Woudyalew, M. (1994) 'Evaluating willingness to Contribute to a local public good: application of contingent valuation to tsetse control in Ethiopia', *Ecological Economics* 11.
- Swallow, B.M., Woudyalew, M. and Leak, S.G.A. (in press) 'Potential demand for a mixed public-private animal health input: evaluation of a pour-on insecticide for controlling tsetse transmitted trypanosomiasis in Ethiopia', *Preventive Veterinary Medicine*.
- Swift, J., Toulmin, C. and Chatting, S. (1990) Providing Services for Nomadic People: A Review of the Literature and Annotated Bibliography, *UNICEF Staff Working Paper 8*, UNICEF, New York.
- Tacher, G., Jahnke, H.E., Rojat, D. and Keil, P. (1988) 'Livestock development and economic productivity in tse-tse infested Africa', in *Livestock production in tse-tse affected areas of Africa*, Proceedings of a meeting held 23–27 November 1987, Nairobi, ILCA/ILRAD.
- Taylor, W.P. (1986) 'Epidemiology and Control of Rinderpest', *Revue Scientifique et Technique, Office International des Epizooties* 5 (2).
- Tber, A. (1995) *Privatisation of Veterinary Practice: Evaluation of the Experience of African Countries in the Field*, mimeo, OIE.
- Thompson, A.M. (1991) Institutional changes in agricultural

product and input markets and their impact on agricultural performance, *FAO Economic and Social Development Paper 99*, FAO, Rome.

- Thrusfield, M. (1986) *Veterinary Epidemiology*, Butterworths, London.
- Tomboc, C.C. and Reyes, G.D. (1993) 'The Ecosystems Research and Development Bureau's (ERDB) Integrated Livestock Programme: Working With People's Organisations in The Philippines', in (J. Farrington, D. Lewis, S. Satish, and A. Miclat-Teves) *Non-governmental Organizations and the State in Asia*, ODI, London.
- Tumurjav, M. (1991) 'Economic and Biological Characteristics of Mongolian Livestock', in *Proceedings of the International Workshop on Pastoralism and Socio-economic Development*, Mongolia, 4–12 September 1990.
- Umali, D. Narrod, C. and Deininger, K. 1994b. *Private sector development in agriculture: constraints, opportunities and new approaches*, paper prepared for the Private Sector Development Department, World Bank.
- Umali, D.L. and Schwartz, L. (1994) Public and Private Agricultural extension. Beyond traditional frontiers, *World Bank Discussion Paper 236*, The World Bank, Washington DC.
- Umali, D.L., Feder, G. and de Haan, C. (1992) The Balance Between Public and Private Sector Activities in the Delivery of Livestock Services, *World Bank Discussion Paper 163*, The World Bank, Washington DC.
- Umali, D.L., Feder, G. and de Haan, C. (1994a) 'Animal Health Services: Finding the Balance Between Public and Private Delivery', *World Bank Research Observer* 9 (1).
- Uotila, M. and Dhanapala, S.B. (1994) 'Dairy Development Through Cooperative Structure', *World Animal Review* 79 (2).
- Villet, J. (1994) 'The Pan African Rinderpest Campaign: Where Communication is the Key', *World Animal Review* 80/81 (3–4).
- Wade, R. (1988) *Village Republics*, Cambridge University Press, Cambridge.
- Walshe, M. (1988) 'Evolution of Support Services for Livestock Producers in Developed and Developing Economies',

Proceedings of the VI World Conference on Animal Production, Helsinki, 1988.

- Walshe, M. J. (1987) *Livestock Support Services*, paper presented at Economic Development Institute Seminar on Organisation of African Livestock Services, Paris, 25–27 May 1987.
- Walshe, S.L.H. (1973) 'The Gambia 1850–1957', in (D.H.L. Rollinson and J.F.F. Callear) *A History of the Overseas Veterinary Services: Part Two*, British Veterinary Association, London.
- Wamukoya, J.P.O. (1991) 'The State Veterinary Services in Kenya', in (de Mello and Moura) *Selected Proceedings of the 24th World Veterinary Congress*, Rio de Janeiro 18–23 August 1991, WVA/WVC.
- Wamwayi, H.M. et al. (1992) 'Observations on Rinderpest in Kenya, 1986–1989', *Revue Scientifique et Technique, Office International des Epizooties* 11 (3).
- Ware, Sir F. (1961) 'India', in (G.P. West) *A History of the Overseas Veterinary Services: Part One*, British Veterinary Association, London.
- West, G.P. (1961) *A History of the Overseas Veterinary Services: Part One*, British Veterinary Association, London.
- Wilkins, J.H. (1961) 'The Army Veterinary Services', in (W.A. Pool) *The Veterinary Annual*, John Wright and Sons, Bristol.
- Williams, T.O. (1989) *Livestock Development in Nigeria: A Survey of the Policy Issues and Options*, ALPAN Paper 21, ILCA, Addis Ababa.
- Winrock (1992) *Assessment of animal agriculture in Sub-Saharan Africa*, Winrock International, Arkansas.
- World Bank (1990) *World Development Report 1990*, The World Bank, Washington DC.
- World Bank (1993) *World Development Report 1993: Investing in Health*, Washington DC.
- World Trade Organization (1995) *The International Markets for Meat 1994–1995*, WTO, Geneva.
- WVC (1987) *Proceedings of the 23rd World Veterinary Congress*, Montréal, August 16–21 1987.

- Young, J. (1993a) 'Where There is no Vet', *Appropriate Technology* 19 (4).
- Young, J. (1993b) 'Village-based Animal Health Care: Effective? Sustainable?', in (P.W. Daniels, S. Holden, E. Lewin and Sri Dadi) *Livestock Services for Smallholders: A critical evaluation of the delivery of animal health and production services to the small-scale farmer in the developing world*, Proceedings of an International Seminar, Yogyakarta, Indonesia, 15–21 November 1992.
- Young, J., Dijkema, H-P., Stoufer, K., Ojha, N., Shrestha, G. and Thapa, L. (1994) 'Evaluation of an Animal Health Improvement Programme in Nepal', in (K. Kirsopp-Reed and F. Hinchcliffe) Special Issue on Livestock, *RRA Notes* 20. IIED, London.
- Zessin, K-H. and Carpenter, T.E. (1985) 'Benefit-Cost Analysis of an Epidemiological Approach to Provision of Veterinary Service in the Sudan', *Preventive Veterinary Medicine* 3.

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