Pro-Poor
Livestock
Policy
Initiative

Funding Animal Healthcare Systems: Mechanisms and Options

Ana Riviere-Cinnamond

A Living from Livestock

PPLPI Working Paper No. 17

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PREFACE

This is the 17th of a series of Working Papers prepared for the Pro-Poor Livestock Policy Initiative (PPLPI). The purpose of these papers is to explore issues related to livestock development in the context of poverty alleviation.

Livestock is vital to the economies of many developing countries. Animals are a source of food, more specifically protein for human diets, income, employment and possibly foreign exchange. For low income producers, livestock can serve as a store of wealth, provide draught power and organic fertiliser for crop production and a means of transport. Consumption of livestock and livestock products in developing countries, though starting from a low base, is growing rapidly.

Animal healthcare has far-reaching implications. Increased livestock production brings risks to public health from greater animal-human contact and zoonotic diseases. There are potential environmental hazards as well as issues of food safety and the need to ensure trade standards are met. But effective, comprehensive animal healthcare services are expensive. At a time when demand is increasing but government budgets for veterinary services are declining, how could such services be funded? The purpose of this Working Paper is to study a wide range of funding mechanisms in both developed and developing countries.

We hope this paper will provide useful information to its readers and any feedback is welcome by the author, PPLPI and the Livestock Information, Sector Analysis and Policy Branch (AGAL) of the Food and Agriculture Organization (FAO).

Disclaimer

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Keywords

Funding mechanisms, taxes, animal health services, public finance, hypothecation, insurance, decentralisation.

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LIST OF ACRONYMS

AFFA	(Department of) Agriculture, Fisheries and Forestry – Australia
AH	Animal Health
AHA	Animal Health Assistant
AHI	Animal Health Insurance
AHS	Animal Health System/Service
AI	Artificial Insemination
ATP	Ability to Pay
CAH	Community-based Animal Health
CAHW	Community-based Animal Health Worker
CHW	Community-based Health Worker
CRF	Consolidated Revenue Fund
DAHD	Department of Animal Health and Dairying
DoH	Department of Health
DSF	Disease Specific Fund
GoI	Government of India
GBP	Great Britain Pounds
GVP	Gross Value of Production
HH	Human Health
HHS	Human Health System/Service
HMO	Health Maintenance Organisation
IFPRI	International Food Policy Research Institute
LIG	Livestock Insurance Group
LRS	Levies and Revenue Service
MoA	Ministry of Agriculture
MoE	Ministry of Education
MoH	Ministry of Health
MoL	Ministry of Livestock
NAHI	National Animal Health Insurance
NGO	Non Governmental Organisation
NHI	National Health Insurance
NHS	National Health Service
NLI	National Livestock Insurance
OIE	Organisation Internationale des Epizooties
PAHC	Primary Animal Health Care
PDEF	Pig Disease Eradication Fund

PHC	Primary Health Care
PLI	Private Livestock Insurance
R&D	Research and Development
RDC	Research and Development Corporations
SHI	Social Health Insurance
SPS	Sanitary and Phyto-sanitary Standards
TF	Taxation Funds
TSK	Germany's "Compensation Fund" Scheme
UC	User Charges
UK	United Kingdom
WB	World Bank
WHO	World Health Organisation
WTO	World Trade Organisation
WTP	Willingness to Pay

EXECUTIVE SUMMARY

Background

According to International Food Policy Research Institute's (IFPRI) estimates, by 2020, developing countries will produce on average 40% more meat and 60% more milk per capita than in the early 1990s ('The livestock revolution'). Such dramatic increases in livestock production have implications for human nutrition, food security and poverty alleviation, environmental sustainability, world trade and food prices, and public health.

As these increases in livestock production will to a large extent be derived from increasing animal numbers and density, it can be foreseen that they will also have implications for animal healthcare (AH) systems, leading to higher demand for preventive and curative services. AH services will need to improve their effectiveness and efficiency to ensure minimum standards for safeguarding international trade, and to contain risks to public health arising from the expected increase in human-animal contact.

Countries which underwent the process of privatisation of veterinary services have seen their, previously frail, allocation of public funds for animal healthcare services further diminished. The foreseen necessity of enhancing the effectiveness and efficiency of AHS calls for an analysis of existing and innovative ways, in which funds in support of these services may be generated.

There is, however, an important information deficit on how animal healthcare services are currently financed. Comprehensive information on how funds for animal healthcare systems are collected and managed is scarce and very few analyses have been performed ion funding mechanisms and options.

Objectives

The objectives of this study are the fourfold:

1. To describe the functional components of animal healthcare systems, highlighting the inter-relationship between the components.
2. To analyse different mechanisms for raising revenue in support of animal healthcare systems.
3. To assess how the different actors in the animal healthcare field respond to the various funding mechanisms and the impact their response has on the efficacy and efficiency of animal healthcare services.
4. To provide research-based recommendations on possible ways of improving empirical and practical knowledge on the organisation and funding of animal healthcare services.

Conclusions and recommendations

To objective 1: The functional components influencing the organisation of AHS are (i) financing - including revenue collection, fund pooling and purchasing -, (ii) provision, and (iii) a third category, which includes mechanisms of system integration, non-financial resource generation, governance and external factors.

To objective 2: Four mechanisms to raise revenue for AHS (and their implications in provision) have been identified, which are (i) taxation, (ii) national livestock insurance contributions, (iii) private livestock insurance, and (iv) user charges or out-of-pocket

payments. These funding mechanisms are not mutually exclusive. On the contrary, most AHS rely on a mix of them. The way in which these funding mechanisms are combined has different consequences in terms of equity and efficiency.

To objective 3: The actors involved in the animal healthcare context are (i) the stock owner/client, (ii) the AH worker/provider and (iii) the third party payer or purchaser. The potential behavioural responses to different funding options are (i) moral hazard (consumer and provider), (ii) adverse selection and (iii) cream skimming. Each of these arises to different extent under each type of funding mechanism.

To objective 4: The study identifies the need for further research focusing on collection of quantitative data on taxes, fees, charges and contributions collected in different countries. Further, qualitative data on ways in which these funds are channelled through the system is needed. This information is needed to deepen current understanding of the specificities embedded in the animal healthcare service field, which in turn will help improving responsiveness of AHS. In parallel, the needs for AHS for the different users have to be assessed so that funds collected are appropriately and accurately allocated.

The study stresses that for pro-poor animal health services the equity criterion in the implementation is crucial and that therefore the choice of funding mechanisms should be tailored to take into account the most vulnerable segment of the population of livestock keepers.

1. INTRODUCTION

1.1 Background and purpose of the study

"Since the early 1980s, total meat and milk consumption grew at 5 and 3% per year respectively through the developing world. In East and South-East Asia, where income grew at 4-8% per year, population at 2-3% per year and urbanisation at 4-6% per year, meat consumption increased between 4 and 8% per year. Between 1983 and 1993, the share of the world's meat consumed in developing countries rose from 37% to 47%, and the share of the world's milk [consumption] rose from 34 to 41%" (2). According to the International Food Policy Research Institute's (IFPRI) projections, by 2020 people in developing countries will produce on average 40% more meat and 60% more milk per capita than in the early 1990s (3).

These trends in the animal production sector are, unlike most other movements, demand driven. Forecasts have led the international scientific arena to label the change as 'Livestock Revolution' (3). What this new food revolution implies is a considerable growth in livestock production and processing of derived products. The implications of such an increased production are several and have been extensively debated by Delgado et al. (3). These include various issues such as: (i) nutrition, food security and poverty alleviation, (ii) environmental sustainability, (iii) world trade and food prices and (iv) public health.

Such production forecasts also have implications for animal healthcare (AH) systems. It seems obvious that this production increase will lead to higher demand for animal health services. The governance of AH services therefore needs to be effective and efficient to assure quality services and minimum international trade standards, and to minimise public health and environmental risks.

There is, however, a significant deficit in information about how animal healthcare services are financed and data on how funds are collected and managed is scarce. Very few analyses have been performed in the animal healthcare field on funding mechanisms and related available options. Those countries which undertook the process of privatising veterinary services have seen their previously frail funding allocation further diminished. Hence, most departments of veterinary services (DVS) are currently pleading the need to increase their budgets (4-6). The increased demand for AHS that is associated with the 'Livestock Revolution' emphasises the need to analyse existing and innovative ways in which funds may be generated in order to present options that could be feasible and acceptable to developing countries.

A characteristic of this study is the underlying comparison to the human health field and it draws on frameworks used in the human healthcare field to analyse the performance of health systems. Similarities between the two systems (animal and human) have been highlighted in earlier papers (4, 7). Furthermore, D.K. Leonard (4) stated that "the two professions [human and animal medicine] are close enough that [their] differences help each to look at its own structures and operations in new and illuminating ways" (4). The theoretical frameworks used for analysing human healthcare (HH) markets can then be used to illustrate the mechanisms underlying the animal healthcare (AH) market.

This study explores the options available to decision makers for raising revenue for AHS. Special focus is given to the implications of choosing one funding mechanism over another, or more usually the implications of a particular mix-funding source mechanism. The study draws from the extensive literature existing in the human healthcare field, and the meagre literature that relates to the AH field. Other distinctive features of this research are that it combines theory and empirical evidence, provides examples of current structures (and surrounding debates) of AHS,

brings together issues related to animal and human health and examines the relationship between funding and resource allocation.

Questions that arise and that are addressed in this study are the following[1]: How are AHS funding mechanisms organised in different countries? Are there different patterns or 'models' of funding AHS? How may revenue be collected and allocated for animal healthcare services? What is the relationship between the different sub-components of some financing structures? What are the implications of such funding mechanisms in terms of equity and efficiency?

1.2 Objectives

The objectives of the study are fourfold:

1. To describe the functional components of animal healthcare systems, highlighting the inter-relationship between the components.
2. To analyse different mechanisms for raising revenue in support of animal healthcare systems.
3. To assess how the different actors in the animal healthcare field respond to the various funding mechanisms and the impact their response has on the efficacy and efficiency of animal healthcare services.
4. To provide research-based recommendations on possible ways of improving empirical and practical knowledge on the organisation and funding of animal healthcare services.

1.3 Organisation of the report

The report is divided into five major sections. Section 2, which follows this introduction, analyses the components and actors involved in the animal healthcare sector and their interactions.

Section 3 introduces a framework for assessing the different components and sub-components involved in the financing and provision of AHS. The focus is on describing their influence on the performance of health systems at three different levels: (i) strategic design, (ii) structural arrangement and (iii) implementation levels.

Section 4 analyses different existing funding and revenue collection mechanisms and groups them in four main categories. This analysis also includes the implications such sources of revenue collection may have on service provision. The main focus is on evaluating the consequences of these collection methods in relation to equity and efficiency.

Finally, section 5 presents the conclusions of the study and provides recommendations for improving current knowledge regarding AHS organisation and revenue collection mechanisms.

[1] Materials used for this study were obtained from a broader literature review used in the context of the author's doctoral thesis. The framework for the analysis of funding mechanisms was extracted from selected references on health economic and public finance. Additionally, a review of the literature on animal health and livestock service financing mechanism was performed.

2. ANALYTICAL APPROACHES TO AHS FUNDING THEORY

Animal healthcare systems rely on access to human and consumable resources as well as funds to be sustainable. For these inputs to be secured, financial resources are needed to pay for equipment and buildings, to compensate animal healthcare staff's time and to pay for drugs and other consumables. The way in which such financial resources are generated and managed (i.e. the process of collecting revenue and pooling funds) are critical issues for policy-makers and planners. These issues relate to the challenge of designing funding systems, as the process generally conveys ideas related to social policy, politics and economics.

Concerns deriving from the privatisation process of AHS (a process supported by the World Bank (8, 9)) started in the early 1990s. Most countries felt and still feel under constant pressure because expenditure requirements are increasing and resources are scarce. This is especially the case of sub-Saharan Africa after the "Great African Depression" of the 1970s (10), which led to major changes in the way animal healthcare systems were organised and financed. In that context, policy-makers have three options: (i) containing costs, (ii) increasing funding for animal health services or (iii) both (adapted from Mossialos *et al.* (11)). Cost-containment through privatisation of services has been driving the policy discussions in the international arena. However, sufficient revenue needs to be generated to balance budgets. As for other sectors (including human healthcare), many countries do not consider large-scale public borrowing to be a sound economic policy. Hence, concern should focus on revenue policies, that is: how to fund animal healthcare systems on a sustainable basis.

For this to be analysed, a brief definition of the different components in AHS is needed. The interactions between actors in the sector, the implications and derived consequences are the focus of the next section.

2.1 Components and main actors of the AHS

AHS can be divided into six main categories: (i) curative services, (ii) preventive services, (iii) pharmaceutical supply, (iv) public health, (v) education/extension and (vi) research and development. The definition of AHS boundaries has been attempted by various authors (8, 9, 12) and the components presented here have been debated in earlier papers (7).

What these different components have in common are the actors involved in the system. In order to understand their roles and interactions better, they can be classify following the "healthcare triangle" framework (11, 13). Players can therefore be grouped into three categories:

(i) *Consumers* of the service (the first party): Stock owners and herders or livestock keepers. Public health issues, such as animal diseases that affect humans, imply that society in general may also be considered a consumer;

(ii) *Providers* of the service (the second party): Veterinarians and veterinary para-professionals (animal health assistants (AHAs), community animal healthcare workers (CAHWs), barefoot vets, traditional healers…);

(iii) *Third party insurers or purchasers* (which might be a public or private body): Government, intergovernmental, non-governmental donors or private entrepreneurs.

Stock owners, herders and livestock keepers are the direct *consumers* of the services. They can be small-scale (backyard raisers) or large-scale farmers, sedentary (mixed farm) producers and pastoralists (14). Farmers may be organised into producer associations, cooperatives or other forms of collective organisations whose functions

may include the provision[2] of animal health services, therefore playing the role of the "third party" insurer or purchaser (see later). As stated by Umali *et al.* (1992) (9), the general population might also be considered as a direct consumer of the veterinary services as several livestock diseases can affect humans[3]. The risks to human health caused by these diseases, and their control and/or eradication, are of public health concern[4]. This is the reason why society in general has been incorporated into the first party element as a direct consumer of veterinary services.

Veterinarians and other auxiliaries *deliver health services* either through private channels or through government sponsored programmes. Veterinary para-professionals assist veterinarians in their duties. However, the extent of healthcare services provided by the government varies widely in relation to national regulations. Because of the limited number of trained veterinarians in some countries and/or their unwillingness to serve in rural areas, para-veterinarians become valuable workers. On the one hand, they supplement and expand the area covered[5] by veterinarians (5), and thereby increasing the number of farmers reached, freeing time for the veterinarians to treat more serious cases (9).

The *third party insurer or purchaser* refers to public and/or private structures. On the public side, it is normally the Ministry of Finance (MoF) which allocates a certain amount of money to the Ministry of Agriculture (MoA). This creates competition between ministries for the funds that are to be allocated (11, 15). The MoA is in charge of redistributing these funds to the different programmes in place. However a certain part can be played by the Ministry or Department of Health (MoH/DoH), depending on its existence and duties, regarding zoonotic diseases and public health education[6]. It is important to highlight that legislative and executive bodies of the government formulate the domestic policies that shape the economic and institutional environment in which livestock and animal healthcare services operate. This means that these bodies create the incentives or disincentives to private-sector activities. Inter-governmental donor assistance is mainly focused on providing funding for national livestock service programmes (animal healthcare services are a component of the livestock services). Their financial assistance is usually channelled through the government thus asserting the role of government in the delivery of livestock services[7] (8, 9). On the other hand, regarding private sector third parties, in the animal health or livestock service field it is common to find non-governmental organisations (NGOs) funding specific programmes. They assist governments by providing technical assistance, but it is more likely to find NGOs financing livestock sector development programmes (hence animal healthcare programmes). However private entrepreneurs have started to play an important role in AHS in most countries. As previously mentioned, these can be producer associations, cooperatives or other types of collective associations. They can offer a relatively wide range of services from curative to preventive including sometimes the production and distribution of veterinary supplies.

Having described the actors in the AH field, the next section analyses their interactions and the underlying reason for them to interact.

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[2] Finance and/or delivery.

[3] These can be of bacterial, viral or fungal origin and might be transmitted through various ways (direct contact, food-borne, vector-borne, water-borne…). Examples of zoonotic diseases include: anthrax, brucellosis, sleeping sickness, Chagas disease, tuberculosis, salmonellosis, cysticercosis, trichinellosis etc.

[4] This has been pointed out by recent events such as BSE, SARS and Avian Influenza.

[5] And hence contribute to limiting transaction costs arising from transport. This is of most importance in pastoral areas.

[6] In some instances, public health education programmes fall under Ministry of Education (MoE) duties, rendering the allocation and coordination between different ministries more complex.

[7] Examples of these inter-governmental organisations include African Development Bank (ADB), Food and Agriculture Organization (FAO), International Fund for Agricultural Development (IFAD), United Nations Development Programme (UNDP) and the World Bank.

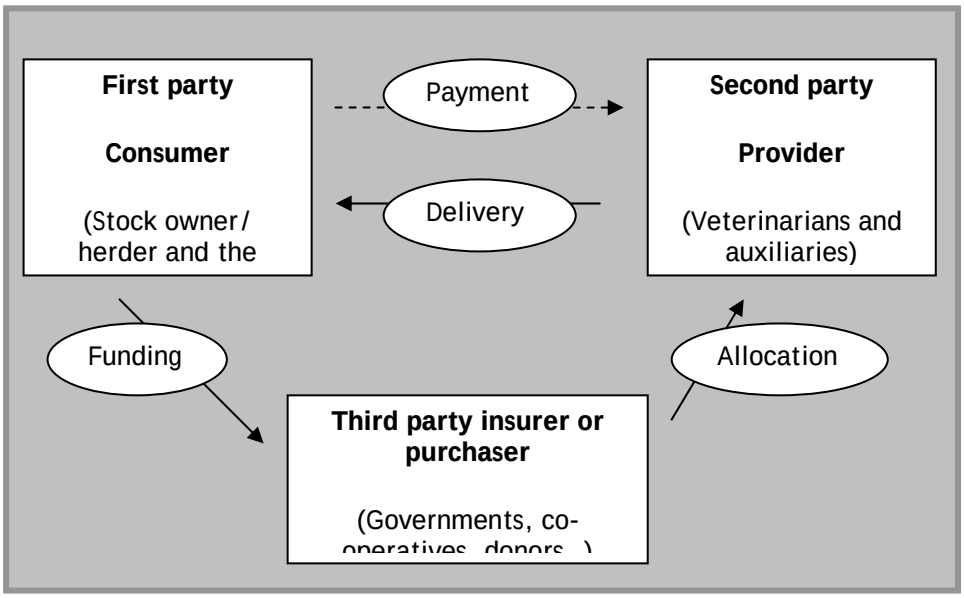
2.2 The agency theory applied to animal health

Illness is unpredictable whether it refers to humans or animals. It might be possible to predict prognoses associated with disease conditions and predict losses in economic terms due to those conditions once an animal is affected, but in general the future health status of animals remains uncertain. Herders cannot therefore plan the future consumption of animal healthcare services as one could do with other commodities (such as food consumption). As a consequence of this inability to plan for what will happen in the future, an unregulated market would respond by developing insurance mechanisms whereby a herder or group of herders could make payments to some risk pooling agency (for example an insurance company) to guarantee some financial or economic compensation in the event of their animals falling ill. Herders cannot insure their animals against illness but they might be able to insure themselves against the financial burden of their animals falling ill. Livestock insurance (LI) thus embodies a wider concept of income maintenance[8].

The analysis of the relationship between the above-mentioned actors starts with the financing and provision of services, which can be simplified as an exchange or transfer of resources. Providers (the 'second party') transfer healthcare resources to patients (in this case the 'first party' or consumers of the service) and then patients or insurers (the 'third party') transfer financial resources to the providers (see figure 1).

[8] The concept of livestock insurance embodies not only animal ill-health but also animal death. Thus, as will be seen in section 4, animal health and insurance tend to be closely related in their financing mechanisms.

Figure 1: *Agency theory applied to AHS (adapted from Mossialos et al. (11).*



The principal/agent theory has been extensively discussed in the human healthcare literature (16-18). However, an attempt at comparison between the two health fields has only been undertaken by D.K. Leonard in 2000 (4). Following his reasoning, and adapting the transaction model from Mossialos *et al*. (2002) to the animal health setting, interactions between different actors in this triangle can be explained.

The simplest form of transaction is by direct payment where the consumer pays the provider directly in return for goods or services. However, healthcare systems have often developed another player: the third party or insurer. This can be a public or private body that has been created to offer protection to a population against the financial risk of falling ill. In the animal health setting this refers to the risk of animal illness and arguably the occurrence of zoonosis. This system allows risks to be shared within a defined population. To finance animal healthcare services, the third party must collect the revenue from the population (in a direct or indirect way), which is then used to reimburse the herder or the veterinarian (or para-professional).

At this stage one key question arises: Where should funds to sustain animal health services (AHS) come from given that their aim is twofold: (i) protecting farmers from possible economic losses and (ii) protecting society from public health hazards? This question raises some of the main controversies surrounding animal healthcare systems funding, which is essentially due to the aforesaid mixed nature and diverse objectives of veterinary services.

A theoretical framework to analyse the different functional components of AHS and how they are linked is presented in the next section.

3. FUNCTIONAL COMPONENTS OF AHS: IMPLICATIONS ON PERFORMANCE

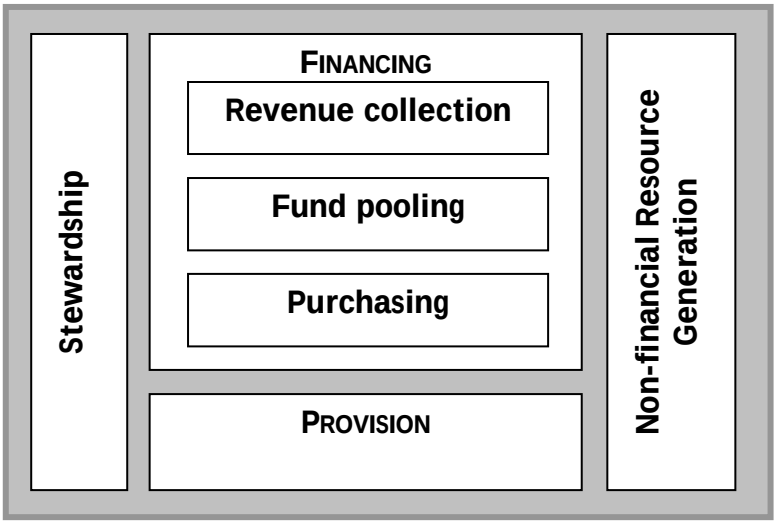
This section introduces a methodological approach to the function and performance of AHS that has been adapted from Murray and Frenk's analysis of human health systems (19). The intention is to give a broader definition of AHS. One reason for promoting this wider view is that recent events in the developed world have raised consciousness about the organisation and performance of AH systems (as for example the FMD episode in the UK in 2001, BSE-CJDv, salmonellosis, listeriosis, SARS, Avian Influenza…). These concerns arose mainly due to consumers' increased awareness of the link between animal health and food safety. At the same time, and for similar reasons, developing countries are also becoming more aware of the risks related to mismanagement of AHS (not only because of zoonotic diseases and economic losses due to poor animal health, but also because of the enforcement of international trade standards[9] recognised under the World Trade Organisation (WTO)). The focus of this section is therefore on promoting a broader view of AHS functional components and on providing an empirical analysis of the systems while identifying the factors influencing their performance.

3.1 Financing

Healthcare systems, whether human or animal, can be divided in two different functional components: financing and provision. Revenues are collected from primary or secondary sources, accumulated in fund pools and then allocated to provider activities. Three sub-components in the financial functional element may be devised. These are: (i) revenue collection, (ii) fund pooling and (iii) purchasing (see figure 2). They can be organised and combined in different ways between and even within countries. For example, functions can be integrated by a single organisational entity and in other cases one entity collects and pools the funds and other bodies purchase and provide the services (20).

[9] Sanitary and phyto-sanitary measures (SPS)

Figure 2: *Health systems functions (adapted from Murray and Frenk (19).*

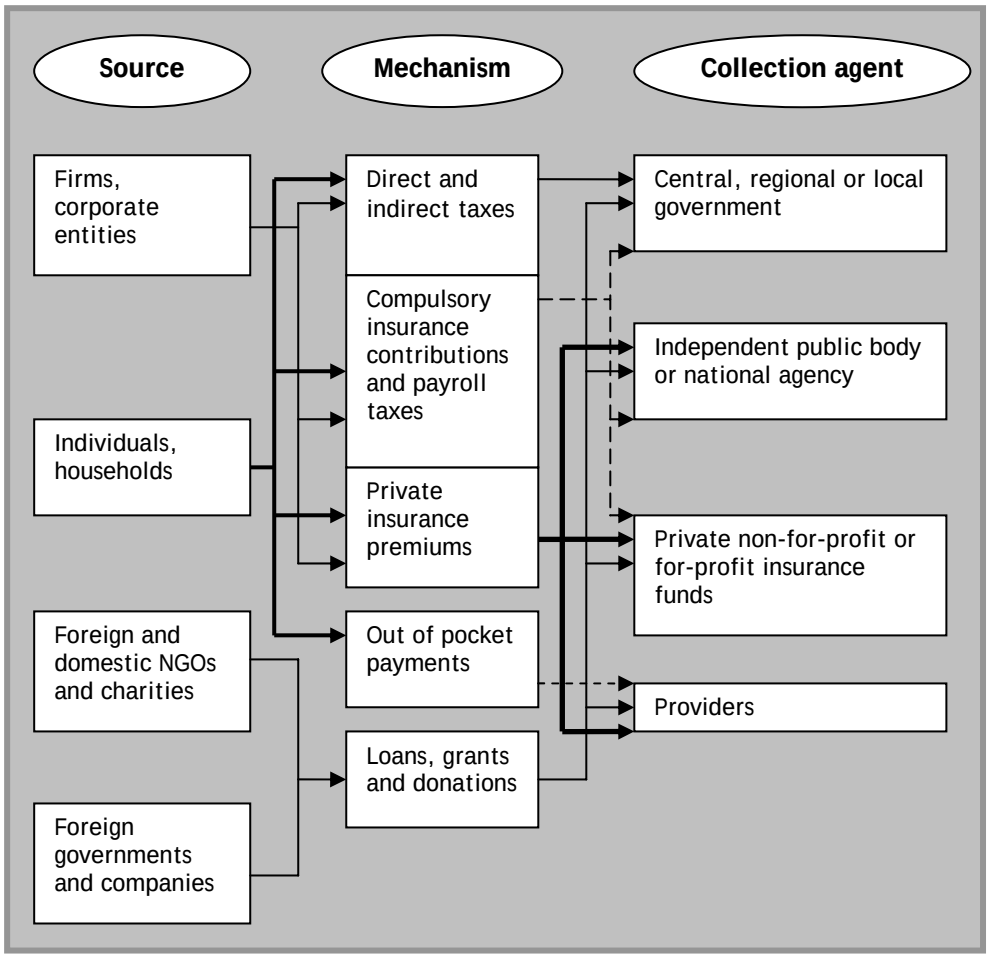


These three sub-functions are analysed next, as well as the provision and other possible influencing factors related to the AH sector. Special attention is given to strategic design, structural arrangements and implementation processes as these might have great influence on the system's performance.

3.1.1 Revenue collection

The process of revenue collection refers to who is paying (source), how the payment is made (mechanism) and who is collecting the money (collection agent) (see figure 3). In the animal health setting, funding mechanisms include primarily (i) individual contributions through out-of-pocket payment, (ii) loans, grants and donations, (iii) private livestock insurance premiums, and depending on the country, the extent of (iv) national livestock insurance and (v) the contribution from taxation which might vary widely (Each of these mechanisms – except for loans, grants and donations - will be analysed in detail in Section 4).

Figure 3: *Funding sources, contribution mechanisms and collection agents (adapted from Mossialos et al. (11).*



Focusing on the strategic design, Murray and Frenk mentioned that the "way in which revenue collection or resource mobilisation is structured is likely to affect the system's performance in a profound way" (19). Issues taking place at a decision-making level, under the umbrella of social policy concerns, relate to:

(i) The *type of payment*, which can be either voluntary (for example enrolling in a private livestock insurance or cooperative association delivering animal health services) or compulsory (e.g. taxes or national livestock insurance contributions),

(ii) The *progressivity or regressivity of the payment*[10] (for insurance premiums, for taxes –both general and hypothecated-, for compulsory contributions), and

(iii) The *payment mechanism* (referring to prepaid services versus payment at point of use).

[10] A progressive tax is one in which payment increases more than proportionately with income.

These three aspects are highly influential on the behaviour of AHS actors as well as on the consequences at different social levels (e.g. progressivity or regressivity of payments). The latter is closely related to governments' political target and standpoint (i.e. the equilibrium between economic growth and development goals) as the method of tax collection may have considerable equity[11] effects. For instance, a progressive taxation system would transfer wealth from rich to poor (thus reflecting government's concern on the ability-to-pay principle) (21). When focusing on AHS actors' behaviour, the choice of payment mechanism at governmental level may influence national expenditure on AH. For example, where AH services are free at the point of use, farmers will have an incentive to over-consume (known as *consumer moral hazard*).

Turning to the *structural arrangement* of revenue collection, governance[12] is likely to influence performance. Associated with governance is the number of organisations carrying out this function. Therefore questions arise regarding economies of scale and concentration. The choice of measures to avoid evasion for each specific collection procedure is a matter, at an *implementation* management level, that might also have an impact upon AHS performance.

3.1.2 Fund pooling

Fund pooling focuses on *"the accumulation of revenues for the common advantage of participants"* (19). Pooling resources thus highlights that funds are not related to contributors, hence there is risk-sharing. The rationale for AHS is that it facilitates the financial risk (of animals falling ill) to be shared across the farmer population or a defined sub-group. The difference with revenue collection lies in that some mechanisms of revenue collection do not share financial risks across contributors as for example out-of-pocket payments.

A key element in the *strategic design* that is likely to affect the performance of fund pooling is the extent to which separate fund pools exist for different farmer groups. Additionally, the presence or absence of cross-subsidisation between low-risk and high-risk contributors (i.e. farmers) might also have an influence. For example, if revenue collection and fund pooling are integrated, the allocation from collection to pooling agent is internalised. An example illustrating this mechanism may well be a national livestock insurance (NLI) scheme (as that of Germany (22)), where contributions are collected and retained by the same funds (in the case of Germany, regional funds). Depending on the degree of decentralisation in any given country, this mechanism may also apply to the collection and retention of regional or local taxes.

Regarding *structural arrangements* of fund pooling, key elements are: (i) the size and number of fund pools, (ii) the mechanisms of transfer of funds among pools, (iii) the choice of compensation funds for enrolment (i.e. competition) and (iv) the governance of institutions which maintain these fund pools. For example, if different agents are carrying out the collection and pooling, a mechanism is needed to distribute resources from the collection agent to the pool. If there are multiple pools, there is a need to adjust the allocation to the risk-sharing among the population in relation to each pool's population risk profile. The reason behind risk-adjustment in earmarked or hypothecated tax systems is to prevent *cream-skimming*. In tax-financed systems, methods such as capitation[13] have been used in human health systems to risk-adjust and hence ensure a "fairer" allocation of resources to territorial health authorities

[11] Vertical equity refers to who is bearing the biggest burden when paying taxes.

[12] Governance here refers mostly to the extent of public versus private participation.

[13] *"Capitation can be defined as the health service funds associated with a plan member for the service in question and for the time period in question, subject to any overall budget constraint. A capitation system puts a 'price' on the head of every member"* (23).

based on the needs of the population. A similar method may well apply to the AH setting and would generate even less surrounding controversy than in the HH field.

At an *implementation* level, the way in which the rules guiding entry and exit of those organisations performing the fund pooling function are set is likely to affect performance. This would include the procedures that protect contributors (farmers) from insolvency or bankruptcy due to loss of animals or enforcement of compulsory slaughtering (an example is provided in section 4.3.1. with Germany's "Compensation Funds").

3.1.3 Purchasing

Purchasing refers to *"the transfer of pooled resources to service providers on behalf of the population for which the funds were pooled"* (20). If the process of allocating resources is to pursue the objectives of equity and efficiency, there is a need to evaluate animal healthcare needs. As previously mentioned, methods such as capitation exist in the human health counterpart that may be a method to calculate risks and hence allocate the "appropriate" amount of resources. Similar methods may well be used in the animal health setting. Purchasing methods may vary from simple budgeting in highly integrated public systems, to a more complex scenario that would include the purchasing of different input, output or outcome units. In the latter example, the government would be collecting the revenue through general taxation, would allocate the resources to programmes and would contribute to staff and other costs. However, in many countries (and especially in developing countries), allocation of resources still depends on political negotiation or historical precedents (this applies also to other sectors). Other ways of purchasing, as for "managed care" type organisations (debated in section 4.4), may include the selection of specific units of inputs, outputs and outcomes.

Hence, the *strategic design* of purchasing lies in the questions of *"what, how and from whom"* services should be purchased (19). To purchase goods or services it is important to evaluate first the needs of the targeted farmer population. Once evaluated, the types of purchasing methods may vary. These could go from directly purchasing interventions (such as vaccinations or surgical procedures), to purchasing more general services (such as services of veterinarians), or even to directly purchasing inputs like veterinarians, AHAs, vehicles etc. Key to this process is the choice of provider. Thus, contractual processes relating purchasers to providers, selection criteria of providers and payment methods need to be explicit.

When turning to *structural arrangements*, Murray and Frenk (19) highlight four main elements likely to influence purchasing performance. These relate to:

(i) *"The size and number of purchasers"*, as for example the size and number of farmers' associations in a specific district,

(ii) *"The mechanisms of funding purchasers from revenue pools"* referring to the mechanisms for calculating the amount of funds to be allocated to e.g. a local branch of a cooperative in a private system, a regional fund in the case of a national system etc.,

(iii) *"The choice and competition between purchasers"*, referring to how many purchasers are present in a certain area and what they may be able to offer (e.g. cooperatives, public veterinary services, NGOs etc), and

(iv) *"Governance of purchasers"*, refers to the coordination between public and private actors.

At an *implementation* level, performance and efficiency will depend on the control and management of the quantity and quality of the services purchased. In the human health field these techniques are called "managed care" and will be explored in section 4.4 in relation to cooperatives and farmers' associations.

3.2 Provision

Provision of services refers to "the combination of inputs into a production process that takes place in a particular organisational setting and that leads to the delivery of a series of interventions" (19). Murray and Frenk separate the provision of human health services in two branches: personal and non-personal health services.

Following the underlying logic of this study, farmers or livestock keepers are considered as the end users of animal health services. Hence, personal animal health services would refer to services directly consumed by the farmer or livestock keeper whereas non-personal animal health services would apply for activities such as public health education in the animal health and production field or to the environment as, for example, hygiene and sanitation. It is worth mentioning that these components also apply in the human health setting according to the broader definition of health systems by Murray and Frenk. This highlights, as previously mentioned, the intertwined nature of human and animal health and the difficulty, for the public health sector, of defining roles and responsibilities for service provision and financing in relation to issues that also come under animal health.

Regarding strategic design, the way in which provision of personal AHS is organised has to do mainly with the relationship of each provider to its environment. An example in the AH setting are cooperatives or farmers' associations where there is vertical integration of different functions. The level of integration between provision and purchase functions may however vary. In relation to National Livestock Insurance systems (NLI) and/or National Animal Health Insurance Systems (NAHS)[14], the way in which governments carry out these two functions lies at the core of the performance of the system. Some governments integrate the two functions (purchasing and provision) whereas others tend to use a purchaser-provider split model[15]. The decision whether to use one model or the other relates to the level of decentralisation of the government and governance of provider institutions. Hence, the design chosen for the system might not only have repercussions in its performance, but also important policy implications.

For non-personal AHS, the conceptual framework for analysing the design would be the same. However, in most countries it is often the public sector which is in charge of these services. An interesting phenomenon in the AHS relates to zoonotic diseases and public health education. In most instances there is no clear attribution of roles and responsibilities between the ministry of agriculture (MoA) and the ministry of health (MoH) (and in some instances the ministry of education (MoE)) for public health education relating to livestock and food safety. At a higher level, the same type of anomaly can be found between international organisations dealing with health and agriculture. Often lack of communication or misunderstanding leaves these public health matters unattended. This has been debated in the literature by Propper[16] in 1995 (24) and highlights an important strategic design problem also affecting structural arrangements and implementation management. Hence, a crucial aspect in strategic design is the extent to which a single organisation provides a wide range of

[14] In this paper National Livestock Insurance schemes embrace a broader concept than National Animal Health Insurance as livestock insurance may include not only animal health services, but also insurance in, for example, the case of compulsory slaughtering etc. Depending on the country studied, livestock insurance schemes may be separate from animal health schemes. However, for study purposes, the term NLI will be used for both animal health and livestock insurance.

[15] Purchaser-provider split model: the provision of the services is contracted by the purchaser so the two functions are independent.

[16] Related to the agricultural and public health context is the example highlighted by Propper in 1995 where she raised the issue of regulatory capture. This refers to a regulating agency which has close association with the regulated and thus may be more sympathetic towards them. The regulatee "captures" or takes control of the regulator and sets the regulatory process to work on their behalf. An important policy example of this situation was illustrated by the handling of the BSE crisis in the UK. The UK's Ministry of Agriculture, Fisheries and Food (MAFF) was "captured" by powerful interest groups and therefore failed in its role of dealing with the crisis (24).

non-personal AHS or whether there are multiple specialist organisations providing specific services such as hygiene and sanitation, veterinary public health education, environmental services, etc. As in the case of personal AHS, the degree of integration with purchasing in non-personal AHS is important, as well as the nature of governance and level of autonomy.

When focusing on structural arrangements for personal AHS at a provision level, the relationship existing between provider organisations will be decisive for the delivery. The level of separation or networking of these entities (such as agrovet[17] and CAHWs, cooperatives etc) will determine access to facilities. Access might be direct (for example direct access to CAHWs, AHAs or veterinarians) or through referral (as for example in the CAH systems, access to the veterinarian through AHAs or CAHWs). The way in which access to services is organised points out the issue of cross referrals between public and private sector networks. This is of most importance when talking about privatisation of AHS (for example business oriented CAH systems and CAHWs duties of referring suspicion of epidemic diseases to government staff or veterinarians working in the public sector as well as the private sector) as inter-sector communication might be severely hindered or biased. This leads to non-personal AHS as the implications of such arrangements in the public sector relate to the staffing in the two categories. Hence, managers can be the same for both services or be different for each service. The public sector would tend to deliver some non-personal AHS such as prevention and veterinary public health education and promotion. But in the case of private arrangements in service delivery (as is happening or has happened with the privatisation process in most developing countries) the issue relates to the existence of incentives in the private sector to deliver non-personal AHS.

Implementation management matters of personal and non-personal AHS provision relate to the internal dimension of each provider organisation. As for the human health sector, the formal and informal means in which each organisation arranges its tasks, control systems and authority relationship are important at implementation level (25). The same reasoning used in HH systems with regard to behavioural management analysis would apply to AHS where the staffing structure for both management and clinical services play an important role (26). Adapting from Murray and Frenk (19), recurrent issues are whether top management of provider organisations is in the hands of veterinarians or of professional administrators. The issue of skill mix amongst various categories of providers (i.e. veterinarians, AHAs, CAHWs etc) at the clinical level is also likely to be a determinant of performance.

3.3 Other influencing factors

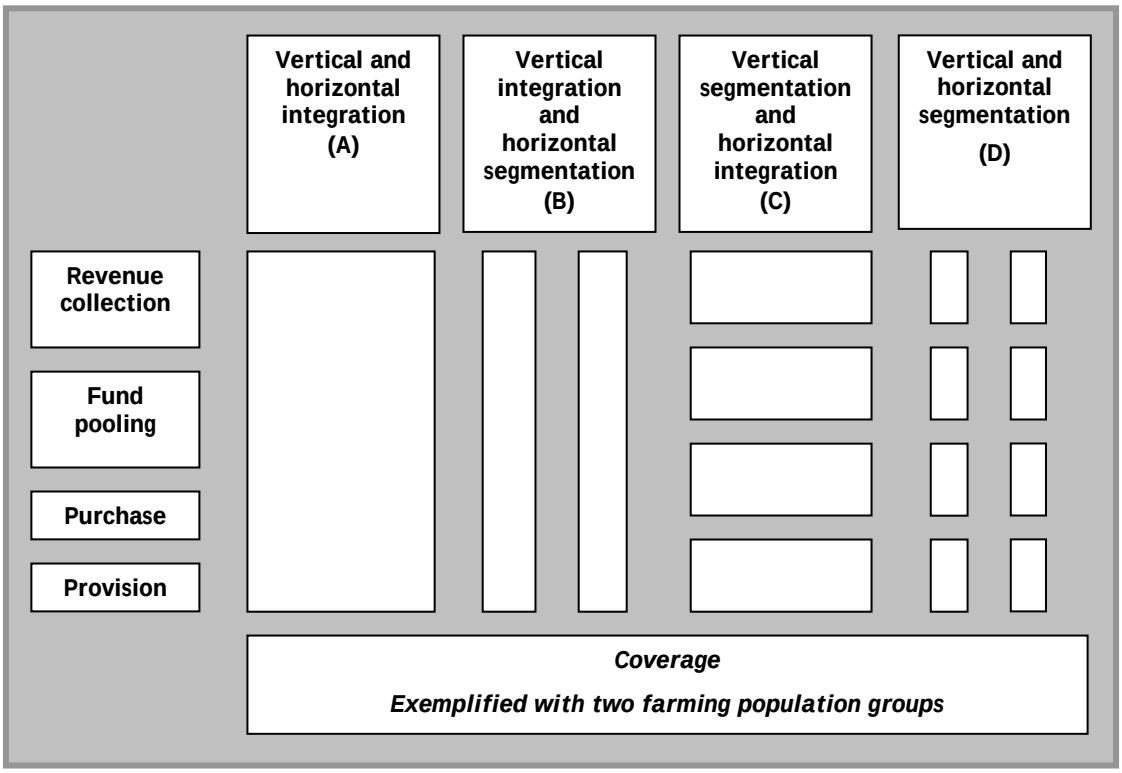
Other aspects that are likely to influence AHS relate to the extent of integration of different sub-functions, non-financial resource generation, governance and external factors to the system.

3.3.1 Vertical / horizontal integration of AHS

It has been pointed out that AHS performance is closely linked to the different elements that form its structure. However, the relation between these functions and sub-functions also influences its efficiency. Figure 4 (below) shows the diverse types of integration that exist in AHS. The degree in which animal healthcare services are integrated depends also on the level of decentralisation of activities in each country. Thus, in African as well as in Latin American countries we can find vast differences in decentralisation levels (5, 6).

[17] Agrovet: veterinary pharmacy located in rural areas. The term is generally used in the East African context.

Figure 4: *Types of integration in AHS (adapted from Murray and Frenk (19).*



In those African countries where privatisation has been undertaken, more than one entity is currently responsible for more than one function, thus falling into the category of *vertical and horizontal segmentation* **(D)**. It has been recently pointed out by Sidibe that one of the problems of most francophone African countries after the privatisation process is the lack of articulation between the central administration and the delivery branches at district or local level. End users in remote areas often believe that they are being excluded from services (5). Linked to this negative perception by stock owners is the lack of organisation and coordination by the central administration of field surveillance programmes, therefore hindering the system's performance.

However, it should be noted that some North African countries and some of those in Southern Africa have maintained the "classical" structure of veterinary services (5) (i.e. they have preserved the structures existing during the colonial period). Throughout this era, African countries tended to be *vertically and horizontally integrated* **(A)** (as for other fields). This type of integration also applies, to some extent, in India (27) where, at a state level, there is vertical and horizontal integration. However central government also contributes with a percentage of the AHS funding.

Belize's newly developed Belize Agricultural Health Authority (BAHA) (15) would fall under the category of *vertical segmentation and horizontal integration* **(C)**. Funds come from the revenues allocated from the "Consolidated Revolving Fund" (from the ministry of finance (MoF)), from fees imposed by the Authority and from donations (28). All these funds are pooled to the Authority. Purchase and provision of services is separated as there is high involvement of the private sector for animal health services delivery (15).

An example that highlights *vertical integration and horizontal segmentation* **(B)** is Australia's national animal health structure (NAHS). Here, collection methods, fund

pooling and purchasing are split between research and development and animal health services. (This example will be further analysed in section 4.2 and 4.3).

The extent of vertical integration especially affects functions such as revenue collection and purchasing, or purchasing and provision of services (19).

When analysing financing and revenue collection mechanisms at a governmental level, the degree of responsibility sharing (i.e. for public health and food safety) between ministries (e.g. MoA and MoH) creates an added difficulty for transparency and accountability in terms of funding mechanisms, as well as for service delivery. This sharing of responsibility delineates different AHS organisational patterns between developing and developed countries. Thus, in developed countries there is a tendency to move public health and food safety matters to the MoH (e.g. Japan (29), Italy (30)) or to a separate authority (AFSSA[18] in France (31) in 1998, FSA[19] in the UK in 2000 (32), EFSA[20] as part of the EU in 2002 (33), the Canadian CFIA[21] in 1996 (34)), whereas in developing countries these still lie under the MoA (or MoL). The split is mainly due to a higher consumer awareness and consciousness of food related hazards. By contrast, developing countries tend to focus on increasing animal production; therefore AHS are principal activities and they remain under the MoA (or MoL).

3.3.2 Non-financial resources

Apart from the institutions that finance or provide services, crucial to the functioning of AHS (as well as for the HHS) are the organisations that provide inputs to these services. Especially important are (i) human resources, (ii) physical resources (i.e. facilities and equipment) and (iii) knowledge (19). Examples will include universities and other educational institutions, research centres, and companies producing specific technologies such as pharmaceutical products, devices and equipment. Each sub-group's organisation is likely to influence the AHS performance as for example the degree of concentration of pharmaceutical companies and the level of competition. Another example could be the degree of autonomy of research institutions to set their goals and priorities. In terms of training institutions such as veterinary schools and animal health workers' training, the main issue would refer to whether they fall into the domain of the MoA or the MoE and the collaboration with the MoH. This will determine the match between supply and demand for animal health personnel.

3.3.3 Governance

The privatisation process in most developing countries has generally weakened the previously frail overall system design. Governance has therefore also been affected as a consequence of the process.

Governance is an important function in AHS performance that has usually been linked to the notion of regulation. Yet, a broader aspect on involvement of governance in the overall system is taken in this study. Its key function is thus associated to setting, monitoring and implementing the rules for animal health systems. Associated with this is assuring a level playing field for all actors in the system, especially in relation to purchasers, providers and clients/farmers. Further, governance plays an important role in defining strategic directions for the whole AHS.

[18] AFSSA (Agence Française de Sécurité Sanitaire des Aliments) is under the umbrella of the MoH, MoA and Ministry of Consumer Affairs. Detached bodies or agencies such as AFSSA do not have the mandate for sanitary policy (except for veterinary drugs). They play the role of control, alert and information dissemination and transparency (31).

[19] FSA: Food Standards Agency.

[20] EFSA: European Food Safety Authority.

[21] CFIA: Canadian Food Inspection Agency.

It is therefore essential for the system's design to consider activities such as performance assessment[22] and priority setting[23]. Inter-sector advocacy in relation to the promotion of policies enhancing animal and public health needs to be addressed in the strategic design. As mentioned earlier, AHS do not only deal with animal health and economic production of livestock products but also with a broader concept of protecting human health through veterinary public health policies, activities and education. Advocating progress on those determinants implies a cross-sector approach. Finally, regulation[24] and consumer protection[25] should also be considered in the design of the system.

3.3.4 External factors

There are factors outside the AHS which are able to influence the performance of the system and hence of its functions. As mentioned by Murray and Frenk (19) in relation to the HHS and applicable to the AHS, a judicial structure which enforces contracts between purchasers and providers is of high importance for the effectiveness of the system. Other attributes such as ethical codes of conduct or, as mentioned by Leonard (4), the levels of corruption in the government are also likely to influence performance.

Having analysed the key components of the organisation of AHS, the following section will focus on the different ways in which these services might be financed and the implications for their provision.

[22] It is essential for providing strategic directions and assuring a level playing field to assess the performance of institutions involved in the revenue collection, purchasing, provision and resource development.

[23] Selecting the criteria for prioritisation, and consensus building around these criteria, are major tasks for governance. This implies both technical and political aspects.

[24] Regulation in the AHS would not only include sanitary regulation on livestock and derived products but should also include certain neglected areas such as the regulation of organisations in charge of the financial, provision and resource development functions of the system.

[25] Given the nature of animal healthcare markets and the presence of asymmetries of information between consumers (herders) and providers (veterinarians, AHAs etc), achieving a level playing field for the actors to enhance information exchange is also a role for stewardship/governance.

4. PRACTICAL APPROACHES TO FUNDING METHODS AND IMPLICATIONS FOR SERVICE PROVISION

As mentioned in the previous section, there are several ways in which services can be funded. These include taxation (TF), national livestock or animal health insurance contributions (NLI), private livestock (or animal health) insurance (PLI) and user charges or out-of-pocket payments (UC)[26]. The way in which AHS can be financed through these mechanisms (or a combination of them) is analysed below.

4.1 The financing equation

Until recent years, national governments in developing countries have been in charge of animal health financing, taking care of all AHS expenses. However, in the past decades, some governments have faced financial difficulties and veterinary services have been, at least partly, privatised. Herders now have to pay for the services of veterinarians or auxiliaries. Some farmers are grouped in cooperatives or integrated farms that help in obtaining a more cost-effective price per unit of veterinary service delivered. In other countries (as is the case in some Asian countries) it is possible to find national animal health insurance (NAHI) supplemented by a national livestock insurance system (NLI) (35). India, for example, has a mix between regional and central government funded AHS (27). The ways in which revenues are collected vary widely between countries. In view of the upcoming challenges related to the "Livestock Revolution", most countries are pleading for an increase in animal healthcare services budgets (5, 6, 15). It is therefore surprising to see that, to date, there have been very few attempts to explore revenue collection mechanisms for the animal healthcare sector (see Anteneh (36)).

By contrast, in the HH side, the debate regarding funding mechanisms started in the early 1960s and is still continuing. Sources of financing have been thoroughly explored and their consequences, both positive and negative, evaluated. The financing debate in the HH field has therefore been much more elaborated and, consequently, is more sophisticated than that found in the AH field.

In the HH context, Evans (18) formulated an equation for financing of healthcare systems (see figure 5). This equation was devised to render (human) health systems more transparent and accountable. It assumes that the total of all revenues has to be equal to all expenditure. This in turn should be equal to the incomes plus the profits of those working in the system. Consequently the equation assumes no deficits. The equation states that: "*revenue - the sum of taxation (TF), compulsory or social insurance contributions (SI), out-of-pocket payments and user charges (UC), and voluntary or private insurance premiums (PI) – is equal to expenditure – the result of price (P) times the quantity (Q) of goods and services. These in turn, must be equal to the income of those who provide health care services - the quantity and mix of inputs (W) times the price of those inputs (Z)*" (11).

[26] Loans, grants and donations are also a way of funding animal health services. Such sources may contribute to funding mechanisms like taxation, national livestock or animal health insurance and private livestock or animal health insurance. Additionally, credit may also have consequences on livestock keepers' ability to pay for AH services. However, credit does not contribute to centrally funded AHS, but (as it affects ability-to-pay) its analysis will mostly lie under the umbrella of service provision and related "payment arrangements". This is why credit is not analysed in this paper.

Figure 5: *The financing equation (adapted from Evans (18).*

TF + SI + UC + PI =	P * Q =	W * Z
Revenue	**Expenditure**	**Income of providers of**

Even though the two systems (for animal and human health) are different, the concept of this equation still applies in the animal health setting. Some of the main inputs in the first part of the equation would definitely differ (as for example the weight of taxation and the counterpart in AH of "social insurance" contributions). But it does not mean that they do not exist. It is just more usual in post-privatisation developing countries to find systems commonly based on user charges or out-of-pocket payments (UC).

No system is based on a single source of revenue. Hence in the AH setting the mixed sources of revenue will come from taxation (TF), national livestock insurance (NLI) contributions, user charges (UC) and private livestock insurance (PLI). In developing countries, though, non-governmental organisation (NGOs), intergovernmental organisations and international banks contribute significantly to this first part of the equation compared to the situation in the developed world (11). This applies to both human and animal healthcare delivery.

4.2 Taxation

Taxation is one of the existing mechanisms to collect revenues. What is explored in this paper is the way in which AHS are or can be financed through taxation. Hence, it relates to an element which is part of a national taxation structure. Developed countries generally tend to have more reliable taxation systems than developing countries. In the latter case, lack of structures and enforcement tend to hinder the implementation and collection of taxes.

According to Cullis and Jones (1), there are two basic principles to report the way in which taxes can be levied. These are the "benefit"[27] principle and the "ability to pay"[28] principle. Some of the elements of taxation take into account benefit considerations. Yet the bulk of taxation is generally planned to satisfy the "ability to pay" principle. Its interpretation is however not exempt from debate (1).

Two different flow measures can be chosen as tax base. These are (i) income (see Box 1 below) and consumption[29] (expenditure), and a single stock measure, (ii) wealth[30]. *Direct* taxation generally encompasses taxes on income, personal expenditure and

[27] The benefit principle argues that people who receive more than their share of public spending should pay more than their share of tax revenues. Benefit taxation is hindered by difficulties of measuring benefits, especially for goods with high externalities (37).

[28] The ability to pay principle is based on the idea of taking proportionally more from the rich than from the less well off.

[29] Following Cullis and Jones (1), a "personal expenditure tax" would be the equivalent to income-based taxes. They argue that such tax method is attractive because it takes into account individuals' consumption instead of their contribution (i.e. income). Hence, it would relate to *"actual rather than possible consumption".* It has been argued that this method of taxation would be more equitable than income tax. However, due to the administrative difficulties, it is not generally used. Yet, there is limited experience and evidence in relation to "personal expenditure taxation" (1).

[30] Wealth is the *"discounted present value of the individual's net income stream"*, which is the stock value of flow. Hence, *"if income is part of the ability to pay, then wealth is also part of it"*. In practical terms the difference lies in that *"some things are more easily measured as a stock than as a flow"* (1).

wealth, whereas *indirect* taxation refers to taxes on sales of goods or services. The implications of this distinction were put forward by Atkinson in 1977 (38).

Box 1: *Income taxonomy (adapted from Cullis and Jones (1).*

Income can be categorised following the 'visible' and 'explicit' criteria (see table below). The elements in cell (a) are those "*most easily documented and are typically subject to the tax system*" (1). If tax rates vary in relation to the source of income, an incentive exists to find a form in which it will not be taxed. Hence, the system is encouraging "fringe benefits" (b) in remuneration packages as well as promoting the "cash economy".

	Marketed- explicit	**Non-marketed- implicit**
Visible	**(a)** Wages, salaries, rent, interests, profits (that may arise as a capital gain)	**(b)** Fringe benefits, e.g. company car, subsidised meals, private health insurance paid by the employer
Camouflage	**(c)** "Extra" work activities, jobs "on the side"	**(d)** Use of part of (e.g.) farmer's own output for domestic consumption

Situation in cell (d) is common in most developing countries with widespread subsistence farming. By definition subsistence farming generated income ('imputed' income) nearly equals total income. Yet, taxation process becomes easier with economic specialisation and trade (national and international), the existence of market prices and the recording of transactions. This is why it will be easier to find more visible and explicit taxation systems in developed than in developing countries (1).

There is, though, a wide gap between tax theory and practice (1). However, Adam Smith's principles for taxation still serve as guidance for any evaluation of such systems. These principles are (i) equity[31], (ii) certainty[32], (iii) convenience[33] and (iv) economy or efficiency[34]. Yet, putting these principles into an analytical and practical context is difficult. An added problem is that these principles may conflict with each other (1).

Although available data and examples are scarce in the AHS context, the next section introduces the debate surrounding the different ways in which taxes can be levied.

4.2.1 Direct and indirect taxes

Direct taxes may be levied on firms, households or individuals. Examples in the economic literature include personal income tax[35], corporate profit taxes and property taxes. In developed countries, direct taxes are administratively simple to collect as formal records of earned income and of companies' profits are kept. Given

[31] Equity conveys the idea that individuals should contribute in proportion to their abilities.

[32] Certainty refers to visibility and compliance cost considerations (1).

[33] Convenience: *"The manner and timing for the tax payment should be convenient to the taxpayer"* (i.e. acceptability) (1).

[34] Economy or efficiency refers to minimising excess burden or welfare costs. This also includes the administrative, collection and psychic compliance costs of a taxation method (1).

[35] Personal income taxes are generally progressive and redistribute income from rich to poor. This refers to a progressive tax system where tax rates are higher for those who have higher incomes.

that income is easily identifiable, it can be directly deducted from source, therefore increasing compliance. If there is a high informal economy, it is important to apply institutional measures to reduce tax evasion (11) (although it might be argued that it is not an easy task). Such taxes are generally collected and pooled to the national treasury. Governments may allocate funds from this pool[36] to AH programmes as happened in the UK during the FMD 2001 outbreak (K. Sumption, personal communication). However, there are several institutional characteristics that might create horizontal inequity[37] such as geographical variation of income tax rates, exemptions of taxation for certain incomes and tax deductible expenditure.

In the AH field, *indirect taxes* are more common. These are levied on expenditure on goods and services as for example sales tax, value-added tax, excise tax and import and export tax (21, 37). An advantage of this taxation method is highly visible and easily identifiable. Yet, they tend to be regressive[38] as they are not related to overall income. Even so, they are useful when there is a large informal economy and widespread evasion of direct taxes (11).

In developed countries, an interesting example of funding mechanism for one of the components of AHS is Australia's scheme for research support. This system relies mainly on *indirect taxation* (which is earmarked for R&D). Levies and charges are therefore used to fund activities such as research and development, marketing and promotion, residue testing, and animal health programmes (39). Collection of taxes is supported and enabled by government legislation (12).

The Levies Revenue Service (LRS) of the Department of Agriculture, Fisheries and Forestry – Australia (AFFA) collects and administers most levies. These are usually collected at the first point of sale of the primary producer or point of further processing. In cases where there are specific difficulties in collecting levies at the first point of sale, a levy on inputs may be considered. Examples of levies for the livestock and dairy sectors include the following[39] (39):

(i) Livestock levies: buffalo export, buffalo slaughter, cattle and livestock export charge, annual cattle and livestock transaction levy, monthly cattle and livestock transaction levy, chickens-laying charge, chickens-meat levy, deer export, deer slaughter, etc.

(ii) Dairy levies: dairy ("All Milk Levy"), dairy adjustment levy, etc.

All levies and charges are paid into the Consolidated Revenue Fund (CRF). The Federal Government assists primary industries by matching certain R&D expenditure up to the limit of the levy receipts, but subject to a further limit in any financial year of 0.5 percent of the gross value of production. Thus, *direct taxes* also contribute to the CRF, and hence to R&D activities, through Federal Government. This matching of expenditure provides additional revenue for primary industry R&D.

The LRS then allocates the funds of the CRF into the appropriate Research and Development Corporations (RDC), which are in charge of R&D activities. These Research and Development Corporations include Animal Health Australia (to be discussed in section 4.2), Australian Pork Limited, Meat and Livestock Australia and others. As an example, RDC invested around 364 million Australian Dollars in R&D during the period 2000-2001. Investment in R&D by industry and Government, not only results in industry-based productivity increases, but also delivers essential public good

[36] Which generally also includes indirect taxes.

[37] Horizontal equity relates to the notion of "equal treatment for equal needs". Vertical equity refers to redistribution.

[38] Regressive tax: people with lower income spend proportionately more of their saving on highly taxed goods such as tobacco than people with higher income.

[39] Specific description and details on each of the taxes may be found at: http://www.affa.gov.au/content/levies.cfm

outcomes. These include regional development, improvements in food safety, environmental benefits, medical advances and new consumer products (39).

In developing countries, Anteneh (36) pointed out some *indirect taxation* mechanisms used, although not generally earmarked, for AHS funding. He explored the different types of taxes, charges and levies that were applied in 14 West African countries. The taxes recorded were (i) import/export taxes on live animals, meat and edible offals; (ii) trade licences; (iii) livestock head tax[40]; (iv) meat inspection fee; (v) slaughter fee; (vi) market fee; (vii) holding ground fee; (viii) transit fee; (ix) sanitary tax/veterinary certificate. The data obtained dated back to 1975, a period well before the privatisation process. It was shown that taxes such as trade and slaughter fees were the most constant across countries. The reason lies in that these taxes are generally easier to administer and encounter less political rejection as they are not directly confronted[41] to livestock owners (as opposed to direct taxes). However, such taxes are more likely to be included in the national or regional treasury than being earmarked for livestock services. Hence, the actual livestock budget may seem to be smaller than the potential one[42]. These taxes were pointed out by Anteneh as a possible source of revenue that could be collected to increase the livestock budget in countries where the sector plays an important role in the economy (36).

4.2.2 National and local taxes

National taxes are useful because they allow trade-offs to be made between AHS and other public policies. Through this revenue collection mechanism the state obtains a yearly amount of money that the MoF then allocates to other ministries in relation to the needs of the period and negotiating power of each ministry[43]. An advantage of collective taxes (i.e. national taxes) is that it enhances economies in administration. Devolving revenue collection to regions produces fewer economies of scale and thus higher costs. In the developing world, countries such as Chad and Mauritania tend to channel their whole AHS budget through the central treasury (36).

Local taxes, however, might be an alternative to national taxation for four reasons. First, local taxes are seen as more transparent (i.e. visibility) because the relationship between the amount of money levied through local taxes and the amount spent on animal health services may seem to be more direct. This has been highlighted previously in Anteneh's example. In countries such as Mali, Niger, Senegal and The Gambia, in addition to central government budgets, finance is channelled through regional (district) administrations, which raise funds through different local taxes and levies including those on livestock (36). Second, local taxes tend to improve accountability as local politicians are closer to the electorate and decisions on how to spend the money are (supposed to be) more apparent. This is especially relevant in countries where livestock plays an important role in the local (and national) economy. Third, theoretically, they enhance responsiveness to local preferences so that people's needs guide the decisions taken. Fourth, local taxes have the advantage of giving importance locally to issues that are not necessarily a priority in the national budget (i.e. in the political negotiation of budget allocation by the MoF). Hence, at a local level and in relation to the characteristics of the region, animal health

[40] Although this tax was later abolished in several of the countries studied.

[41] Although it may be arguable for some of the indirect taxes.

[42] Of course this depends on the weight of livestock related activities in the country studied.

[43] In Bangladesh the biggest bulk of animal health protection and treatment falls under the responsibility of the government through the Directorate of Livestock Services (DLS). AHS are executed through a network of 9 regional diagnostic laboratories, 17 district diagnostic laboratories, one Veterinary Vaccine Production Laboratory (VVPL) and 464 Upazila Veterinary Hospitals (UVH). However, no data is available on how the national animal health services in Bangladesh are funded (types of taxes or existence of a separate fund). Presumably funds come from taxation (local and/or general) therefore there is no separate fund-pool. It is worth pointing out that, in spite of an allocation of TK 50.0 million intended for free distribution of medicines and de-worming drugs to poor farmers, disease diagnosis and treatment of ruminants carried out by the DLS staff are not cost-free (40).

expenditure might be given higher priority than at a national level (this would apply differently in developed and developing countries. Developed countries would give priority to food safety whereas in developing countries, where animals and derived products tend to play a major role in the local economy, AHS would be considered more important).

However, depending on the importance given to animal health and/or food safety, local taxation might create political inertia. Issues of horizontal inequity might also arise not only if local taxes differ between regions but also if the tax applied in all regions is the same. Local taxation can be as progressive or regressive as national taxation, however the scope will be more limited and it has the potential to redistribute income only within a region (as opposed to the whole population).

4.2.3 General and hypothecated taxation

General taxation has two main advantages. First, taxes are obtained from a broad base and diverse sources. Second, it allows trade-offs between animal health care and other areas of public spending which might reflect the priorities of the population. However as previously mentioned, the allocation of the budget for animal health services in the general taxation system is subject to annual negotiations. This is a highly political procedure but makes the process more democratically accountable.

Hypothecated taxation refers to taxes that are earmarked (in the context of this study, for animal health). They might be direct or indirect. This revenue collection process may be considered to have several advantages over general taxation for three reasons. First, it renders the process more transparent and possibly less susceptible to political pressures (as taxes are earmarked). Second, it reduces resistance to taxation because its purpose is more visible. A third possible advantage is that *"people feel more connected to the tax system, which in turn, may increase the pressure on providers to improve quality"* (11). However, disadvantages of this system also arise. In practice not all hypothecated taxes are practically earmarked. As mentioned by Anteneh (36), the livestock tax revenue may be merged with other taxes. Therefore the above-mentioned "connection" between the population and the tax system is undermined. Furthermore, this method might increase rigidity in the budgetary system as expenditure depends on the revenues collected (limited budget) and not on political decisions. Finally, some interest groups and professional lobbies might take advantage of the hypothecation systems to exert pressures over the funds. In fact, some compulsory insurance contributions are a payroll or earmarked tax collected by the government.

4.3 National insurance for livestock and animal health services (NI)

In the human health field, social health insurance (SHI) contributions are earmarked for health. Their main characteristics are that taxes are mandatory, collected by a separate fund which is closely linked to the government (otherwise it would be an earmarked payroll tax), and contributions are usually related to income and not to risk (41).

In the livestock and animal healthcare field, earmarked contributions also exist and some similarities can be drawn from SHI schemes. However, attention should be drawn to the different focus that national insurance schemes in the livestock sector may take. These schemes may include compensation funds for losses due to particular diseases and/or animal health services needed to prevent or contain such diseases. Therefore, for simplicity in study purposes, national insurance schemes in the livestock sector will be conveniently divided into National Livestock Insurance (NLI)[44]

[44] The concept of NLI is wider than that of NAHI. The latter is restricted exclusively to animal health.

and National Animal Health Insurance (NAHI). Funding mechanisms will vary in relation to the organisation and type of scheme.

4.3.1 National livestock insurance (NLI) contributions

Livestock insurance in intensive production systems is widely used in European countries (42). In these systems, two types of compensation funds exist: compensation for direct losses and compensation for consequential losses. Public intervention varies between countries and in relation to the elements for which compensation is paid.

4.3.1.1 Direct losses

Compensation of direct losses[45] in Europe is partly based on European Union (EU) directives[46] for list-A diseases. Compensation includes 50% of the value of animals subject to compulsory and pre-emptive slaughter, 70% of the value of those slaughtered for welfare reasons and 50% of the costs of organisation (i.e. administrative). The rest of the costs may be (i) refunded from national budgets, (ii) co-financed through public-private financing schemes where farmers pay a compulsory levy or (iii) suffered by the producer.

(i) Countries where governments fund compensation for direct losses from their national budgets include Sweden, Finland, Denmark and the UK[47].

(ii) Those countries that opted for public-private partnerships are Austria, Belgium, The Netherlands, Greece and, as previously mentioned, Germany. In this case, the arrangement generally includes a compulsory or voluntary levy, paid by farmers to a separate fund. In Belgium, for example, types of levies are differentiated in relation to the animal species and farm size. Additionally, levies for pig production vary depending upon whether the production system is open or closed. These levies are collected in a fund managed by the Ministry of Agriculture. Services delivered through these funds include some animal health and quality improvement measures. However, the collection method varies between countries. Hence, Greece, which has a NLI programme under the Greek Agricultural Insurance Organisation (ELGA), defines the compulsory fee as 0.5% of the value of the stock production sold.

(iii) Farmers in Spain and Italy do not receive any compensation from their respective governments other than for destroyed animals. There is no voluntary or compulsory levy.

4.3.1.2 Consequential losses

Options in Europe to compensate for consequential losses[48] are mainly: (i) private insurance schemes, (ii) free public disaster assistance, (iii) public-private partnerships.

(i) Private insurance schemes in Europe exist for certain types of livestock (mainly cattle and sheep). Examples of countries having such schemes include the UK, The Netherlands and Germany. In Italy private insurance schemes are exclusively for dairy production and sheep but participation is very limited.

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[45] Direct losses include the value of the animal destroyed, welfare control measures and organisational aspects (e.g. monitoring of farms in restriction zones).

[46] Council directive 90/424/EEC http://www.warmwell.com/90424eec.html

[47] The main welfare control measure for the UK FMD outbreak in 2001 was to slaughter animals thought to be suffering as a result of movement controls. Producers were compensated for their value. However, this policy will not be continued. In future outbreaks such compensation will not be paid (M. Upton, personal communication).

[48] Indirect losses include: business interruption, losses related to the established restriction zones, additional repopulation costs, losses from emergency vaccination and price effects.

(ii) Free public disaster assistance exists in Finland and France. Although funds are public, the scheme is administered by private insurers, who receive a commission but do not incur any loss. There is therefore no risk transfer to private insurers.

(iii) Finally, public-private partnerships for the compensation of consequential losses exist in Denmark, Finland (to some extent) and Spain (through a structure co-financed by the government named Agroseguro). Under this type of partnership, the government may act as an insurer or re-insurer. Under these schemes the risk of losing financial resources is transferred to the private insurers, as opposed to the retailing mechanism under free public assistance.

Through this overview of compensation mechanisms in Europe, it can be seen that government or public intervention still remains high as the extent of negative externalities stemming from the occurrence of list-A diseases is likely to be high. Private livestock insurance involvement seems however to be increasing in Europe for consequential losses (42).

In a developed country setting, private sector intervention is interesting as it transfers risk[49] away from public funds. However, in developing countries, the weak legal framework and institutional context, as well as the lack of private providers of livestock insurance, make public intervention the only alternative available.

Livestock insurance for farmers exists in Asian countries. Nevertheless, specific and comprehensive data on how such services are financed and organised is lacking. In India, as part of the national insurance scheme (General Insurance Company - GIC), livestock insurance is automatically granted to poor dairy farmers when buying an animal from a specific source[50]. The scheme reimburses the owner in case of animal death (35). GIC in India will compensate only under the following conditions: accident, diseases contracted under the period of the policy, surgical operations, and riot and strike. The policy may be extended to a Permanent Total Disablement (PDT) on payment of an extra premium and will therefore cover the event of dairy cows not conceiving and not producing milk, or stud bulls incapacitated for breeding purposes (43).

It is worth highlighting the entangled nature of livestock insurance and animal health services. In India, the latter services fall under the responsibility of state governments (although central government also plays an important role and some privatisation has already been undertaken), and is managed separately from the national livestock insurance. In 1991, the Department of Animal Husbandry and Dairying (DAHD) was created in the MoA (central government). The DAHD primarily concentrates its activities on supplementing and complementing the efforts of state governments in enhancing productivity levels of livestock. Hence, one of the components relates to the provision of animal healthcare services. Funds for the provision of these services come from two sources: (i) the central government and (ii) each state's regional fund[51]. Regional funds are the ones bearing the biggest part of the animal health budget. For example, in Gujarat during the period 1996-1997, the state government share provided to AH was 61%, whereas the central government share was 39% (27). Nonetheless, GIC has *"employed a number of veterinary officers who have been provided with kits for treating animals during their rounds. Their services can be utilised by various agencies, whenever necessary, in the overall national interest"*

[49] Cost of disaster.

[50] By introducing a master policy, all animals financed by bank loans were automatically covered by the insurance. A low cost insurance cover at a premium rate of 2.25% was introduced for animals subsidised by special development programmes (i.e. Integrated Rural Development Programme (IRDP), Small Farmer Developing Agency (SFDA), Marginal Farmer and Agricultural Labourer (MFAL) and Drought-Prone Area Programme (DPAP) projects).

[51] However no data is available on the fund collection mechanisms for either of the two fund-pools. Presumably the origin is likely to be general taxation (for both, central and regional levels) although some user-charges have been introduced in India in 1996 for (the previously free) AHS, which might contribute to the regional pools.

(35). It is however stressed that *"veterinary services should be provided free or at a cheap and affordable cost and government line agencies have to fully cooperate* [with GIC]*"* (35). Hence, livestock insurance and health care are supposed to be complementary, thereby highlighting the intertwined nature of AHS and livestock insurance.

Similar livestock insurance schemes exist in other Asian countries such as Nepal, Thailand, Sri Lanka, Indonesia, Malaysia and Philippines (43). These schemes started during the 1970-80s and were initially focused on dairy production, but they expanded later on to include other livestock. Strong links with banks (generally national and a few commercial) have been created. For example, when farmers ask for a loan or credit from the bank, the adoption of an insurance policy is obligatory[52]. Yet it is commonly stated in the insurance policy documents that no compensation for compulsory or emergency slaughtering (i.e. direct losses) is reimbursed by the national insurance company.

NLI embraces a wider concept of insurance of income maintenance and may or may not include animal health. Livestock insurance and animal health insurance are, as seen in these examples, highly entangled. However, schemes may exist at a national level focusing more specifically on the animal health service component.

4.3.2 National animal health insurance (NAHI) contributions

The origins of NAHI contributions go back to the beginning of the 20th century in Germany when the Bismarkian model[53] of SHI started.

In the AH field, Germany passed a national law on contagious livestock diseases enabling the establishment of "Compensation Funds" (TSK) in 1909. These collected funds to support official measures against contagious diseases. TSKs were then established in the German federal states. The philosophy of the TSKs relied on the combination of the livestock owners' will of risk-sharing with the state support for agriculture. It was introduced as a compulsory scheme and the intention was to accumulate funds to compensate farmers for losses incurred from the application of official measures. Those measures were (i) the control and fight of contagious livestock diseases and (ii) the application of prophylactic or preventive measures (prevent the outbreak and spread of diseases), which constituted the biggest bulk of the financing. Nowadays, TSKs exist in all federal states as parastatal self-governing institutions and their mandate is determined in the statutes. It is an independent management body that takes decisions according to best practice (22).

Financing of (or contributions made to) TSKs come from three different sources. First, membership is compulsory for all livestock holders and the annual fee is related to the number of cattle, horses, pigs, sheep and poultry owned. Second, TSK receives state grants to finance legally ordered activities such as vaccinations and routine tests. And third, another source of income is revenue coming from financial investments and assets held (22). Compensations received by livestock owners from TSK relate to the following situations (22):

(i) Losses due to notifiable diseases,

[52] Insurance premiums vary between 3 to 5% of the value of the animal. Premiums are generally kept in a para-statal fund. The funds collected serve to reimburse the farmer when the insurance policy refunds in the stipulated cases.

[53] The "Bismark" model is the model of social health insurance developed by Germany. It has often been considered the standard model of social insurance. As an example, in the former Federal Republic of Germany *"75% of the population were insured compulsorily, about 13% voluntarily* […] *and 10% privately".* However, two other types of models of human health systems have been devised: (i) the "Semasko" model characteristic of the former Soviet Union, representing the most "pure" public model (at least in theory as there were substantial 'under-the-counter' payments) in that it is publicly funded and provided, and (ii) the British model, which is largely publicly provided and financed by the National Health Services (NHS) yet including some forms of user-charges and a small private insurance sector outside the NHS (44).

(ii) Losses due to compulsory measures for disease prevention and control,

(iii) TSKs contribute partly to the costs incurred by proper disposal of rendering carcasses in rendering plants, and

(iv) TSKs compensate mass vaccination and laboratory testing expenses[54].

TSKs operate under the guidance of the federal MoA or MoH (in relation to each federal state). At the top of its structure is the supervisory board composed of representatives of livestock holders, private veterinarians, public veterinary officers and the supervising ministry. It is the supervisory board which sets the guidelines and relevant decisions applied by the management on day to day operations (22).

The newly created Animal Health Australia embodies a similar structure to that outlined above for Germany. Animal Health Australia was founded in February 2000 as a result of a consultation between government and industry groups regarding strategic planning for policy and funding mechanisms for a national livestock system programme. The Australian National Animal Health System (NAHS) is organised as a not-for-profit company which currently includes 24 members spread across four membership categories: (i) the Commonwealth, (ii) State and Territory governments, (iii) key primary industry groups and (iv) other key interested organisations.

Funding is provided via annual subscriptions paid by the members to the Company and *"is applied in pursuit of an integrated national animal health system"* (45). Subscriptions to Animal Health Australia are determined on a three year rolling average of the Gross Value of Production (GVP) as established by figures published by the Australian Bureau of Statistics. Each livestock sector or species is represented by an organization that is effectively the "peak body" for livestock producers utilizing that species of animal. The Commonwealth (Federal) government is also a member, as are the seven States and Territories. The Commonwealth pays one-third of the total subscription funding due (based on break even expenditure budgets prepared in advance and approved by members of the Company in general meeting), the States and Territories pay one-third (split between them all on the basis of GVP as noted above), and the "peak bodies" pay one-third, also split between them as per their relative GVP figures (Willoughby, personal communications).

The structure is supported and enabled by legislation. The Company also has the capability to manage national animal health related programmes for all, or a subset of its members. Programmes that have a collective benefit for members are funded from members' subscriptions. The Company currently has three major subscription-funded programmes addressing (45):

(i) Animal health services, *"which aims to improve the national capability, standards and performance of Australia's animal health system",*
(ii) Animal disease surveillance, *"which provides a nationally integrated, innovative surveillance system to underpin trade",* and
(iii) Emergency animal disease preparedness, *"which enhances management approaches to deal with animal disease emergencies".*

Animal Health Australia also includes disease specific programmes. Those diseases of interest to a limited number of members are therefore funded directly by the primary beneficiaries. In 2003, the Company managed 'special' programmes and projects such as Tuberculosis Freedom Assurance Programme (TFAP), National Transmissible Spongiform Bovine Encephalopathy Surveillance Programme and the National Arbovirus Monitoring Programme.

[54] The eradication of the major contagious diseases (Foot-and-Mouth disease, bovine tuberculosis, cattle and sheep brucellosis and cattle leucosis) in the 1950s in Germany has been largely attributed to the TSK.

Similar examples of disease targeted specific programmes can be found in the UK[55], but also in developing countries, as for example, in Côte d'Ivoire[56].

4.3.3 Advantages of NI schemes for the livestock sector

These examples show the diverse and mixed nature of funding mechanisms for livestock insurance.

The pattern observed from the above examples is similar to that found in the human health counterpart. The main particularity of a "national health system", which is the existence of a separated collector agent, is therefore also found in the livestock setting. The collector agent (in the AH field) can therefore be a single NI fund (such as in Belize) or several funds devolved to the regions (e.g. Germany, Australia, India). The predominant attraction of NI (whether central or regional) in its broader sense, is the "independence" of the insurer from government[57] and the perceived greater responsiveness to the consumer (i.e. farmer). It is however easy to see that due to problems of governance, accountability and regulation of funds, these might fall again under the control of the MoA or MoF.

NI, as a way of collecting revenues, has similar advantages to those outlined for hypothecated taxation. It is more transparent and usually more acceptable. Theoretically, NI funds are supposed to be better protected (than if they were managed by the ministry) from political interference since budgetary and spending decisions are devolved to independent bodies. However, independent agencies might also be vulnerable to political influence or pressure, a process known as "regulatory capture" (mentioned earlier in section 3.2). Additionally, the risk pool created through NI is much larger than that obtained through private insurance, especially in developing countries. However, depending on the nature of the contributions to the NI fund/s, difficulties may arise when trying to obtain a census of farmers (as they might produce in the informal market), when identifying and recording the actual number and breeds of animals they possess (35) or in determining the gross value of production (GVP). This might limit access to certain parts of the farmer/producer population, especially for poor farmers and small producers and this highlights some of the equity problems arising from NI.

Other key points in the functioning of NI are associated with the specific organisational arrangements of the insurer's fund(s) (i.e. single or multiple funds). These arrangements might have an important impact on the system's efficiency. Hence, a single fund may reduce administrative costs, ease regulation and obtain bigger risk pooling. Multiple funds may or may not compete with each other. If they compete, there might be an incentive for improving efficiency. Yet, insured farmers

[55] After the outbreak of Aujezsky's disease in 1981, the British government offered help by partially compensating the eradication of the disease. The British pig industry's first answer was to refuse this offer. However, after weighing the costs and benefits, in 1983 an agreement was reached between the British government and the pig producers to control the disease. A Pig Disease Eradication Fund (PDEF) was created to coordinate the financing and control of the disease. A levy of 0.3 GBP per head was raised on all pigs destined for slaughter or export. This levy covered the compensation costs incurred through the compulsory slaughter of animals. There was a fund in charge of the collection of the money: the Meat and Livestock Commission acting under the Pig Industry Levy Act of 1983 and transferred to the PDEF Ltd for compensatory payments to producers with affected herds. This tax collection raised an amount of 27 million GBP. All other costs associated with the scheme were borne by the government which includes administrative, veterinary and laboratory resources (12).

[56] In Côte d'Ivoire, specific funds for disease eradication or containment exist. In the case of compulsory control and eradication of CBPP, Rinderpest and PPR, funding sources from 1994 to 2002 came from: (i) the government through the "Budget Special d'Investissement et d'Equipement" (BSIE), (ii) livestock keepers' direct contributions and (iii) external funding (European Development Funds). Livestock keepers contribute through payment of charges for services which are collected by the external services of the ministry in charge of animal production and subsequently pooled to the "Caisse Autonome d'Amortissement" (CAA, state bank). Management of these funds is centralised at the livestock and animal health project level, which falls under the direction of the ministry in charge of animal production. Management of these projects is also supported by the decentralised governmental structures (46).

[57] However, as previously mentioned, the "independent" NLI fund is at "arms' length from the government", therefore it may still be subject to a certain degree of manipulation, although less than that of the general taxation fund.

will not be able to choose. This may lead to some lack of responsiveness and certain degree of inefficiency. Defining the extent of coverage for non-competing funds in relation to the region or to a specific disease might also be essential. For example, regional funds exist in Germany. They are geographically distinct and cover the entire farmer population of the territory. This allows for larger pools, spreading administrative costs and functions over a larger base. However, they can also have the disadvantages of local taxation regarding regional inequity of wealth, income and risk status.

Schemes targeted at specific diseases are not generally compulsory. Commonly, it is a collective decision of the farmers/producers affected by the disease to organise such schemes themselves. The underlying rationale is usually based on the economic implication related to the presence of the disease for both, producers and government. Such specific funds are generally non-competing and targeted to a defined population. Under such funds, services are tailored to meet the needs of farmers/producers. Contribution rates might though be higher than average, especially for highly intensive farming. In rural areas this may raise some equity considerations. Another possible disadvantage of disease targeted schemes is that coverage might serve overlapping geographical areas, therefore duplicating administrative costs and limiting the total size of the pool.

Some of the characteristics outlined for disease targeted schemes relate to those found in private livestock insurance.

4.4 Private insurance for livestock and animal health services (PLI)

Private insurance[58] exists in the livestock sector and may be structured and financed through farmers' associations, cooperatives (9), community-based initiatives, mutual livestock insurance groups or insurance companies (22, 42).

These organisations can play a valuable role in the financing, provision and delivery of a wide range of toll good services[59] varying from preventive to curative, drug distribution or even ordinary animal diseases not covered by the national livestock/animal health insurance (if existing) and other hazards. These types of PLI are largely related to high value productions like dairy, pig or poultry.

In developed countries, and especially in Europe as mentioned in the previous section, PLI is increasingly being managed through insurance companies (42). Examples of PLI mainly focusing on AHS include Israel's HACHAKLAIT (47), which started as early as 1919, New Zealand's "Veterinary clubs" (48, 49) created in 1930 from associations of private livestock owners, service cooperatives in Ethiopia (8), which started in 1975, and Kenya's cooperative societies (8, 49, 50), which have been evolving since 1988. Similar structures exist in other countries such as in the state of Gujarat in India. There the Amul Cooperative and the Kheda and Mahesana district cooperative unions are among the most active and are operating relatively well-managed insurance delivery systems (27). In Latin America, similar schemes may also be found such as the AGSO (Asociacion de Ganaderos de la Sierra y Oriente) which started in 1995 (51).

According to Mossialos and Thomson (52), insurance in the human health sector may be classified in three categories: (i) substitutive, (ii) supplementary (or choice-increasing), and (iii) complementary. Given the similarities existing between the human and animal health sectors, outlined in previous sections and elsewhere (4, 7), such categorisation may also be applied to the sector of private livestock insurance.

[58] The concept of private insurance for the livestock sector includes all those initiatives that are individually or collectively organised without government involvement or intervention.

[59] Toll good services are those for which after paying an initial fee, consumption of the good or service is unlimited, up to capacity maximums.

The boundaries of each of these categories of PLI are not always clearly defined; therefore overlap is expected when revising PLI schemes in different countries. Nonetheless, such classification is useful for the purposes of this study.

4.4.1 Substitutive insurance

Substitutive private livestock insurance may exist as an alternative to the national animal health and/or livestock scheme applied in a country. For example in the Netherlands, pig producers are increasingly encouraged to opt for such private schemes (53) to shift risk away from government budgets. This development is driven by two main factors: the changing role of government[60] and the increasing industrialisation of agriculture (53). Farmers or producers with higher benefits may opt out from the public sector scheme leaving that sector to bear the smaller producers' risk.

4.4.2 Supplementary (or choice-increasing) insurance

PLI will be supplementary when it allows quicker access to services, which are generally of higher quality than those provided by the public structure. An example of such scheme would include Israel's HACHAKLAIT service provider. The scheme operates nation-wide and may also cover diseases which are under the NAHS mandate. This may therefore generate differential access to animal health services and livestock insurance between those who adhere to the private scheme and those who do not. Certainly, not all production types carry the same risks, thus high risk production may be forced to revolve to private schemes. Depending on who these higher risk farmers or producers are, inequalities may arise, potentially making the PLI scheme regressive.

4.4.3 Complementary insurance

Finally, complementary PLI refers to those schemes which deliver services not provided or covered by a national structure. In the livestock sector, an example included in this category could be artificial insemination (AI). Given the 'private good' characteristics of these services, provision is generally left to the private providers which may be organised as an association offering AI service packages for a stated premium (e.g. Israel Cattle Breeders' Association). Such schemes may be highly profitable for users, but will generally leave the lower profit producers unable to pay for their services.

The organisational structure and functioning of these different types of PLI has some similarities with the managed care structures found in the human healthcare setting. The classical example of this structure is the Health Maintenance Organisation (HMO) seen most commonly in the USA but also found in Europe.

In human healthcare, HMOs are the most well known alternative to fee-for-service (FFS) for medical care. However different the origins of HMOs and PLIs might be, their structure and organisation remain similar. HMOs were created as a means of counteracting moral hazard (consumer and provider) originated by FFS payments, whereas PLIs were created to enable farmers to finance highly valued veterinary services not or poorly provided by the state. This might be one of the reasons why most of these structures exist in high production sectors.

HMOs and PLIs are based upon a similar concept: a fixed periodic per-capita prepayment which is paid by consumers/farmers directly to a provider of comprehensive (animal) healthcare services[61]. The latter concept refers to a structure

[60] For example less price control but more regulation on the use of medicines.

[61] And in some cases including also livestock insurance.

combining the roles of provider of both medical (veterinary) services and insurance, hence removing at least a part of the hidden information problem. Under this structure, veterinarians or physicians are paid a salary or might be contracted by the insurer/cooperative on the basis of a negotiated fixed salary, thus coping with provider's moral hazard. Drugs are usually bought directly from pharmaceutical companies enabling the insurer/cooperative to obtain reduced prices. They can be fully charged to the consumer or partially subsidised by the insurer depending on the type of HMO or PLI. Clinical services delivered by the veterinarian or physician are free at the point of use or might involve a certain fee charge to overcome consumer's moral hazard. Hospitals and/or laboratories might be an integral part of the HMO or PLI but can also be contracted by the insurer/cooperative at a fixed negotiated rate. In the case of HMOs, the state usually gives incentives in the form of tax reductions to employers and employees to enrol in the scheme. PLIs do not always involve government support. However it is common to see some government involvement during the start up phase of the insurance scheme until the cooperative has attained a cost-recovery level (i.e. financial sustainability).

Insurance coverage varies greatly between PLIs. It can be national as in the case of HACHAKLAIT and the "Veterinary clubs", or restricted to intensive dairy or poultry units as in Kenya. However, it is common to see these structures arise first in dairy industries and expand later to other types of farming. This was the case in both Israel and New Zealand's PLIs.

Premium setting and benefit package definition differ between insurance groups. HACHAKLAIT calculates the fee according to the species served. Payment is regressive according to the size of the herd. The benefit package includes all veterinary and diagnostic costs. However drugs are charged at 100% but can be purchased by the individual farmer either from the insurance company itself or from the market (but drugs are less expensive when bought from HACHAKLAIT as they contract with pharmaceutical companies for drug supply). Benefit packages in Kenya include clinical treatments, herd health interventions (which include advice for persistent health problems such as mastitis, fertility and recurrent tick borne diseases), artificial insemination and vaccinations. In New Zealand packages are restricted to clinical services, whilst operating costs are met through charging for each farm visit. Similarly in Ecuador, the AGSO (Asociacion de Ganaderos de la Sierra y Oriente[62]) delivers, through its "Integrated Programme of Farm Management", a package of services including technical assistance which covers animal health (vaccinations, diagnostics, parasite control, epidemiological surveillance, control and management of farm records, rearing of calves, etc.) and quality control (especially for milk). The conditions of service delivery are fixed in a service contract. To provide services, professionals and/or technicians of AGSO make two visits per month and farm. Samples are analysed in the laboratory of AGSO (or handed to others). The farmer has to pay a fee for the services, which is based on the number of animals on the farm. Clients of this service package are mainly medium-size commercial dairy farms (i.e. 50 ha) (51).

PLI as a means for funding animal healthcare may have several advantages in practice. First, it enables the demands of certain farmers to be self-financed, leaving the government to target the (limited) public resources on delivery of animal healthcare services to other premises with more externality features. Second, it mobilises

[62] This producer organisation represents approx. 5,000 cattle holders, most of them dairy farmers. The objective of AGSO focuses on *"defending the interests of its members and to offer services which permit an increase in productivity and a better life for the members and their families"* (51). Up to the beginning of the 1990s services of technical assistance in livestock related subjects where offered free of charge by the Ministry of Agriculture and Livestock (MAG) to farmers in Ecuador. The MAG then recognised the shortcomings the public sector in terms of limited financial and human resources in providing efficient, client-oriented good quality services. It subsequently reached several agreements with AGSO allowing the latter to deliver specific services that were formerly provided by the ministry (such as artificial insemination, veterinary diagnostics and extension services).

additional resources for infrastructure that might benefit both privately insured and not privately insured farmers. Third, it encourages innovation and efficiency, which might catalyse the reform of the public sector because of its flexibility and the profit motive (11). Finally, the fourth reason regards the increase of choice of services delivered to farmers.

However, PLI's potential may not be attained as performance depends on its design and regulation and on the way it interfaces with the public sector. PLI also has potential problems in practice. These are, as previously mentioned, moral hazard (mainly consumer moral hazard), adverse selection and/or cream skimming. The latter two arise mainly from the definition of the premium package and associated premiums. Such consequences might hinder the objective of equity in access, an issue also arising when dealing with user charges or out-of-pocket payments.

4.5 User charges or out-of-pocket payments (UC)

As mentioned by Robinson (54), UC can conceptually be viewed as *"different positions on a continuum ranging from full third party payment (zero cost-sharing) to full user charges (costs met completely by the out-of-pocket payment)".* Following Rubin and Mendelson's (55) analytical framework for classifying these UC, two types of cost-sharing can be devised: direct and indirect cost-sharing.

In the AH setting *direct* cost-sharing will refer mainly to co-payments[63] (a flat fee or charge per service), and in some instances co-insurance[64] (a percentage of the total charge)[65]. *Indirect* cost-sharing would, as in the HH field, refer to the policies that result in out-of-pocket expenditure even if charges are not directly imposed. This refers to policies on the criteria of inclusion and/or exclusion (such as insurance companies which specify which are the services that will and will not be reimbursed, or government policies deciding what services should be privatised), and pharmaceutical regulatory mechanisms (also linked to government policies on, for example, free drugs).

This section focuses on cost-sharing as there is widespread lack of disaggregated data on the UC, both in developed and developing countries. Furthermore, in most transition and developing countries, informal payments tend to represent an important source of direct cost-sharing (for example, when services are supposed to be free of charge but a payment is made by the client to the practitioner for the service rendered). Their informal nature means that they fail to meet the standards of transparency met by formal systems and the magnitude is largely unrecorded.

Previous sections have introduced the criteria used to assess such systems. Cost-sharing schemes in the animal healthcare sector may also be analysed following the criteria of efficiency, equity, feasibility and acceptability (or compliance).

Anteneh's study in 1984 (36) listed several sources of cost-sharing schemes in some Sahelian countries. He listed charges related to (i) vaccination, (ii) clinical treatments and (iii) veterinary drugs. In this context, *efficiency* has several connotations. Although there is widespread lack of data regarding user-charges (both in developed and developing countries) such charges can be used by the government with two aims. First, they might be devised as a way to limit or discourage superfluous or "unnecessary" use of government animal health services. Beyond this, disaggregating

[63] For example, in most community animal health systems in Sub-Saharan Africa, diagnostic and treatment services as well as drugs are charged. In India's Gujarat state, AH services provided at government veterinary dispensaries were free of charge until 1996. However, a nominal fee per visit to the centre was then introduced (56).

[64] For example in Bangladesh animal health services are heavily subsidised by the government, e.g for vaccines the government pays 40% of the cost (40), hence farmers pay a percentage of the vaccine price.

[65] Other more sophisticated methods in which direct cost-sharing can be materialised (found in the HH setting) are the so called "deductibles" (a payment covering the first *x* amount of money before insurance coverage begins).

changes (reductions) in utilisation is important to examine whether these have involved appropriate (effective) or inappropriate (ineffective) services, if these can be distinguished. This, in turn, addresses the effects of cost-sharing on the regional (or national) animal health situation or status. Second, charges may also be utilised to increase government's treasury. In most developing countries the rationale behind their application relates to this objective. This is generally not related to the economic concept of efficiency but rather with government's policy of cost-containment. Cost-sharing could therefore be judged in relation to its success in meeting this objective. However, the desirability of the objective is less well recognized than that of efficiency in allocating resources.

The *equity* criterion is often missing in the AH field. In the HH field, Chalkley and Robinson (57) highlighted the importance of the payment profile faced by the health service user. Of particular interest is the importance of marginal prices and their expected impact on behaviour. In the AH field it is also relevant to look at consumers' (stock owners) behaviour when faced with cost-sharing. Such behaviour might greatly differ from low to high potential areas. In the rural setting, several studies have demonstrated livestock keepers' willingness to pay (WTP) for AH services (27). However, this willingness is not always matched with the ability to pay (ATP). It is therefore likely that farmers will tend not to demand AH services even if the services needed are a necessity. This will not only entrench consequences that might have a higher economic impact at a regional (and/or national) level than the income generated from UC, but is also likely to heavily undermine poor farming households' livelihoods. Conversely, in high potential areas, production systems tend to focus on improving productivity levels. Equity consequences in such settings would tend to be less important as ATP if significantly higher. Hence, equity in financing as well as equity in utilisation should be taken into consideration. This refers to the financial burden UC may cause when evaluating their share in relation to income among different socioeconomic groups.

Although equity and efficiency are the most commonly used criteria in the HH field to assess performance of health systems, other criteria should be taken into account. The *feasibility* of administering cost-sharing schemes should be considered as in some instances the costs of running such arrangements might hinder its main purpose. Finally, *public acceptability* of cost-sharing might be a hotly debated and political issue in many countries. Public viewpoints can represent an important constraint on implementing cost-sharing arrangements.

5. CONCLUSIONS

International research institutions forecast a significant increase in animal production in the next two decades. Such growth will have several consequences, one of them being an expected increase in demand for animal health services.

AHS have proved to be slow in responding to recent challenges across developed and developing nations. Several factors may affect efficiency and effectiveness of AH services. However, it has often been argued that the scarcity of funding heavily undermines the system's ability to improve and cope with new situations. A framework has been devised to analyse AHS functional components concentrating on the structure and organisation of existing revenue collection mechanisms across different nations. These are (i) financing - including revenue collection, fund pooling and purchasing-, (ii) provision, and (iii) a third category, which includes types of system integration, non-financial resource generation, governance and external factors.

Four mechanisms to raise revenue for AHS (and their implications in provision) exist: (i) taxation, (ii) national livestock insurance contributions, (iii) private livestock insurance, and (iv) user charges or out-of-pocket payments. These funding approaches are not mutually exclusive. On the contrary, most AHS rely on a mix of them. The way in which these mechanisms are combined has different consequences in terms of equity and efficiency. However, issues such as feasibility and public acceptability need also to be considered when implementing AH systems.

When focusing on pro-poor policies for the livestock sector the equity criterion will play a central role. Several authors have lately debated the role of the state in agricultural and consequently on livestock production systems arguing that structural adjustment programmes may have left vulnerable groups worse off than in the previous situation. State intervention may therefore be justified in areas where there is market failure (which is the case of most remote areas), and under social or environmental grounds (58, 59).

Most African countries rely on a centralised tax based systems. Hence, it is the ministry of finance making annual budget allocations to the livestock sub-sector. Decentralisation is taking place in most of these countries. This process provides a strategic time for re-organising the funding mechanisms for animal heath and livestock services. In districts where livestock constitutes an important income generating source, devolving the management of resources collected to local authorities and earmarking those taxes associated with livestock to animal health services may be a suitable alternative. This process would enable local authorities to obtain a more stable and predictable budget for animal health services, which could then be adapted to local needs. Such alternative would make budget allocation a more transparent process vis-à-vis local population.

Another funding system is that found in some Asian countries (such as Nepal, India, Thailand, Sri Lanka, Indonesia, Malaysia and the Philippines) which seem to have a relatively consolidated culture of using National Livestock Insurance (NLI) schemes (which started in the 1970-80s). These tend to specially target dairy production systems.

For pro-poor animal health services the equity criterion in the implementation is crucial and therefore the choice of funding mechanisms should be tailored to take into account the most vulnerable segment of the population of livestock keepers.

Finally, the study identifies the need for further research focusing on collection of quantitative data on taxes, fees, charges and contributions collected in different countries. Further, qualitative data on ways in which these funds are channelled through the system is needed. This information is needed to deepen current understanding of the specificities embedded in the animal healthcare service field,

which in turn will help improving responsiveness of AHS. In parallel, the needs for AHS for the different users have to be assessed so that funds collected are appropriately and accurately allocated.

6. REFERENCES

1. Cullis, J., and Jones, P. *Public Finance and Public Choice*. Great Claredon Street, Oxford: Oxford University Press, 1998.
2. Delgado, C. L., Rosegrant, M. W., Steinfeld, H., Ehui, S., and Courbois, C. "The Coming Livestock Revolution," *Background paper n.6, Department of Economic and Social Affairs, Commission of Sustainable Development, Eighth Session*. New York: Food and Agriculture Organisation, 2000.
3. Delgado, C. L., Rosegrant, M. W., Steinfeld, H., Ehui, S., and Courbois, C. "Livestock 2020. The next food revolution." Washington D.C.: International Food Policy Research Institute, Rome: United Nations Food and Agriculture Organisation, Nairobi: International Livestock Research Institute, 1999.
4. Leonard, D. K. *Africa's Changing Market for Health and Veterinary Services. The New Institutional Issues*. London: MacMillan Press LTD, 2000.
5. Sidibe, A. S. "Organisation actuelle et future des services veterinaires en Afrique," *Revue Scientifique et Technique* 22 (2003): 473-484.
6. Gimeno, E. "La organizacion de los servicios veterinarios en Latinoamerica y su evolucion," *Revue Scientifique et Technique* 22 (2003): 449-461.
7. Riviere-Cinnamond, A. "A public choice approach to the analysis of animal healthcare systems." Rome: FAO-PPLPI Working Paper 11, 2004.
8. deHaan, C., and Bekure, S. *Animal health services in sub-Saharan Africa. Initial experiences with alternative approaches*. Washington D.C.: The World Bank, 1991.
9. Umali-Deininger, D., Feder, G., and deHaan, C. "The balance between public and private sector activities in the delivery of livestock services," *World Bank Discussion Paper* 163 (1992): 114.
10. Leonard, D. K. "Structural reform of the veterinary profession in Africa and the New Institutional Economics," *Development and Change* 24 (1993): 227-267.
11. Mossialos, E., Dixon, A., Figueras, J., and Kutzin, J. *Funding health care: Options for Europe*. Buckingham, Philadelphia: Open University Press, 2002.
12. Holden, S. "The economics of delivery of veterinary services," *Revue Scientifique et Technique* 18 (1999): 452-439.
13. Reinhardt, U. E. *Economic relationships in health care, in OECD Health care systems in transition: the search for efficiency*. Paris: Organisation for Economic Co-operation and Development, 1990.
14. Leonard, D. K. "Draft research proposal on the organisation of animal health services in Africa presented at the International Livestock Centre for Africa," in Umali, L. D., Feder, G., and de Haan, C., eds., *The balance between public and private sector activities in the delivery of livestock services (1992)*. Washington DC: World Bank Discussion Papers, The World Bank, 1990.
15. Gongora, V. "Veterinary services in Belize: adapting organisational models to the needs of small economies," *Revue Scientifique et Technique* 22 (2003): 463-471.
16. Arrow, K. J. "The Economics of Agency," *in Pratt J, Zeckhauser R. (1985), Principals and Agents. The Structure of Business*. Boston: Harvard Business School, 1985.
17. Pratt, J., and Zeckhauser, R. *Principals and Agents. The Structure of Business*. Boston: Harvard Business School, 1985.
18. Evans, R. G. "Going for gold: the redistributive agenda behind market based health care reform," in Chinitz, D., Cohen, J., and Doron, C., eds., *Governments*

and Health Systems : Implications of Differing Involvements. Chichester: Wiley, 1998.

19. Murray, J. L., and Frenck, J. "A framework for assessing the performance of health systems," *Bulletin of the World Health Organization* 78 (2000): 717-731.
20. Kutzin, J. "A descriptive framework for country level analysis of health care financing arrangements," *Health policy and planning* 56 (2001): 171-204.
21. Begg, D., Fischer, S., and Dornbusch, R. *Economics*. Berkshire, England: McGraw-Hill, 2000.
22. Donhauser, F., and Pauels, F. J. "Scope and limitations for establishing a joint funding scheme to support official control and eradiation programmes against contagious livestock diseases in Turkey," GTZ, 1997.
23. Rice, N., and Smith, C. P. "Strategic resource allocation and funding decisions," in Mossialos, E., Dixon, A., Figueras, J., and Kutzin, J., eds., *Funding Healthcare: Options for Europe*. Buckingham: Open University Press, 2002.
24. Propper, C. "Agency and incentives in the NHS internal market," *Social Science & Medicine* 40 (1995): 1683-1690.
25. Scott, W. R. "Some implications of organization theory for research on health services," *Milbank Memorial Fund Quarterly* 44 (1966): 35-64.
26. Frenk, J., Ruelas, E., and Donabedian, A. "Staffing and training aspects of hospital management: some issues for research," *Medical Care Review* 46 (1989): 189-220.
27. Ahuja, V., George, S., McConnel, K. E., Kurup, M. P. G., Gandhi, V., Umali-Deiniger, D., and de Haan, C. *Agricultural Services and the Poor: Case of Livestock Health and Breeding Services in India*: India: Indian Institute of Management, Ahmedabad; Washington D.C.: the World Bank; Bern, Switzerland: Swiss Agency for Development and Cooperation, 2000.
28. Belize. "Belize Agricultural Health Authority Act Chapter 211, Revised Edition 2000." Belize: Government of Belize, 2000.
29. Ozawa, Y., Chang, K., Yoshida, K., and Michino, H. "The present and future organisation of veterinary services in Asia: the examples of the Republic of Korea and Japan," *Revue Scientifique et Technique* 22 (2003): 499-508.
30. OIE. *Administration et gestion des services veterinaires. Volume I. Specificites des services veterinatires: Elements fondamentaux*. Paris: OIE, 1994.
31. Nairaud, D., and Prunaux, O. "La renovation du dispositif francais d'analyse des risques sanitaires," *Revue Scientifique et Technique* 22 (2003): 433-447.
32. UK-Government. "Food Standards Agency," UK Goverment, 2003.
33. European-Union. "European Food Safety Authority," EU, 2003.
34. Evans, B. R., Doering, R. L., Clarke, R. C., and Ranger, C. "The organisation of federal veterinary services in Canada: The Canadian Food Inspection Agency," *Revue Scientifique et Technique* 22 (2003): 409-421.
35. FAO. *Livestock Insurance in Asia. Experience of Selected Asian Countries*. Bangkok, Thailand: FAO Regional Office for Asia and the Pacific (RAPA), 1992.
36. Anteneh, A. "Financing animal health services in some African countries," *AAU Workshop Paper No 3: Financing the Recurrent Costs of Agricultural Services in Developing Countries*. Windsor, UK: ODI Pastoral Development Network, 1984.
37. Stiglitz, J. E. *Economics of the Public Sector*. London / New York: W.W. Norton and Company, 2000.
38. Atkinson, A. B. "Optimal taxation and the direct versus indirect tax controversy," *Canadian Journal of Economics* 10 (1977): 590-606.

39. Government-of-Australia. "Levies and Revenue Service," Government of Australia, Department of Agriculture, Fisheries and Forestry, http://www.affa.gov.au/content/levies.cfm, 2003.
40. Jahan, N., and Rahman, H. "Livestock Services and the Poor in Bangladesh. A Case Study." Aarhus, Denmark: Danida, IFAD and The World Bank, 2003.
41. Normand, C., and Busse, R. "Social health insurance financing," in Mossialos, E., Dixon, A., Figueras, J., and Kutzin, J., eds., *Funding Health Care: Options for Europe*. Buckingham, Philadelphia: Open University Press, 2002.
42. Van Asseldonk, M. A. P. M., Meuwissen, M. P. M., Huirne, R. B. M., and Wilkens, E. "European public and private schemes indemnifying epidemic livestock losses: A review," *Forthcoming in Livestock insurance products* (2003).
43. Mathema, V. R., and Joshi, D. D. *Livestock and Livestock Insurance in Nepal*. Kathmandu, Nepal: Padma Mathema and Ram Narayan Kunj Publishers, 2000.
44. McPake, B., Kumaranayake, L., and Normand, C. *Health Economics. An International Perspective*. London: Routlledge, Taylor and Francis Group, 2002.
45. Animal-Health-Australia. "Animal Health Australia," http://www.aahc.com.au/about/what.htm, 2003.
46. Vame, B. K. "Rapport de Consultation. Renforcement des Capacites Nationales pour la Surveillance et le Controle Zoo-sanitaires en Cote d' Ivoire." Abdijan: Republique de Cote d'Ivoire, 2003.
47. Efron, Y. *HACHAKLAIT: Mutual society for clinical veterinary services and livestock insurance in Israel*. Israel: Hidekel Press, 1997.
48. FAO. "Profile of veterinary services in New Zealand,1995," in FAO, ed., *FAO electronic conference on principles of for rational delivery of public and private veterinary services*. Rome: FAO, 1997.
49. Smith, L. D. "Reform and decentralization of agricultural services: A policy framework,," *FAO Agricultural Policy and Economic Development Series*. Rome: FAO, 2001.
50. Chema, S., Oruko, L. O., and Heffernan, C. "Livestock Services and the Poor, Appendix I and II: The Kenya case study and report of consultant's visit," Draft report prepared for IFAD, 2001.
51. Kleemann, G. *Services Management in Livestock Development*. Wiesbaden: GTZ, 1999.
52. Mossialos, E., and Thomson, S. M. S. "Voluntary healt insurance in the Eurapean Union," in Mossialos, E., Dixon, A., Figueras, J., and Kutzin, J., eds., *Funding Health Care: Options for Europe*. Buckingham, Philadelphia: Open University Press, 2002.
53. Meuwissen, M. P. M. "Insurance as a risk management tool for European agriculture," *Department of Social Sciences, Farm Management Group*. Wageningen, The Netherlands: Wageningen University, 2000.
54. Robinson, R. "User charges for health care," in Mossialos, E., Dixon, A., Figueras, J., and Kutzin, J., eds., *Funding Health Care: Options for Europe*. Buckingham, Philadelphia: Open University Press, 2002.
55. Rubin, R., and Mendelson, D. "A framework for cost-sharing polict analysis," in Mattison, N., ed., *Sharing Costs of Health: A Multi Country Perspective*. Basle: Pharmaceutical Partners for Better Health, 1995.
56. Ahuja, V. "Commercialisation of Livestock Health and Breeding Services. Papers and Proceedings," in Ahuja, V., ed.: Indian Institute of Management, Ahmenabad; The World Bank, Washington D.C.; The Swiss Agency for Development and Cooperation, Bern, Switzerland, 1999.

57. Chalkley, M., and Robinson, R. *Theory and Evidence on Cost-sharing in Health Care: An Economic Perspective*. London: Office of Health Economics, 1997.

58. Upton, M., and Riviere-Cinnamond, A. "The provision of services to the livestock sector - A public choice approach." Background Paper for the Intergovernmental Meeting on Meat and Dairy Products, 15-20 July Winnipeg: FAO, 2004.

59. Dorward, A., Kydd, J., and Poulton, C. *Smallholder Cash Crop Production under Market Liberalisation: A new Institutional Economics Perspective.* Wallingford: CAB International, 1998.