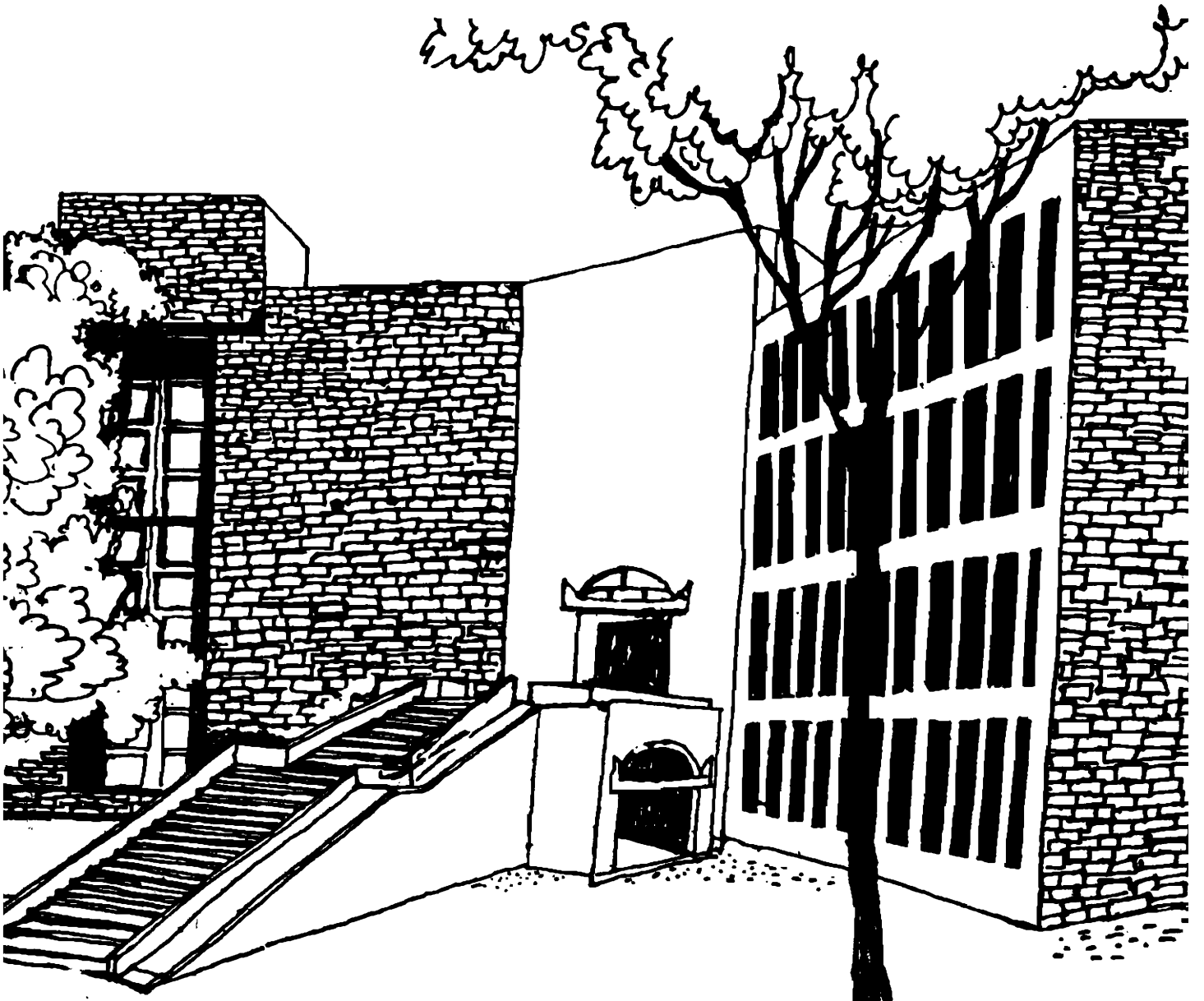




Working Paper



**Economic and Policy Issues in the Livestock
Service Delivery to the Poor**

by

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Economic and Policy Issues in the Livestock Service Delivery to the Poor

**Vinod Ahuja
Elizabeth Redmond**

May 2001

This paper was prepared as a background paper for the FAO project memorandum "Pro-poor Livestock Policy Initiative: Fostering the Policy Dialogue in Support of Equitable, Safe and Clean Livestock Farming. We sincerely acknowledge the inputs received from Henning Steinfeld and Joachim Otte on previous version of this paper.

Economic and Policy Issues in Livestock Service Delivery to the Poor

Introduction

Livestock are important to millions of poor households across the world not only as a source of income but also as a major source of protein and supplementary nutrition, draft power, fertilizer, fuel and a store of wealth. A large number of rural households across the world own livestock, the majority of them poor. A large majority of livestock owners comprise of small and marginal farmers, who also account for a large share of poor. In general, the distribution of livestock has been found to be more equitable than that of land, leading to a much more equitable distribution of gains from livestock production. This is specially true in subsistence economies with a predominance of smallholder production system. These are also the regions/countries with large concentrations of the poor (Figure 1), where the depth of poverty is more severe, and where absolute poverty has shown a rising trend over the last few years (Figure 2)¹.

Significant opportunities are opening up for the livestock sector as a result of globalization and more market friendly policies introduced by a large number of countries. Livestock production is growing faster than any other agricultural sub-sector and, by 2020, this sub-sector is predicted to produce more than half of the total agricultural output in value terms. Growth in demand for livestock products is primarily

Figure 1: Distribution of World's Poor

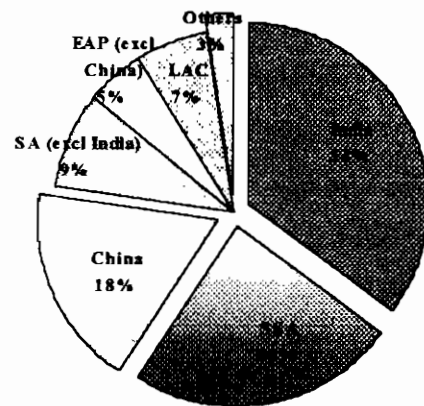
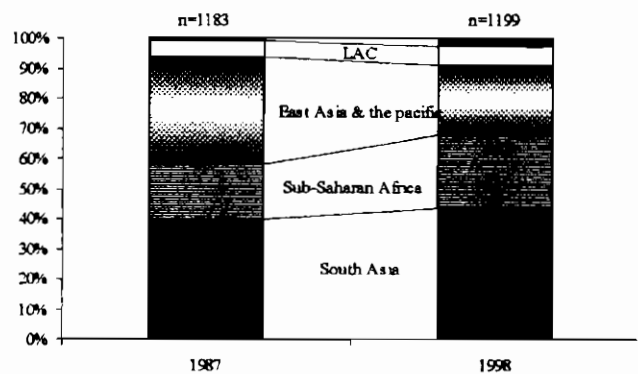


Figure 2: Progress in Poverty Reduction: 1987-98*



* Based on international poverty line of \$1 a day

¹ Figures 1 and 2 are based on the international poverty line of \$1 a day per capita at 1985 prices. This poverty line was originally used in the World Bank's *World Development Report 1990* (World Bank 1990) and proposed by Ravallion, Datt and van de Walle (1991) where its rationale is documented. Unless otherwise specified, the symbol \$ in this paper denotes US dollars adjusted for purchasing power parity.

expected to emanate from the developing countries due to human population growth, increasing urbanization and rising incomes. These developments are likely to have significant influence on the global economy in general and the economy of developing countries in particular. In view of these developments, the process has been described as the 'livestock revolution' (Delgado *et al*, 1999).

These developments present enormous opportunity for developing countries to boost rural incomes and accelerate the pace of poverty reduction. However, this requires a policy regime that facilitates growth in productivity at the farm level as well as in the processing sector. The productive potential of animals depends crucially on the quality of nutrition, genetic material and health status, and these in a large number of developing countries continue to be poor.

While the unfolding of the livestock revolution is likely to result in a rapid increase in the demand for quality livestock services, the policies and institutions in a number of countries are not geared up to meeting that challenge. There are no mechanisms in place to identify the constraints to livestock production, the service needs of poor livestock keepers and the ways and means to deliver them at minimum cost. The policy priorities and directions for service delivery often get determined by the biases and beliefs of the decision makers. While those trained in veterinary science argue that it is poor animal health which is the main constraint to livestock production, the nutritionists point to the poor availability of feed and fodder, and the breeders to poor genetics.

There is a whole range of services that are needed to enhance the capacity of poor households to exploit the full potential of livestock production. These include health and production services such as clinical care, preventive health and provision of pharmaceutical supplies, feed and fodder supply, artificial insemination, livestock research and extension, and other market services such as credit, livestock insurance, delivery of market information, output marketing and milk collection (see Appendix 2 for a classification of livestock services). Good support services are critical for enhancing livestock productivity and for enabling the poor to gain access to expanding markets (see Boxes 1 and 2). This paper reviews the economic framework and the context for livestock service delivery and raises some issues for efficient delivery of these services to the poor.

The economic framework

Farmers make economic decisions. The first principles of economics must therefore be the point of departure in thinking about the most efficient way of organising livestock service delivery. The first fundamental theorem of welfare economics states that if (i)

Box 1: Market information has an empowering role

I always sell eggs to middlemen. Before, whatever prices they offered I accepted because I had no idea of the going prices. Last week the middleman came and wanted to pay me 12 taka for a *hali* (four units). Keeping him waiting, I rushed to check the prices on the village phone—a *hali* was selling for 14 takas in nearby market. I came back and refused to sell, and after some haggling we agreed on 13 taka a *hali*.

Kalima Khatun, village woman, Bangladesh

Source: Narayan and Shah, 2000.

Box 2: Extension for poultry and small ruminants has a large pay-off

“Backyard” poultry comprising of small flocks of birds which are reared inside the family household, as scavengers either for the family needs of eggs and meat, or generation of small cash income are important for poor in many parts of the world. Despite their important role in egg and meat production, they have not received adequate attention. These birds seldom receive proper feed, and health coverage against infectious diseases, which results in huge economic losses. Kelly et al (1994) reported 25% mortality in rural household chickens kept in Chitungwiza, an urban centre in Zimbabwe. Shakir et al (1999) found a mortality rate of (13.5±15%) in Pakistan. One of the reasons for lower production, poor management, and health coverage and severe losses could be poor know-how and lack of health and extension services to the farmers.

Recognising the need to increase rural household chicken production as one of the means of alleviating poverty, a team of Female Livestock Extension Workers (FLEWs) was formed and equipped with skills in various disciplines of livestock production activities to help the poor and subsistence female farmers in North West Frontier Province of Pakistan (NWFP). The primary aim of this initiative was to enable the farmers to increase their household income through increased livestock productivity. These extension workers provided training to female farmers regarding backyard chicken production, breeding, care of the newly hatched chicks, housing, feeding, disease prevention, hygienic measures, control of external and internal parasites, egg selection and storage, hatchability of eggs, selection and culling of birds, provision of vaccines and other medicines and development of linkages with the agencies and Livestock and Dairy development Department of the Government of NWFP. The FLEWs were trained to work for vertical expansion of the backyard chicken system taking account of the limited resources of the farmers. For example in the case of the farmers who were buying broken rice from the market for newly hatched chicks, it was suggested they should buy chick starter feed in amounts equivalent in cost to what was paid for broken rice, so as to ensure better growth and development of the chicks. However, for those farmers who wished to make more drastic changes to improve production then they were guided as to appropriate inputs. No extra inputs were provided in terms of birds.

An impact assessment study undertaken to evaluate the effectiveness of farmer training found a significant increase in the flock size maintained by the households who participated in the training program. Training also had a positive effect on egg production, hatchability, reduction in morbidity and mortality.

Source: Farooq, et al, 2000.

there are no externalities, (ii) both buyers and sellers have symmetric information, (iii) there are no increasing returns to production, (iv) all buyers and sellers take prices as given (that is, no one has any market power), and (v) there are no transaction costs, then the competitive equilibrium is pareto-efficient². This result significantly influenced early thinking on the delivery of livestock health services (Umali *et al*, 1992; FAO, 1998) which, in turn, drove the policy for delivery of veterinary services in many countries around the world in the eighties and the nineties.

The first fundamental theorem is a useful starting point when thinking about the framework. However, if any of its conditions are violated, 'market failure' occurs resulting in efficiency loss. In that case a set of mechanisms is needed to correct the market failure or to find alternative models for organising the activity. The literature on livestock health services has recognised the sources of market failure – specially public goods and externalities, and moral hazard. Umali, Feder and de Haan (1994), for example, categorically stated that, "In determining the appropriate channel for delivery of services, it is necessary to classify each service on the basis of its public and private good character, while taking into account any externalities, moral hazard problems, or free rider problems that may accompany the production or consumption of the service". Based on these characteristics, they suggested the classification and sectoral delivery of livestock health and production services as given in Appendix 3. The table classifies clinical diagnosis and treatment, production and distribution of vaccines and other veterinary supplies as pure private goods which do not involve any externalities or moral hazard problems. These can, therefore, most efficiently be supplied by the private sector. Services such as veterinary surveillance, research and extension, on the other hand, have a significant public good component and should remain the responsibility of public sector. Using the same principles, FAO (1998) suggested the following responsibility of public and private sector for delivery of animal health services

Public sector: ensuring the health of the national herd including disease surveillance, compliance monitoring, quarantine, quality control of remedies and vaccines, planning for emergencies and reporting to international bodies and neighbouring countries; oversight of food safety, import and export inspection and certification according to international standards; regulation, monitoring and support of other partners in the animal health care system; accreditation of personnel; creation of an enabling environment for the private sector; and general formulation of livestock development policy.

² It is important to understand the assumptions underlying this theorem to appreciate its strengths and limitations. A more detailed explanation of the concepts such as externalities, asymmetric information, and pareto-efficiency is given in Appendix 1.

Private sector: clinical diagnosis and treatment; production and distribution of remedies and vaccines; artificial insemination; management of herd health and production programmes; marketing livestock and products; and others.

Shared responsibility: disease diagnosis and reporting; compulsory testing; accreditation; tick and tsetse fly control; food hygiene and inspection; continuing education and training; diagnostic support; animal welfare; notifiable disease control; disease emergency response; zoonosis control; research; and advice and extension.

Market efficiency and information: The first fundamental theorem requires that both buyers and sellers *know* and *do not know* the same things. This assumption is obviously violated in the case of a number of livestock services. The service provider has significantly more information than the user and there are incentives to exploit the rents to that information.

Asymmetry of information can lead to two types of market failures—moral hazard, and adverse selection. Although Umali *et al* (1994) and others recognized the problem of moral hazard, according to them this problem was likely to be limited to functions such as food hygiene/inspection and drug quality control. It appears, however, that the problem of information asymmetry is much more general than perceived by them.

Both moral hazard and adverse selection can be analyzed within the 'principal agent framework'. The principal-agent framework deals with the problem in which one party (the principal) hires another party (the agent) to accomplish a certain task but the agent has some informational advantage. In the patient-doctor relationship, for example, the patient (the principal) hires the doctor (the agent) to cure an ailment but has no mechanism to monitor whether the doctor is acting in the best interest of the patient. A moral hazard problem can arise if the doctor exploits the informational advantage for his own benefit. For example, if the patient can not distinguish between an active and inactive vaccine, the doctor can easily administer the inactive vaccine³. Similarly, the doctor could easily over provide the medical service in order to maximise his own income⁴. A number of principal-agent relationships can be identified in livestock service delivery, and it is the poor who are often at an information disadvantage. The adverse selection problem arises when the agent can not distinguish between a high and low quality service provider. In this case poor quality agents drive out the better quality agents and the market achieves the equilibrium in which there is predominance of low quality agents/service providers.

³ Indeed, a recent study of drug supply in Kenya found that nine out of 21 anthelmintics, obtained from local pharmacies and merchants, did not contain any active ingredient (Monteiro, AM *et al* 1998; quoted in Schillhorn van Veen, 1999).

⁴ This problem has been studied under what has come to be known as *physician inducement theory*.

The principal agent problem can be solved in many ways—optimal contract design⁵, repeated interaction between principal and the agent, sanctioning systems, social and moral norms, and so on. More importantly, however, the problem of information asymmetry underlines the importance of strong institutional mechanisms for regulating behaviour, enforcement of ethics, and regular dissemination of information to minimise the information asymmetry. In the case of livestock health services, for example, Ly (2000) observes that “If left alone, the market for veterinary services in Senegal would evolve toward a typical lemons market where only low quality services would be demanded⁶. This would create a sub-optimal situation for herders, providers and society (p.229).” He further notes, “the challenge faced by the privatization of veterinary services delivery systems in Senegal is in the urgency of strengthening the transformation process in the subsector so that livestock production and productivity is higher and veterinary inputs marketing systems are more efficient. Among the prerequisites are the creation of more suitable and workable organisational arrangements, leading to a new shape of veterinary input and service delivery with respect to structure, form, quality, and prices (p.259)”.

These arrangements/institutions can take several forms—the producer and consumer organisation, veterinary associations, etc. All these institutions have the crucial role of educating service users about service quality and enforcing professional ethics. This also points towards the need for an effective regulatory and legal framework, and an effective extension service. These are the public goods that governments will need to provide for proper functioning of the market.

Subcontracting: For the services which must remain the responsibility of governments, it has been suggested that the efficiency of these services can be significantly enhanced by sub-contracting the service delivery to private agents. While sub-contracting does have the potential of yielding some cost savings by circumventing the rigidities and perverse incentives that often characterise the government delivery systems, there is also the need to ensure that contractual obligations will be met.

⁵ Contract theory provides useful insights regarding which type of contracts would be appropriate under various types of asymmetries and institutional environments. Discussion on various contract types is however not within the scope of this paper.

⁶ Akerlof (1970) introduced the term ‘lemon market’ in his seminal paper on quality uncertainty and market failure. He used the example of used car market to make the point that since sellers of used cars have significantly more information and since it is difficult for an average buyer to distinguish between good and bad cars, only poor quality cars (or the lemons) will be traded in the market.

One critical issue in this context is how to ensure public accountability. This can entail significant costs and there can be real trade-offs between transactions costs to ensure accountability and the possible gains in efficiency. This is once again a principal-agent problem in the sense that the government is hiring a private agent to accomplish a certain task. There is plenty of scope for opportunistic behaviour on the part of the agents.

The problem of opportunism can be minimised through contract design and administration. That would, however, require defining the quantity and quality of the service as well as specifying the conditions under which the service will be delivered. And then there is the issue of contract monitoring and enforcement and the costs associated with this function. It is much easier to write contracts for services with tangible outputs. Thus, whether the government chooses to supply the service itself or to sub-contract the delivery would also depend on its ability to resolve the principal-agent problem which, once again, is a function of the availability of public goods such as legal framework, institutional structure, and the organisational arrangements.

Competition and market efficiency: The market efficiency argument also rests on the assumption that both buyers and sellers take prices as given which, in turn, is based on the assumption of many buyers and sellers in the market. Again, the markets for livestock services are likely to violate this condition especially in poor remote areas. Whereas it is feasible to generate some competition among the service providers in high potential high density areas, the effective aggregate demand in poor marginal areas is often not adequate to support many providers leading to monopoly situations. In cases where private service providers are contracted for providing these services in poor areas this problem could be even more serious. While competitive bidding at short intervals can dissipate the monopoly advantage conferred by contracts (Leonard 2000), this takes us back to the principal agent problem mentioned earlier and the role of state in establishing transparent processes and institutional structures to facilitate efficient functioning of the market.

Given the political economy in many developing countries and the poor record of the states in providing public goods, it may appear then that the scope for delivering services through efficient market mechanisms is also limited. The point of the preceding discussion however is to illustrate that efficient market functioning requires strong institutions and workable organisational arrangements, and it is therefore not very useful to discuss the economic issues in isolation from the larger political economy and the issues related to governance. This is one of the areas where future thinking in livestock service delivery will need to focus.

The equity dimension

The first fundamental theorem of welfare economics is a pure efficiency result. It completely side-steps the notions of fairness, distribution and equity, and is obviously silent about the welfare of those who are excluded from the market.

Due to the importance of livestock in supporting the livelihoods of poor farmers throughout the developing world, and the assumption that the market will exclude poor livestock keepers due to poor paying capacity, the governments in a large number of countries chose to build and heavily subsidise large systems and networks for delivering even those services that could be most efficiently provided through the market. A large number of African and Asian countries opted for that route. While the deterioration in the fiscal condition of many African states, as well as deterioration in efficiency due to resource misallocation, forced many African states to shift the delivery of curative and clinical veterinary services to the private sector, a number of countries in South Asia continue with the model of state provision of these services.

Recent studies, however, cast doubt on the belief that the poor are not willing or able to pay for services (See Appendix 1 and Box 3 for a conceptual explanation of the willingness to pay). In a recent study in Kenya, for example, Heffernan and Misturelli (2000) state that “the finding indicates that far from being passive recipients, the poor are consumers with the ability to discern the quality of service offered”. They further add, “It appears that the ability and willingness to pay for veterinary services is not the primary inhibiting factor to animal healthcare seeking”. In the context of human health in Africa, Leonard (2001) notes, “...non-governmental organisation (NGO) health services have always provided, and continue to provide, health services in Africa. Since NGOs charge significant fees and their success is widespread, the failure of private markets cannot be attributed to a lack of demand”. Similar evidence has recently become available from other poor regions of the world. Based on a contingent valuation survey in three states of India, Ahuja *et al* (2000) concluded that there is significant willingness to pay for animal health services by all income groups. Indeed, there are cases of successful private delivery of livestock health and breeding services in some very poor areas of India (Box 4).

A number of studies have also examined the structure of demand for these services across income groups. In general, these studies do not find the structure to be much different across poor and non-poor. In a study of the demand for animal health services in Uganda, Koma (2000) notes that “the effects of herder income and wealth on the demand for animal health services are so weak as to lack statistical significance in a sample of reasonable size”. Similarly, Ahuja *et al* (2000) report from India, “While price of veterinary services does turn

Box 3: Willingness and ability to pay

Estimates of the 'Willingness to Pay' (WTP) for goods and services are often used to assess the demand for those goods and services which are not traded in the market. These estimates are derived from either the direct survey methods such as 'Contingent Valuation' or methods which are based on the observed behavior of the buyers in related markets.

Some authors have recently questioned the use of WTP estimates for policy purposes on the grounds that it is the *ability* and not *willingness* which should form the basis of social policy. Some examples are given below:

- "There is a strong case for resisting the doctrinaire application of principles such as 'willingness to pay' that may not take into account the problems connected with the ability to pay" (Anonymous, 2000).
- "...the majority of previous studies focus on the *willingness to pay* of producers. Conversely, the intention of the affordability parameter is to assess the *ability* of poor households to pay for animal health care" (Heffernan and Misturelli, 2000).
- "It is implicitly assumed by proponents of user-fees that if individuals express a willingness to pay for social services, they must be able to pay. In other words, there is a presumption that expressed preferences and needs can be translated into effective demand. This is an implausible leap of faith" (Watkins, 1997).

This distinction between willingness and ability is artificial at best. In the strict economic sense, WTP actually describes the *demand* curve which, in turn, is conditioned on tastes and preferences, availability of substitutes and complements, and the disposable income of the individual. WTP is therefore not a simple expression of 'wants'. It indeed combines the preference structure, market structure, and the ability to pay.

This distinction between ability and willingness is not just artificial but also counterproductive. It has taken years of field research to establish that poor do *demand* quality services and are not averse to paying for it. 'Underpricing' the services, which is intended to bring them within the reach of the poor, actually *hurts* them because underpricing also limits supply and leads to higher waiting times. Access is then determined by other factors such as connections, political patronage, and so on, and it is the rich who have more connections and political clout than the poor.

out to be statistically significant, the magnitude of this effect is quite small. Price elasticity is very low and does not vary across income groups". Similar results are reported in the case of human health care. For example, Ndesao Atanga (2000) finds only modest differences in the structure of demand between top and bottom income quartiles in Cameroon.

In light of the economic logic presented in section 2, and the recent research on the nature and pattern of demand for these services, there is a fair degree of consensus that the animal health functions such as clinical diagnosis and treatment, drug production and distribution, and breeding services such as artificial insemination, can be delegated to the private sector, but the institutions and mechanisms to minimise market failure must be put in place. Any subsidies must be targeted towards those who genuinely can not afford to pay the market prices. Due to the strong public good component and externalities, however, it is generally agreed that

Box 4: The business of service delivery: Two success stories

1. Bihar, the second most populous state of India (comprising a little more than 10 per cent of the country's population), fares worst among all the states of India on indicators of social and economic development. It has the highest poverty head count ratio, lowest per capita income, lowest literacy rate, and a very high child mortality rate. Although over 80 percent of Bihar's population lives in rural areas and depends on agriculture sector for its livelihood, there is very poor development of infrastructure like irrigation and power, non-availability of modern inputs, low value of credit and poor extension services.

The Patna Development Private Limited (PADP) was established in 1991-92 in Patna, the state capital. The company has emerged as a large scale provider of AI, frozen semen straw and the liquid nitrogen to self-employed AI practitioners. Since 1994, the company has started providing training in AI at Rs.1000 per trainee for a four month training course.

The AI network is spread over 48 districts in the state through 405 outlets. 63 percent of the practitioners have set-up their practice in urban areas and 37 percent in rural areas. In 1992-93, a total of 10,948 doses were sold which rose to 1,59,281 doses in 1997-98—annual growth rate of over 70 percent. The price charged per dose is Rs 10. The delivered price of liquid nitrogen is Rs 45 per litre.

The most established AI practitioners perform between 1500-2000 inseminations per year. The charge is Rs.50/- per AI but can go up to Rs.100/- depending upon the distance. All practitioners use bicycles/mopeds for mobility and cover the area within the radius of 5-6 kms.

2. Dr. D.C.Mahajan provides veterinary clinical services in indapur Taluka of Pune district. 8 technicians work with him. In the year 1997 they performed 18,000 inseminations.

For each insemination, the price is Rs 50 if the call is from within 10 kms and Rs.80 if it is over 10 kms. If the farmer desires to have his animal inseminated with proven bull semen, the charge is Rs.150.

Each AI technician owns a motor bike and including the AI equipment he has invested around Rs.50,000/-. The average monthly net earning of the AI technician is Rs.8000-10,000.

For treatment of non-operative clinical cases, he charges Rs.50.00 for service. In addition, the farmer bears the entire cost of drugs and medicines. His primary clients comprise of landless livestock keepers and small and marginal farmers. He attributes his success to the regularity and continuity of the service.

Source: Mital, S.P. 2000.

services such as preventive health, disease surveillance, etc. should remain in the public domain, although there are sufficient opportunities for healthy partnerships between public and private sector (including NGOs, co-operatives and other self help groups). Indeed, various innovative models are already beginning to emerge. In agricultural extension, for example, Ecuadorian farmers sharecrop with extension agents for a profit (Van Crowder, 1991). Costa Rica has experimented with vouchers that promote private technical assistance to small and medium scale producers (Kenyan, Olin, and Dinar, 1997). Chile publicly finances 70 per cent of the costs of private technology transfer firms, which contract with small-scale producers (Picciotto and Anderson, 1997). Many more such models can be identified where NGOs, producer

associations, co-operatives, community based organisations, and paraprofessionals are actively involved in delivering services to farmers.

It is important to recognise however that the purpose of these alternative models is to overcome the failures of the market or the state. These should not crowd out the private market and should be subject to the same level of scrutiny as the market or the state model. Although no systematic studies are available comparing the cost efficiency of service delivery for various provider types, there is some anecdotal evidence to suggest that some of the non-government service providers suffer from the same weaknesses as the state. This is specially true of larger non-government organisations with centralised governance structures.

This section can be summarised with the observation that the commonly held notion of the poor not willing and able to pay for these services is unfounded. The livelihoods of the poor are critically linked to availability of good support services. Field research has shown that poor livestock owners value these services tremendously and are not averse to paying for them. Studies have also shown that the structure of demand for these services is not significantly different across poor and non-poor groups. Governments therefore have a responsibility to create a conducive environment for the emergence of a vibrant private sector in livestock service delivery. It is important to recognise, however, that the efficiency of private market is contingent on the ability of the state in providing public goods, such as an effective legal framework, transparent organisational process and strong institutions. In the absence of these public goods, private markets may also not perform as well as predicted by the economic theory. It is therefore important to integrate the larger political economy and governance issues in the economic debate on livestock service delivery.

The context

While economic theory shapes the conceptual framework, it is the context of farming systems, market infrastructure, agro-ecological conditions, and the socio-economic, political and cultural environment, that would shape the actual model of service delivery. As pointed out in the previous section, a number of innovative models and approaches are already beginning to emerge. Some of these models have emerged as a means to solve the principal-agent problem, some to minimise the transactions costs, and some to overcome other failures of the state and the market. Given the diversity of contexts across the world, it is natural that there will be a myriad of models of service delivery. However, at the same time it must be ensured that the fundamentals of economic efficiency and fairness, presented in the previous section, are respected. As has been documented by several field studies in a number of countries, it is the poor who are most likely to suffer if these principles are violated.

This paper deliberately avoids discussion on appropriate service delivery models for various contexts. The knowledge base to identify options and approaches for various contexts of service delivery is weak and much more analysis is needed on their merits and limitations. Nonetheless, an examination of the broad parameters in various contexts can help accelerate the process of identifying these options. In that spirit, this section provides a brief description of three regions—South Asia, East Asia and the Pacific, and Sub-Saharan Africa. These regions together account for 90 percent of the world's poor.

South Asia

South Asia accounts for approximately 22 percent of the world population and over 40 percent of the world's poor. Poverty in South Asia is primarily rural—over 80 percent of all poor are in rural areas and directly and indirectly depend on agriculture.

Livestock is an integral part of South Asian agriculture. The region accounts for over 20 percent of the world's ruminant livestock population (Appendix 6). Approximately 57 percent of the ruminant population comprises of cattle and buffalo and another 43 percent small ruminants. However, there are marked differences in this respect across countries within the region. In Bangladesh and Pakistan, for example, small ruminants form a much larger share of the total population of ruminant animals compared to other countries (Figure 4).

This could perhaps be due to a larger proportion of non-vegetarians in the population in these two countries, with goat meat being the preferred meat in the region. The population of monogastrics is relatively small—the region accounts for less than 5 percent of world poultry population and less than 2 percent of pigs.

Figure 3: Distribution of livestock species (excluding poultry) in South Asia

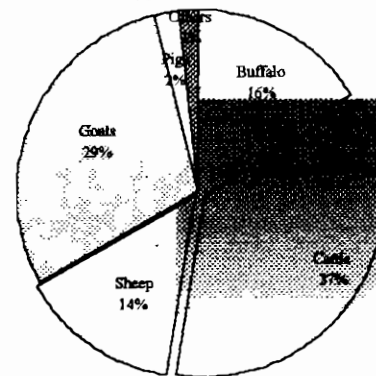
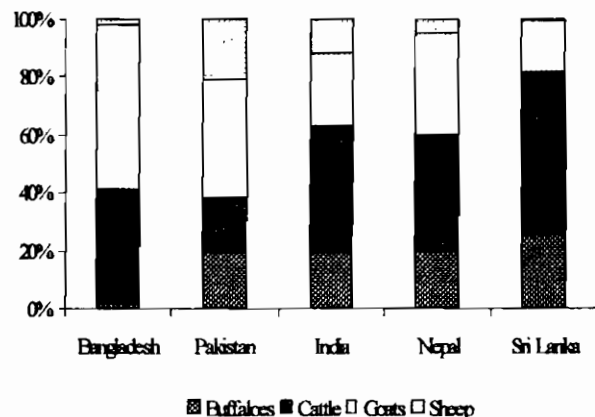


Figure 4: Composition of Ruminant Population in South Asia



The predominant livestock production system in the region is *mixed crop-livestock farming* system⁷. Livestock production is oriented towards production of milk and draught power⁸. A significant proportion of the livestock in this region is owned by small and marginal farmers and landless households, who also account for a large share of poor households. Except in egg and poultry meat production, there are no big players in livestock production. Compared to many other regions of the world, average land and livestock holding is very small (Table 1).

Table 1: Land and livestock holding size in selected countries of South Asia

	Area per holding (hectares)	Livestock heads per holding				
		Cattle	Buffalo	Sheep/goats	Pigs	Poultry
Bangladesh	4.40					
India	1.70					
Nepal	0.94	3.60	2.40	4.00	2.1	8.80
Pakistan	3.80	3.60	3.40	7.00	1.90	
Sri Lanka	1.10					

Source: World Census on Agriculture

In general, access to livestock services is poor. Access to both input and output markets is weak and characterised by distortions. Market infrastructure is generally poor resulting in high transactions costs. Private investment in livestock marketing and processing is constrained due to the nature of the production systems, poor market infrastructure, and government interventions in input and output markets. Overall, livestock productivity is low and livestock extension support either non-existent or very weak and poorly targeted.

In production and health services, the emphasis is on curative health and breeding services. For the most part, government is the direct provider of these services. The services are delivered either free of charge or with heavy subsidies. Private sector participation in livestock service delivery is negligible. While some co-operatives and non-profit non-governmental organisations do participate in the provision of these services, the coverage from these sources is limited and concentrated in a few areas.

There is relatively good access to curative veterinary services for large ruminants in high potential areas. However, the knowledge base on livestock service availability and needs in low potential areas with relatively large populations of small ruminants (arid and semi-arid areas in particular) is weak. Similar is the case with backyard poultry. On the health side, it has been argued that for these animals routine preventative work is more important than the diagnostic

⁷ Thornton (2000) classified over 96 percent of total human population as living in mixed farming system zones, approximately 65 percent of this in irrigated zones (Appendix 5).

⁸ Of the total value of milk production in India, for example, about 65 percent came from the milk group alone. Meat group contributed less than 18 percent and this share has marginally declined in the

services, but very little effort has gone into developing appropriate delivery channels and institutions for this purpose.

Ability of the state to target subsidies and to manage the delivery systems is weak and there are significant leakages. A recent study in three states of India documented that a large part of the subsidy in the delivery of veterinary and AI services does not reach the service users (Ahuja *et al*, 2000), and whatever does reach them does not necessarily benefit the poor.

Due to fiscal pressures and concerns about service delivery efficiency, there is an ongoing debate on greater participation of the private sector in livestock service provision. India, which accounts for over 75 percent of regional population, 82 percent of region's poor and about 70 percent of livestock population of the region (excluding poultry), initiated market oriented economic reforms in 1991. However, due to overwhelming dependence of the rural poor on livestock, reform in this sector has been extremely slow. Despite some recent evidence that there is sufficient demand for these services, and the service users, including the poor, are willing to pay for these services, there has been no serious attempt to create an environment that would support the emergence of the private sector in livestock services. High transaction costs due to poor market infrastructure, subsidised delivery of health services resulting in unfair competition, absence of appropriate institutions for market regulation, vested interests in policy circles, and the populist nature of the state resulting in market distortions and inefficiencies are some of the main constraints affecting the efficiency and equity of livestock service delivery in this region.

East Asia and the Pacific

This is a very diverse region in terms of economic development and growth history of the countries. At one end of the spectrum are the four tigers (Hong Kong, Korea, Singapore, and Taiwan) which are now classified as upper-middle- or high-income economies. These are followed by newly industrialised countries such as Malaysia and Thailand, with per capita incomes above \$6000 and manufacturing and services sectors accounting for more than half of employment. On the other end are the low income economies such as Philippines, Papua New Guinea and Indonesia with relatively poor growth performance⁹. In addition, the region has a number of transition economies which may be further divided into two groups—China, and 'other transition economies'. China, a nation of more than 1 billion inhabitants, adopted market

recent years.

⁹ Prior to the East Asian financial crisis of 1997, Indonesia had achieved per capita income significantly higher than Philippines and had a fairly good growth history. It suffered negative growth rates after the crisis and, in 1998, had a per capita income of \$2407 (US\$640) against \$3725 (US\$1050) for Philippines and \$2205 (US\$890) for Papua New Guinea.

oriented economic policies in 1978-79 and has recorded one of the highest rates of economic growth in the world during the last two decades. The second group comprises of economies such as Cambodia, Lao PDR, Mongolia and Vietnam that began economic reforms considerably later than China. These countries have relatively lower income levels, a high incidence of poverty, and more than 70 percent of their populations dependent on agriculture.

Apart from Mongolia and Philippines, however, economic growth in this region, has continued at a remarkable pace and become geographically widespread. Furthermore, the nature of this growth has been highly inclusive, leading to a rapid reduction in the number of absolute poor. Indeed, the number of absolute poor was halved within a short span of two decades (1975-95). Despite spectacular economic achievements, however, poverty remains a problem. A little less than a quarter of world's poor still live in this region. China, being the largest country in this region, accounts for more than 75 percent of the region's poor¹⁰.

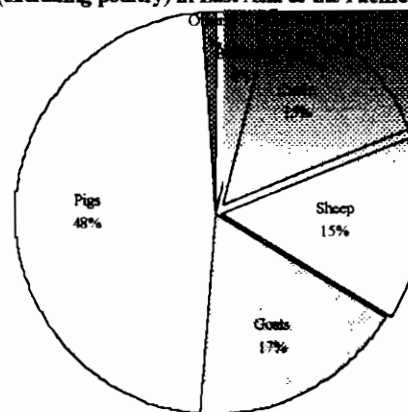
Livestock plays a very important role in the economy of this region. Large ruminants (cattle and buffaloes) are raised for meat, milk and draught power for farming and rural transportation. The region accounts for 23 percent of world livestock population (excluding poultry) (Appendix 6). Nearly half the livestock population in this region comprises of pigs (Figure 5). Another 31 percent are small ruminants (sheep and goats). Swine and poultry production have emerged as important commercial activities. In China, for example, swine and poultry raising was encouraged as a means to solve the surplus grain problem in the mid 1980s to late 1990s. Currently, the region

accounts for more than half of world's pig population and 37 percent of poultry. Comparable figures for China alone are 46 and 25 percent respectively.

The diversity in economic transformation has also resulted in similar diversity in the structure of agriculture and livestock

production. Some countries in the region have and continue to experience sharp intensification and industrialisation of livestock production and processing. Rapid growth in demand accompanied by technological changes are creating capital intensive integrated production units for poultry meat, eggs, pork and dairy products. These units employ/contract professional service providers for their service needs.

Figure 5: Distribution of livestock species (excluding poultry) in East Asia & the Pacific



On the other hand there are also a large number of small scale producers whose livelihoods are critically linked to livestock. In China, for example, over 90 percent of pig production units are comprised of holdings of between 1 and 5 head, and their share in total pig slaughter in 1996 was about 60 percent. Another quarter of the pork production was contributed by units/households raising between 6 and 30 head. In the case of poultry, on the other hand, about 57 percent of the production came from the units with over 1000 birds. At the same time, backyard poultry also seems common. Over 95 percent of all units comprised of units with less than 50 birds, contributing a little over a quarter of the total poultry production in China (Table 2).

Table 2: Structure of livestock production in China: 1996

Holding size	Holders (million)	Units Slaughtered (million)	
		Pigs	
1-5 heads	110.1 (92.6)	205.20 (59.4)	
6-10 heads	5.51 (4.6)	40.66 (11.8)	
11-30 heads	2.93 (2.5)	44.80 (13.0)	
31-50 heads	0.18 (0.15)	7.02 (2.03)	
51-200 heads	0.14 (0.12)	13.09 (3.79)	
201-1000 heads	0.02 (0.02)	9.41 (2.72)	
Above 1000 heads	0.006 (0.01)	25.25 (7.31)	
Total	118.92 (100.0)	345.41 (100.0)	
		Poultry	
1-50 birds	101 (96.8)	835 (27.0)	
51-200 birds	2.399 (2.3)	220 (7.11)	
201-1000 birds	0.59 (0.6)	283 (9.14)	
1001-10000 birds	0.291 (0.28)	968 (31.3)	
above 10000 birds	0.032 (0.03)	789 (25.5)	
Total	104.3 (100.0)	3095 (100.0)	
		Beef cattle	
1-5 heads	10.43 (96.9)	14.043 (72.2)	
6-10 heads	0.195 (1.8)	1.493 (7.68)	
11-100 heads	0.113 (1.1)	2.314 (11.9)	
Above 100 heads	0.03 (0.3)	1.60 (8.23)	
Total	10.77	19.45	
		Dairy cattle	
1-5 heads	0.71 (86.7)	1.41 (41.63)	
6-10 heads	0.07 (8.50)	0.52 (15.52)	
11-100 heads	0.04 (4.65)	0.78 (22.95)	
Above 100 heads	0.002 (0.20)	0.67 (19.90)	
Total	0.824 (100.0)	3.38 (100.0)	

Note: Figures in parentheses are percentages to total. In case of dairy cattle, the number in the last column are number of units held by the respective holding size group.

Source: Bingsheng, 2001.

Systematic documentation on various models of livestock service delivery in the countries of this region is relatively scarce. It appears that while relatively higher income

¹⁰ See Ahuja *et al* 1997 for in-depth analysis of poverty and inequality in east Asian countries.

countries have moved ahead in privatising/commercialising services such as clinical veterinary services, abattoir management, vaccine production, artificial insemination, milk collection and so on, the government still plays a more direct role in service provision in other countries such as Cambodia, Vietnam, and Philippines. However, not much is known about the efficiency of service delivery, access by the poor, service quality, market regulation, and so on. Focused studies to document/analyse these aspects in a cross-section of countries would be very useful for advancing the thinking on livestock service delivery in this region.

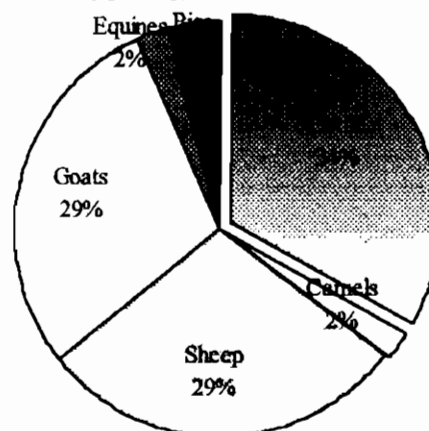
Sub-Saharan Africa

With about 45 percent of the population in sub-Saharan Africa living below the international poverty line of \$1 a day, this is the poorest region of the world. Within sub-Saharan Africa, poverty is more widespread in West Africa compared to the countries in east and southern Africa. In Nigeria, which accounts for 44 percent of total population in West Africa, the poverty incidence at \$1 a day poverty line was estimated to be over 70 percent in 1998 (Appendix 7). Other countries with a very high poverty incidence (poverty incidence greater than 60 percent) include Burkina Faso, Central African Republic, Gambia, Mali, Niger, Sierra Leone, Madagascar, and Zambia. A large number of countries in this region have suffered declining per capita income during the last two decades.

Over 65 percent of the total regional population lives in mixed crop-livestock production systems. Again, the proportion is higher in West Africa (about 80 percent) compared to east and southern Africa (about 50 percent). Availability of irrigation is extremely poor, with only about 2 percent of those in the mixed farming zone being classified as living in mixed-irrigated production zones.

There is predominance of small ruminants in the region. A little less than 60 percent of the livestock population in the region comprises of small ruminants (distributed evenly across sheep and goats) (Figure 6). This reflects the importance of livestock production systems based on extensive utilisation of native grasslands. The region also has a large camel population, accounting for approximately 58 percent of the world's camels. The largest number of camels are concentrated in the horn of Africa

Figure 6: Distribution of livestock species (excluding poultry) in sub-Saharan Africa



where they are an important source of transportation and milk. Monogastric animals account for only a small fraction of livestock in the region. Approximately 3 percent of the world's pigs and 5 percent of poultry are in sub-Saharan Africa.

In terms of market infrastructure this region probably fares worse than south Asia. Access to both input and output markets is poor due to lower population density and poor transportation and communication infrastructure. Ability of states in the region to implement and monitor government policies and programmes is also limited and overextended. In this context, it is instructive to quote Leonard (2000), "The larger number of African states are confronted with most of the following: corruption (Gould 1980; Gould and Amaora-Reyes 1983; Klitgaard 1990); patronage (Joseph, 1987); inflated public payrolls; severe fiscal scarcity and a consequent 'budgeting by cash-flow'(Caiden and Wildavsky 1975); constant shortages of critical inputs (Moris 1977), weak performance rewards for public servants, due both to erosion of their value by inflation and the failure to use them to support organisational objectives (Montgomery 1987); and political authorities who are insecure, indecisive, arbitrary, and interventionist (Moris 1977; Jackson and Rosberg 1982)".

Despite poor market infrastructure, poor ability of the state to regulate the market, and absence of appropriate institutions, many countries in this region privatised the delivery of veterinary services during the 1980s. This was done under donor pressures to relieve the fiscal constraints of the states in the wake of the great African depression. Systematic impact evaluations of privatization of these services are not available. However, some of the experts maintain that while private markets may not have produced any miracles, they have certainly helped in improving the efficiency and access to these services by all livestock keepers including the poor. This may seem to corroborate the conjectures of some of the early economists, that even imperfect markets might outperform the state simply because of the incentives private agents have in reducing costs. While that question does have some academic appeal, from the policy point of view what is needed at this stage is a systematic analyses of various experiences within this region, with the objective of identifying appropriate institutions and processes for improving the efficiency of service delivery and access to these services.

The foregoing discussion, though useful for understanding broad differences across regions, is nevertheless inadequate for identification of appropriate interventions in the context of livestock service markets. That requires a much deeper understanding of the microeconomic environment within which the households function and make decisions. These questions need to be answered with the help of qualitative and quantitative field surveys.

Several national and international agencies routinely carry out field surveys which might contain the data necessary to test some of the behavioral hypotheses, in order to understand

household behavior. For example, the "Living Standards Measurement Study" established by the World Bank in 1980 has already completed household surveys in over two dozen countries at various points in time (see Box 5). Similarly, FAO works with several national governments to carry out household surveys in the agriculture sector. It would be worthwhile to explore the possibility of using these surveys for understanding the profile of livestock dependent poor and household behavior in response to changes in the policy environment.

Box 5: The Living Standard Measurement Surveys

The World Bank established the living standard measurement study in 1980 to explore ways of improving the type and quality of household data collected by government statistical offices in developing countries. The objectives were to develop new methods for monitoring progress in living standards, to assess the impact of government policies on households, and to improve communications between survey statisticians, analysts, and policymakers. As of 1997 the household surveys had been conducted in about two dozen countries.

Although the format of these surveys varies somewhat from country to country, most of these surveys collect comprehensive data on various production and consumption activities, employment, health, education, nutrition, migration, etc of the sample households. The data is usually collected with the help of three different types of questionnaire—the household questionnaire, the village/community questionnaire, and the price questionnaire. Sample size varies from country to country and also sometimes within countries from year to year, but most of these surveys retain the characteristic of being nationally representative in nature. The table below gives the countries and years for which the survey data are already available.

Table: Coverage of LSMS Surveys

Countries for which surveys are available	Survey Years and Sample Size
Africa	
Tanzania	1993 (5200)
Ghana	1987-88 (3200), 1988-89 (3200), 1991-92 (4565), 1998-99 (5998)
Cote d'Ivoire	1985 (1588), 1986 (1600), 1987 (1600), 1988 (1600)
South Africa	1993 (9000)
East and South Asia	
Nepal	1996 (3373)
Pakistan	1991 (4800)
Papua New Guinea	1996 (1396)
Vietnam	1992-93 (4800), 1997-98 (5994)
Latin America and the Caribbean	
Ecuador	1994 (4500), 1995 (5500)
Guyana	1992-93 (5340)
Jamaica	1988-98 annual (2000-7300)
Nicaragua	1993 (4209), 1998 (4209)
Panama	1997 (4945)
Peru	1985 (5120), 1991 (2200), 1994 (3500)
Eastern Europe and Central Asia	
Albania	1996 (4290)
Armenia	1996 (4920)
Azerbaijan	1995 (2016)
Bulgaria	1993 (2500)
Kazakhstan	1996 (1996)
Kyrgyz Republic	1993 (2000)
Romania	1994-95 (36,000)
Russia	1992 (6,500)
Tajikistan	1999 (2000)
Middle East and North Africa	
Morocco	1991 (3373)

Summary

This paper has reviewed the economic framework for delivery of livestock services to the poor. It is argued that the "livestock revolution" is likely to result in a rapid increase in demand for these services. The ability of the poor to participate in this revolution is linked critically to the availability of good services both on the input and output side. Governments therefore have a responsibility to supply the necessary public goods (including the institutions and legal framework) and the market infrastructure for facilitating the emergence of efficient markets for livestock services. The paper further argues that public policy dynamics in developing countries are much more complex than the simple application of economic logic. It is the larger political economy that often dictates policy choices. It is therefore important to integrate political economy and governance issues in the economic debate on livestock service delivery.

The paper also reviews the context in which the markets for livestock services will need to function. Different countries are facing very different sets of issues, and identification of possible interventions in livestock service markets would require careful field research and analysis. The paper identifies some broad issues in the three regions—South Asia, East Asia and the Pacific, and Sub-Saharan Africa—which should be part of the research agenda for the next few years.

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Appendix 1

Some commonly used economic terms in the literature on livestock service delivery

Asymmetric information, adverse selection and moral hazard

Assumption of symmetric information simply implies that all people *know* and *do not know* the same things. Thus, no one has any informational advantage in the market over the other. When this condition is violated, asymmetric information exists which can impair market efficiency.

Two types of market failures occur in the presence of asymmetric information. One known as 'Moral Hazard' and the other 'Adverse Selection'. Both of these can be analyzed within the framework of the 'principal-agent problem'. In the 'principal-agent problem', the objective of the principal is to accomplish a task by hiring an agent whose actions are not fully observable to the principal.

Moral hazard occurs when the agent's characteristics are known but his/her actions are hidden. In the case of health insurance, for example, a person's age, preferences, current health status are usually known but how careful he/she is with his/ her health is not known. The informational disadvantage translates into some risk to the insurance company. The solution to this problem is to structure the transaction in a way that the agent will take actions desired by the principal. For example, private health insurance companies only offer partial insurance so that the insured has an incentive to be careful with his/her health.

Adverse selection occurs when actions can be observed but type is unknown. In other words, if the buyer can not readily distinguish between a low quality and high quality service provider then the market invariably spirals downwards towards an equilibrium where there are many more low quality service providers.

Economies of Scale

Economies of scale exist when the average cost of production decreases with output. This is usually observed in enterprises which have large fixed costs.

In such cases, presence of a large market is necessary for the private agents to invest in such fixed cost and provide the service. Some of the livestock services fall into this category and therefore the private agents may not provide the service in areas with low aggregate demand for these services.

Public/private goods and externalities

A pure public good provides benefits that are *non-excludable* and *non-rival*. In contrast, the benefits provided by a pure private good are fully *excludable* and *rival*. Examples of pure public goods include clean air and national defence. On the other hand, food and clothing are the examples of pure private good. Among the livestock services clinical diagnosis and prescription and AI are examples of private good; services such as disease surveillance, quarantine, food hygiene/inspection are public goods.

Nonexcludability and nonrivalry

Benefits of a good or service that are available to all, once provided, are called nonexcludable. In other words, if the benefits can not be appropriated by the provider or the owner, then benefits are nonexcludable — others can not be excluded from benefiting from the good or service. Nonrivalry on the other hand, implies that one person can consume the good or the service without reducing the consumption of same good or service by others. Examples of non-excludable goods include pollution control and national defence. Once the air is cleaned up in an area, no one, irrespective of whether they contributed to the clean up, can be excluded to benefit from it. Clean air also presents the case of nonrival consumption. That is, breathing of clean air by one person does not make it less available to others.

Due to the characteristics of non-rivalry and non-excludability, the free market tends to under-provide public goods since the providers can not appropriate full profits. Thus, it becomes the responsibility of the state to provide these goods and services. Private goods, on the other hand, are provided by the private agents at a socially optimal level if there are no externalities. Between the two extremes of pure public and private goods lies a whole continuum based on the degree of excludability and rivalry.

An *externality* occurs when the action of one economic agent affects the consumption or production of other economic agents in a way that is not reflected in the market. For example, in the case of industrial pollution when a factory pollutes air or water, it may lead to adverse health effects on consumers and these will not be reflected in the market. Externality also provides a rationale for intervention in the market.

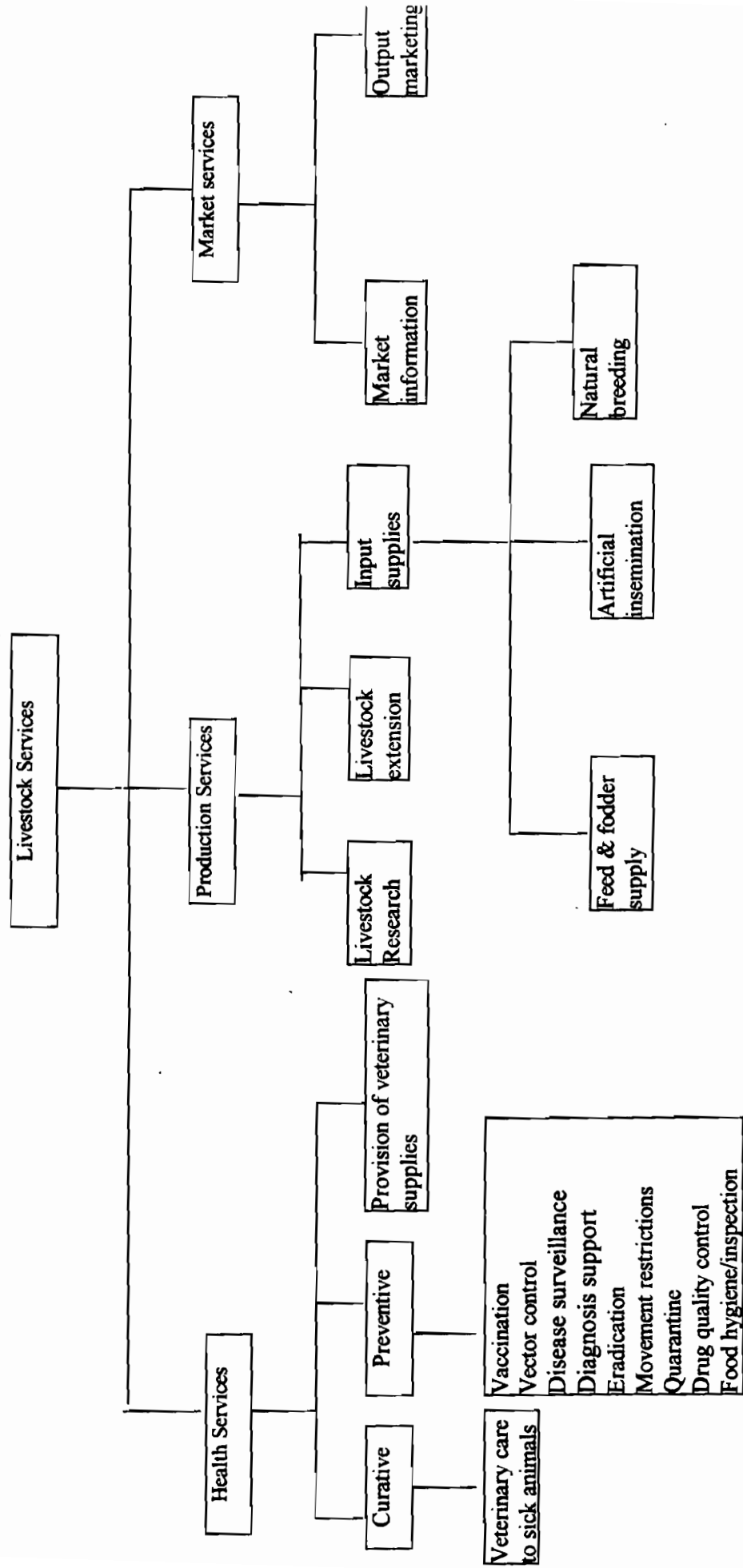
Economic efficiency

The most widely used notion of economic efficiency was given by the Italian economist Vilfredo Pareto. He defined the state of an economy as efficient in which no one can be made better off without someone else being made worse off. This notion, commonly known as *Pareto-efficiency*, combined two types of efficiency—productive and allocative. The productive efficiency implies that the production of an economic good can not be increased without reducing the production of some other good. In other words, all the production inputs are optimally employed. Allocative efficiency (or the exchange efficiency), on the other hand, requires that all gains from trade be exhausted. In other words, given the consumer tastes and preferences, resource endowments, and technology, it is not possible to make anybody better off without making someone else worse-off.

Willingness to pay

Willingness to pay refers to the maximum amount someone would be willing to pay for a good or service rather than go without it. The difference between the price someone actually pays and the willingness to pay is known as the *consumer surplus*. There are two approaches to assessing the willingness to pay. One is to exploit the observations on prices and quantities to estimate the demand curve, and from there infer the willingness to pay. The second approach is contingent valuation, a more direct assessment of willingness to pay which uses responses to hypothetical questions to infer preferences and the willingness to pay (Box 3).

Appendix 2: Classification of Livestock Services



Appendix 3: Nature of livestock services and appropriate sectoral delivery mechanism

	Type of economic good		Measures to correct		Sectoral delivery	
	Public	Private	Externality	Moral Hazard	Public	Private
Health services						
<i>Clinical intervention</i>						
Diagnosis		x*				YY
Treatment		x**				YY
<i>Preventive</i>						
Vaccination		x*			Y	YY
Vaccine production		x*				YY
<i>Vector control</i>						
Tick control		x*			Y	YY
Tsetse fly control	x				Y	YY
Veterinary surveillance	x				YY	
Diagnosis support		x*			Y	YY
Quarantine			x		YY	
Drug quality control				x	YY	
Food/hygiene inspection				x	YY	
Veterinary research	x	x			YY	YY
Veterinary extension	x	x			YY	YY
<i>Provision of vet supplies</i>						
Production		x				YY
Distribution		x				YY
Production services						
AI – semen production		x				YY
AI – insemination		x				YY
Research	x	x			YY	Y
Extension	x	x			YY	Y

* - private good with consumption externalities; ** - private goods with consumption externalities only in case of infectious diseases; YY – economically justified; Y—economically justified under special circumstances.

Source: Umali, Feder and de Haan, 1994.

Appendix 4: Distribution of human population across major regions of the world

('000)		
REGION	Total Population	Agricultural Population
(1)	(2)	(3)
South & East Africa	369,234 (71.2)*	249,651(67.6)
West Africa	241,691 (61.3)	129,620 (53.6)
China	1,262,817 (67.0)	854,536 (68.0)
East Asia & Pacific (excl China)	580,729 (60.0)	273,884 (47.2)
India	982,223 (72.2)	548,794 (55.9)
South Asia (excl India)	337,600 (73.5)	194,845 (57.7)
Eastern Europe & Central Asia	475,350 (32.5)	87,960 (18.5)
High Income	780,810 (22.8)	30,901 (4.0)
Latin America – Central & Caribbean	165,354 (34.0)	45,766 (27.7)
Latin America – South	336,997 (21.2)	64,580 (19.2)
Middle East	216,556 (31.1)	56,661 (26.2)
North Africa	204,711 (50.0)	70,692 (34.5)
World Total	5,954,072	2,607,890

* Figures in parentheses in column 2 are the percent of total population in rural areas whereas in column 3 these are percent of agricultural to total population.

Source: FAO Statistical Database.

Appendix 5 : Human Population in Livestock Production Systems

('000)				
Region	Livestock	Mixed	Mixed	Other
	Grassland	Rainfed	Intensive	
South & East Africa	130,366	153,039	4,617	7,473
West Africa	42,920	188,551	0	3,257
China	263,681	312,958	590,946	7,864
East Asia & Pacific (excl China)	2,310	112,612	415,900	6,712
India	6,842	418,454	454,324	21,865
South Asia (excl India)	0	0	322,141	8,664
Eastern Europe & Central Asia	0	58,368	0	1,230
High Income	4,084	2,769	21,679	388
Latin America - Central & Caribbean	18,937	88,186	43,728	2,873
Latin America - South	113,828	175,121	16,773	5,243
Middle East	30,103	16,820	84,233	5,925
North Africa	4,877	61,064	54,844	6,749
World Total	617,948	1,587,942	2,009,185	78,243

Source; Thornton et al, ILRI, 2000

Appendix 6: Distribution of Livestock Population Across Regions of the World

Region	Buffalo	Cattle	Camels	Sheep	Goats	Equines	Other Camelids	Pigs	Poultry
South & East Africa	0.03	155,103	11,139	126,820	115,135	10,873	0	8,155	409,253
West Africa	0	59,579	2,615	60,958	73,940	4,895	0	18,529	383,385
China	22,545	99,212	350	120,956	134,801	23,246	0	400,348	3,677,000
East Asia & Pacific (excl China)	16,825	48,412	355	23,091	36,857	4,261	0	68,779	1,749,958
India	90,909	212,121	1,030	57,100	121,362	2,190	0	16,005	375,000
South Asia (excl India)	26,264	51,983	1,465	47,649	92,041	6,521	0	917	411,078
Eastern Europe & Central Asia	557	96,259	271	104,055	17,949	8,697	0	79,015	1,076,513
High Income	169	221,933	251	292,801	15,706	9,242	0	203,031	3,444,461
Latin America - Central & Caribbean	0	50,116	0	7,261	12,427	15,961	0	22,397	593,248
Latin America - South	1,706	296,897	0	81,368	25,906	23,053	5,777	50,492	1,520,741
Middle East	1,013	21,623	1,082	142,942	64,739	4,955	0	61	724,562
North Africa	6,299	11,497	768	54,550	18,742	8,506	0	77	497,713
World Total	166,287	1,324,735	19,327	1,119,552	729,605	122,400	5,777	867,805	14,862,912

Source: FAO Statistical Database

Appendix Table 5: Poverty incidence in selected countries

	Population (millions)	Poverty incidence (%)	Poverty headcount (millions)	Poverty headcount (%)	Poverty headcount (US\$ million)
East and Southern Africa					
Botswana	1.570	33.3	522.8	61.35	963.2
Ethiopia	59.649	31.25	18640.3	76.43	45589.7
Kenya	29.008	26.54	7698.7	62.29	18069.1
Lesotho	2.062	43.14	889.5	65.69	1354.5
Madagascar	15.057	60.17	9059.8	88.78	13367.6
Mozambique	18.880	37.85	7146.1	78.39	14800.0
Rwanda	6.604	35.73	2359.6	84.55	5583.7
South Africa	39.357	11.47	4514.2	35.78	14081.9
Tanzania	32.102	19.89	6385.1	59.65	19148.8
Uganda	20.554	36.7	7543.3	77.16	15859.5
Zambia	8.781	72.63	6377.6	91.7	8052.2
Zimbabwe	11.377	35.95	4090.0	64.24	7308.6
Total	246.661	30.7	75807.0	66.9	165104.8
West Africa					
Burkina Faso	11.305	61.18	6916.4	85.82	9702.0
Central African Republic	3.485	66.58	2320.3	83.96	2926.0
Côte d'Ivoire	14.292	12.29	1756.5	49.36	7054.5
Mali	10.694	72.79	7784.2	90.55	9683.4
Niger	10.078	61.42	6189.9	85.31	8597.5
Nigeria	106.409	70.24	74741.7	90.81	96630.0
Senegal	9.003	26.26	2364.2	67.76	6100.4
Sierra Leone	4.568	57.03	2605.1	74.47	3401.8
Total	173.592	60.7	105433.0	83.9	145686.7
East Asia					
Indonesia	206.338	15.17	31301.5	66.13	136451.3
Korea, Rep.	46.109	2.0	922.2	2.0	922.2
Mongolia	2.579	13.92	359.0	49.96	1288.5
Thailand	60.300	2.0	1206.0	28.15	16974.5
China	1,262,817	18.5	233621	53.7	678132.7
Total	1,578,143	16.9	267410	52.8	833769.1
South Asia					
Bangladesh	124.774	29.07	36271.8	77.84	97124.1
Nepal	22.847	37.68	8608.7	82.46	18839.6
Pakistan	148.166	30.96	45872.2	84.65	125422.5
Sri Lanka	18.455	6.56	1210.6	45.35	8369.3
India	982.223	44.208	434221	86.21	846774.4
Total	1,296,465	40.6	526184.5	84.6	1096530
Latin America—Central					
Costa Rica	3.841	9.57	367.6	26.25	1008.3
Dominican Republic	8.232	3.19	262.6	16.02	1318.8
El Salvador	6.032	25.26	1523.7	51.92	3131.8
Guatemala	10.801	39.81	4299.9	64.27	6941.8
Honduras	6.147	40.49	2488.9	68.78	4227.9
Jamaica	2.538	3.15	79.9	25.24	640.6
Mexico	95.831	17.9	17153.7	42.47	40699.4
Nicaragua	4.807	2.95	141.8	18.13	871.5
Total	140,996	18.9	26603.4	42.2	59533.8
Latin America—South					
Bolivia	7.957	11.28	897.5	38.57	3069.0
Brazil	165.851	5.1	8458.4	17.42	28891.2
Chile	14.824	4.18	619.6	20.28	3006.3
Colombia	40.803	19.9	4484.2	28.71	11714.5
Ecuador	12.175	19.9	2460.6	52.32	6370.0
Paraguay	5.2	19.9	1011.0	38.45	2007.9
Peru	24	19.9	3841.1	41.36	10256.0
Uruguay	3.4	19.9	65.8	6.62	217.7
Venezuela, RB	23,442	19.9	3414.2	36.41	8462.4
Total	299,443	8.5	25411.3	24.9	74495.2

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