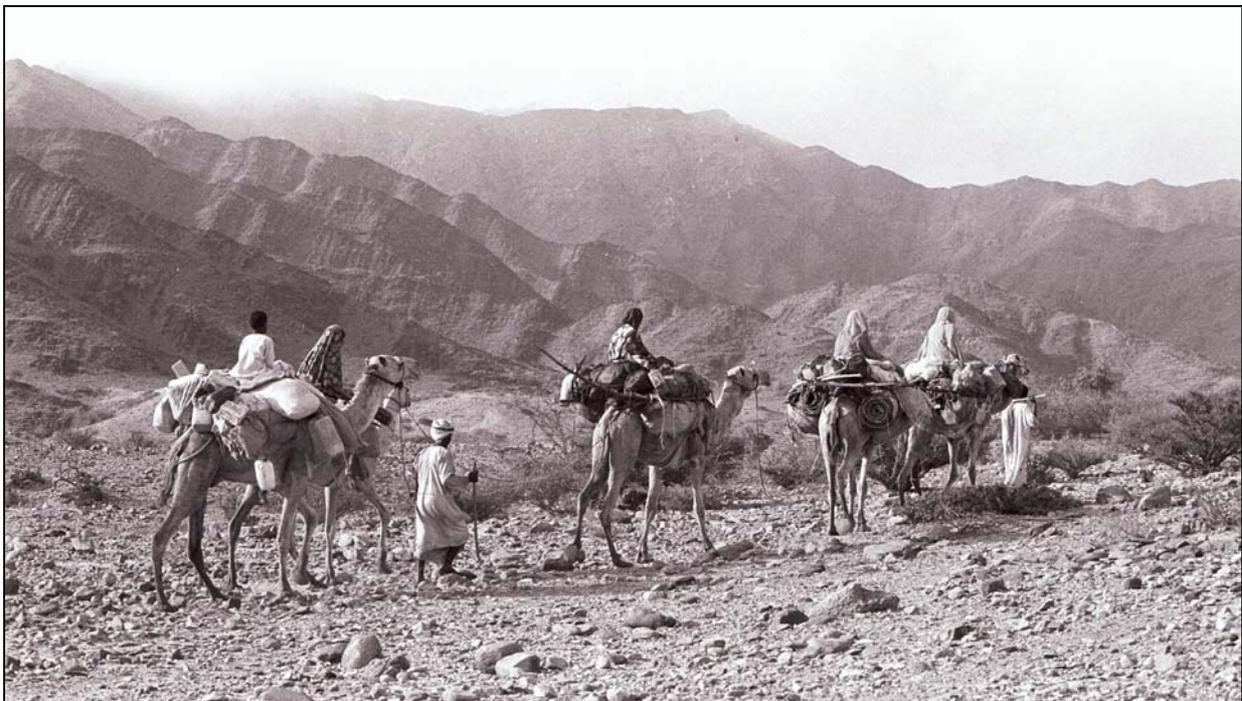


Methods On The Move

A review of veterinary uses of participatory approaches and methods focussing on experiences in dryland Africa



Andy Catley

1999

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PARTICIPATORY APPROACHES TO VETERINARY EPIDEMIOLOGY (PAVE) PROJECT

The PAVE Project was part of the Sustainable Agriculture and Rural Livelihoods Programme of IIED from 1999 to 2001. The project investigated options for using participatory appraisal in veterinary epidemiology and focussed on animal health services and information systems in pastoral areas of Africa. The PAVE Project was funded by the Animal Health Programme of the Department for International Development (DFID), United Kingdom and was implemented in partnership with the Participatory Community-Based Vaccination and Animal Health Project (PARC-VAC) of the Organization of African Unity/Interafrican Bureau for Animal Resources (OAU/IBAR), Nairobi, Kenya.

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SUMMARY

This literature review describes the origins of participatory approaches and methods, and discusses their application in animal health services and research in less developed countries. The review focuses on dryland areas of Africa, particular pastoral and agropastoral areas of the Greater Horn of Africa. In these areas, most experience with veterinary uses of participatory approaches and methods resides with community-based animal health projects, some of which are involved in rinderpest control. This use of participation has proved to be effective relative to conventional approaches to service delivery. Other institutions such as livestock research centres, veterinary schools and government services are also beginning to use community participation and associated methods, albeit in widely varying contexts and with different outcomes. Recent applications of participatory methods include disease-specific investigations, stakeholder analysis of veterinary services and business planning for private veterinary clinics.

Veterinary epidemiology is a relatively new branch of veterinary medicine that has received much attention from the larger aid agencies and donors during the last two decades or so. However, although considerable investments have been directed at sophisticated, computer-assisted management and analysis of quantitative data, often at central locations, support to developing improved field-level data collection methods has been very limited. While participatory methods have been used during rinderpest investigations in remote areas, in general epidemiologists continue to rely on formal survey tools such as questionnaires. A review of questionnaire usage by veterinarians indicates few, if any, examples of surveys which have applied all of the 'good practice' guidelines as recommended in the veterinary or other literature. While operational context can affect survey design and implementation, few workers attempt to relate methodological deviations from best practice to local circumstances.

Much participatory investigation and analysis on animal health topics has generated qualitative data. In terms of the validity and reliability of participatory methods for use in veterinary epidemiology, there are at least two ways to assess the value of these methods. Conventional assessment using typical scientific criteria (internal validity, external validity, objectivity and reliability) assumes that an essentially qualitative system of inquiry can be usefully judged within a hard science paradigm. Alternatively, participatory evaluation has been proposed which uses a 12-point framework for judging the trustworthiness of participatory inquiry. As veterinary epidemiology has a history of borrowing from other disciplines, it would seem appropriate to consider the value of participatory methods from both conventional (mainly quantitative) and participatory (mainly qualitative) perspectives. Options for combining methods and systems of evaluation should also be investigated.

1. Introduction

1.1 The aims and scope of the review

This literature review describes the development of a learning and facilitation methodology called participatory appraisal (PA) and its applications in animal health services and research. The review focuses on experiences in Africa and in particular, arid and semi-arid areas inhabited by pastoralist and agropastoralist communities.

During the last 15 years or so systems of inquiry which are commonly called Rapid Rural Appraisal (RRA), Participatory Rural Appraisal (PRA) or similar names have been developed. These systems were designed to overcome some of the limitations of conventional survey and research methods in developing countries and ultimately, aimed to increase the involvement of local people in development activities from which they were supposed to benefit. Consequently, the advent and use of RRA and PRA has been closely associated with the concept of community participation. Although community participation has various meanings, the term usually conveys some form of interaction between local people and outsiders in which the former play a role in identifying, implementing or even controlling development activities. For the sake of this review PRA and associated methods have been termed participatory appraisal (PA) and definitions of these terms together with community participation are discussed in section 2.0.

To a large extent, PA methods originated from the social sciences and were characterised by interviewing and visualisation tools which produced qualitative data in relatively short time-frames. Among the factors which influenced methodology development were dissatisfaction with participant observation studies and questionnaire surveys when used in remote rural areas. When using PA the aim was not to generate detailed information on specific topics, but rather to identify key issues and problems from the local perspective and consider what action needed to be taken to improve a situation. PA methods were not fixed and could be adapted by researchers in the field according to what worked well and local systems of communication. A degree of ignorance was acceptable and initially, statistical analysis of data was avoided. Despite the informality of PA it was soon widely used by development professionals in sectors such as human health, agriculture, education, water supply and natural resource management. In line with the flexible and adaptive philosophy behind PA, sector-specific modifications of participatory approaches and methods began to emerge. Some workers started to combine PA with formal data collection methods while others adapted PA tools in order to produce more quantitative data which was suitable for statistical analysis. The development of PA approaches and methods is described in section 3.0.

The emergence of PA was influenced by a diverse group of experiences including field-level project implementation in various technical sectors, social science methods, agricultural research, ecological theory and systems analysis (Chambers, 1994). Prior to and during its development, PA was also influenced by wider social and political ideologies concerning issues of power, equity, social organisation and poverty alleviation in institutions ranging from non-governmental organisations (NGOs) to agencies such as the United Nations and World Bank. Consequently, development contexts and institutional aims and behaviour have been important in determining how and why methods such as PA have evolved (Biggs and Smith, 1998; Rifkin *et al.*, 1998). The review attempts to summarise these influences on PA in addition to more specific methodological details. For example, to a certain extent the advent of PA was a response to unsuccessful development initiatives in less developed countries (LDCs) over more than two decades. The technology transfer development paradigm in the 1960s and 1970s did not deliver long-term benefits to poor rural people and the notion that western science *per se* could solve the problems of LDCs was found to be seriously flawed. Poor results in livestock development were one group of negative experiences which led to a reassessment of top-

down technical approaches in LDCs and prompted discussion on alternative, more people-centred ways of working. For example Chambers (1983) noted a professional fixation among livestock workers with the promotion of exotic cattle in tropical countries in preference to research on local breeds and other types of livestock. Other notable failures were attempts to develop animal-drawn wheeled tool-carriers (Starkey, 1988) or improve pastoral production systems in dryland areas of Africa by the introduction of ranching schemes (Scoones, 1994).

Looking specifically at animal health service delivery in dryland areas of Africa, most experience with PA methods probably resides with NGOs and particularly their field staff who interact on a day-to-day basis with livestock keepers. Unlike many readers of this review, these workers have relatively few incentives or opportunities for publishing their experiences in professional journals, academic theses or other formal literature. Geographical isolation, poor communications and postal services, limited access to libraries and the use of western languages in scientific media are some constraints faced by veterinary personnel in remote areas. Their work performance tends to be measured against objectives related to basic animal health service provision and development rather than points scored from academic publications in international journals. Hence, an unavoidable weakness of a veterinary-orientated literature review on a subject such as PA is that it reflects only that which is written, often by expatriates, rather than the much wider hands-on experience of local veterinary professionals or other workers. Although there is a growing and influential body of literature concerning participatory methods and approaches, accounts of their application in veterinary medicine are still relatively few.

1.2 Pastoralists and livestock in Africa

Among rural communities in Africa those people who are most dependent on livestock are pastoralists and to a lesser extent, agropastoralists who inhabit arid and semi-arid areas¹. These people own approximately 50% of Africa's livestock, equivalent to approximately 225 million animals (de Leeuw *et al.*, 1995). The number of pastoralists in sub-Saharan Africa has been estimated at more than 50 million people (Coughenour *et al.*, 1985) while Sudan, Ethiopia, Eritrea, Djibouti, Somalia, Kenya and Uganda support around 16.5 million pastoralists (Bonfiglioli, 1992).

Typically, pastoralists derive at least 50% of their food and income from their livestock (Swift, 1988). Another common feature of pastoral groups and perhaps the key to understanding their way of life, is mobility. Movement is essential for pastoralists because low and erratic rainfall in dryland areas causes marked spatial and temporal variations in the grazing resource on which livestock depend.

Although criticised for many years for their apparent inefficiency and neglect of the environment, African pastoralism is increasingly viewed as a rational and productive use of a fragile environment (Mearns, 1996). Until the 1980s, many livestock development initiatives in pastoral areas were based on the notion that mobile and extensive livestock production systems were wasteful and environmentally unsound. Containment of livestock on ranches and fodder improvement schemes were typical attempts to improve livestock productivity. However, more recent research showed how the opportunistic and flexible systems used by many pastoral groups were well-adapted to dynamic ecosystems with highly variable rainfall. Comparisons of pastoral and ranching production systems from South Africa to Mali clearly showed how pastoralists were outperforming less adaptive systems (Scoones, 1994).

A main determinant of pastoral livelihoods is drought. Annual rainfall in arid and semi-arid lands is characterised by extreme variability in terms of the amount of rain, where it falls and when it falls. Drought is not always due to a single failure of rain in a given year but can be related to more long-

¹ Rainfall in semi-arid regions is between 300-600mm/year and in arid regions < 300mm/year.

term climatic change over many years during which rainfall declines. The Turkana pastoralists of northern Kenya anticipate a minor drought every three to four years and a major drought every ten years or so². In Turkana *"The first impacts of drought are environmental and economic. With the failure of rain, livestock productivity declines slowly at first and then more rapidly. As livestock deaths mount and as purchasing power collapses, households break up, old people and children grow sickly and serious hunger sets in. Famine comes at the end of the cycle: when people cannot produce their own food and when they no longer have anything of value to sell for exchange for food, famine results."* (Bush, 1995).

Despite variations in ethnicity, culture and systems of livestock management, in recent years pastoral communities throughout eastern Africa have experienced major threats and challenges to their lifestyle. While they have long suffered from drought and political isolation, they now experience increasing levels of conflict, competition for natural resources and falling levels of per capita income. In addition, inappropriate aid and development policies continue to affect pastoralists throughout the region (Toulmin and Moorhead, 1993). In some areas population growth, increasing sedenterisation and market orientation are affecting traditional livestock production systems and placing pressure on grazing resources around expanding human settlements (e.g. Department of Livestock Production/Oxfam UK&Ireland, 1996).

Looking more closely at the problem of conflict in pastoral areas of Africa, pastoralists have a long history of competing with neighbouring groups for access to grazing resources or theft of livestock by raiding (Ocan, 1994; Blench, 1996; Hendrickson *et al.*, 1998). However, civil war in the Horn of Africa and increased access to modern weaponry has had profound implications for pastoralists in Somalia, Sudan, Djibouti, Ethiopia and Eritrea. War has caused huge displacement of pastoral people from their traditional homelands and has resulted in considerable human and material loss. Families become divided as the men and older boys join the fighting while the women, elderly and children move to avoid conflict and human rights abuses (Amnesty International, 1997).

In much of the Horn of Africa, the internally displaced, refugees and returnees find themselves living in camps which over the years, have evolved into a more or less permanent feature of the pastoral landscape. Due to conflict, camp populations are characterised by large numbers of female-head households, children, old people and the physically and mentally disabled. The longevity of conflict and long-term nature of the camps cannot be understated. For example, the Somali-occupied areas of the Horn have been in a *"virtually continual state of conflict"* since the late 1970s (Bradbury, 1993) and around 200,000 Somalis still inhabit the camps in south-east Ethiopia. The ongoing civil war in Sudan has displaced more than 1 million people (Operation Lifeline Sudan, 1994) and despite the cessation of the 27 year Ethiopian civil war in 1991, around 400,000 Eritrean refugees continue to reside in camps in eastern Sudan (Kulman, 1994). Fighting between Ethiopia and Eritrea resumed in 1998.

Large-scale conflict also affects pastoralism in other ways. For pastoralists, the ability to move their herds is crucial if they are to find good grazing and maintain the productivity of their stock. Conflict inhibits movement causing increased pressure on available grazing resources and altered patterns of livestock disease. Conflict also disrupts markets which pastoralists need to sell livestock or milk and buy cereals. Market disintegration due to conflict is particularly apparent in parts of southern Sudan (Harragin, 1998).

² This does not mean that major drought occurs every ten years.

1.2.1 Livestock for food and income

The key features of pastoral household economies are a reliance on livestock-derived foods through the direct consumption of livestock products and the sale or exchange of livestock for grain. However, there are also less obvious benefits and uses of animals that are also important. Livestock skins can be used for clothing, to make household implements or the house itself; dung is used as fuel or burnt to repel flies; donkeys and camels are important for transportation of both materials and people, including the carrying of goods to markets for sale. When crops are grown, oxen, camels or donkeys can be used for ploughing.

Regarding food intake, milk, milk products and cereals are important to pastoralists and milk alone can account for up to 75% of daily energy needs. Other important foods are meat, blood, wild foods and heavily sugared drinks, particularly tea. The pastoralists of northern Kenya were particularly dependant on milk and daily energy provided by this food alone accounted for 75%, 66% and 62% of daily needs of the Rendille (Field and Simkin, 1985), Ariaal (Fratkin, 1991) and Turkana (Galvin, 1985) respectively. Milk was also the main source of protein for these pastoralists, providing 100% of protein requirements for the Ariaal and 88% of daily needs for the Turkana. For Somali pastoralists, milk was estimated to meet 80% of daily energy requirements (Dunbar, 1984) and milk from Boran livestock in Ethiopia supplied up to 55% of the daily energy needs of their owners (Cossins and Upton, 1988).

1.2.2 The social and cultural value of livestock

In addition to their more obvious use as food and income providers, livestock also play major social and cultural roles in pastoral communities in Africa. Livestock ownership affects wealth, status and decision-making power and social events such as births, marriages and deaths often involve ceremonies which require livestock (Box 1). The close links between livestock, wealth and social interaction outlined above are reflected in the strong social support mechanisms which are a feature of pastoral communities. These systems are often complex and involve gifts or loans of animals or animal products to poorer members of the community. In many cases, the recipient has close kinship ties to the provider as described for the Maasai (Muir, 1994), Dinka and Nuer (Iles, 1994a) and Somali (Ahmed Aden and Catley, 1993; Catley, 1999a, 1999b).

While animals clearly play crucial social roles in pastoral communities, this aspect of livestock ownership rarely features in the accounts of national livestock assets that are produced by governments or international livestock agencies. The strong focus on production criteria to predict, or attempt to predict, how development programmes would benefit pastoral communities is perhaps one reason why pastoral development in Africa has not been successful. Scoones (1994) noted how livestock development in dryland areas during the preceding 30 years was considered by many to have been a disaster and according to Chambers (1997), *"A history of pastoral 'development' in the drier areas of sub-Saharan Africa would read like the afflictions of Job. Few domains can claim such consistent failure"*. Much of the literature describing the complex socio-cultural uses of livestock in African communities has been written by social scientists and information is available in specific anthropological accounts or multi-disciplinary studies (e.g. Coppock, 1994). However, when livestock professionals *per se* describe livestock rearing in Africa they often fail to mention these benefits, perhaps because they are difficult to quantify.

Nuer communities, southern Sudan: *".....most of their social behaviour directly concerns their cattle.....they are always talking about their beasts. I used sometimes to despair that I never discussed anything with the young men but livestock and girls, and even the subject of girls led inevitably to that of cattle. Start on whatever subject I would, and approach it from whatever angle, we would soon be talking of cows and oxen, heifers and steers, rams and sheep, he-goats and she-goats, calves and lambs and kids. I have already indicated that this obsession - for such it seems to an outsider -is due not only to the great economic value of cattle but also to the fact that they are links in numerous social relationships. Nuer tend to define all social processes and relationships in terms of cattle. Their social idiom is a bovine idiom. Most of their social activities concern cattle and 'cherchez la vache' is the best advice that can be given to those who desire to understand Nuer behaviour."* (Evans-Pritchard, 1940).

Dinka communities, southern Sudan: *"Cattle play an essential role in Dinka society, providing not only milk and dowry, but performing important social functions and determining a man's position and influence in the community. A song bull, while not productive in the sense of providing milk and meat, is a source of great pride, prestige and possible influence. The value of a song bull is determined by an animal's size, colour and shape of the horns. To be Dinka you must own cattle. Cattle provide the means by which kinship ties are made and maintained, a process for ensuring the long term viability of the household and a means of receiving support and animals in the event of disaster."* (Iles, 1994a).

Dodoch communities, Karamoja, Uganda: *"Besides providing blood and milk they (cattle) are the basis for all the ceremonies and rituals that are needed for the smooth running of society. Their most important use is in bride-wealth. Marriage and therefore affiliations between groups of people are sealed by the payment of cows"* Lochhead (1994).

Somalia: *"To the Somali pastoralist the camel is the most valuable animal of all, and a large herd is a sign of strength, power and prestige. As a form of property the camel is strongly associated with patrilineal kinship, which is a major structural principle in Somali society and culture.....camels are not primarily disposable income. Their value lies in the material and social survival capacity that they offer the families that keep them. The camel, which in Somali culture represents the image of continuity and reproduction, is a source of security in case of drought and misfortune "* (Talle and Abdullahi, 1993).

2.0 Participation and Development

2.1 Concepts of participation in development

The role of people in developing society has been a feature of the literature since Aristotle analysed Greek city-states in order to define those factors which contributed towards human happiness and 'the good life' (Cohen and Uphoff, 1980)³. However, in the 20th century the critical period influencing theoretical constructs of community participation was immediately following the Second World War (Rifken *et al.*, 1998). In the late 1940s and 1950s industrialised countries associated underdevelopment with lack of technology (Cohen and Uphoff, 1980). Hence, in the early history of the provision of aid to poorer countries, development theory was based on a western perception of a technology gap and the notion that poor people would become more developed by

³ In Aristotle's time, people participated by voting, paying taxes, holding office, attending meetings and defending the state. Citizenship required members to contribute towards the public realm which in turn, provided benefits to citizens.

adopting new technologies. Later, a resource gap was also identified as a major constraint to development. The resource-based theory dealt with disparities between government income and expenditure, imports and exports, and savings and investments. In the technology transfer and resource-based theories of development people were expected to either improve their lives by adopting new technology or make contributions to the national good in the form of taxes, production of items for export and through savings and investment. Up to the late 1960s, both of these theories were the basis for international aid. They implied a passive role for the majority of people in poor countries who would have technological innovations delivered to them or be compelled by government to contribute to national resource flows. These processes were controlled by a relatively small number of highly trained technicians or resource managers.

In the 1950s and 1960s an important approach to rural development was introduced - community development. Community development had its origins in Theodore Roosevelt's Country Life Commission which aimed to improve the livelihoods of rural Americans by enabling deprived communities to develop their own resources and become self-reliant (Christensen and Robinson, 1980). According to Rifkin *et al.* (1998), community development was popularised by the United Nations in the 1950s and early 1960s as decolonisation spread in LDCs. At this time, community development was linked to government policy and was associated with five main principles:

1. Integrated development involving community plans and cooperation with all technical sectors.
2. Planning based on a community's 'felt needs' rather than those of technical experts.
3. Emphasis of self-help efforts.
4. Concern for identifying and training local leadership.
5. Technical assistance from industrialised nations.

In practice, community development was largely an educational approach to development which aimed to remove the stigma of charity and involve local people in decision-making. However, the approach suffered from a number of serious flaws. For example, it was assumed that communities were homogenous rather than complex entities and that all people wanted the same things at the same time. While community development was based on consensus over local needs, it failed to recognise the practical difficulties in reaching consensus. For these and other reasons, community development lost credibility as a development approach (Rifkin *et al.*, 1998). Relating community development to thinking on community participation Cohen and Uphoff (1980) judged it to have a narrow view of participation and was often ineffective in transforming rural communities. Essentially, participation within community development was a process defined by experts who felt that they had the answers to solving the problems of the poor.

In the late 1960s, two decades of experience with the technology gap and resource gap theories was revised and an 'organisational' gap was identified in relation to LDCs. In this latest theory, underdevelopment was related to inappropriate relationships between centralised, powerful bodies and poor rural communities. Rural development was hindered by 'one-way, top-down, extractive' linkages between government and rural populations. To a large extent, these problems had arisen due to previous development theories. The new theory advocated greater, more active involvement of people in development, called for decentralised local approaches and appropriate technology. The phrases 'popular participation' and 'people participation' began to appear in the strategies of international donors such as USAID as early as 1966, although were not given much attention (Cohen and Uphoff, 1980).

Concepts of participation began to feature more prominently in overseas development in the 1970s. Participation began to appear in the language of aid organisations such as the World Bank (1975), Overseas Development Administration (1975) and United Nations (1975), all of which called for participation to be a feature of national development strategies and variously referred to 'popular

participation' and 'active participation' of citizens in the development process. Early publications discussing participation were various articles in the journal *Rural Development Participation Review* produced by Cornell University (e.g. Korten, 1981) and the book *Putting People First* (Cernea, 1985). Cohen and Uphoff (1980) sought to clarify the meaning of participation and suggested that the process required people's involvement in decision-making, programme implementation, sharing the benefits of development programmes and evaluating programmes.

Other workers advocated more in-depth participation characterised by empowerment of rural communities. In this type of participation, communities developed new skills and confidence which enabled them to initiate their own projects and make claims on governments and donors (Oakley, 1991). When using participation for empowerment the process was viewed as an end in itself rather than a means to achieve more relevant or efficient programme implementation. Definitions of participation continue to be discussed in the literature to the present day and are now so varied and open to misinterpretation that the concept requires clarification each time it is used or mentioned (Pretty, 1994; 1995). The different meanings of participation are discussed in more detail in section 2.1.2.

Since the emergence of RRA and PRA there has been a notable increase in the use of these methods by development and research bodies in both developing and industrialised nations. Although originally conceived and promoted by a small number of NGOs and academic institutes, terms such as PRA and community participation soon became commonplace in development, academic and political institutions worldwide (Chambers, 1997). However, the growth of participatory approaches and methods did not coincide with a common understanding of community participation or capacity within development agencies to use PA. These and other concerns regarding the growth of PA and community participation are discussed in section 3.0.

2.2 Definitions of community and community participation

2.2.1 Meanings of 'community'

One of the key themes in the literature on PA and the concept of community participation is different definitions of community and community participation according to varying technical, institutional and project preferences and levels of understanding (Pretty, 1994; 1995; Rifkin *et al.*, 1998; Biggs and Smith, 1998). This diversity is a reflection of the rapid growth in participatory approaches and methods during the last 20 years but often leads to confusion when comparing experiences within or between sectors. Working in primary human health care, Rifkin *et al.* (1998) cited three definitions of community according to geography, degree of shared interest and levels of risk to health problems. While epidemiologists tended to regard communities as specific populations defined by geographical or risk variables, health planners were interested in groups with shared interests who might for example, be willing to support a particular health intervention. In a more involved analysis of meanings of community, Jewkes and Murcott (1996) suggested that a community had a distinct geographical location, shared economic, socio-cultural and political interests, and shared problems and needs. Not surprisingly, social scientists have also been interested in the concept of community and have used social organisation, ethnicity, capacity for collective action and other defining criteria; 55 definitions of community were offered by Hillery (1955).

When using participatory methods, it is often possible to use local definitions of community to understand geographical and social boundaries, leadership, decision-making processes or other criteria that people use to describe their social structure and location. While in some cases local perceptions of community will fit western concepts e.g. administrative boundaries, in other cases communities can describe themselves according to complex social relationships and groupings which may vary over time. In the latter situation, it might be argued that researchers and development

workers should adapt their methods to suit these local definitions rather than impose their own criteria of what constitutes a community.

2.1.2 Meanings of 'community participation'

Community participation and similar terms were also subject to mixed interpretations and uses. While a typical dictionary definition of participation usually referred to some level of involvement of people in an activity or process, this definition was too vague when used in connection with development. Many of the attempts to define participation have identified different types of involvement of people in development processes. An early example was the eight levels of citizen control over initiatives or 'ladder of participation' described by Arnstein (1969) in the United States. Some years later four types of participation were described in relation to agricultural research. These types of participation were based on the nature of the relationship between researchers and farmers, and were described as contractual, consultative, collaborative and supporting farmers' research (Biggs, 1989). Other workers in agriculture have also used a four-tier definition of participation but related different types of participation to the power and scope of interaction between different players (Farrington and Bebbington, 1993). More recently, other attempts to characterise types of participation in agriculture have included Pretty's seven levels of community participation ranging from manipulation to mobilisation, as summarised in Table 1 (Pretty, 1995). The underlying theme behind these definitions related to the balance in control of decision-making, information and resources between outsiders and the community, with more involved types of participation requiring local people to take ownership of development activities.

Moving from 'Manipulative participation' to 'Self-mobilisation' in Table 1, people's participation became less passive and more active. As people participated more actively, they had the option of seeking technical assistance according to their own perception of need rather than according to external assessment. Commonly, development workers linked interactive participation (type 6) and self-mobilisation (type 7) to concepts such as local empowerment and decentralisation. Pretty based his analysis of community participation on a review of both successful and unsuccessful projects conducted over more than 15 years and concluded that development benefits in agriculture were more likely to be sustainable when community participation reached interactive participation (co-learning) and mobilisation (collective action). In common with Chambers (1994), the capacity of external agents such as professionals, government or aid personnel to empower communities was related to changes in professional behaviour based on learning with rural people and moves towards more holistic rather than sector-specific understanding.

In addition to the various typologies mentioned above, alternative typologies of participation included 11 levels of participation depending on people's control over information and initiatives (Adnan *et al.*, 1992) and four levels of participation depending on local people's involvement in key stages of projects (Guijt, 1991). Based on experience of working with children, Hart (1992) defined seven types of participation according to who was controlling the development initiative and Stiefel and Wolfe (1994) discussed 11 levels of participation, largely from a political perspective.

When discussing the use of participatory research in human health, seven levels of participation were identified by Cornwall (1996) and these have been incorporated into Table 1. In the literature on primary health services the meaning and uses of participation have been discussed at length in journals such as *Social Science and Medicine* and *Health Policy and Planning*. For example, current debate on the use of community participation in primary human health care gives some insight into the various meanings and applications of community participation which have evolved since the World Health Organisation's Alma Ata in 1978.

Table 1
Seven types of community participation (adapted from Pretty 1994 and Cornwall 1996)

Type of participation	Description
1. Manipulative participation (Co-option)	Community participation is simply a pretence, with people's representatives on official boards who are unelected and have no power.
2. Passive participation (Compliance)	Communities participate by being told what has been decided or already happened. Involves unilateral announcements by an administration or project management without listening to people's responses. The information belongs only to external professionals.
3. Participation by consultation	Communities participate by being consulted or by answering questions. External agents define problems and information gathering processes, and so control analysis. Such a consultative process does not concede any share in decision-making, and professionals are under no obligation to take on board people's views.
4. Participation for material incentives	Communities participate by contributing resources such as labour, in return for material incentives (e.g. food, cash). It is very common to see this called participation, yet people have no stake in prolonging practices when the incentives end.
5. Functional participation (Cooperation)	Community participation is seen by external agencies as a means to achieve project goals. People participate by forming groups to meet predetermined project objectives; they may be involved in decision making, but only after major decisions have already been made by external agents.
6. Interactive participation (Co-learning)	People participate in joint analysis, development of action plans and formation or strengthening of local institutions. Participation is seen as a right, not just the means to achieve project goals. The process involves interdisciplinary methodologies that seek multiple perspectives and make use of systemic and structured learning processes. As groups take control over local decisions and determine how available resources are used, so they have a stake in maintaining structures or practices.
7. Self-mobilisation (Collective action).	People participate by taking initiatives independently of external institutions to change systems. They develop contacts with external institutions for resources and technical advice they need, but retain control over how resources are used. Self-mobilisation can spread if governments and NGOs provide an enabling framework of support. Such self-initiated mobilisation may or may not challenge existing distributions of wealth and power.

Although the Alma Ata strategy *Health for All by the Year 2000* focussed on public participation in health services, twenty years later it was evident that health professionals still lacked a common framework for describing, analysing or measuring participation in service delivery (Zakus and Lysack, 1998). Analysing concepts of community participation in health in some detail, Rifkin (1996)

noted that health planners had taken two distinct and diametrically opposed approaches to community participation. In the first approach, health professionals had determined programme objectives and then attempted to convince communities to accept these objectives and collaborate with the programme. In some cases, community involvement was expected to include financial or other contributions. The resources allocated to this type of programme were controlled by professionals and programme success was usually determined according to technical, quantifiable health indicators. Community participation in this 'target-orientated' and 'top-down' approach was viewed by professionals as a means to an end.

The second approach to community participation used by health planners aimed to counteract inequalities in programme design and resource allocation by encouraging communities to become more involved in decision-making. In this 'empowering' and 'bottom-up' approach, local people set priorities and sought advice from professionals. Participation was viewed as a process through which communities, and particularly poor people, gained access to information and resources in order to take more control of their lives. Consequently, community participation was the end rather than the means and professionals acted as facilitators rather than controllers of change.

One of the main reasons for attempting to define participation has been lack of clarity over what participation actually means. Cohen and Uphoff (1980) noted the ambiguity of participation in the 1970s and suggested that it was basically a descriptive term encompassing various different activities and situations. While participation was widely supported by development agencies there was *"Also a real danger that with growing faddism and a lot of lip service, participation could become drained of substance and its relevance to development programmes disputable"*. Pretty (1995) noted the ubiquitous use of community participation by development organisations in more than 130 countries and suggested that interpretations and applications of the term varied widely according to different institutional aims and operational styles. For example, participation was used to justify contradictory objectives such as the extension of state control and the promotion of local institutions and self-reliance. In summary, although discussion on the meaning of participation has been a feature of the development literature for many years, agreement on a definition is not yet evident.

Articles on the meanings of participation are now so numerous that other workers have reviewed different typologies in order to identify weaknesses and common features. Discussing typologies of participation in relation to agricultural research and development, Guijt and van Veldhuizen (1998) suggested various limitations. First, there was the problem of classifying projects as static entities with respect to participation although changes occurred during the course of projects and different people participated in different ways at different points in time. The much-used distinction between 'community' and 'outsider' failed to recognise differences in types of participation within these two groups. Many typologies assumed that projects should automatically aim for a *"state of absolute and enduring local participation"* although the feasibility and desirability of 100% local participation was thought to be questionable. These workers also argued that the use of distinct levels of participation tended to over-simplify complex interactive processes into a 'participation thermometer' might encourage prescriptive use of typologies and hinder innovation.

3.0 The Development of Participatory Appraisal

The development of PA was influenced by two main bodies of experience which can be summarised as negative and positive experiences. Negative experiences included decades of poor success in rural development in non-industrialised countries and the widespread failure of aid programmes to improve the lives of poor people (Chambers, 1983). Associated with these failings was criticism of formal research and survey methods which often produced large quantities of unusable data at high cost. Despite the lack of quality information arising from this approach, development workers continued to seek descriptions of complex problems in rural communities according to western scientific principles and the development paradigm of top-down technology transfer persisted. One of the underlying but

unwritten principles behind technology transfer was that relative to developing nations, western perceptions, systems and views were superior.

Positive experiences which contributed towards PA development included lessons from Freirian-style adult education in Latin America (Freire, 1968); the methods of agroecosystem analysis developed at the University of Chiang Mai in Thailand (Conway, 1985); experiences from applied social anthropology such as the value of indigenous knowledge (IDS, 1979; Brokensha *et al.*, 1980), emic-etic distinctions and informal survey methods (Rhoades, 1982); contributions from field research on farming systems such as recognition of the complexity of farming systems and the capacity of farmers to conduct their own research and analyses (Farrington and Martin, 1988; Chambers *et al.*, 1989); and the methods of Rapid Rural Appraisal (KKU, 1987; Beebe, 1987; Gibbs, 1987; Grandstaff and Grandstaff, 1987). Although PA evolved from a diverse group of disciplines and professional experiences, the main influences were drawn from the social sciences and novel systems approaches in agricultural and ecological research. It comprised a mixture of old, rediscovered and new methods together with researcher attitudes that recognised that local people were best placed to describe and analyse problems in their own environments. This review uses the term participatory appraisal (PA) to encompass Participatory Rural Appraisal (PRA), Participatory Learning and Action (PLA) and various similar approaches and methods.

3.1 Negative experiences influencing the development of participatory appraisal

3.1.1 *The failings of top-down technology transfer*

As outlined in section 2.0, the 1960s and early 1970s saw the widespread application of the technology transfer mode of development in LDCs. In the agricultural sector technology transfer involved the use of more intensive farming systems which had been developed in temperate regions of western countries and required the use of externally-supplied seeds, fertiliser, pesticides, machinery and other inputs. The resulting increases in rice and wheat yields in countries such as India, the Philippines and Mexico became known as the Green Revolution and were considered by many to be a technological success (Ruttan, 1977; DeWalt, 1985). However, the limitations of this form of technology transfer soon began to emerge (Simmonds, 1985).

First, it was evident that the benefits derived from the new technologies were restricted to farms in areas with more favourable agro-climatic conditions i.e. areas for which the technologies had been originally designed, and uptake by farmers in more marginalised areas was low. According to Chambers and Ghildyal (1985), only resource-rich farmers with commercially orientated, often monocropped systems benefited from the farming systems which were introduced during the green revolution. Even in high potential areas, farmers were rarely able to match the yields reported by agricultural research stations and problems such as increasing pest populations and diseases, and reduced soil quality began to appear. In order to purchase the improved seeds, fertiliser or other inputs farmers entered into credit arrangements but were unable to pay off their debts when production failed to meet expected targets.

These negative ecological and socio-economic effects raised serious concerns over the sustainability and value of western-style agricultural systems in poorer areas of developing countries and led to calls for more holistic, systems-orientated approaches to agriculture research. While experiences in agricultural production were probably the most dramatic and widely documented problems associated with top-down technology transfer, comparable mistakes had also been made in livestock development.

3.1.2 Farming Systems Research

In response to the limitations of conventional agricultural research methods and technology transfer, a research approach called Farming Systems Research (FSR) was developed in the 1970s (Kearle, 1976). The FSR model was based on recognition that farmers possessed valuable knowledge and due to the complexity of farming systems, holistic and multi-disciplinary research was required (Kassorla, 1977). FSR used a four-stage framework comprising problem description followed by the design, validation and promotion of alternative technologies (Simmonds, 1985). While both problems and solutions were based on the perceptions of the researchers, the resulting technology 'packages' were aimed at the poor farmers who had not benefited from previous technology transfer initiatives. With hindsight, this aspect of FSR proved to be one of its major weaknesses because the research agenda was set by scientists in research institutes, governments or donor agencies rather than by the end-users of the new technologies (Biggs, 1980; Okali and Knipscheer, 1985). Another problem with FSR was the management of multi-disciplinary teams who rather than agreeing on research findings and presenting an holistic view of a system, become divided according to technical preferences. This often led to hierarchic and bureaucratic leadership of research teams who as a result, were less able to work with poor farmers (Biggs and Gibbon, 1986; Chambers and Jiggins, 1986).

FSR was also criticised because although researchers experimented with farmers, they did so using formal survey methods. Hence FSR researchers produced large quantities of data which required computer-assisted analysis (Conway, 1985). In some cases, scientific publications rather than practical solutions to farmers' problems were viewed as the most desirable research output (Biggs and Farrington, 1990). Many workers argued that this approach reduced the farmer's role to that of labourer rather than equal research partner (Baker *et al.*, 1988) and in general, farmers participation in FSR was thought to be unacceptably low (Chambers and Jiggins, 1986; Chambers, 1990; Baker, 1991). For example, *"Information has been obtained from farmers by outsiders, and analysed by them to decide what would be good for the farmers, leading to the design of experiments for testing and adaptation"* (Chambers, 1990).

Although FSR was often ponderous and controlled by scientists, some useful rapid (Hildebrand, 1982) and informal (Rhoades, 1985) survey methods were associated with the approach and later influenced the development of PA methods.

3.1.3 The use of formal surveys in rural development

In the early 1970s, development professionals working in agriculture and rural development became increasingly critical of the use of formal data collection methods in LDCs (Bulmar and Warwick, 1983; Chambers, 1983). In particular, the widespread use of the questionnaire as a survey tool was reviewed in the light of methodological constraints, the practical value of the data which was produced, and financial and time considerations.

According to Chambers (1983) the popularity of questionnaires in rural development surveys was linked to the scientific background of researchers and a misguided belief that rigorous, formal investigation was required before development projects could be designed and implemented. Consequently, questionnaires were widely used because the results could be easily quantified and findings from relatively small samples could be extrapolated to large populations. Variables could be measured and relationships between variables assessed using statistical methods. The advent of user-friendly computer hardware and software allowed more rapid and sophisticated data handling, statistical analysis and presentation of numerical data and therefore made questionnaire surveys easier to conduct.

Social scientists had been discussing the strengths and weaknesses of formal surveys in developing countries for many years. For example, the limitations of questionnaire surveys have been described

(Zarkovich, 1966; Moris, 1970; Zeller and Carmines, 1980) and in particular, the use of a western research tool in a foreign setting had attracted considerable criticism for reasons of cultural insensitivity (O'Barr *et al.*, 1973; Chen and Murray, 1976). Chambers (1983) argued that in rural areas of under-developed countries questionnaire surveys were difficult to design and administer, time-consuming and expensive to implement, and often produced results which were either wrong or which could only be confirmed by more research. When data analysis took place in an office or laboratory it became difficult to cross-check information or follow up interesting results because of the physical problem of relocating respondents in remote areas with poor roads and telecommunications. Furthermore, investigators had their own professional interests and consequently, they designed questionnaires according to their own technical background and information requirements. This situation was a reflection of the top-down development paradigm in which the views of scientists, professionals and academics were sacrosanct.

When discussing these constraints, it was also noted that researchers tended to use formal systems of inquiry because of peer pressure and career development incentives. The all-pervading publish or perish culture in academic institutions was a powerful influence on scientists from a wide range of disciplines³. Typically, on returning from overseas missions researchers were expected to publish their findings in scientific journals and almost inevitably, this required the presentation of numerical data, statistical analysis and probability statements. Despite this professional focus on western scientific, quantitative methods it was also argued that many studies which had used questionnaire survey failed to discuss important non-sampling errors⁴ such as enumerator bias.

The problems of non-sampling errors in questionnaire surveys was highlighted in a study in Nepal which cross-checked the results of a human fertility questionnaire survey based on the knowledge, attitudes and practices (KAP) approach (Stone and Campbell, 1984). The fertility survey had been conducted throughout Nepal under the Ministry of Health's Family Planning and Maternal and Child Health project and focussed on awareness and attitudes towards different methods of contraception. The cross-checking methods used by the researchers included repetition of the original questionnaire followed by informal interviews and conversation with questionnaire respondents, and tests on the intelligibility of the language used in the questionnaire. The results of cross-checking indicated that the original questionnaire survey had seriously underestimated the villagers' knowledge of family planning methods. For example, the official fertility survey had found that only 4.8% of respondents had heard of condoms whereas on cross-checking 95.0% of respondents had heard of this method of contraception. Linguistic testing of the questionnaire indicated that when the questions were read out as written they were fully or partially unintelligible to 80% of the respondents sampled.

³Although academics are partly evaluated according to the number of papers they publish, there are reports of substantial under-utilisation of research results e.g. Guba and Lincoln (1981). When assessing the use and relevance of papers indexed by the Institute for Scientific Information between 1981 and 1985, Hamilton (1990) reported that 55% of papers received no citations in the first five years after publication. A later review showed that of papers published between 1981 and 1997, 47% were never referred to again in the scientific literature, even by the researchers who conducted the original work. (Anon, 1998a).

⁴According to Nichols (1991), non-sampling errors are due to factors other than random variation between samples. Non-contacts, interview error, poor form design and errors in data processing all contribute to non-sampling error. Interviewer error could lead to misunderstandings between the interviewer and respondent. Although non-sampling errors are difficult to quantify, their effect on statistical analyses is understood and can be substantial. Non-sampling error (δ) is the mean bias (the mean systematic error) between the survey measurements and the intended 'true' value. The total error (ξ) of a survey is the sum of the sampling error (SE) squared and the non-sampling error (δ) squared (Zarkovich, 1966) i.e. $\xi = (SE)^2 + \delta^2$. Therefore, small increases in non sampling error have a large impact on total error.

The authors of the Nepal study proposed that non-sampling errors were responsible for the disparity between the original survey results and the cross-checked results, and that these errors were related to a 'cultural gap' between the people who designed the survey and the village respondents. It was suggested that the contextual setting of the survey was at odds with the socio-cultural norms of the communities involved. For example, the novel experience of villagers answering direct questions from unfamiliar interviewers in public was described as a contextual bias which reduced the chances of open and accurate responses (and had been discussed by other workers e.g. Chen and Murray, 1976). Related to this problem was the researchers' perception that people tended to provide answers which they believed the interviewers wanted to hear and also, failed to provide honest responses to questions of a personal or sensitive nature. Furthermore, the language used in the questionnaire was not easily understood by the respondents.

The researchers suggested that non-sampling errors tended to be ignored in many surveys in developing countries even though they could be greater than sampling errors. Reasons for the limited attention to non-sampling errors included difficulties in the direct measurement of these errors. Also, many researchers assumed that levels of non-sampling error in western contexts and Third World contexts were similar, usually insignificant and reduced by the use of large sample sizes. The contextual bias of using questionnaires in non-western settings, as demonstrated by the Nepal study, was an indication that researchers were insensitive to cultural and contextual factors in developing countries which could invalidate survey findings⁵. Negative experiences with health surveys in LDCs have not been restricted to Nepal. When reviewing health interview surveys generally in developing countries Kroeger (1983) concluded that epidemiologists "*have often failed to take notice of basic anthropological tools geared to establish cross-cultural contact, and communication is a precondition for avoiding severe interview biases*".

Looking more closely at the use of interviews as a means of collecting information, Slim and Thomson (1994) noted that while an interview was a common form of communication in western societies and contexts⁶, in other societies the interview was not always an "*established speech event*" in indigenous systems of communication. Hence in some situations, it was suggested that "*the interview form has a tendency to put unnatural pressure on people to find ready answers, to be concise and to summarise a variety of complex experiences and intricate knowledge. It may also mean that the researchers and interviewers unfittingly violate local communication norms relating to turn-taking, the order of topics for discussion or various rituals attached to storytelling. In some societies, individual interviews are considered dangerously intimate encounters*". When preparing to conduct interviews, it was advised that researchers should learn about cultural norms and people's "*communication repertoire*" - its particular forms, its special events, its speech categories and its taboos.

3.1.4 The biases of rural development tourism

The term rural development tourism was coined by Chambers (1983) when summarising a series of anti-poverty biases which affected researchers who were collecting data in rural areas of developing countries. It was argued that a typical survey often involved short visits to rural locations by 'outsiders' such as foreigners, professionals or government officials. These workers often failed to

⁵In terms of lessons learned by health institutions in Nepal and others from debate on appropriate research methods in rural areas, in 1998 KAP questionnaire surveys were still being used by health professionals in Nepal. Although a paper describing a KAP survey of kala-azar made no reference to possible sources of error in the survey methodology, the findings were deemed suitable for publication by the World Health Organisation (Koirala *et al.*, 1998).

⁶For example, western media often feature interviews for information or entertainment, people take part in polls and questionnaire surveys and the job interview is a standard part of gaining employment.

recognise and meet people who were the poorest and most in need of assistance. Consequently, during needs assessments and project design, the perceptions of the poor were overlooked. The biases of rural development tourism are summarised in Table 2 and include spatial, behavioural and logistical factors which all limited the capacity of well-educated, more wealthy and urban-based researchers to understand complex rural communities.

Table 2
The biases of rural development tourism (adapted from Chambers, 1983)

Type of bias	Key features
spatial	Most learning by outsiders about rural communities and conditions takes place near to urban centres or in the proximity of tarmac roads i.e. areas which tend to be better serviced and more prosperous than those where the poorest people often live. When outsiders visit rural communities, the poorest households are located at the periphery of a village and are overlooked.
project	Outsiders who wish to learn about rural conditions are directed towards villages where successful projects are in progress or have taken place. Such villages are visited repeatedly by researchers while other sites are ignored.
person	<p>Outsiders seeking contact with rural communities work through and are influenced by intermediaries who are biased against the poor. Such intermediaries can 'hide' the poor, limit access to the poor or inhibit open discussion when the poor are present.</p> <p><i>Elite bias</i> - Outsiders meet first and foremost with a local elite comprising elders, village headmen, traders, religious leaders, progressive farmers or professionals.</p> <p><i>Male bias</i> - The groups of local elite mentioned above are nearly always dominated by men.</p> <p><i>User bias</i>- When assessing a service or facility, outsiders meet those people who use the service or facility rather than those who do not.</p> <p><i>Active, present and living bias</i>- Outsiders tend to meet the healthy, active and wealthy rather than the sick, immobile and poor. The poor can be removed from the scene through migration or death.</p>
temporal	The tendency for outsiders to visit rural areas in the dry season(s) when access is easier but when conditions can be markedly different to the wet season(s).
diplomatic	In order to avoid embarrassment, to either themselves or local officials, outsiders avoid contact with the poor.
professional	Professionally trained outsiders are drawn to the better educated, more progressive and less poor. Professionals tend to have narrow, technically-specific interests which limit their capacity or willingness to take the wider perspective required to understand poverty.

Recognition of rural development tourism biases was to be an important factor in the development of rapid rural appraisal (RRA) because in part, RRA was designed to offset these biases and ensure that

outsiders met with poor people and incorporated their perceptions and needs into development projects.

3.2 Positive experiences influencing the development of participatory appraisal

When discussing the origins of participatory approaches and methods Chambers (1994) identified five bodies of experience which contributed towards the development of PRA, as summarised in Table 3.

Table 3
Influences on the development of participatory rural appraisal (adapted from Chambers, 1994; 1997)

Discipline/system of inquiry	Key aspects which contributed to PA	References
Applied anthropology	<ul style="list-style-type: none"> ▪ promotion of indigenous skills and knowledge. ▪ attention to flexible methods of learning. ▪ researcher attitudes and behaviour. ▪ self-critical awareness. ▪ emic-etic distinctions. ▪ informal survey methods. 	IDS (1979); Brokensha <i>et al.</i> (1980); Rhoades (1982).
Agroecosystem analysis	<ul style="list-style-type: none"> C multi-disciplinary analysis. C attention to research team management. C avoidance of mathematical models. C pattern analysis of time, space, flows and decisions. C visualisation methods to describe systems e.g. maps, calendars, flow diagrams and Venn diagrams. C identification and use of key system features rather than comprehensive analysis of all system features. 	Gypmantarsi <i>et al.</i> (1980); Conway, (1985).
Participatory activist research	<ul style="list-style-type: none"> C recognition of poor people as able investigators, analysts and planners. C critical self assessment by professionals. C the facilitating role of outsiders. C empowerment of the poor, weak, marginalised. 	Freire (1968); Cornwall and Jewkes (1995).
Research on farming systems	<ul style="list-style-type: none"> C promotion of farmers as knowledgeable, analytical experimenters who behave rationally. C use of informal surveys. C recognition of farming complexity and risk. 	Biggs (1980); Farrington (1988); Farrington and Martin (1988); Chambers <i>et al.</i> (1989).
Rapid rural appraisal	<ul style="list-style-type: none"> ▪ promotion of rural people's knowledge. C offsetting the biases of rural development tourism C attitudes and behaviour of outsiders. C interdisciplinary approaches; pluralism. C informal interviewing and visualisation methods. C triangulation to cross-check information. C concept of optimum ignorance. 	Chambers (1980);Carruthers and Chambers (1981); Beebe (1987); Gibbs (1987); Grandstaff and Grandstaff (1987); KKU (1987).

3.2.1 The adult education movement, participatory research and participatory action research

Experiences from the field of adult education in Latin America, Asia and Africa were among the most important influences on the development of PA. The basis of these experiences was often cited as Paulo Friere's book *Pedagogy of the Oppressed* (Friere, 1968) which provided a critique of conventional education processes and described how typical practices failed to teach poor people to challenge the inequalities and power relationships which affected their lives. Friere argued that without understanding and questioning their place in society, people were less able to take action to improve their situation. An alternative form of education was proposed in which learners were encouraged to take control over their own learning, and the acquisition of knowledge was closely linked to action. This approach required educators to recognise that poor people were able to conduct their own investigations and analysis, and that they were well placed to design and plan initiatives, and act. During this process, the role of the conventional educator shifted towards facilitation of research, learning and thinking among co-learners rather than prescriptive instruction. Hence, educators needed to modify their behaviour and attitudes towards poor people and had to be willing to enter into mutual research and learning processes.

In the mid 1970s the term 'participatory research' (PR) appeared in the literature on adult education and this practice was closely related to the Friirian themes of empowerment, research and learning systems linked to action, and appropriate researcher attitude (Fernandes and Tandon, 1981; Hall, 1981). Participatory research was promoted by the International Council for Adult Education (Tandon, 1988) and regional workshops were organised in Africa in 1979 (Kassam and Mustafa, 1982) and Asia in 1982 (SPR in Asia, 1982). 'Participatory action research' (PAR) developed along similar lines to PR but placed greater emphasis on 'acting' as a basis for learning and critical reflection (Fals-Borda, 1985; Fals-Borda and Rahman, 1991). In both PR and PAR the process of learning was as, if not more important than the research products. According to Cornwall (1996), *"PR aims to substitute a cyclical, ongoing process of research, reflection and action for the conventional linear model of research, recommendation, implementation and evaluation. Research becomes one mode of a continuing process of learning. Doing is reflected upon, raising more questions which in turn create further possibilities for action"*.

The adoption of PR and PAR was not restricted to education but included use in the agriculture and industry sectors (Whyte, 1991), primary health care (de Koning and Martin, 1996) and other areas of work. As a measure of the scope of PAR in the 1990s, Selener (1997) reviewed more than 1000 references and characterised the four major approaches and areas of development of PAR according to its application in community development, research in organisations, research in schools and farmer participatory research.

3.2.2 Agroecosystem analysis

Agroecosystem analysis (AEA) was developed in Thailand in between 1980 and 1985 at the universities of Chiang Mai and Khon Kaen. The method was designed to overcome the shortcomings of FSR and in particular, moved away from specialised data handling and analysis towards non-mathematical descriptions of the systems being studied. According to Conway (1985), the avoidance of conventional, quantitative analysis was intended to encourage the involvement of a wide range of individuals, particularly local researchers, in the analytical process rather than depending on a small number of highly skilled (often expatriate) operators.

AEA applied multi-disciplinary and systems-based analysis to agroecosystems⁷ which were described according to four main system properties - productivity, stability, sustainability and equitability. These system properties were defined as detailed in Table 4.

Table 4
The four system properties of agroecosystem analysis (from Conway, 1985)

System property	Description and measurement of system property
Productivity	The yield or net income per unit of resource.
Stability	The effect of relatively small, normal fluctuations in environmental variables such as climate; measured as the reciprocal of the coefficient of variation in yield or income.
Sustainability	The ability of a system to maintain productivity in the event of stress or perturbation. Stresses were regular, relatively small and predictable disturbances to the system e.g. soil salinity. Perturbations were large, unpredictable disturbances e.g. a rare drought or disease epidemic. No satisfactory methods of measuring sustainability were available.
Equitability	The distribution of products from an ecosystem among its human beneficiaries; measured using statistical distribution parameters.

Drawing on ideas from systems analysis (Checkland, 1981) AEA also recognised the need to identify levels of hierarchy within systems and understand the behaviour of each hierarchical level. In addition to using system properties as indicators of system behaviour, AEA also used these four properties to assess change and measure agricultural development. During this process, four important assumptions were made (Conway, 1985):

1. It was not necessary to know every detail of an agroecosystem in order to generate a useful and realistic analysis.
2. Knowledge of a few key functional relationships enabled understanding of the behaviour and properties of the system as a whole.
3. Within the system, a few key management changes could produce significant improvements in performance.
4. The recognition and understanding of key linkages and decisions could be based on a limited number of questions and answers.

Therefore, AEA did not aim to describe every aspect of a farming system but sought to identify key features that might be altered to improve the whole system. This aspect of AEA was similar to the

⁷ Conway (1985) defined a system as an assemblage of elements contained within a boundary which had strong functional relationships with each other but weak or no relationships with elements in other assemblages. The strong functional relationships between elements were such that a system had a distinctive behaviour and tended to respond to stimuli as a whole, even when the stimuli was applied to only one part of the system. In agroecosystems, an hierarchical relationship existed between for example, field-level, farm-level, village-level, watershed-level and regional-level systems and each level of hierarchy has to be studied in its own right.

notion of 'optimal ignorance' which was to become an important characteristic of RRA and later PA (see section 3.2.5).

In order to describe important functional relationships and system properties, AEA used the three patterns of time, space and flow that proved to be valuable in defining ecological systems (May, 1981). The initial focus on the analysis of these three patterns also had the advantage of acceptance to both natural and social scientists in multi-disciplinary teams. A fourth pattern called 'decisions' was also used in the pattern analysis in order to understand the role of human decisions and management in the system. The methods used in AEA included visualisation tools such as maps and transects to describe spacial patterns, graphs to describe changes over time, flow diagrams to illustrate movements of resources, and decision trees and Venn diagrams to show decision-making processes and power relationships between different players in the system. These visualisation methods, in which complex information was represented using simple diagrams, later became an important feature of RRA and PA.

3.2.3 Applied anthropology, emic-etic distinctions and rural people's knowledge

From the early 19th century well into the 20th century, social scientists and others had described non-western societies as primitive, savage and ignorant (Warren, 1989). This stereotypical image persisted well into the post-colonial era and to some extent, influenced the top-down development paradigm based on technology transfer. Development theorists regarded traditional practices as inefficient, inferior and an obstacle to development (Agrawal, 1995).

In general, social anthropology has been a discipline of description. Typical research methods included participant observation with detailed accounting of social structure, events and behaviour with minimal influence over these events by the researcher. According to Chambers (1994), social anthropologists began to take on a more applied role in the 1980s when work with other professionals in aid agencies, agricultural research centres and human health services was highly influential. Perhaps the most fundamental influence related to the distinction between the perspective, views and knowledge of outsiders (e.g. foreigners, professionals, urbanites) and the perspective, views and knowledge of rural people. Sometimes termed 'emic-etic distinctions' by anthropologists, understanding and acceptance of different world views influenced changes in the methods which were used by development workers and their attitudes towards rural people. These developments can be summarised as greater attention to rural people's knowledge, uptake of specific social anthropological approaches and methods, and the emergence of rapid data collection

a. Rural people's knowledge

Social anthropologists played an important role in showing other professionals that rural people had their own, complex knowledge which had developed over many years according to local environmental and socio-cultural conditions. Rather than seeing rural people as resistant to change and irrational because they rejected the inventions of technology transfer, research on local knowledge and skills demonstrated that these resources were valuable and could contribute towards development (IDS, 1979; Brokensha *et al.*, 1980). Renewed recognition of age-old indigenous crop and livestock production methods also showed how farmers were active experimenters and were constantly adapting to new opportunities and external pressures (Thrupp, 1989).

Much of the early development-orientated work on local knowledge regarded this attribute as essentially technical in nature. Hence, the initial focus was on practical skills and know-how which could be understood by scientists by reference to their own technical training. Accounts of indigenous crop production methods, animal husbandry or local tool-making are among the many descriptions of what became known as 'indigenous technical knowledge' (ITK) (e.g. Farrington and Martin, 1988; Howes, 1979; Swift, 1979). While attention to ITK became an inherent component of much

participatory research and was promoted by many academic institutions and NGOs, there was also concern that ITK was being appropriated by western scientists. In agroforestry, Thrupp (1989) noted how western scientists had extracted ITK from rural farmers, modified and repackaged the information, and then transmitted the new 'improved' information back to farmers. In addition, there is growing debate on intellectual property rights and the exploitation of local technical knowledge by western scientists, pharmaceutical companies and biotechnology multinational corporations (Agrawal, 1995).

Other workers tried to take a more holistic view of ITK and have argued that people managed resources within their own reality of the natural world and within a system encompassing social and cultural norms, and important political and power relationships (Scoones and Thompson, 1993). Hence the term 'rural people's knowledge' (RPK) has been used in an attempt to acknowledge the complex cultural, economic and political factors which influence how knowledge arises, how it is disseminated and used, and who benefits. Central to the concept and application of RPK was a need to *"account for the social and political forces at play in the interaction of contrasting, sometimes conflicting, knowledge systems"* (Scoones and Thompson, 1993). Also by reference to power relationships, Agrawal (1995) argued that the practical use of indigenous knowledge required recognition that indigenous knowledge in LDCs and western scientific knowledge were not distinct entities and their treatment as such led to increasing control of indigenous knowledge by outsiders. Knowledge systems in relation to PA are discussed in more detail in section 3.4.

b. Approaches and methods from social anthropology

Among the most important contributions from social anthropology to the development of PA was the use of informal research approaches and methods which initially, were adopted by FSR researchers (Hildebrand, 1982; Rhoades, 1982; Collinson, 1981). Interviewing skills, use of open rather than closed questions, personal attitudes and behaviour, and recognition of other people's body language and behaviour were inherent in social anthropological research methods in which qualitative data was actively sought. Analysis was based on the connections and differences revealed in the accounts of informants, all of which were considered to be important when presenting an holistic view. According to Park (1989), the typical participant observer or ethnographer often arrived at their findings using skills which were more of an art than a method. Informal surveys became an important tool in FSR (Rhoades, 1982) and later, semi-structured interviews were widely adopted as a central key method in PA.

c. Medical anthropology and rapid procedures in human health and nutrition

In addition to the use of social anthropological methods in the agricultural sector, anthropologists also began to influence research methods and service planning in the human health sector. A distinct discipline called medical anthropology began to emerge as health care planners began to realise that programmes had to be tailored towards people's cultural beliefs and practices, and that ethnographers were well equipped to collect this type of information (Pelto and Pelto, 1992). According to Foster (1975) medical anthropology emerged from conventional ethnography, the cultural and personality movement of the late 1930s and 1940s with its collaboration between psychiatrists and anthropologists, and the international public health movement after World War II.

At least two distinct methodologies were influenced by medical anthropologists *viz.* rapid assessment procedures (RAP) and rapid ethnographic assessment (REA). In RAP anthropological methods such as interviews, conversation, observation and focus groups were used to assess community views of health, disease and both traditional and modern health interventions. The methodology evolved from earlier work on health-seeking behaviour in Central America (Scrimshaw and Hurtado, 1984) and led to general primary health care (Scrimshaw and Hurtado, 1987) and disease-specific RAP guidelines and manuals.

Closely related to and influenced by RAP, was REA. The main difference between these two methods was that REA focussed on a single disease problem or group of related problems e.g. diarrhoea (Bentley *et al.*, 1988). Both RAP and REA were reviewed in detail by Manderson and Aaby (1992) who concluded that "*The development of rapid assessment procedures of various kinds have provided techniques to ensure that a community voice and cultural understandings are reflected in health policies and programmes*". These authors also advocated the wider use of qualitative research methods and noted that RAP could help health workers to identify the basic research questions that needed to be asked. In a similar vein, Annett and Rifkin (1995) mentioned the role of RAP and REA in addressing the problems of communities, particularly poor communities rather than individuals, and related these methods to action rather than research⁸.

3.2.4 Lessons from research on farming systems

Section 3.1.2 above outlines negative experiences from FSR that influenced the development of PA and section 3.2.3b describes some important methodological aspects of FSR, namely informal surveys which were a positive influence. In addition to the specific discipline of FSR, other workers were conducting on-farm research that did not fit into the typical FSR mode. For example, farmers' well-developed skills and capabilities were described as informal research and development by Biggs (1980), and Richards (1985) and Bunch (1985) showed how farmers were rational and adaptive researchers in their own right. The theme was later developed by other workers and farmers' participation in agricultural research was widely promoted (Farrington and Martin, 1988; Chambers, Pacey and Thrupp, 1989).

3.2.5 Rapid Rural Appraisal: its origins and key features

In the late 1970s various methods and ideas from the disciplines and systems of inquiry outlined in sections 3.2.1 to 3.2.4 above were transferred between professionals who were becoming increasingly frustrated with formal survey methods and development approaches. Experimentation began with less formal survey tools such as those used in social anthropology and agroecosystem analysis, and experience of indigenous knowledge systems began to merge with the field testing of informal interviewing, visualisation and other methods (Chambers, 1994). This mixing of experiences and new learning involved many individuals and institutions, and culminated in a landmark conference on RRA at the University of Khon Kaen, Thailand in 1985 (KKU, 1987; Chambers, 1994). This conference and the publications which followed established RRA as a practical and useful methodology with a sound theoretical basis (Beebe, 1987; Gibbs, 1987). Some key features of RRA are outlined below according to the training manual of McCracken *et al.* (1988).

a. Attitudes and behaviour of RRA practitioners

RRA practitioners were required to assess their own professional and cultural biases. Essentially, they needed to be genuinely willing to learn from local people, not lecture to them but actively and patiently listen. This required respect for local knowledge and culture, and a degree of humility.

b. The RRA toolkit - informal interviews and visualisation.

RRA methods included a wide range of interviewing, scoring and ranking, and visualisation methods. Of these, interviews were the most important group of methods because they were used alone but also

⁸Experiences from RAP and REA were later combined with the less extractive and more holistic aspects of PRA to develop 'rapid participatory appraisal' for use in health needs assessment, planning and implementation of services (Annett and Rifkin, 1995; Rifkin *et al.*, 1998). RAP and REA were also incorporated into 'Rapid Epidemiologic Assessment' (Smith, 1989; Vlassof and Tanner, 1982).

complemented and formed the basis for other tools. Interviews were generally informal and semi-structured, the latter being defined as *"Guided conversation in which only the topics are predetermined and new questions and insights arise as a result of the discussion and visualised analyses"* (Pretty *et al.*, 1995). Slim and Thomson (1994) discussed interview techniques at some length and advised that *"As well as patience, concentration, and a genuine commitment to listen and respect the views of others, a crucial interviewing skill is that of putting questions and guiding discussion. Interviews should not be straight-jackets which force narrators into unnatural and passive roles as objects of the process. Instead they should be semi-structured but guided encounters. Interviewers should be aware of their own body language, too: they should make eye contact and make culturally appropriate gestures to indicate agreement, enjoyment, sympathy understanding or encouragement. The ability to keep an open mind and respond quickly to the unexpected and spot interesting and unusual avenues for further questions is a vital ingredient of good interviewing. Thus a good interview is semi-structured and improvisational"*. One of the keys to good interviewing technique in RRA was the use of open rather closed questions.

The visualisation methods used in RRA were many and varied. They included mapping (natural resource maps, social maps, service maps), seasonal calendars, time-lines, transects, Venn diagrams, flow diagrams and numerous scoring and ranking tools including direct matrix ranking and proportional piling. These methods were described in detail in training manuals such as those produced by IIED (e.g. McCracken *et al.*, 1988) and others. The value of visualisation methods when working with farmers were discussed by Conway (1991) by reference to experiences in agroecosystem analysis and RRA. Noting the frequent misconception among professionals that illiterate farmers were incapable of constructing or understanding diagrams, the advantages of diagrams were stated as follows:

1. They were open-ended methods. The general subject matter was predetermined but precise details were added by informants according to their own perceptions.
2. Certain types of information could not easily be expressed verbally or in writing e.g. the boundary of a geographical area or elevation of a landscape. Diagrams could acquire and present information that was less precise or clear when written down. This clarity eased analysis of the information.
3. Diagrams were shared information that could easily be cross-checked by informants, discussed and amended.

Ranking and scoring tools were used to understand people's preferences for different items or services, or relate items to key characteristics of those items. Whereas ranking required informants to place items in order of importance (1st, 2nd, 3rd etc.), scoring tools usually involved counters such as stones or seeds. Examples of RRA-type tools that have been used by animal health workers are provided in section 6.0.

c. Managing groups in RRA

The RRA training curriculum for researchers included managing group interviews and exercises. Attention to group dynamics was used to identify those people who were talking and those who were not; various methods could be used to encourage less willing participants to contribute their views. RRA researchers were also taught how to handle dominant talkers in groups i.e. those people who talked to such an extent that other people were excluded from the discussion.

d. The use of key informants in RRA

Within communities, certain local people are recognised as possessing particular knowledge and skills. These local experts can be identified by asking people to identify others who know most about a certain topic and then seeing which names are mentioned repeatedly by different informants. Key informants can be used to provide very detailed information on specialised areas such as specific aspects of crop production, animal husbandry or human health.

e. Triangulation in RRA

Triangulation is the process of describing and analysing situations using a variety of methods and types of data. It is a way of cross-checking information by taking the results of one method and comparing them to the results of a different method or existing data. These findings might have arisen from different informants or groups of informants. Triangulation was an important mechanism for ensuring the validity of findings in RRA surveys.

f. Optimal ignorance in RRA

The concept of optimal ignorance in RRA is based on the notion that it is not necessary to know everything about a problem in order to decide how that problem should be solved. Rather, a description of the main features of a problem is usually sufficient for people to decide how to act. This aspect of RRA is designed to overcome the problem of excessive data collection in conventional surveys and a tendency to seek information that has limited practical value.

In summary, RRA was designed to use farmers' knowledge and skills when planning development projects and aimed to identify best-bet interventions. The system used a toolkit of interviewing, diagramming, ranking and mapping exercises with different social groups within communities and was characterised by its informality, flexibility and low-cost. Many RRA tools required researchers to use a list of prompts (a checklist), and the use of different tools combined with analysis of results in the field enabled immediate cross-checking of information at the field level (McCracken *et al.*, 1988). Although RRA surveys tended to avoid quantification or statistical analysis of data, this omission did not hinder the planning of priority inputs for development projects (Moris and Copestake, 1994).

Coinciding with the growth in RRA usage was the development of networks of practitioners and the publication of the informal journal RRA Notes in 1988 by the International Institute for Environment and Development (IIED). Consequently, experiences in RRA were widely disseminated in both industrialised countries and LDCs (Chambers, 1994). Specific examples of RRA tools are provided in section 6.0.

3.3 From Rapid to Participatory Rural Appraisal

While the use of RRA grew rapidly and new tools and ideas appeared in RRA Notes, its users were also aware of the limitations of the methods. In particular, RRA was viewed as essentially a process which was controlled by outsiders with the primary aim of data collection and analysis. In terms of the development of PRA, seven types of RRA had been outlined at the 1985 conference at Khon Kaen University and one type had been called 'participatory RRA' (KKU, 1987). This term was later used in IIED's four classes of RRA methodologies together with exploratory RRA, topical RRA and monitoring RRA (McCracken *et al.*, 1988). Although not mentioned in relation to RRA, discussion on community participation began to feature more regularly in other literature (e.g. Korten, 1981) and experiences were summarised in a World Bank-supported publication in 1985 (Cernea, 1985).

At field level, various organisations became interested in participatory RRA in which researchers took on the role of facilitators who encouraged local analysis and ownership of information, leading to community action plans. Experiences in Kenya (Kabutha and Ford, 1988) and India (McCracken, 1988) were reported as 'participatory rural appraisal' and 'participatory rapid rural appraisal' respectively and prompted considerable interest, particularly in NGOs in India where numerous training courses in participatory rural appraisal (PRA) were conducted (e.g. Ramachandran, 1990); Indian experiences in PRA were later collated by Mukerjhee (1993). In order to disseminate information on PRA to an international readership, the Sustainable Agriculture Programme at IIED organised 30 field-level workshops in 15 countries, published papers about PRA in RRA Notes, and produced guides and training manuals (e.g. McCracken *et al.*, 1988; Gueye and Freudenberg, 1990, 1991; Theis and Grady, 1991).

As experiences with PRA developed, the distinctions between RRA and PRA became more obvious. In relation to RRA, PRA was characterised by greater facilitation rather than investigation by outsiders, more local analysis, ownership and use of information, and ultimately, local capacity to plan and take action (Chambers, 1997). The actual methods used in PRA were on the whole, similar to those used in RRA although RRA has tended to use more interviewing methods, secondary data and observation whereas PRA has focussed on visualisation methods and scoring and ranking exercises (Cornwall *et al.*, 1993). However, although there was overlap in the methods used commitment to the empowering aspects of PRA required personal and institutional change in order to hand over control of data analysis and use to local people (Chambers, 1997).

3.4 Alternative Learning Paradigms: Participatory Learning and Action

Some of the most recent conceptual and methodological issues arising from experiences with participatory approaches and methods have focussed on aspects of human knowledge, the control and use of knowledge, and the methods by which knowledge is acquired and validated (Pretty, 1994, 1995; Scoones and Thomson, 1993; Agrawal, 1995). In the literature on these topics one of the most prominent points of discussion has been the role of western science in human development and the limitations of positivist theories⁹ and methods in agricultural development in the late 20th century. Central to this theme has been the failure of positivism and conventional science methods to provide sustainable benefits to an increasing number of impoverished people in rural areas of the developing world. Although different kinds of knowledge influence the way human beings behave and act *viz.* instrumental knowledge, interactive knowledge and critical knowledge, it is instrumental knowledge derived largely from conventional, western controlled systems which dominates development policy and processes (Habermas, 1972; Park 1989).

3.4.1 Positivism, instrumental knowledge and 'good science'

According to Pretty (1994, 1995) science in the 1990s is automatically equated with objective descriptions of reality. The Cartesian paradigm based on the discovery and control of nature is omnipresent in the powerful institutions of industrialised countries. This positivist and reductionist paradigm assumes that the world can be described by reference to facts and laws which are discovered using methodologies based on a strict separation of the object of inquiry from the investigating subject. This process requires a complex world to be compartmentalised into manageable units which are suitable for controlled manipulation and investigation. Perhaps due to the many successes of this approach and the obvious advances in technology and medicine which have occurred this century, highly controlled and context-free investigation is considered to be 'good science' and the only

⁹Positivist theory dictates that every rationally justifiable assertion can be scientifically verified or is capable of logical or mathematical proof.

rational way to determine how human development should proceed. In this process, instrumental knowledge overrides other forms of knowledge and positivism dominates scientific method.

However, according to Scoones and Thompson (1993) the weaknesses of positivist, rationalist, western scientific epistemologies have attracted much discussion. For example, there are other forms of knowledge which play important roles in influencing change in human society. In addition to instrumental knowledge, Habermas (1972) described interactive knowledge and critical knowledge. The former was acquired by people living with other human beings and experiencing basic human interactions. This knowledge did not result from the analysis of data about other human beings but from sharing a life and world together, speaking with one another and exchanging actions against the background of common experience, tradition, history and culture. Interactive knowledge made human community possible as it enabled social solidarity through mutual support and common action. Critical knowledge was described as the kind of knowledge that derives from reflection and action, which makes it possible to deliberate questions of what is right and just i.e. human value judgements.

When these types of knowledge are understood, the limitations of instrumental knowledge as an apparently all-persuasive instigator of change become clear. Although western science might provide people with facts, the possession of interactive and critical knowledge means that people interpret and use these facts according to their perception of the world and what they wish to achieve as self-reliant and self-determining social beings (Park, 1989). Essentially, the *"process of knowing should be seen as interactive, value-bound and context determined, rather than detached, value free and independent of context"* and therefore *"interpretation, translation and representation are social acts that cannot be assumed to be neutral and objective"* (Scoones and Thompson, 1993). According to Pretty (1994; 1995) the positivist paradigm failed to recognise that all data are constructed within specific social and professional contexts, and results are open to different interpretations according to the perceptions, social and economic interests of different interest groups and individuals. In agriculture, the dichotomy between western scientific facts and uptake of new technology by poor farmers has been apparent since the Green revolution. In those areas where technology was not a perfect fit to local systems or where farmers were not highly controlled, agricultural modernisation was not adopted by rural people.

In other natural sciences there was also evidence that conventional methods of investigation and problem solving had severe limitations. For many years, pastoral rangelands in Africa were described by ecologists using linear theories which had arisen from work on relatively stable environments. Succession theory in ecology dictated that a stable, equilibrium environment was created from a linear series of events, with each stage influencing the next stage. Related to this theory was the use of 'carrying capacity' to measure the optimum number of livestock or wildlife that a particular area of rangeland could support (Behnke *et al.*, 1994). This analysis of rangeland ecology led to numerous attempts to improve the productivity of pastoral livestock production systems through enclosure of rangeland, improvement of rangeland fodder, ranching schemes and other interventions which to varying degrees were all designed to increase human control over the environment. However, succession theory was found to be seriously flawed when applied to dryland environments with highly variable rainfall. Instead of progressing through a set of neat stages towards a stable, optimum situation, dryland areas were characterised by multiple, co-existing states with varying degrees of stability. The optimum use of this non-equilibrium environment required mobile, opportunistic livestock management which was able to respond to natural variations in resource location and availability. Ironically, this type of management had been used by pastoralists for hundreds of years. Comparative studies of typical pastoralism and ranching in dryland areas demonstrated the superior productivity of the former (Scoones, 1994).

On a global scale, the serious environmental issues facing human development have led many workers to seek alternative ways of describing the world and understanding complex relationships. According to Chambers (1997), *"In the natural sciences, conventional approaches, using hard*

systems and reductionist assumptions and methods, are in crisis when faced with many of our important problems".

3.4.2 Alternative systems of inquiry and action

Although the positivist influence on scientific method is extremely powerful, many workers have noted that positivism is only one way of describing and trying to change the world (Kuhn, 1962; Feyerabend, 1975; Habermas, 1987; Giddens, 1987; Uphoff, 1992). Various bodies of knowledge and methodology development suggest that alternative systems of inquiry and learning might provide more holistic and yet context-specific analysis and problem solving (Pretty, 1994; Chambers, 1997). Hence disciplines and theories such as chaos theory, constructivist theory, soft systems methodology, post-modern social science and even business management share similarities and to varying degrees have emerged in parallel to participatory approaches and methods.

a. Chaos theory

Chaos theory highlights the importance of recognising change as an inevitable, inherent characteristic of systems and environments, and proposes that systems at the edge of chaos are better able to respond to change (Gleick, 1988). Hence, conventional notions of sustainability as the ultimate goal of many development programmes seem flawed if transition is continuous and systems exist in environments which are constantly changing. While positivists view sustainability as a linear convergence of events leading to an optimum, stable situation, in chaos theory such a situation never exists. In comparison with positivist paradigms, chaos theory advocates rapid, adaptive and holistic learning.

b. Constructivist theory

Constructivist theory examines knowledge, human behaviour and concepts of reality and truth. The theory dictates that reality, truth and knowledge only exist in the context of a human mental construct and consequently, any system of inquiry is value-bound and findings are influenced by interactions between object and subject (Lincoln and Guba, 1985). Constructivism advocates that the selection of theories and methods should be made according to context, and hence should be flexible. These ideas are reflected in the naturalistic paradigm of inquiry.

c. Soft systems methodology

Soft systems methodology (SSM) emerged in the 1970s in response to the limitations of conventional engineering to solve complex problems (Checkland, 1981). In contrast to hard systems which were associated with well-defined objectives, soft systems acknowledged that problem situations were often ill-defined and messy. Like participatory action research (section 3.2.1), learning and conscious reflection was an intrinsic part of SSM and consequently, SSM used the process of inquiry as a research object in itself. According to Bulow (1989 - cited by Checkland and Scoles, 1999), *"SSM is a methodology which aims to bring about improvement in areas of social concern by activating in the people involved in the situation a learning cycle which is ideally never-ending. The learning takes place through the iterative process of using systems concepts to reflect upon and debate perceptions of the real world, taking action in the real world, and again reflecting on the happenings using systems concepts"*.

d. Business management and development

Similarities between participatory development and business management were noted by Chambers (1997). For example, the business management guru Tom Peters advised managers to empower people, love change, learn to listen and delegate responsibility to those at the frontline (Peters, 1989).

The bottom-up, people-centred aspects of PRA are strikingly similar to the concept of 'customerizing' in which businesses emerge and adapt according to what people want. Peters (1992) warned that "*We (the business) are still at the centre of the universe presenting them (the customer) with a carefully crafted menu of offerings. It misses that huge Disney leap into their creating us. Customer-as-initiator is the point*".

When describing learning organisations McGill *et al.* (1992) stressed the importance of continuous experimentation and feedback if organisations wanted to define and solve problems successfully. The behaviour of managers in learning organisations was characterised by openness, systemic thinking, creativity, self-efficacy and empathy.

3.4.3 The principles of participatory learning and action (PLA)

By the mid-1990s a diverse range of participatory approaches and methods had been developed by practitioners working in different technical sectors and operational contexts. Thirty two participatory systems of inquiry were listed by Pretty *et al.* (1995)¹⁰ and it was suggested that these and other systems shared a number of important common principles. These principles were brought together using the rubric term participatory learning and action (PLA) (Pretty, 1994, 1995) and are summarised as follows:

1. A defined methodology and systemic learning process

The focus was on cumulative learning by all participants, which included both professional trainees and local people. Given the focus of these approaches as systems of joint analysis and interaction, their use had to be participatory.

2. Multiple perspectives

A central objective was to seek diversity rather than simplify complexity. This recognised that different individuals and groups made different evaluations of situations, which led to different actions. There were multiple possible descriptions of real-world activity and all views were important.

3. Group learning process

Group learning was based on the recognition that the complex nature of the world was best revealed through group analysis and interaction. Three possible mixes of investigators were suggested: those from different disciplines, those from different sectors and from the outside (professionals) and inside (local people). Within each of these combinations, there were other types of mix e.g. not all local people in a community were the same.

¹⁰ Including Agroecosystem Analysis (AEA), Beneficiary Assessment (BA), Development Education Leadership Teams (DELTA), Diagnosis and Design (D&D), Diagnostico Rural Participativo (DRP), Farmer Participatory Research (FPR), Groupe de recherche et d'appui pour l'auto-promotion paysanne (GRAAP), Methode Accelere de Recherche Participative (MARP), Participatory Analysis and Learning Methods (PALM), Participatory Action Research (PAR), Process Documentation (PD), Participatory Learning and Action (PLA), Participatory Rural Appraisal (PRA), Participatory Rural Appraisal and Planning (PRAP), Participatory Research Methods (PRM), Participatory Technology Development (PTD), Rapid Appraisal (RA), Rapid Assessment of Agricultural Knowledge Systems (RAAKS), Rapid Assessment Procedures (RAP), Rapid Assessment Techniques (RAT), Rapid Catchment Analysis (RCA), Rapid Ethnographic Assessment (REA), Rapid Food Security Assessment (RFSA), Rapid Multi-perspective Appraisal (RMA), Rapid Organisational Assessment (ROA), Rapid Rural Appraisal (RRA), Samuhik Brahman (Joint trek), Soft Systems Methodology (SSM), Training for Transformation and Visualisation in Participatory Programmes (VIPPP).

4. Context specific

The approaches had to be flexible enough to adapt to each new set of conditions and actors, and so there were multiple variants. Invention of new methods was encouraged.

5. Facilitating experts and stakeholders

Professional and outside 'experts' should act as facilitators and assist local people to conduct their own study in order to achieve something according to their own perception of need.

6. Leading to change

The participatory process led to debate about change. In turn, debate changed the perceptions of the actors and their readiness to contemplate action. The process of joint analysis and dialogue helped to define changes that would result in improvement and motivate people to take action. This action included local institution building or strengthening, so increasing the capacity of local people to initiate action independently of outsiders.

This review uses the terms participatory appraisal (PA) to encompass philosophical and methodological aspects of RRA, PRA and PLA. PA acknowledges that participatory approaches are not always rapid, conducted in rural situations or used by institutions that are likely to shift their orientation towards involved levels of community participation in the near future. The appearance of PLA as a distinctive but broad group of learning and facilitation methods was also accompanied by renewed debate on the validity of information that was produced by participatory methods.

3.4.4 Issues of validity in participatory learning and action

a. Validity in qualitative and quantitative research

For many years systems of inquiry based on qualitative methods have attracted criticism, particularly from researchers who rely on quantitative approaches (Maxwell, 1992). Whereas quantitative and experimental research used well-defined measures of data quality such as internal and external validity, reliability and objectivity, qualitative research was thought to lack a standard system for assuring the trustworthiness of data. Consequently, qualitative methods were associated with poor quality, second-rate work and informal methods were interpreted as highly subjective and undisciplined (Moris and Copestake, 1993). Qualitative researchers have responded to these criticisms in various ways but the main points of discussion have focussed on fundamental differences in the nature of qualitative and quantitative research and, alternative means to validate qualitative research methods.

In quantitative research issues of validity and reliability are usually addressed during the design stage of the research. Techniques such as random sampling, selection of appropriate sample sizes and use of controls help to ensure that data is accurate and reliable (Maxwell, 1992) and enables the use of probability statements to describe associations in large populations. However, qualitative research is often more to do with understanding particulars in specific contexts rather than extrapolating findings to a general population with similar characteristics to the research sample. The process of understanding in qualitative research requires methods that are more inductive and therefore, sources of error cannot always be predicted at the onset of the research. Hence, qualitative researchers tend to respond to validity problems as they arise during the course of the research. In part, the validity of findings in this situation is dependent on the skill of the researcher and their capacity to cross check data as it emerges and confirm or refute previous findings. In terms of the types of knowledge described in section 3.5.1, qualitative research often aims to understand interactive or critical knowledge which is derived from very different processes to those which produce instrumental knowledge. Consequently, it has often been argued that validity measures for instrumental knowledge should not be applied to other types of knowledge (Park, 1989).

b. Validity in participatory surveys: comparisons of participatory and formal data

In the literature on participatory approaches and methods, the question of validity has often been discussed. In justifying RRA methods in comparison with questionnaire surveys, Chambers (1997) cited five examples in which the results and use of RRA surveys compared favourably with questionnaires and in some cases, were considered to be more accurate than the questionnaires. In all cases, RRA was more rapid and less time-consuming and costly. Participatory maps were also found to compare well with official maps (three examples) and census data collected using participatory methods was found to be more accurate than questionnaire results (seven examples). Working in Nepal, Gill (1991) compared farmers' diagrams of rainfall patterns with 20 years of rainfall data from the nearest meteorological station. This comparison showed that in some respects, farmers' judgements were superior to the averaged, official data.

c. A framework for judging trustworthiness in participatory inquiry

Participatory research is holistic and encompasses aspects of instrumental, interactive and critical knowledge. As participation forms the basis for this research paradigm, it has been suggested that the process of assessing the validity of participatory research should also be participatory in nature i.e. participatory evaluation (Fernandes and Tandon, 1981). An initial attempt to design a system for validating alternative systems of inquiry, specifically naturalistic inquiry, identified four 'trustworthiness criteria' which were called credibility, transferability, dependability and confirmability (Guba, 1981). However, these criteria were considered to be too closely linked to the conventional measures of internal validity, external validity, reliability and objectivity respectively which were used in conventional science, and hence additional 'authenticity criteria' were proposed (Lincoln, 1990). Drawing on these criteria together with the 'goodness' criteria of Marshall (1990) and Smith (1990), workers at IIED developed a framework for judging trustworthiness comprising 12 criteria as detailed in Box 2 (Pretty, 1994).

Pretty suggested that the criteria in this framework could be used to judge the quality of participatory inquiry. It was proposed that although the absolute certainty of the data could only be verified by reference to objective measures of validity, the framework was sufficient to enable independent observers to understand how the process of information gathering had taken place and identify whether important elements of the process had been omitted. With this in mind, people could make judgements on whether they trusted the data.

3.4.5 Methodological complementarity

In general the literature on the relative values of quantitative and qualitative research methods is characterised by workers who seek to defend their own approach rather than learn from other disciplines. The tendency has been towards a dichotomy in methodological development in which criticism of quantitative methods by qualitative researchers and vice versa has prevented constructive dialogue. For example, qualitative research methods were described as "*one-shot case studies which were well-nigh unethical*" (Campbell and Stanley - cited by Maxwell, 1992) whereas qualitative researchers have bemoaned the widely held view that true knowledge or good science is only associated with positivist theories and methods (Park, 1989; Pretty, 1994).

Based on experience of using both quantitative and qualitative methods to investigate the same problem, Trend (1978) advised that combined approaches were useful but only if separate studies were conducted and the qualitative and quantitative results were combined "*late in the analytical game*". It was felt that researchers tended to use one or the other approach and few were comfortable with handling both types of methods and data, partly because procedures for dual methodologies were not well developed and hence "*The tendency is to relegate one type of analysis or the other to a secondary role according to the nature of the research and the predilections of the investigators*".

Box 2

A framework for judging the trustworthiness of participatory learning and action (source: Pretty, 1994)

1. Prolonged and/or Intense Engagement between the Various (Groups of) People.
For building trust and rapport, learning the particulars of the context, and to keep the investigator(s) open to multiple influences.
2. Persistent and Parallel Observation.
For understanding both a phenomenon and its context.
3. Triangulation by Multiple Sources, Methods and Investigators.
For cross-checking information and increasing the range of different peoples' realities encountered, including multiple copies of sources of information, comparing the results from a range of methods and having teams with a diversity of personal, professional and disciplinary backgrounds.
4. Expression and Analysis of Difference.
For ensuring that a wide range of different actors are involved in the analysis, and that their perspectives and realities are accurately represented, including differences according to gender, age, ethnicity, religion and class.
5. Negative Case Analysis.
For sequential revision of hypotheses as insight grows, until one hypothesis accounts for all known cases without exception.
6. Peer or Colleague Checking.
Periodical review meetings with peers or colleagues not directly involved in the learning process, so as to expose investigators to searching questions.
7. Participant Checking.
For testing the data, interpretations and conclusions with people with whom the original information was constructed and analysed. Without participant checks, investigators can make no claims that they are representing participants' views.
8. Reports with Working Hypotheses, Contextual Descriptions and Visualisations.
These are descriptions of complex reality, with working hypotheses, visualisations and quotations capturing people's personal perspectives and experiences.
9. Parallel Investigations and team Communications.
If sub-groups of the same team proceed with investigations in parallel using the same approach, and produce the same or similar findings, then these findings are more trustworthy.
10. Reflexive Journals.
These are diaries that individuals keep on a daily basis to record a variety of information about themselves.
11. Inquiry Audit.
The inquiry team should be able to provide sufficient information for an external person to examine the processes and product in such a way as to confirm that the findings are not a figment of their imagination.
12. Impact on Stakeholders' Capacity to Know and Act.
For demonstrating that the investigation or study has had an impact, for example if participants were more aware of their own realities, as well as those of other people. The report itself could also prompt action on the part of readers who have not been directly involved.

As PLA was developing as a distinctive group of participatory approaches and methods with common principles and criteria for validity, various researchers were considering options for combining PLA with formal methodologies (Abbot and Guijt, 1997). This interest in mixing methods recognised that

participatory investigation was not suitable for all purposes. For example, while PLA often yielded useful location-specific data this scale of information was not always relevant to policy makers.

Therefore, the question arose as to whether combined methods might produce information which described local concerns in the context of broader regional or national level situations. Various examples of combined formal-participatory methodologies were presented in volume 28 of *PLA Notes* in 1997. Different sequencing of methods were reported such as the use of a questionnaire survey followed by PRA (Leach and Kamangira, 1997), and an opposite approach in which an initial participatory survey was used to guide the design of a questionnaire (Davis, 1997). Both combinations were thought to be useful.

A recent DFID project entitled 'Methodological Framework for Integrating Qualitative and Quantitative Approaches for Socio-Economic Survey Work' summarised different combinations of methods and revisited Guba's four tests of trustworthiness as mentioned in section 3.4.4c (Anon, 1998b). One group of mixed methods includes swapping tools and attitudes from informal to formal and vice versa. This approach considered options for incorporating informal methods such as semi-structured interviews or longer PRA sessions into conventional, structured questionnaires leading to the concept of 'participatory questionnaires'. Other ideas were to use participatory mapping to create sampling frames for social surveys and use qualitative insights to inform the choice of cluster variables in cluster analysis.

Regarding options for the use of formal methods in informal surveys, the researchers noted the limitations of participatory surveys in terms of extrapolation of findings to larger populations and suggested that probability-based sampling was required¹¹. This need was related to the apparent weakness of Guba's test of validity called transferability (equivalent to external validity in formal methods). It was also proposed that statistical analysis could be conducted on unbalanced, binary, categorical and ranked data sets using analysis of variance and multi-level models. In addition, the application of Bayesian statistics to qualitative but scored cause-effect diagrams was suggested.

Although not mentioned in the above report, participatory methods had already been combined at field-level and produced useful results. One example of this adaptation of PA was the use of matrix ranking by agricultural researchers in Zanzibar to quantify local knowledge on the performance of different varieties of ginger and mango (de Villiers, 1996). The research methodology involved interviews with key informants followed by the development of matrices in order to compare the performance of different types of crop according to variables such as shade and soil fertility. The matrices were drawn on the ground and crops and variables were represented using objects which were to hand, such as leaves and stones. Results were analysed using analysis of variance and the Students t-distribution. The researcher noted that while the information obtained using these methods was collected over a six month period, comparable data from conventional field trials would have taken over 40 years to collect.

During the initial development of RRA and PRA there was a deliberate move away from the quantification of data and use of statistics. This aspect of participatory methodologies encouraged workers to recognise that the collection of large quantities of data and detailed analysis was often unnecessary in order to make rational decisions about local problems and make plans in response to these problems. Typically, the presentation of data from RRA/PRA surveys was informal and included hand-written notes, copies of diagrams which had initially been drawn on the ground and sketch maps.

¹¹Also see section 5.0 which discusses sampling procedures in animal health questionnaire surveys in LDCs and in particular, describes the limited use of random sampling due to logistical and other constraints. Hence, even in formal surveys, random sampling is not always used.

This approach meant that reports could be collated rapidly and decisions on action could be made without too much delay. Accuracy of results was determined by triangulation and community meetings in which the final results were presented, discussed and amended as necessary. As a measure of the increasing interest in the statistical analysis of data produced by PA tools, the informal journal *PLA Notes* published guidance on the use of ranks as statistics in 1998 (Fielding *et al.*, 1998). This paper suggested ways to collect ranks and analyse the results using tests such as Kendall's coefficient of concordance and Friedman's test.

3.5 The rapid growth of participatory approaches and methods: conceptual, methodological and other concerns

As noted in section 2.1, the rapid growth of participatory approaches and methods was associated with mixed interpretations and uses of community participation by development agencies and others. An editorial in *PLA Notes* in 1995 (Anon, 1995) outlined real or potential problems with the practice of PRA and these ideas were later expanded in volume 24 of *PLA Notes* in the same year. Some of these concerns were summarised by Guijt and Cornwall (1995) (Box 3) and in particular, confusion over definitions, principles and objectives.

Definitions of PRA varied from an approach or process to a narrow set of data collection tools. The need to produce a single definition of PRA was questioned in view of the flexible, adaptive and learning nature of PRA and attempts by its practitioners to move away from established, often dogmatic practice. While some workers recognised the creative and innovative aspects of PRA which encouraged methodology development in the field, others preferred to associate PRA with pre-defined, even prescriptive methods. Related to confused definitions was a lack of clear objectives. Whereas RRA tended towards data collection controlled by outsider's agendas, PRA was intended to enable people to set their own agendas according to local priorities. The balance between data collection and analysis, and the more empowering aspects of PRA was often skewed towards the former, though was still called 'participatory'. Hence, extractive processes were wrongly labelled as PRA.

The production of numerous method-focussed PRA training manuals tended to reinforce perceptions of PRA as a toolkit rather than a learning process. While the methods were often novel and easy to learn, PRA also required changes in professional and personal attitudes and behaviour. When researchers concentrated on method, diagrams, data and reports became the main output of PRA and contextual and interactive features were overlooked. It was difficult to train people to view social interactions and context as crucial in PRA. Another key cause for concern in PRA practice was raised expectations and an assumption by those involved that assistance from a project or others was guaranteed. Therefore, when the objectives of PRA were not clearly and carefully explained to community members, people assumed that because they had talked about a particular problem that material or other resources would appear automatically.

Perhaps the most fundamental concern regarding the use of participation and PRA was the issue of power relationships, either between 'outsiders' and 'insiders', or between different groups or individuals within communities. For example, Mosse *et al.* (1995) felt that PRA was not very useful for understanding the social dynamics of communities or the reasons why marginalised groups might be excluded from decision-making or project benefits. It was also noted how community leaders could direct PRA towards their own aims or attempt to undermine activities that had no obvious benefit to themselves. In terms of outsider control over participatory development, Pottier (1997) claimed that "*Whatever the PRA pundits say about relaxed settings, participatory workshops are structured encounters marked by hidden agendas and strategic manoeuvres*". Similarly, when discussing experiences in community health in Kenya, Nyamwaya (1997) described the rhetorical use of participation and how local people had limited role in prioritising health needs. In this case, "*Development is still effected in a top-down manner, and there is always the implicit assumption that*

communities can only develop once they have assimilated specialized technical and material inputs from the outside" and "while in theory communities are supposed to play a leading role in the health development process, the process is still largely controlled by government and NGO development 'experts' who do not allow communities to play major roles".

To some extent, misunderstanding and misuse of participation was linked to the expansion of PA from small, often field-level situations to large-scale, sometimes politically-motivated institutions. At the time of writing, the 'scaling-up' or institutionalisation of participatory approaches and related power dynamics between development agencies and rural people was becoming a prominent theme in the development literature (e.g. Thomson, 1995; Blackburn and Holland, 1998).

Box 3

Some concerns over the use of participatory approaches and methods (source: Guijt and Cornwall, 1995)

- C There is an assumption that using PRA methods and/or approach in itself brings about positive change.
- C There is a lack of conceptual clarity, transparency and accountability.
- C Emphasis has been placed on information extraction with the rhetoric of political correctness.
- C Assumptions about community harmony have been unchallenged.
- C A lack of in-depth analysis has obscured awareness of political realities within communities.
- C There has been one-off training with no follow-up by trainers of institutions.
- C PRA has been poorly integrated into project planning and implementation.
- C The reasons for using PRA have are not always clear.
- C Agendas have been driven from outside the community, not from within.
- C Co-option of the PRA acronym, making it a label without substance.

4.0 Animal Health Services in African Drylands

Livestock disease has often been described as a serious constraint to both macro-level economic development in Africa (Tambi and Maina, 1999a) and the well-being of millions of poor livestock keepers (Holden *et al.*, 1998)¹². Disease-related economic losses have been estimated at US\$ 4 billion annually for Africa as a whole (Huhn and Baumann, 1996) and specific loss estimates are available for rinderpest (Tambi and Maina, 1999b), trypanosomiasis (Swallow, 1997), tick-borne diseases (Mukhebi *et al.*, 1992; Norval *et al.*, 1992; de Vos, 1992) and other animal health problems. Although progress has been made towards the eradication of rinderpest (Masiga, 1996) other diseases of major importance such as contagious bovine pleuropneumonia (CBPP) and foot and mouth disease continue to cause substantial losses and restrict international trade opportunities (Rweyemamu, 1998).

¹²A distinction between large-scale and local-scale development is made here because national economic growth does not necessarily result in reduced poverty (UNDP, 1997).

4.1 The early development of modern veterinary services in Africa

The development of modern veterinary services in Africa is often associated with the colonial armies and their need to protect cavalry and pack horses against disease. Examples of army veterinary services have been described as early as 1795 in South Africa (Wilkins, 1961) and 1902 in Sudan (Jack, 1961). In Somalia, the Italians established the first veterinary institute in Merka, south of Mogadisho, in 1914 and in the former Somaliland Protectorate, veterinarians were deployed by the British from 1924 (Peck, 1973). Although Ethiopia was not colonised, an animal disease survey was conducted as early as 1885 by Italian veterinarians and a French mission provided veterinary services up to 1914; from 1936 to 1941, the Italian army needed veterinary services for its cavalry (Ministry of Agriculture, 1995).

As colonial farmers settled in Africa they imported exotic breeds of livestock which were susceptible to tropical diseases. This situation prompted the development of civilian veterinary services which aimed to safeguard livestock in the new colonies and enable trade in livestock between the colonies and Europe. At this time, scientific knowledge on tropical livestock diseases was limited and therefore the control of major diseases was based on quarantine, movement restrictions and slaughter of infected stock. Later, research institutes were established to develop vaccines and effective disease control campaigns were launched, most notably against rinderpest. As the colonial veterinary services developed, their range of activities were broadened in order to address problems of livestock productivity, food hygiene and public health. New activities included clinical treatments and control of non-epidemic diseases, improved diagnosis via veterinary laboratories, vaccine production and meat inspection. At the time of independence in Africa in the 1960s, these responsibilities and structures were inherited by new governments (Holden *et al.*, 1996).

In the post-colonial era, veterinary services attracted considerable donor support. Within two decades of independence, the number of veterinary faculties in African universities rose from three to twenty-eight and in sub-Saharan Africa, the number of veterinarians increased from an estimated 2,500 in 1964 to 42,000 in 1984. This increase reflected a high level of donor support to veterinary services which effectively removed incentives for governments to fund their own veterinary services through taxation and crucially, "*Meant that state veterinary services were vulnerable to changes in donor policy*" (Holden *et al.*, 1996). Up to the mid-1980s, the organisational structure of many veterinary services had hardly changed from that inherited at independence (Cheneau, 1985).

4.2 The funding crisis in state veterinary services and structural adjustment

In the 1970s and 1980s the global economy was affected by serious recession. Developing countries were faced with increasing debts and with some reluctance, accepted donor structural adjustment policies that advocated drastic cuts in state-funded services, including veterinary services (Leonard, 1993). In the past, these services had virtually guaranteed employment to veterinary graduates (de Haan and Nissen, 1985) but now had to contend with declining budgets as structural adjustment programmes took hold. Typically, state services were reluctant to reduce the number of civil servants under their control and therefore, savings were dependent on reductions in operational costs rather than staff costs. In some countries, the number of veterinary staff employed by government continued to increase as operational budgets dwindled (Antennah, 1991; Leonard, 1993).

Inevitably, the reduced operational funds available to state veterinary services led to a decline in efficiency and service provision. Typical problems included drug shortages, lack of transport and failure to maintain equipment (Antennah, 1991); reduced resources leading to declining staff morale (FAO, 1991); and re-emergence of diseases of major economic and social importance such as rinderpest and contagious bovine pleuropneumonia (CBPP). In summary, the level of donor support to state veterinary services in the twenty years after independence could not be sustained through domestic revenues when donor funding was withdrawn. A common response of state services to

structural adjustment was to implement cost recovery programmes and in the case of veterinary services, establish revolving funds. However, these systems met with very limited success in sub-Saharan Africa, accounting for only 2-5% of livestock budgets (Tber, 1995). According to de Haan and Nissen (1985), *"When revolving funds have been established - often as a condition of external funding - experience indicates that as soon as the project is completed such funds vanish in the Treasury or are used for other purposes, and little activity remains. Second, revolving fund performance has been poor. The receipts from drug sale programs suggest that at best only 80-90% (at worst only 20%, as experienced in a World Bank-funded project) of the sale is deposited in the revolving fund, the rest being lost due to administrative negligence or embezzlement by civil servants. Revolving funds therefore become rapidly depleted."*

4.3 Economic theory and privatisation of veterinary services

The trend towards privatisation of state services was based on neo-liberal economic theory. The theory stated that under conditions of perfect competition, the private sector could outperform the state in virtually any circumstance (Leonard, 1993). The theory also provided a framework for identifying whether the state or the private sector was most likely to provide a given service at optimum economic efficiency and also, characterised those aspects of a state service which should remain under state control - state intervention was only justified when the private sector was unlikely to perform efficiently (Umali and Schwartz, 1994). This type of analysis formed the basis for numerous 'Veterinary Privatisation Programmes' in African countries (FAO, 1997). In particular, these programmes focussed on support to veterinarians who wished to establish private clinics or pharmacies. Apart from improving the private veterinary sector, these programmes were supposed to enable the state veterinary sector to operate more effectively because less staff were needed and therefore the ratio of staff costs to operational costs should improve. When the state was no longer responsible for curative veterinary activities, those staff who remained had relatively more resources to conduct public good services such as disease surveillance (assuming that budget levels were maintained).

Looking at state veterinary services in terms of institutional pressures and behaviour, Leonard (1993) described various political influences which inhibited change and innovation. The first general point was that animal health policy in many African countries was of major political importance. When livestock production made substantial contributions to economies at both national and household levels, governments were wary of reform which might reduce their control over veterinary services. Veterinary services were also one of the few expenses faced by livestock owners who used low-input, low-output production systems. In addition to the high political profile of animal health services, it was recognised that many African states continued to suffer from profound institutional weaknesses such as corruption, patronage, and political decision-making based on the channelling of resources towards specific ethnic groups or individuals. In these situations, professional judgements by veterinarians and others tended to take second place to political allegiances and short-term personal gain.

Hence, government veterinary services in many African countries have been in a transitional phase since the 1970s. State veterinary services in some countries have been gradually redefining their roles and handing over the provision of clinical veterinary services to the private sector, particularly with support from the privatisation component of the Pan African Rinderpest Campaign (Tambi and Maina, 1999a). However, progress has been slow and it seems that veterinary service reform has often been more of a priority for donors than African governments. Although structural reform was intended to improve the financial and operational efficiency of the public sector (de Haan and Nissen, 1985; Holden *et al.*, 1996; FAO, 1997), to date there is little evidence that government veterinary services are now better able to fulfil public sector duties compared with the period before structural adjustment. As noted by Ndiritu and McLeod (1995), *"The global economic recession has brought public animal health services to something of a crisis point and many countries cannot afford to*

maintain the level of monitoring previously considered to be necessary for a comprehensive assessment of national disease level".

4.4 Veterinary service delivery in pastoral areas

While veterinary services are poorly developed in many African countries, this situation is most evident in more remote, dryland areas inhabited by pastoral and agropastoral communities. These areas are characterised by their large size, harsh climate, poor infrastructure and relatively small but mobile human populations. These factors alone were constraints to conventional, fixed-point service delivery through facilities such as government or private, urban-based veterinary clinics (Catley *et al.*, 1998). However, in addition to these mainly logistical difficulties were political and cultural barriers. In general, pastoral ethnic groups in African countries have limited political power. Their reliance on livestock coupled with a mobile lifestyle continues to be viewed by more urban and educated people as backward and wasteful. Government policy on pastoral development rarely acknowledges the efficiency of mobile livestock production systems in arid and semi-arid areas, and typically, has viewed pastoralists and pastoralism as a problem to be solved by sedenterisation or other inappropriate means (Oxby, 1989; Swift *et al.*, 1990; Bonfiglioli, 1992; Toulmin and Moorhead, 1993; Scoones, 1994; Haagsma and Hardeman, 1998).

In addition, professionals from other ethnic groups were often reluctant to work in pastoral areas. Working in Sudan, Schwabe (1980) noted the *"boredom, sense of isolation and other frustrations"* which seriously affected the morale of veterinary staff in pastoral areas. Similarly, in northern Uganda *"Government livestock-related services in Kotido District and Dodoth County are currently paralysed through lack of equipment, funds, transport, direction and supervision. There have been no large-scale vaccination campaigns in the county for ten years and most cattle herds have not been immunised. There are no vehicles, refrigerators, syringes, needles, drugs, microscopes, sprayers or diagnostic equipment in working order. There is little incentive to work: staff are under-paid, under-supervised and under-encouraged"* (Sandford, 1988). Based on experiences in Ethiopia and Eritrea, a recent review of veterinary services in the Greater Horn of Africa noted that the typical situation *"Involved a government veterinarian, usually of highland descent, posted to a hot, lowland, pastoral area where he (as it was nearly always a man) was unable to speak the local language and had limited respect for or understanding of the pastoral way of life. When these problems were compounded by no vehicle (or no fuel or spares), no equipment, no medicines, delays in receipt of salary and expectations raised by a western-based veterinary education, it was easy to see why so many government veterinarians in dryland areas described their work as a punishment"* (Catley *et al.*, 1998). Increasing levels of conflict, as mentioned in section 1.3, also make pastoral environments less attractive to professional workers.

In general, information on the effectiveness of veterinary services in pastoral areas of Africa is scanty due to the reasons outlined above. Relative to other livestock production systems, little research has been conducted on animal diseases affecting the livestock of African pastoralists and the relationship between animal disease and pastoral livelihoods is not well documented (Catley, 1999a). Some large, multidisciplinary research studies on pastoral systems, such as an 11 year study on the Borana in Ethiopia, virtually ignored animal health constraints (Coppock, 1994).

While veterinary service provision to pastoralists has been a cause of concern for some time (Swift *et al.*, 1990), recent reports from Ethiopia (Godana, 1993), Eritrea (FAO, 1994), Uganda (Catley, 1997a) and Kenya (Tambi *et al.*, 1997a; CONSORTIUM/BCEOM/SATEC, 1998) indicate very limited if any progress in the development of conventional veterinary services in pastoral areas during the last twenty years or so. A recent analysis in the Ogaden region of Ethiopia, as summarised in Box 4, gave an indication of the scale of the service delivery problems in one pastoral area and highlighted features which are common to other countries.

In terms of the delivery of basic clinical veterinary services to pastoral communities in Africa, recent veterinary privatisation programmes have had little impact on facilities in dryland areas (Tambi *et al.*, 1997b). Even in those countries such as Kenya where privatisation was judged to be relatively successful, private veterinary pharmacies and clinics were concentrated around urban or peri-urban centres in mainly highland areas. Although OAU/IBAR is currently testing private delivery systems in pastoral areas (Leyland and Akabwai, 1998), the approach remains largely unproven¹³.

Box 4

Summary of key features of veterinary service delivery in the Somali National Regional State, Ethiopia (adapted from Catley *et al.*, 1997)

<u>Background information</u>	
Geographical area	Approximately 400,000 square kilometres; semi-arid and arid climate.
Human population	Approximately 3.5 million people.
Livestock population	Approximately 1.5 million camels, 6.0 million cattle and 11.5 million sheep and goats.
Basic infrastructure	Less than 5km of asphalt road; dilapidated telephone system; public shortwave radio communication officially banned.
<u>Veterinary services</u>	
Human resources	23 veterinarians - 1.6 times below recommended level; 10/23 veterinarians located in the regional capital. 52 veterinary assistants - 13.2 times below recommended level.
Coverage	Geographical coverage from 30 fixed-point clinics/offices estimated to cover 2.7% of the region. Vaccination figures indicated that 84.5% to 95.0% of livestock remained unvaccinated for each year.
Cost recovery	Estimated to be less than 20%. Government budget for veterinary drugs in 1997 was Ethiopian birr 780,000.00. Estimated veterinary drug requirements for the region valued at approximately Ethiopian birr 9.3 million.

Notes

- recommended staffing levels from de Haan and Nissen (1985) of 240,000 veterinary livestock units (VLU)/veterinarian and 12,500 VLU/veterinary assistant.
- vaccination for blackleg, anthrax and pasteurellosis was conducted only in response to disease outbreaks; diagnosis was not confirmed by laboratory tests. No other vaccination was conducted.

However, there is substantial evidence that pastoralists are willing and able to pay for basic services at commercial rates (Catley *et al.*, 1998). The use of alternative approaches to animal health service delivery has met with some success in pastoral areas of Africa and as many of these experiences relate to community-based systems and participation, they are discussed in section 6.0.

These contextual and operational features of veterinary services in pastoral areas are relevant to the development of alternative systems of inquiry because ultimately, such systems have to be appropriate for use in situations with limited human and material resources. In most if not all information systems, there are trade-offs between the ideal system and the system which can be afforded, is timely and usable on a practical level. Similarly, when defining the reliability and validity of information these

¹³Specifically, the Participatory Community-based Vaccination and Animal Health Project (PARC-VAC) of OAU/IBAR is assisting veterinarians to develop private veterinary facilities in pastoral areas. Evidence from a community-based private veterinary practice in Salamat, a pastoral area in eastern Chad, indicated that the approach was viable (Mariner - personal communication).

tests are not absolute measures but can vary according to context. Hence a system of relatively low quality which can be implemented and sustained may be acceptable in situations where more sophisticated systems are unworkable.

4.5 The development of animal health information systems in Africa

The need to collect information on animal health in Africa is largely related to disease control measures. Priority diseases need to be identified, characterised and controlled using interventions that are economically feasible and advantageous at national and sometimes international levels (Putt *et al.*, 1988). Veterinary epidemiology has been defined as "*The investigation of disease, other health-related events, and production in animal populations and the making of inferences from the investigation in an attempt to improve the health and productivity of populations*" (Thrusfield, 1995). Consequently, the design and use of animal health information systems is one aspect of veterinary epidemiology as these systems provide data on the disease situation in animal populations.

4.5.1 A brief history of veterinary epidemiology

The emergence of veterinary epidemiology as a distinct branch of veterinary medicine has been taking place since the early 1960s (Schwabe, 1982). At this time, many industrialised countries had been successful in controlling or eradicating important livestock diseases such as rinderpest through relatively simple measures. These and other diseases were characterised by specific causal agents, ease of diagnosis (often laboratory diagnosis) and control via mass action such as large-scale vaccination programmes, vector control or slaughter-compensation schemes. However, experience with these approaches also led to recognition that some animal diseases had far more complex causes and behaviour than others, and that simple cause-effect relationships as dictated by Koch's postulates¹⁴ could not be applied to all problems.

When discussing the evolution of veterinary epidemiology, Schwabe (1982) and Thrusfield (1995) cited various anomalies that influenced a shift towards broader-based investigation of animal diseases. At least four types of disease problem were recognised which were not amenable to conventional investigation and control strategies *viz.* complex infectious diseases, subclinical diseases, non-infectious diseases and diseases of unknown cause. The complex infectious diseases included tuberculosis and brucellosis which despite lengthy eradication schemes, persisted in 'problem herds'. In these cases it was suspected that previously neglected ecological factors were important in maintaining the disease in animal populations. Other complex diseases resulted from a combination of infection with single or multiple causal agents together with environmental factors. Hence, infection alone was not sufficient to cause disease. In some complex diseases, carrier animals could harbour and transmit agents without showing clinical signs of disease. With this latter group of diseases, there was some overlap with subclinical diseases that caused production losses in the absence of overt clinical signs in affected animals. Non infectious diseases included genetic, neoplastic and production-related diseases.

To varying degrees, these new types of disease were all characterised by complex relationships between animals, causal agents and the environment. Hence, attention to multi-factorial rather than simple relationships began to emerge as the basis for epidemiological investigation. Drawing on methods from disciplines such as business economics (time series analysis), astronomy (life table methods) and genetics (multivariate path analysis), veterinarians began to study disease in animal populations in terms of causal models and quantitative analysis. Related to these developments was

¹⁴Koch's postulates stated that an organism caused disease if it was present in all cases of the disease; if it did not occur in another disease as a fortuitous and non-pathogenic parasite; and if it is isolated in pure culture from an animal and following repeated growth induces the same disease in other animals (Thrusfield, 1995).

the concept of disease surveillance in which the structured collection of information on animal disease was linked to appropriate action on disease control (Schwabe, 1993). An important feature of the development of veterinary epidemiology to the present day has been the application of quantitative methods in order to manage and analyse data, and an increasing need for computer-assisted procedures. The various components of veterinary epidemiology are summarised in Figure 1 and it can be noted that despite developments in computer technology, data collection and qualitative evaluation were the starting points for epidemiological investigation.

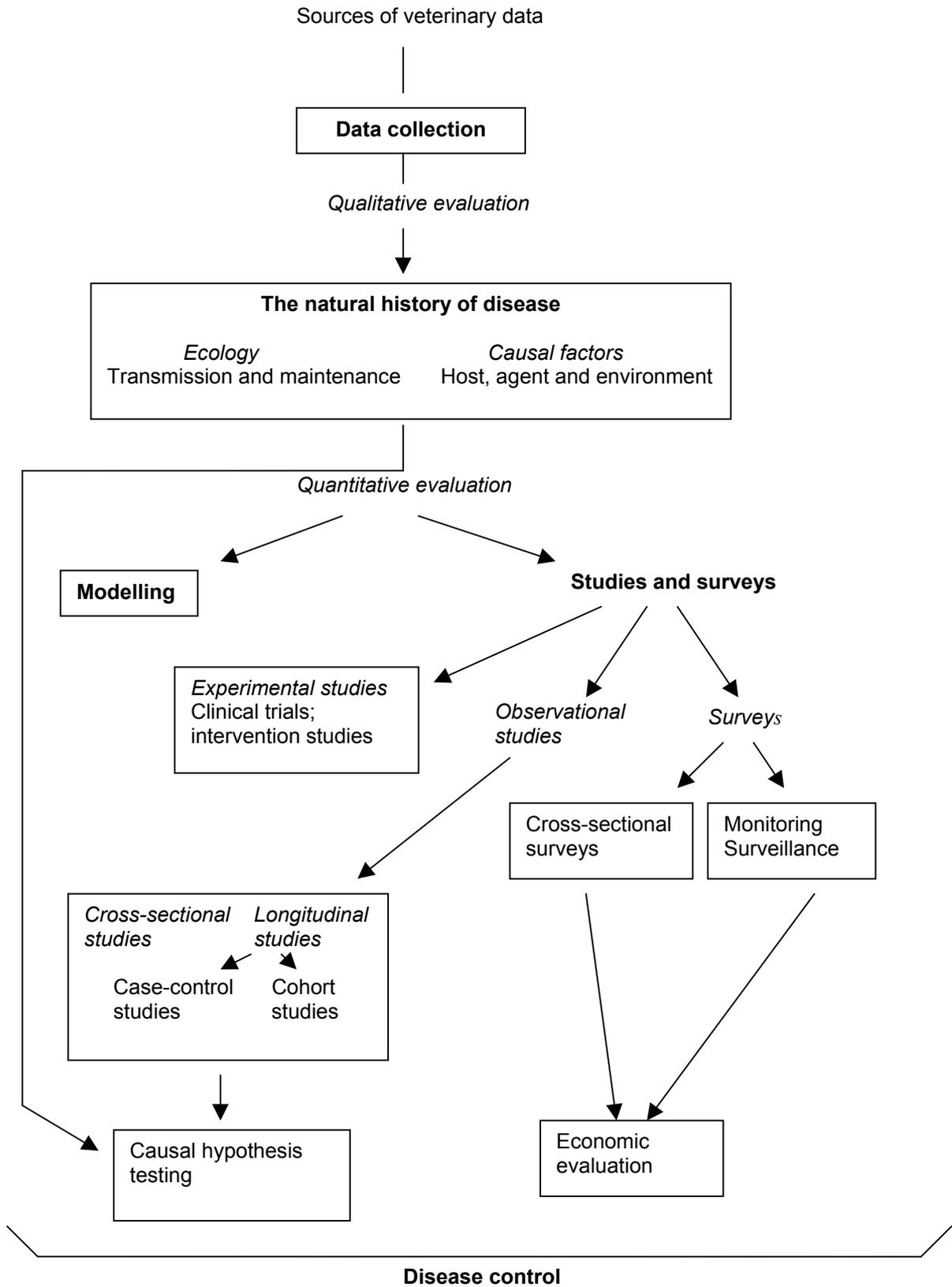
The recognition of veterinary epidemiology as a distinct branch of veterinary medicine led to the development of specific undergraduate and postgraduate training courses in universities such as Davis California, Guelph, Copenhagen, Reading and Edinburgh. A journal dedicated to veterinary epidemiology and preventive medicine called *Preventive Veterinary Medicine* was first published in 1982 and international symposia on veterinary epidemiology and economics were organised.

4.5.2 Technology transfer and veterinary epidemiology in dryland Africa

In LDCs, support to building the epidemiological capacity of government veterinary services in Africa became a common feature of bilateral and multilateral aid programmes in the 1980s and 1990s. Typically, these programmes involved postgraduate training for veterinarians in western universities and technical assistance to design and manage animal health data systems. In common with other aid-related veterinary interventions in LDCs, information on the impact of these interventions is limited. In some countries there were problems in establishing new epidemiology and economics units due to the institutional reform which was taking place within veterinary services as a whole. For example, in Kenya attempts to promote private sector veterinary activities hindered active disease surveillance due to a lack of clarity regarding the roles of the public sector and private sector in epidemiological functions (Ndiritu and McLeod, 1995). This experience illustrated the difficulty of institutionalising a new technology when the target institution itself was in a state of flux.

From the perspective of the technology transfer paradigm of development (sections 2.1 and 3.0) the application of veterinary epidemiology in African countries is worthy of discussion. When describing epidemiological trends in veterinary medicine as a revolution, Schwabe (1993) noted how *"Epidemiological intelligence as the infrastructural basis for governmental veterinary services is clearly replacing older patterns worldwide; this trend undoubtedly will accelerate in the future"*. The transfer of veterinary epidemiology from industrialised to developing countries as a component of aid programmes illustrates that animal health information systems have become a priority for donors during the last two decades. However, there is a danger that in countries with very limited government resources the rationale for adopting state-of-the-art epidemiological approaches has been overstated. At least two anomalies exist and these are particularly relevant to dryland areas with poorly developed veterinary services.

Figure 1
 The components of veterinary epidemiology (source: Thrusfield, 1995)



The first anomaly relates to the influence of successful disease control in western countries on the emergence of veterinary epidemiology. In pastoral areas, age-old livestock diseases such as rinderpest, CBPP and foot and mouth disease persist and consequently, the situation in some areas is similar to that in industrialised countries in first half of the century. Hence, proven solutions to these disease problems already exist and the need for more in-depth understanding of the nature of these diseases is questionable unless research is closely related to resource and operational constraints. According to Catley *et al.* (1998) the challenge is to develop services which can deliver disease control measures in areas with extreme logistical, resource and contextual problems. Although studies in pastoral areas such as southern Sudan indicated how epidemiological and economic approaches might be used to inform disease control strategies which require less resources than conventional approaches (Zessin and Carpenter, 1985), the actual implementation of studies based on formal methods is problematic in many pastoral areas (Catley, 1997c; Catley *et al.*, 1998).

The second anomaly is the influence of western farming systems on the development of veterinary epidemiology. Many of the complex, sub-clinical and production-related diseases which prompted interest in epidemiological investigation were associated with intensive farming systems in industrialised countries and a need to develop more thorough economic analyses of disease control options. In pastoral areas of Africa these conditions do not apply because livestock production systems are extensive, low-input, low-output systems which are considered to be efficient in terms of both natural resource use and production outputs relative to user needs (Scoones, 1994). Although pastoralism is constantly adapting to factors such as increasing sedenterisation, market orientation and environmental change, herders tend to prioritise diseases that are already well described in the veterinary literature.

The dichotomy between developed and developing country contexts has not passed unnoticed by veterinarians. Schwabe (1982) noted the inappropriate transfer of intensive farming systems to LDCs and that *"repeated costly failures have resulted since World War II from many ill-conceived efforts to introduce such systems and technologies into Third World countries..."*. Unfortunately, the same author then proposed the transfer of western-based epidemiological approaches to developing countries, without reference to the role of intensive farming in prompting their development. In a more considered analysis, when suggesting new approaches to solving animal health problems Davies (1985) recalled the past application of simple but successful control measures to eradicate major epidemic diseases. Drawing on experience from East Africa it was advised that *"The lesson for 1985 is that technical aids are not enough; disease occurs in animals that exist in husbandry systems that are susceptible to economic and social pressures, and unless these pressures are conducive to disease control then even the most sophisticated array of technical aids will be of no avail"* and *"The difficulty we face is that research and development in infectious disease control, and probably in other areas of veterinary medicine, has been technology-led rather than problem-led. In other words we are concentrating on developing new scientific tools and only later considering how they might be used in controlling disease, rather than considering the fundamentals of the disease problems facing us and developing an approach that embraces the social and economic systems in which farm animals exist"*.

These views were similar to those expressed in a recent review of 800 livestock development projects, including veterinary research and development, supported by the major multilateral and bilateral donors over 35 years. When assessing investments in animal health services in Africa from the perspective of impact on the lives of poor or marginalised communities, the overall impression was that veterinary inputs have followed a similar trend to other technical sectors and that evidence of impact was limited (Holden *et al.*, 1998). The authors concluded that *"Given the heavy investment in technical projects, the paucity of evidence demonstrating sustainable impact on the poor is disappointing"*. Using theories from New Institutional Economics, the disappointing performance of livestock development was attributed to organisational weaknesses and inappropriate institutional frameworks which did not support client-focussed delivery of services. Taking livestock research centres as an example, it was argued that because progress was assessed according to the novelty of

the research rather than the impact on end-users, there was little incentive to invest in participatory client-led research. Despite many years of scientific research on livestock diseases, notably trypanosomiasis and tick-borne diseases, reports of actual rather than predicted positive impact on poor people in LDCs were few.

These workers were not alone in their analysis of veterinary interventions in LDCs. When reviewing progress in trypanosomiasis control in Africa, Masiga (1997) noted that scientist's efforts to control the disease over many years had met with limited success. According to Huhn and Baumann (1996), among the constraints facing veterinary research in sub-Saharan Africa were insufficient applied research to solve field problems contributing to development and poor working relations between research centres and farmers. When discussing constraints facing government veterinary services generally in sub-Saharan Africa the same workers noted *"negligence of farmers' needs, interests, priorities, resources and capabilities"* and *"little or no efforts to achieve the active participation of farmers in disease control"*. From a more epidemiological perspective, Waltner-Toews (1988) noted that when working in developing countries, there was a *"tendency for northern epidemiologists to gravitate toward the kind of farms they recognise and to conveniently select European or North American types of farms to sample"* even though that type of farming *"may be entirely inappropriate in terms of the social and ecological matrix in which it is situated"*. Overall, the literature indicates that those institutions responsible for animal health service development have been slow to involve livestock keepers during project design and implementation, despite past failings. Related to these problems was the development of the veterinary profession in Africa and the influence of a western and highly technical education systems on African universities. In short, African veterinarians were trained to diagnose and treat animal diseases, often according to the most recent advances in veterinary medicine and with a focus on modern, more intensive systems of livestock production.

4.5.3 The current status of animal health information systems in pastoral areas

In pastoral areas of Kenya, Uganda, Ethiopia and Eritrea official animal health reporting systems were based on information from field-level government clinics or smaller facilities, sometimes called sub-clinics or outposts. As indicated in section 4.4, these clinics were often poorly resourced with minimal diagnostic equipment, medicines or vehicles. Typically, the clinics used a daybook to record activities such as examination and treatment of livestock, sale of medicines or vaccinations. The daybook column headings usually included date, name of owner, location/address of owner, livestock type, number of sick animals, sex, age, clinical signs, diagnosis and treatment¹⁵. Sometimes there was also a column to detail samples taken for laboratory tests. Each month the entries in the daybook were summarised on to an official form that detailed numbers of different species of livestock treated or vaccinated, often by type of drug or vaccine. Animals receiving antibiotic would be grouped into a category such as 'infectious diseases' or 'use of antibiotic'. This report would then pass through various administrative levels until eventually the data reached a central point. At each administrative level, the original report might be compiled with other reports. This type of system produced data that was used to present the official view of livestock diseases in pastoral areas.

The weaknesses of the system were numerous and included:

- Excessive filtering of information from the daybooks so that data on variables such as the location of diseases, seasonality of diseases and age groups of animals affected was collected locally but never analysed centrally.

¹⁵To the author's knowledge, the mode of disease reporting at field level in government veterinary services in pastoral areas has not been described in the literature. These notes are based on the author's field experience in the countries mentioned between 1992 and 1999.

- Incorrect reporting of disease events due to lack of diagnostic facilities and other reasons. In some cases, clinical signs or reports of clinical signs were reported as specific diseases. For example, sudden death cases were reported as anthrax, diarrhoea became helminthiasis or coccidiosis, and coughing became pasteurellosis. Lack of diagnostic facilities meant that confirmation of disease diagnosis was rare.
- Limited geographical coverage of the clinics. Without transport veterinary staff could probably reach an area of around 10km radius from the clinic and so huge areas remained unserved. This problem was compounded by irregular and insufficient supplies of drugs so that the timing of treatments and vaccinations was subject to factors other than the timing of disease events. When drug and vaccine supplies were unreliable, livestock keepers were less inclined to risk long journeys to clinics only to find that no service was available.
- Limited accurate information on livestock population and so numbers of cases seen or reported and numbers of animals treated or vaccinated were not compared with populations.

Looking at animal health information generally in pastoral areas, Bourn and Blench (1999) suggested that *"Information on the occurrence, epidemiology and economic importance of most of the diseases common to wildlife and domestic livestock in the rangelands of east Africa is fragmentary and of limited value"* and in view of this *"prioritising diseases for research or control will continue to be dependent largely on limited information and informed guesswork"*. Although more detailed information was available on specific diseases such as rinderpest, the persistence of this disease in parts of eastern Africa was a measure of the limitations of conventional approaches to veterinary service delivery in pastoral areas (Leyland, 1996; Mariner, 1996). Although an effective vaccine for rinderpest had existed for many years and conferred lifelong immunity (Plowright and Ferris, 1962; Mariner *et al.*, 1994) up until the early 1990s vaccination programmes were unable to penetrate important dryland areas such as the Afar region of Ethiopia, southern Sudan, Somalia and northern Kenya. The re-emergence of rinderpest in Kenya in 1994 and confusion over the source of the outbreak highlighted the weakness of official information systems used by veterinary services in pastoral areas. When describing the epidemiological features of the outbreak, Barrett *et al.* (1998) noted that *"There is major concern over how such a notoriously severe disease can have remained undetected for over 30 years"*. As rinderpest eradication strategies move away from mass vaccination towards disease surveillance and rapid response to suspected disease outbreaks, the need for improved information flow from remote areas becomes increasingly important.

Although it was widely recognised that livestock owners possess detailed information on animal health matters (see section 6.1.2) it seems that this knowledge-based resource has been under-utilised in official animal disease reporting systems. Novel approaches such as the use of animal health workers to act as disease monitors have been used successfully in Niger (Sollod and Stem, 1991), Somalia (Baumann, 1990) and southern Sudan (Jones *et al.*, 1998) and these systems are discussed in more detail in section 6.0.

5.0 Methods for Collecting Information from Livestock Keepers: Experiences with Questionnaires

As noted in section 3.0 an important factor in the development of PA was dissatisfaction with questionnaire surveys in rural development settings. In veterinary medicine, questionnaire surveys have been very widely used to collect information from informants such as livestock owners and veterinary workers (Edwards, 1990; Vaillancourt *et al.*, 1991; Thrusfield, 1995). This section outlines some of the key features of questionnaire methodology and discusses the application of questionnaires in developing countries by veterinarians.

5.1 Good practice in questionnaire design and implementation

Drawing on experiences from medical epidemiology, social science and market research, advice on the correct design and implementation of questionnaire surveys has featured in the veterinary literature for more than 15 years (Waltner-Toews, 1983; Edwards, 1990; Vaillancourt *et al.*, 1991; Thrusfield, 1995) and specific aspects of using questionnaire interviews in LDCs have also been described (Perry and McCauley, 1984; Putt *et al.*, 1988; Pfeiffer, 1996). The important features to consider when using questionnaires can be summarised as follows.

Target population and sampling methods: Random and non-random sampling methods for animal health questionnaire surveys have been described (Edwards, 1990; Vaillancourt *et al.*, 1991). Random sampling methods included simple random sampling, systematic sampling, stratified sampling, cluster sampling and multi-stage sampling.

Questionnaire design: This aspect of questionnaire practice encompassed the choice of questions to be asked, the precise wording and ordering of questions, and the title, layout and appearance of the questionnaire (Waltner-Toews, 1983; Edwards, 1990; Vaillancourt *et al.*, 1991; Thrusfield, 1995). Question types were usually categorised as open (also called open-ended), closed (also called closed-ended) and semi-open-ended depending on the level of freedom offered to the informant when responding.

Administration: Different ways of administering questionnaires *viz.* by mail and personal interviews conducted by telephone or in person have been discussed in relation to animal health surveys (Waltner-Toews, 1983; Edwards, 1990; Vaillancourt *et al.*, 1991; Thrusfield, 1995). The latter is particularly relevant to LDCs as described below and in common with telephone interviews, required training of interviewers.

Quality control - reliability and validity: Reliability in questionnaire design was defined as the ability of the questionnaire to produce consistent results on repeated trials (Waltner-Toews, 1983; Vaillancourt *et al.*, 1991; Thrusfield, 1995). Hence, reliability could be assessed by repeating questions to the same informant, asking similar questions to the same informant or using paired statistical tests. Validity was the extent to which answers reflected the true state of nature and consequently, could be checked by reference to an independent, reliable dataset. Related to quality control in questionnaire surveys was the practice of pre-testing the questionnaire in order to assess understanding of the questions and language used and make amendments as necessary before using the questionnaire on the target population. Large non-response rates were associated with systematic differences between respondents and non-respondents.

Despite an ample literature on questionnaire methods and their application in veterinary epidemiology, a number of workers noted methodological weaknesses when questionnaires were actually used. For example, when discussing types of error in questionnaire surveys Waltner-Toews (1983) wrote that *"There is at present so little standardisation and measurement of reliability in veterinary questionnaires that comparison of results from different surveys must remain at the most informal, impressionistic level"*. Edwards (1990) and Vaillancourt *et al.* (1991) were also critical of questionnaire surveys used by veterinary researchers and considered surveys to be poorly designed and biased. The latter paper described an analysis of 120 articles in six peer reviewed veterinary journals¹⁶ which referred to questionnaire data. In these articles, 18.3% failed to mention sampling methods; only 15.8% mentioned some or all of the questions used; only 8.3% mentioned pre-testing

¹⁶The six journals reviewed were the Australian Veterinary Journal, the Journal of the American Veterinary Medical Association, the Canadian Veterinary Journal, the Journal of Preventive Veterinary Medicine, the Veterinary Record and the New Zealand Veterinary Journal.

of questionnaires; only 11.2% described validation procedures; and in those articles in which non-respondents were reported, only 5.7% attempted to explain the non-response figures.

In developing countries many of the factors which enable the use of questionnaires in developed countries do not apply. Logistical problems which inhibit effective questionnaire administration include poor postal, telephone and transport services in rural areas (Broadbent, 1976) and as previously discussed, these problems are particularly noticeable in the African drylands. Government veterinary services in many countries are under-resourced and tend to be located in the main urban centres. In pastoral areas of Africa, veterinarians are often from a different ethnic group to local communities

When discussing the use of questionnaires in LDCs, Perry and McCauley (1984) noted the importance of the direct interview with livestock owners or keepers as a means to obtain information on animal health matters. Based on their experiences in southern Sudan (McCauley *et al.*, 1983a; 1983b) and Zambia (Perry *et al.*, 1984) guidelines for conducting interviews were proposed which included standardisation of the interview technique by the use of a single interviewer; recognition of local concepts of time; avoidance of rushed interviews; use of a local interviewer familiar with cultural norms; ordering of questions so that sensitive subjects were discussed late in the interview; use of questions related to specific and recent time periods in order to reduce recall bias. These workers also noted the limitations of random sampling procedures in LDCs and in common with Broadbent (1976) mentioned that in some areas an absolute lack of data inhibited the use of random sampling methods.

Further advice on the use of questionnaires and interviews to collect information on animal health in LDCs was provided by Pfeiffer (1996). In particular, question-answer behaviour was discussed in the context of interviews in which *"Everything that goes on in an interview can potentially influence the respondent's answers"*. The exchange of information between interviewer and respondent was subject to various encoding and decoding processes.

5.2 Examples of questionnaire and owner interview methods to collect information on animal health in LDCs

This section discusses the use of questionnaires and owner interviews to investigate animal health problems in LDCs and in particular, attempts to relate some of the best practice outlined above to the actual use of these methods. A comprehensive review of research papers based on questionnaires was not conducted and the following examples were selected according to a single day spent browsing journals in a university library. In addition to specific methodological details, information is also provided on the circumstances which prompted the research.

Bovine abortion in northern Nigeria

In northern Nigeria a questionnaire survey was used to investigate abortion and reproductive performance in cattle (Nuru and Dennis, 1976). The study was prompted by a lack of published information on constraints to reproductive performance in indigenous, nomadic herds which were estimated by the researchers to represent 90% of the cattle population in Nigeria. The materials and methods for this study are quoted verbatim below.

"Questionnaire: A questionnaire was designed in both English and Hausa language and was coded for possible computer analysis. The Chief Veterinary Officers of the six northern states were contacted personally and informed about the survey and their co-operation requested. Each State Chief Veterinary Officer was given 50 copies for his officers to complete in the field. One of the authors carried out over 80% of the interviews because the State returns were poor or incomplete. Other incomplete or poorly completed forms were deleted from the analysis.

Practically all interviews were conducted at the herd location because of the difficulties of bringing the cattle to any given camp site and to minimise withholding of cattle by owners. Care was taken to allay suspicion that the information was being indirectly collected for tax purposes by primarily confining the questions to pregnant cattle. Estimate of herd size were made by visual counting where owners were reluctant to count their animals. Records of breeds, age at first conception and management methods were noted.

Selection of herds: Herds were randomly selected from a list of herds in accessible locations with herd-owners who were likely to be cooperative in this type of investigation.

Criteria: The following criteria were used in this investigation:

Abortion. Visible expulsion of a non-viable foetus at any stage of gestation.

Chronic abortion. More than one abortion by the same cow or cows in a herd.

Regular conception. A Fulani criterion of mature cows having a calf every other year.

Repeat breeding. Cows observed to be served three or more times.

Percentage calf crop. $\text{No. calves} < 1 \text{ year} \times 100 / \text{No. females of breeding age}$.

Percentage pregnancy rate. $\text{No. pregnant females} \times 100 / \text{Total no. females of breeding age}$.

Percentage prevalence of herd abortion. $\text{No. herds with abortion problem} / \text{Total no. herds examined}$.

In this study 319 cattle herds containing an estimated 8,970 breeding cows were sampled between 1972 and 1973. When discussing their results the researchers noted that during interviews with Fulani cattle herders, interviewers required both knowledge of the local language and sensitivity to suspicions regarding the use of the survey. Although it was suggested that lay-person interviewers would not be able to obtain reliable information, it was unclear why the researchers considered themselves to be more capable of communicating effectively with herdsman relative to other people. No information was provided on their language skills or previous experience in the survey area. The potential for enumerator bias in the survey was not discussed nor were means of validating the survey findings or assessing the reliability of the questionnaire. The authors concluded that further study was needed in order to clarify the causes of abortion in cattle in Nigeria and the economic impact of this apparent problem.

In the context of participatory approaches to research, the authors recognised that Fulanis were knowledgeable about their animals. For example, herders had observed that after acute incidents of abortion in their cattle the calf crop soon returned to normal in following years. In view of this observation and the long distances between herds and veterinary facilities, from the herder's viewpoint there was little incentive to report abortion cases to veterinary personnel.

Bovine schistosomiasis in southern Sudan

In southern Sudan owner interviews were used to investigate mortality in cattle due to schistosomiasis (McCauley *et al.*, 1983b). This survey was conducted in response to the development of a vaccine for bovine schistosomiasis in 1978 and the need to assess economic losses from the disease and predict the cost-benefit of vaccination. The authors' description of their study included detailed information on the single researcher who conducted the interviews and his capacity to communicate well with the survey respondents. The interviewer was a Sudanese veterinarian who lived in the survey area whose family and relatives were cattle owners. He conducted 155 interviews over a three month period. The researchers suggested that this person was able to overcome problems such as mistrust of outsiders and as a local veterinarian, could correctly interpret vernacular names for livestock diseases and clinical signs. The interviews were described as informal and although the respondents were aware that the researchers were interested in schistosomiasis (called *gorag* locally) they were also encouraged to talk about other animal health problems during the interviews. Specifically, the interviews were used to collect information on the clinical signs which respondents associated with *gorag*, clinical signs they associated with other diseases and signs they had observed in cattle which

died during the previous year. This latter time period was defined according to local seasons, with a year beginning at the end of the main wet season. Information was also collected on the use of flukicidal drugs and vaccines, and numbers of cattle owned. Cattle ownership was assessed using information provided by cattle owners, numbers of cattle actually observed by the interviewer and estimates provided by the respondent's neighbours. The last of these three methods was considered to be the most accurate.

This survey was also of interest because it was preceded by a separate study which aimed to determine the ability of livestock owners to diagnose schistosomiasis according to the clinical signs of the disease (McCauley *et al.*, 1983a). This earlier study involved a comparison of herder's diagnosis of the disease called *gorag* with gross pathology, parasitology and histology of typical cases. Guided by this information, the researchers claimed that they were able to make diagnostic judgements on the interview findings and estimate mortality of cattle due to schistosomiasis in the survey area. Hence, the earlier study was used to interpret the owner interview results and in part, validate the findings. The authors concluded that an astute herdsman who attributed cases of poor performance to *gorag* was most likely making a correct diagnosis of schistosomiasis.

From a participatory research perspective, this work indicated that the researchers were interested in local ability to diagnose schistosomiasis and validated this ability by a comparison of local and formal diagnoses. The validation process then informed the owner interview survey. They also recognised that a local and respected interviewer was best placed to obtain reliable information from livestock owners. However, the need to investigate schistosomiasis was identified by veterinarians in response to the development of a vaccine and the need for a cost-benefit analysis of vaccination programmes. It might be argued that the economic feasibility study should have preceded the development of the vaccine as in the event of a negative cost-benefit analysis, the investments in vaccine technology would have been difficult to justify¹⁷.

Cattle health and production survey, Zambia

In Zambia a questionnaire survey was used to collect baseline data on production and health of traditionally-managed cattle as part of a broader study which included a serological survey and a sentinel herd scheme for disease surveillance (Perry *et al.*, 1984). The questionnaire survey was conducted in areas of high cattle density and used district maps to randomly select 40 farmers in each of 7 districts for interviewing. A single 'interrogator'¹⁸ was used to conduct interviews with selected farmers over a period of 3.5 months. The researchers assumed that the use of a single interviewer who was fluent in the languages spoken in the survey areas would minimise sources of error and that the standard placing of questions during the interviews was intended to "*minimise the influence of the interrogator on the answer, and maximise the co-operation of the farmer and the accuracy of the replies*". The questionnaire was pre-tested and minor changes were made before the main survey was conducted.

Regarding important cattle health problems, two series of questions were used. In the first series of questions farmers were asked to grade a list of 19 signs, syndromes and diseases according to four grades called 'non-existent', 'present but no problem', 'moderate problem' and 'severe problem'. Both the list of signs/syndromes/diseases to be graded and the grades were defined by the researchers according to criteria or previous experience which were not detailed. In the second series of questions, farmers were asked to name the four most important health problems affecting cattle on their farm by

¹⁷To the author's knowledge, a vaccine for bovine schistosomiasis was never used on a routine basis in White Nile Province.

¹⁸The researchers' term for the interviewer.

reference to the previous list or by naming other health problems according to their own views. When presenting and discussing the results arising from this line of questioning, it was noted that the two series of questions produced similar results. However, it was unclear whether the initial use of a researcher-defined list of health problems had influenced the farmer's subsequent choice of the four main problems. In other words, had farmers merely repeated information which had recently been presented to them by the interviewer? Farmers were also asked to provide information on the mortality of different age groups of cattle. Four age groups of cattle (<1 year; 1-2 years; 2-4 years and >4 years) were defined by the researchers. Information was also collected on morbidity rates and case fatality rates for different diseases.

When interpreting the results of the questionnaire survey the researchers appeared to make a number of associations between a single clinical sign of disease and a specific disease. For example, a relatively high grading of 'subcutaneous oedema' by farmers in one area was described by the researchers as "*probably a manifestation of principally haemorrhagic septicaemia*" because all ages of cattle were affected. However, in another area, the same clinical sign was "*probably a manifestation of fascioliasis*" because only adult animals were affected. Another highly graded sign 'sudden death' was "*probably a manifestation of haemorrhagic septicaemia or fatal theileriosis*". In each of these cases no additional information such as clinical examination of cattle or laboratory confirmation of disease by age group was provided to support the association between the clinical sign and the disease.

Bovine brucellosis and contagious bovine pleuropneumonia, southern Sudan

Livestock owner interviews were used in combination with serology during an assessment of the prevalence of bovine brucellosis and CBPP in Kongor Rural Council, southern Sudan (McDermott *et al.*, 1987). This work was conducted in response to local and researcher interest and was heavily influenced by the latter's experience in the survey area, which was described. For example, using their knowledge of the social organisation of the local Dinka community and the structure of temporary cattle holding areas called cattle camps (*wut*), the researchers were able to conveniently sample three out of the seven court areas which made up Kongor Rural Council. Each court area contained a number of cattle camps and each cattle camp contained 20 to 100 family herds (*gol*). According to ease of access, 2 cattle camps were selected in each of the 3 court areas. Within each of the sampled cattle camps, family herds were selected according to their location in the camp (e.g. the third *gol* from the east). Finally, the interviewers selected 25 cattle within the *gol* using their knowledge of herd structures and strata according to age and sex¹⁹.

The survey was conducted by two teams and each team included interviewers who were described as educated, well-respected local Dinka who were fluent in Arabic, English and Dinka. The interviewers had previous interviewing experience and all interviews were conducted in Dinka. The information collected during the interviews included the individual animal's colour²⁰, age, genealogy and breed. The owners were also asked to provide information on the occurrence and treatment of CBPP and trypanosomosis, and previous rinderpest vaccination history. Blood samples were collected from the sampled cattle for brucellosis and CBPP serology.

¹⁹Hence, 20 females and 5 male cattle were selected. The females comprised 10 cows, 2 heifers of less than 1 year of age, four heifers of 1 to 2 years of age and four heifers of 3 or more years of age. Heifers were females which had not calved or aborted. The males comprised 3 animals of 2 or less years of age and 2 animals more than 2 years of age.

²⁰The Dinka have sophisticated systems for identifying cattle and describing their colours and markings. Regarding herder's ability to recognise individual animals, in a study of the Bor Dinka in southern Sudan it was concluded that "*Dinka herdsmen have a remarkable ability to identify their own animals from among a large herd of very similar coloured and shaped stock. The Dinka recognise and give specific names according to the relative position of the colour patches*" (Mefit-Babtie, 1983).

When discussing their methods and findings, the authors noted the constraints affecting the use of random sampling methods in animal disease surveys in remote areas. They suggested that non-sampling methods required prior knowledge of the survey area and justified their own choice (convenience sampling followed by stratified sampling) by reference to information on local social organisation and cattle management which had been collected during the three years prior to the study.

The potential for recall bias was also discussed. The prevalence of brucellosis and CBPP was reported according to different age groups of cattle in the study and hence the ability of herd owners to accurately remember the age of specific animals was important during the analysis of results. On the point of age recollection, it was noted that *"While in some livestock areas such information cannot be collected accurately, for the Dinka (and other Nilotic cattle-culture peoples), cattle are the central focus of their daily activities and detailed genealogies and life histories for individual animals are known by every owner"*²¹.

Regarding the validity of livestock owners' views on the prevalence of CBPP, a significant association between interview results and CBPP serology results was demonstrated for cattle less than four years of age ($P=0.0041$)²². This association was of particular interest because in the authors' view, CBPP cases in the survey area did not show typical textbook signs of disease but rather vague signs such as occasional coughing. Hence, although the clinical appearance of CBPP was not dramatic, livestock owners were able to accurately diagnose the disease. No information was provided on owner's recollection of abortion in their animals and the prevalence of brucellosis. The authors described the limitations of serological tests to determine the prevalence of CBPP and brucellosis²³.

African swine fever, southern Malawi

In common with the survey described above, livestock owner interviews were also combined with serology in a study on African swine fever (ASF) in southern Malawi (Allaway *et al.*, 1995). This study was prompted by a serious outbreak of ASF and reports of high mortality. The questionnaire methodology in this survey was described thus, *"Interviews were conducted with all the current pig owners in the 35 selected villages which had been affected by ASF during the 1989-1990 outbreak.*

²¹ It seems that western-trained researchers often find it difficult to accept this level of recall and knowledge. However, livestock topics form a substantial part of the everyday conversation of pastoral communities and daily meetings are held to discuss how different animals are performing and should be managed. For example, according to Akabwai (1992) herders in Turkana, northern Kenya are often perceived by outsiders to be lazy because they spend long periods sitting under trees chatting to each other. However, most of the talk is about livestock, whether such and such an animal is pregnant, whether a new calf is growing well, the condition of the pasture and so on. Turkana elders meet each day under the Tree of Men to decide how cattle should be watered and grazed, and other livestock-related issues. In Neur areas in southern Sudan, an *"apparent obsession"* with talking about cattle over and above all other topics was noted by Evans-Pritchard (1940) (see Box 1). Hence, people who live off their animals spend much of their waking hours thinking and talking about their livestock. Based on past performance and experience, they are constantly reassessing their situation and deciding what action to take.

²² This association was not evident if all ages of cattle were included in the analysis. This finding was attributed to the use of the complement fixation test for CBPP serology and its limited capacity to detect either early or chronic cases.

²³ CBPP serology used the complement fixation test (CFT) and brucellosis serology used the Rose-Bengal plate test and CFT.

Many people had stopped keeping pigs after the outbreak and were therefore not interviewed. A total of 216 pig owners who kept 529 pigs were questioned. The aim was to determine the history of ASF in pigs kept by the owner, and to obtain information about husbandry and trade in pigs. Owners were questioned for evidence of free-range husbandry of pigs and the feeding of waste for food preparation. Owners were also shown the Ornithodoros tick and asked if such ticks were present in their village". No other information on the questionnaire methodology was provided. It was not stated how the sample villages were selected other than they were known to be villages which had been affected by the ASF outbreak. The total number of villages in the two survey districts was not stated and details on the method of questionnaire administration were omitted.

Despite the absence of important methodological details, the researchers were able to demonstrate a statistically significant difference in the frequency of ASF between the two survey districts and attributed this difference to variations in pig husbandry. The ability of pig owners to diagnose ASF was not mentioned even though information on the frequency of outbreaks, as reported by pig owners, formed the basis for some of the study's main conclusions.

Foot and mouth disease in northern Thailand

In northern Thailand a questionnaire survey was used to assess the incidence of foot and mouth disease (FMD), mortality, morbidity and vaccination practices (Cleland *et al.*, 1995). A purposive sample²⁴ of 60 out of an estimated 5000 villages were targeted in the survey and these villages were selected according to the willingness of livestock owners to cooperate, previous involvement in government programmes and physical accessibility of the villages during both wet and dry seasons. The survey was conducted between 1991 and 1992 and a 'standard questionnaire' was used to record the collective opinions of the village headmen, 'keymen' and other 'influential farmers' in the village. The headmen were government officials and the keymen were volunteers who assisted with government programmes. When describing the survey methodology, no information was provided on the composition of the survey team or levels of training in interview techniques. It was not stated how many questions were asked or how the collective opinion of the respondents in each village was determined, particularly in the event of differences of opinion. The number of respondents in each village was not detailed. Although some information was provided on the content of the questions, it was unclear whether questions were open or closed, or if the questionnaire had been pre-tested.

Two measures of validity were mentioned in the article in relation to specific questions. The use of laboratory submission data was suggested as a means to cross-check respondent's knowledge of whether or not samples from sick animals had been collected by livestock officers. However, although respondent's opinions were reported no laboratory data was presented to link these views with actual submissions. The findings of a separate risk factor study and disease investigation were used to support respondent's views on sources of infection during outbreaks. No information was provided on the ability of respondents to either diagnose FMD or determine mortality and morbidity levels due to this disease. Questionnaire reliability and non-sampling errors were not mentioned.

This study is also of interest because the views of a few individuals who were linked to government were reported as the views of 'the villagers' and the researchers seemed to assume that the opinions of a select few were representative of villagers as a whole. Hence, although the impact of FMD on different types of livestock was reported it was unclear who owned these animals or whether less wealthy people or women had different views to those of the respondents. The study included a livestock problem ranking in which respondents were asked to name the two main problems affecting livestock in their villages. The finding that poor pasture during the dry season was the major problem was deemed to be true for all villagers regardless of their livestock holdings.

²⁴A non-probability sampling method in which the choice of sample is dependent on researcher judgement on what constitutes a representative sample.

In the context of participatory approaches to animal health service delivery this study highlighted an important constraint facing government veterinary services *viz.* although the Thai government and donor prioritised FMD control it was evident that village headmen and influential farmers had other priorities. The proposed solution to this dichotomy was to educate farmers about the benefits which they would receive if their animals were vaccinated against FMD and reduce local concerns over side-effects of vaccination, which the researchers considered to be ill-founded.

5.3 Good practice verses actual practice in the use of questionnaire surveys

The examples quoted above indicate that animal health researchers in LDCs have not always heeded the recommendations of veterinary epidemiologists with respect to questionnaire design and implementation.

When describing sampling methods, convenience (Nuru and Dennis, 1976; McDermott *et al.*, 1987; Cleland *et al.*, 1995) and expected cooperation from respondents (Nuru and Dennis, 1976; Cleland *et al.*, 1995) were mentioned as factors which influenced sampling. For the schistosomiasis survey in southern Sudan the interviewer tried to *"interview as many owners as possible, regardless of size of their herd or prior knowledge of disease problems"* (McCauley *et al.*, 1983b) whereas in Malawi, pig owners were targeted whose pigs had survived a disease outbreak (Allaway *et al.*, 1995). In only one of the surveys, in Zambia, was a random sampling method applied (Perry *et al.*, 1984).

Although only six examples of questionnaire surveys were reviewed in detail, it seemed that when non-random sampling methods were used the researchers usually failed to discuss the dangers of applying the survey results to a wider population. When reviewing these questionnaire surveys in relation to the biases of rural development tourism (Table 2), there was evidence of spatial, male and professional bias. Waltner-Toews (1988) mentioned the importance of seeking out those informants who were most likely to be knowledgeable on a particular subject, rather than directing questions at those who hold power - *"If the women are caring for the buffaloes, but the men are politically in charge, to whom does one direct the questions of buffalo rearing?"* However, the examples of surveys described above indicate limited attention to varying levels of knowledge within communities and a bias towards men as questionnaire respondents.

In only one survey did the researchers justify their sampling method according to understanding of social structure and livestock management (McDermott *et al.*, 1987). These workers acknowledged the shortcomings of their methods but also explained how logistical, resource or other constraints prevented the use of a more rigorous survey design. A key lesson from this survey was that the authors were able to describe specific methodological adaptations and relate them to the context in which they were working.

In the six questionnaire surveys reviewed, information on questionnaire design was usually brief. No copies of the questionnaire were reproduced and information on specific questions asked varied from non-existent (Nuru and Dennis, 1976) to details of a ranking method for cattle diseases (Perry *et al.*, 1984). It was often unclear what type of questions were asked (e.g. closed or open), the ordering of questions according to topic or the number of questions. The time period required for each interview was not stated. None of the examples reviewed provided the reader with sufficient information to repeat the method.

Section 3.1.3 discusses non-sampling errors in surveys in LDCs and some of the best-practice advice on questionnaires indicated that attention to local customs and language were important during livestock owner interviews. However, in general the veterinary literature contains very little information on methods and behaviour for communicating effectively with people from different cultures, ethnic groups or backgrounds to the researchers. Although some workers mention the

importance of non-verbal communication during interviews (e.g. Waltner-Toews, 1983) the precise details of appropriate behaviour and attitude of interviewers were not discussed, nor were ways of determining whether interviewers were hindering or promoting constructive, open dialogue. Perry and McCauley (1984) suggest that a local veterinary worker might be used as an interviewer but did not discuss how such a person might misinterpret or misreport the views of livestock keepers due to their own technical training or other reasons. The assumption has usually been that the use of local interviewers automatically overcomes cultural and language barriers.

When discussing research methods in development settings Pratt and Loizoz (1992) noted the limitations of personal interviews for collecting information on sensitive or private topics unless time was taken to build a trusting relationship with informants. This issue has been mentioned in relation to animal health surveys (Pfeiffer, 1996), particularly in connection with questions on numbers of livestock owned (Perry and McCauley, 1984). However, specific advice on how to create good rapport with livestock owners is absent in the veterinary literature on questionnaire methods. Although the need for training of interviewers is mentioned by various workers the precise topics to be covered during training are not mentioned and it is unclear whether veterinarians themselves possess the skills required to train interviewers. Further considerations affecting the use of questionnaires in pastoral areas of Africa are cultural and professional biases affecting veterinary workers. Typically, veterinarians who are posted to these areas are not from pastoral ethnic groups and they have different moral and social values, religion and language. In many African countries, the notion of pastoralists as irrational, uncooperative and uneducated still prevails and in veterinary medicine, is reinforced by training which focuses on intensive, western-style farming (Catley *et al.*, 1998). With these limitations in mind, the view of Stone and Campbell (1984) that non-sampling errors are often ignored in formal surveys in LDCs must to apply to some questionnaire surveys on animal health topics.

While the use of a single, local interviewer can help to overcome some cultural and language problems this approach can lengthen the survey period. Although cross-sectional, the surveys in Zambia (Perry *et al.*, 1984) and southern Sudan (McCauley *et al.*, 1983b) described above were conducted over 3.5 and 3 months respectively. When the time required for questionnaire preparation and data analysis are also considered, even cross-sectional surveys can require time inputs of greater than six months.

Regarding validity of survey findings, a number of issues arose. First, measures of validity in the schistosomiasis and Zambia surveys were largely subjective, with veterinarians making qualitative judgements on survey findings. Although the schistosomiasis survey included an assessment of the ability of livestock keepers to diagnose the disease, surveys on African swine fever and foot and mouth disease seemed to assume that informants were 100% accurate in their diagnosis. No information was provided on local names or descriptions for health problems under investigation. McDermott *et al.* (1987) were able to compare the opinions of livestock keepers with serological findings and noted agreement between owner diagnosis and presence of CBPP antibody in some age groups of cattle. However, the limitations of CBPP and brucellosis serological tests were also discussed.

Overall, the use of formal data collection methods seems to reinforce the top-down research and development approach, with researchers setting the agenda and deciding which questions to ask. In only one of the above examples (McDermott *et al.*, 1997) did the researchers seem to respond to a problem which seemed to be prioritised locally by livestock keepers. In two examples (Nuru and Denis, 1976; Cleland *et al.*, 1995) it was noted how informants had little interest in the research topic for very practical reasons. In livestock development the problem of researcher-driven topics and methods was discussed by Leyland (1991). In addition, it was noted how questionnaires can sometimes make livestock owners seem ignorant when they were not simply because researchers asked the wrong questions about the wrong subjects. When these problems are considered together

with the time periods needed to implement questionnaire surveys, problems of questionnaire design, administration and the logistical difficulties of pre-testing questionnaires and accessing remote areas, the need for alternative methods becomes apparent.

6.0 Community Participation and Participatory Appraisal in Animal Health Services and Research

6.1 Community participation in animal health service delivery

6.1.1 *The early use of primary-level veterinary workers in Africa*

In the animal health sector in Africa, attention to the involvement of local people in service provision was evident during the colonial period. Before independence, many veterinary services used trained livestock herders as vaccinators or reporters of disease outbreaks. These workers were given basic training and accounts of their activities are available from Nigeria (Henderson *et al.*, 1973), Uganda (Carmicheal, 1973), Sudan (Jack, 1961), Botswana (Falconer, 1973), Tanzania (Lowe, 1973) and northern Somalia (Peck, 1973). At this stage in the history of primary animal health services, paravets and vetscouts were used to control diseases which were prioritised by government. Although herders also wanted to control problems such as rinderpest and CBPP, they had limited influence on the design of services which were controlled, if not enforced by government. Following independence in Africa there was a lull in the use of primary-level field workers for over ten years as new African governments trained their own veterinarians and other types of worker using formal systems of education (Baumann, 1990).

6.1.2 *Towards community-based approaches*

The idea to use primary veterinary workers in Africa was resurrected in 1976 when a rangelands project in Ethiopia used veterinary scouts to provide a limited range of vaccination and treatment services (Sandford, 1981). Veterinarians in Sudan also began to promote the 'paravet', 'barefoot vet' or similar type of worker (Schwabe, 1980; Schwabe and Kuoajok, 1981; Halpin, 1981) and in Somalia, 'Nomadic Animal Health Auxiliaries' (NAHAs) were used to good effect in the central rangelands (Baumann, 1990). These experiences coincided with the development of decentralised animal health projects in Nepal and India with support from the United Mission of Nepal and Intermediate Technology Development Group (ITDG) in the early 1980s (Hadrill, 1989; Mulvaney, 1984). The common feature of these projects was greater use of local people to identify key problems, select people for training as animal health workers and support these workers via schemes such as surcharges on veterinary medicines. Hence, communities began to participate more fully in the design and delivery of services, and in some projects paravet-type workers were regarded as independent operators. Maximilian Baumann encapsulated these ideas when describing GTZ's NAHA system in Somalia. He noted that "*... in our system, the NAHA is an independent, privately-practising, informally-trained person of pastoral origin who is not on the payroll of any government service nor development project. He is an auxiliary in the sense of being a self-employed complement to official services, a person who lives a pastoral life himself...*" (Baumann, 1990) and "*trainee selection is community based and one integral task of the village committees and associations is to monitor the performance of their NAHA*" (Baumann, 1993).

In the late 1980s, decentralised animal health systems began to attract increasing interest from NGOs working in marginalised areas of Africa, particularly dryland areas inhabited by pastoralist communities. The concept of community participation and its role in animal health services was reviewed (Leyland, 1991) and ITDG and Oxfam UK/Ireland were active in developing projects in pastoral areas of Kenya (Grandin *et al.*, 1991). ITDG organised workshops which brought together veterinarians who were developing paravet-type projects in dryland areas of Sudan, Chad, Uganda

and Ethiopia (Young, 1992a). These small-scale projects were often said to be 'community-based' because they involved local people in various stages of project implementation and focussed on local priorities. Experiences from community-based approaches began to appear more frequently in the informal development literature and The Arid Lands Information Network published information from paravet projects in Senegal (Obel-Lawson, 1992) and Chad (Hammel, 1995). In 1993 an issue of the journal *Appropriate Technology* (1993) was dedicated to community-based animal health and described experiences from Kenya (Blakeway, 1993), Afghanistan (Leyland, 1993), Sudan (Dahir, 1993) and Chad (Peters, 1993). In 1998, the French NGO *Vétérinaires sans frontières* reported CAHW activities in Guinea, Mauritania, Niger, Senegal and Togo (*Vétérinaires sans frontières*, 1998). Participatory methods often featured in these NGO projects and are discussed in more detail in section 6.2.

The trend towards more community-based approaches to animal health service provision could be justified on both practical and ideological grounds. On a practical level, veterinarians had long known that pastoralists possessed detailed knowledge of animal health matters and had good diagnostic skills. The use of herders as vetscouts and vaccinators during the colonial period was a reflection of local capacity to carry out important veterinary duties. Accounts from northern Somalia (Hunt, 1951; Mares, 1951, 1954a, 1954b), Sudan (Schwabe and Kuoajok, 1981) and Turkana (Ohta, 1984) were examples of literature which detailed a rich, local veterinary terminology and the use of indigenous practices including traditional vaccination, use of medicinal plants, avoidance of parasites and surgical procedures. Mares (1954b) noted that it was *"surprising to find that the nomad recognises the flies that spread trypanosomiasis; that he has a good idea of the infective nature of disease and knows that cattle with rinderpest are dangerous to other cattle; and that he has learnt logical and effective, though very primitive, methods of immunisation"*. Similarly, after working with camel herders in northern Somalia in the late 1960s, a British veterinary team concluded that despite their laboratory tests for trypanosomiasis *"the best diagnostic tool was probably the camel owners own opinion. This is not something to be dismissed lightly because a camel owner knows his animals and the disease intimately"* (Edelsten, 1995). In Maasailand it was herders who first suggested that wildebeest were associated with the epidemiology of malignant catarrhal fever (Barnard *et al.*, 1994) and when discussing rinderpest, Plowright (1998) suggested that *"nomadic cattle owners could give uninitiated professionals a firm diagnosis of rinderpest and even husbanded mild strains purposely to immunise their young stock"*. These local skills did not escape the attention of proponents of community-based approaches, some of whom were pastoralists themselves (Akabwai *et al.*, 1994).

From the ideological viewpoint, more involved levels of community participation such as the interactive participation outlined in Table 1 were viewed as prerequisite to more relevant animal health services. Crucially perhaps, local say in service provision was viewed by project staff as a basic right rather than just a means to achieve better services. According to Mariner (1999), *"Livestock owners are no longer seen as an inert substrate upon which development is to be practised; they are active participants who can and must bring important intellectual contributions to development"*.

Although for many years community-based projects produced limited information on project impact, recent assessments showed how this approach to veterinary service delivery in pastoral areas of Africa was effective. Reviewing experiences in southern Sudan, Blakeway (1995) calculated substantial reductions in calf mortality and other production benefits from the use of CAHWs. In a CAHW project in northern Kenya, Holden (1997) concluded that *"In this case study CAHWs reduced cattle mortality rates by 42%, and small-ruminant losses by 68%. These gains translated into an increase in average income of \$48 per year per farm in villages with active CAHWs"*. Also in Kenya, a review of Oxfam UK/Ireland's project in north-east Kenya compared livestock mortality in project and non project areas (Odhiambo *et al.*, 1998). In non-project sites annual mortality in camels, cattle and sheep and goats was estimated at 31%, 32% and 25% respectively whereas in project sites annual mortality was 20%, 17% and 18%. The reduced loss of livestock was valued at KSh. 22,853 (approximately USD 350.00) for each household in the project area and this sum was sufficient to buy grain to feed 2

adults and 4 children for 250 days. This finding was used to support pastoralists' claims that the project had improved their well-being²⁵.

6.1.3 Community-based approaches to rinderpest eradication in Africa

In the early 1990s the persistence of rinderpest in endemic, remote pastoral areas of eastern Africa was a serious threat to the eradication of the disease. For many years, conventional government vaccination teams had been unable to access these areas or create useful working relations with local herders (Mariner, 1996; Leyland, 1996). However, the development of a heat-stable rinderpest vaccine (Mariner *et al.*, 1990) raised the possibility of using trained livestock herders to vaccinate cattle in remote areas (Mariner *et al.*, 1994). Using the principles of community-based approaches which had been developed by NGOs, the Pan African Rinderpest Campaign (PARC) began to use CAHWs to vaccinate cattle in the Afar region of Ethiopia and southern Sudan.

In Afar, PARC Ethiopia trained 20 CAHWs in 1994 and supplied them with heat-stable rinderpest vaccine. Prior to this activity conventional vaccination campaigns had vaccinated around 20,000 cattle per year in Afar and achieved approximately 60% immunity. In 1994-95, CAHWs vaccinated 73,000 cattle and achieved 83% immunity (Mariner, 1996). No outbreaks of rinderpest were reported from Afar after November 1995 and PARC suggested that *"The success in the Afar region is perhaps the most striking example of the impact of participatory techniques in remote, marginalised communities"* (PARC, 1996).

In southern Sudan, community-based rinderpest vaccination has formed the basis for animal health service delivery since 1993 (Blakeway, 1995; Leyland, 1997; Jones *et al.*, 1998). Using a network of NGOs to work with communities to train and support CAHWs, the UNICEF-Operation Lifeline Sudan (Southern Sector) Livestock Programme achieved a 10.6 fold increase in vaccination coverage following the introduction of community-based systems. Since 1993, vaccination coverage has been maintained at more than 1 million cattle vaccinated/year and reported outbreaks of rinderpest in southern Sudan decreased from 14 outbreaks in 1994 to 1 outbreak in 1997. According to Catley *et al.* (1998), *"Considering the complex emergency context of southern Sudan and the importance of rinderpest in a cattle-centred economy and culture, the effective control of rinderpest by UNICEF-OLS/SS can be viewed as a major achievement"*. CAHWs were also trained to address other animal health problems and in 1998 a network of 563 workers covered approximately 70% of southern Sudan (Jones *et al.*, 1998).

Considering the successful use of CAHWs for rinderpest vaccination, some specific aspects of this approach are worth noting. When describing the lessons learned after three years of working in southern Sudan, Leyland (1996) advised that projects should:

- build on what local people already know;
- use and develop people's abilities and skills to analyse and evaluate their situation;
- reveal whether human and material resources are being used efficiently and effectively;
- help people to analyse their individual situations and see how their activities may be altered in a beneficial manner, thus setting local priorities;
- enable people to study their own methods of organisation and management;
- increase the sense of collective responsibility for programme development, implementation, monitoring and evaluation;
- draw-up community action plans or 'social contracts' which detail priority actions to be taken, use of materials and labour, and roles and responsibilities of different players.

²⁵Both the Kenya reviews were based on questionnaires combined with the limited use of PA tools. Questionnaire methods are discussed in section 5.0.

6.1.4 Community-based animal health systems and quantitative data

Although CAHWs involved in rinderpest vaccination were active reporters of disease outbreaks (Catley *et al.*, 1998), in general community-based animal health projects in pastoral areas have been isolated from government veterinary services as mentioned in section 6.1.2²⁶. Although not well documented, it seemed that the poor relations between NGOs and government veterinary services, particularly at central level, meant that data arising from NGO projects was rarely if ever used in official animal health information systems. In addition, the information produced by NGOs was probably deemed unsuitable for official purposes because of its qualitative nature. The lack of quantitative information on community-based systems also limited the capacity of NGOs to influence government policy on CAHWs, because evidence of project impact was often based on methodologies which government veterinarians were unwilling to acknowledge.

When justifying the lack of quantitative data in some community-based animal health systems in pastoral areas, it was advised that data needs and methods had to suit operational contexts (Catley, 1997c; Catley *et al.*, 1998). Community-based systems had been used in emergency/relief, rehabilitation and development situations and quantitative data was most likely to emerge from development projects with their more long-term presence and inputs. A large number of community-based animal health projects had been implemented in emergency and rehabilitation contexts in which the value of formal disease investigation and surveys was questionable. Although conventional methods seemed to be unworkable in many areas, a strategy of waiting for conflict or humanitarian situations to improve was also impractical considering the longevity of complex conflict situations in areas such as southern Sudan, the Ogaden and Somalia.

The role of primary-level veterinary workers in disease surveillance has been a point of discussion in the literature for many years. In the early 1980s workers in Sudan suggested that traditional livestock healers could act as disease surveillance agents²⁷ (Schwabe, 1980; Schwabe and Kuojok, 1981) and in central Somalia, NAHAs were used in a structured disease reporting system established by GTZ in the mid 1980s (Baumann, 1990). The most detailed disease surveillance data collected from NAHAs related to a respiratory disease in small ruminants called *sambab* which project veterinarians assumed was contagious caprine pleuropneumonia (CCPP). The project was able to compare NAHA reports with a serological survey of CCPP and concluded that the two sets of data were not statistically independent. Consequently, it was suggested that NAHAs could be a useful means of CCPP surveillance in the Somali rangelands (Baumann, 1990).

As community-based animal health systems become more popular in pastoral areas, it seems likely that implementing agencies and government will need to design appropriate disease information systems which properly utilise the skills and capacity of CAHWs. In particular, although it is widely recognised that pastoralists possess detailed knowledge about animal health problems there is also evidence that many of the most effective CAHWs in pastoral areas are illiterate (e.g. Jones *et al.*, 1998; Leyland and Akabwai, 1998). In these situations, the use of PA methods in disease surveillance might overcome some of the literacy, time and resource limitations of more conventional methods. For example, visualisation methods lend themselves to pictorial reporting formats similar to those

²⁶In relation to animal health service delivery, while NGOs have often viewed governments to be bureaucratic, corrupt, highly centralised and politically unsound, governments have regarded NGOs as "*loose cannons*" who worked in areas where government was unable to provide services. Hence, NGOs were perceived by the state as undermining state authority (Catley, 1997).

²⁷The value of traditional healers as disease reporting agents was never tested in southern Sudan. When community-based approaches were introduced in the early 1990s, communities rarely selected traditional healers for training as CAHWs (Adolph *et al.*, 1996).

which are already used to monitor programmes with illiterate CAHWs. Examples of visualisation methods such as mapping and some types of scoring tools are described in section 6.2.

6.1.5 Current status and understanding of community participation in animal health services

In common with other sectors, community participation in animal health services was often a vague concept. Various veterinary activities and projects can be used to illustrate the types of participation described in Table 1 (section 2). For example, the construction of government veterinary clinics in dryland areas of Africa relied on the passive participation of livestock keepers. In these cases, a central authority told those people who were intended to use or provide the service that clinic construction would take place, but potential service-users and providers were not involved in the decision making process. Participation by consultation was typical of much veterinary research which through formal surveys, relied on livestock owners to provide information which was later analysed and used without their involvement. Functional participation related to conventional vaccination campaigns which required livestock owners to collaborate with government vaccination teams. Interactive participation was found in some community-based animal health and vaccination projects.

In the author's experience, when presented with a typology of participation such as that detailed in Table 1, field-level veterinary workers in Kenya and southern Sudan immediately recognised that their work involved different types of participation simultaneously, though ultimately they were often trying to achieve interactive participation or even self-mobilisation in projects as a whole. They also noted that participation did not move neatly from one level to the next as projects evolved, but there were many overlaps between the different levels of participation. Hence, these workers highlighted the weaknesses of a linear typology of participation and realised that different situations and project activities were related to different types of participation. In contrast to field-level workers, government staff and academics often felt less comfortable with the typology because they recognised that their work could be largely extractive, prescriptive or involved minimal contact with livestock keepers.

Regarding more involved forms of participation, some NGOs continued to support in-depth types of community participation based on local management of basic animal health services. A similar approach was used by the PARC-VAC Project of OAU/IBAR but with more attention to combining community participation with private delivery systems (Leyland and Akabwai, 1998). Despite operating in a war zone, the UNICEF-OLS/SS Livestock Programme was also promoting local institution-building which was designed to encourage community-level control over service delivery (Jones *et al.*, 1998). However, while some NGOs had been at the forefront of the CAHW approach and had developed technically proficient ways of working, among other NGOs and aid organisations there was considerable variation in technical capacity to implement community-based work. Weaknesses varied from a lack of understanding of the overall concept of community participation to highly paternalistic institutional behaviour that assumed for example, that livestock owners were unable or unwilling to pay for services. Other NGOs were more interested in maintaining their operations indefinitely rather than handing over control of projects to local people (Catley, 1997c; Catley *et al.*, 1998).

While community participation was known to be a worthwhile approach to service delivery in pastoral areas (Mariner, 1996; Leyland, 1996, 1997; Holden, 1997; Leyland and Akabwai, 1998; Jones *et al.*, 1998; Odhiambo *et al.*, 1998; Catley *et al.*, 1998; Catley, 1999b), other attempts to use participatory approaches have met with less success. A recent review of community-based tsetse control projects in Africa concluded that in many cases, commitment to community participation had been limited and projects tended to demonstrate low sustainability (Barrett and Okali, 1998). In part, this situation was attributed to a balance between technical and social issues which was skewed towards the former - inputs from staff with community organisation skills were reported to be absent.

Other discussion points in the review included poor financial sustainability, even in areas where livestock keepers were buying trypanocidal drugs, and lack of clarity regarding the objectives of tsetse control i.e. suppression or eradication. The review indicated that livestock keepers participated in tsetse control programmes by being questioned by researchers, often using conventional systems of inquiry; being instructed by local leaders or outsiders to implement and manage projects; contributing towards costs; and being educated about tsetse control. These activities indicated that according to the typology in Table 1, levels of participation in these projects were not consistent with sustainable change.

This type of analysis of participation raises important questions for veterinarians in developing countries. For example, if animal health projects or services are using participation what type of participation best describes the work and how does this relate to the equitable and sustainable provision of veterinary services? As community participation has attracted greater attention within aid organisations, more veterinarians have been trained in PA and the methods are applied in increasingly diverse situations. In the late 1990s, the use of community participation by veterinarians included the promotion of CAHW systems, veterinary research and large-scale disease and vector control programmes (see section 6.2). Although all these veterinary activities are 'participatory', understanding and expectations of the concept varied considerably between the projects and professionals concerned. To date, the need to look more closely at commitment to and understanding of participation by veterinarians has not featured in the veterinary literature.

6.2 Participatory appraisal methods for use in animal health services and research

Veterinarians and livestock workers have used and are currently using a wide range of PA methods to investigate animal health topics. These methods included various interviewing methods, scoring and ranking tools, and visualisation tools such as seasonal calendars, maps, Venn diagrams and flow diagrams. Collated descriptions of these methods were produced by Andrea Cornwall (1992) and were added to in a special edition of *RRA Notes* in April 1994. When describing the use of PA methods in pastoral development, Waters-Bayer and Bayer (1994) also detailed numerous PA methods which were relevant to animal health investigations. These reports together with other key papers describing the use of PA methods in animal health are listed in Table 5. Specific PA methods according to information needs are summarised in Table 6.

6.2.1 Interviewing methods

Interviewing methods have been widely used during participatory surveys. Not only were they useful methods in their own right, but they were often considered to be an important component of other methods (Pretty *et al.*, 1995). Most if not all other PA methods involved interviewing skills and it was often the follow-up questions asked after the completion of a diagram, map or scoring tool which provided the most insightful information.

Guidelines for conducting open, semi-structured interviews have been detailed in previous sections of this review (sections 3.2.3b and 3.2.5b). In relation to veterinary medicine, the use of semi-structured interviews in PA has some overlap with history-taking and diagnosis in veterinary practice. Although undergraduate veterinarians are taught a fairly rigid set of questions to ask when taking case histories from animal owners, this question list becomes more probing and yet also more flexible and relaxed as the clinician learns which questions are most pertinent with respect to reaching a diagnosis in particular cases. The good clinician becomes adept at cross-checking information during these interviews²⁸ and following up interesting lines of inquiry.

²⁸A simple example might be the use of "How old is Daisy?" early on in the history taking followed by "And when was Daisy born?" at a later stage.

Table 5
Key literature on the use of participatory appraisal in animal health services

Country	Notes	References
Ethiopia	Included as an early example of animal health issues featuring in a general needs assessment.	Scoones and McCracken (1989).
Various	Thesis discussing the potential applications of RRA and PRA in livestock development.	Leyland (1991).
Kenya, Zimbabwe	Use of wealth ranking and disease ranking in ITDG projects.	Maranga (1992); Young (1992b).
Ethiopia	Report which includes a method for 'interviewing cows'.	IIED and ActionAid Ethiopia (1992)
Afghanistan	Use of wealth ranking, disease ranking, fodder ranking and seasonal calendars during the design of an animal health project.	Leyland (1992).
Nigeria	Use of RRA to study constraints and solutions facing poultry farmers; comparison of RRA with questionnaire method.	Sonaiya (1992).
Zambia, Ethiopia, Guinea	Describes a methodology for rapid appraisal, including the use of livestock disease calendars and transect walks.	Ghirotti (1993).
Somaliland	Seasonal calendar showing variations in disease incidence; herders' calendars showing seasonal movements of livestock.	Hadrill and Yusuf (1994a; 1994b).
Kenya	Describes the progeny history method.	Iles (1994b).
Mongolia	Use of labour calendars by gender; illustrates division of labour for livestock tasks.	Cooper and Gelezhamstin (1994).
India	Use of maps, interviews, seasonal calendars and livelihood analyses during an evaluation of a dairy buffalo project.	Devavaram (1994).
Nepal	Use of maps, progeny histories, rankings and interviews during an evaluation of a village animal health worker project.	Young et al. (1994).
Mozambique	Use of Venn diagrams to understand institutional links between communities and agencies involved in livestock.	Braganca (1994).
Indonesia	Outlines the use of progeny histories in a study of economic aspects of malignant catarrhal fever in buffaloes and cattle.	Nurhadi et al. (1994).
Somaliland	Use of participatory scoring tools including 'before and after' scoring for programme review/evaluation.	ActionAid Somaliland (1994).
Southern Sudan	Outlines the use of participatory animal health surveys from 1993 in the UNICEF Operation Lifeline Sudan Livestock Programme.	Leyland (1996).
Somalia	Use of PA methods to conduct preliminary investigations on rinderpest in a remote area.	Mariner and Flanagan (1996).
Somaliland	Use of seasonal calendars and scoring tools to investigate tick ecology and tick-associated disease.	Catley and Ahmed Aden (1996).
Somaliland	Detailed account of a livestock disease scoring tool; discussion on reliability and validity.	Catley and Mohammed (1996).
South Africa	Outlines the use of RRA within a systems approach to animal health needs assessments.	McCrindle et al. (1996).
Non-specific Ethiopia	Summary of PA tools and training needs for veterinary epidemiology. Stakeholder analysis of animal health services based on the use of PA tools, particularly proportional piling.	Catley (1997b). Save the Children UK (1997).
South Africa	Use of rapid appraisal with stakeholders to assess community veterinary needs.	McCrindle (1998).
Trinidad and Tobago	Use of school essay method and group interviews as part of an ethnoveterinary study.	Lans and Brown (1998a; 1998b).

Table 6
Some PA tools for use in veterinary epidemiology and economics (adapted from Catley, 1997b)

Information required	PA tools and methods ^a
System boundary	Natural resource maps, social maps.
Social organisation	Social mapping, Venn diagram
Wealth groups	Wealth ranking
Relative livestock ownership	Proportional piling
Role of livestock in household economy	Livelihood analysis
Preferred types of livestock reared	Livestock species scoring
Income from livestock	Proportional piling
Marketing structure	Flow diagrams, service maps
Veterinary services	Service map, Venn diagrams, ranking and scoring
Animal husbandry	Seasonal calendars ^b , mobility maps ^c ; transects
Resources available to rear livestock	Natural resource maps, transects.
History of livestock diseases	Timelines
Priority livestock diseases	Livestock disease scoring
Seasonal variations in livestock disease	Seasonal calendars
Relative mortality rates	Proportional piling
Livestock productivity	Progeny history

^aSemi-structured interviews can provide information on all topics

^bParticularly useful for showing breeding management and feeding management

^cTo show livestock movements in pastoral and agropastoral systems

During the interview, the clinician also observes or examines the animal and therefore cross-checks verbal information which is being provided by the owner. With time and practise this process becomes almost subconscious, and perhaps is part of the art of veterinary medicine in much the same way as qualitative inquiry is an acquired skill in the social sciences²⁹.

This type of interviewing was reflected in the approach of Grandin and Young (1994) and the use of question lists such as those detailed in Box 5. Essentially, this method used the type of questions that a veterinary worker would routinely ask when taking a clinical history. Another structured interview tool was the progeny history method which was developed primarily to collect information on animal production (Iles, 1994b). Progeny histories were livestock genealogies which detailed the fate of all of the offspring of particular female animals. The method used a brief question list which was applied to animals showing varying performance as perceived by the livestock keeper and described as 'good', 'average' and 'poor' by the researchers.

The key questions of the progeny history method are detailed in Box 6. When repeated with animals in different herds, the results of various progeny histories were summarised quantitatively and could be presented as pie charts. An example is shown in Figure 2. As progeny histories were dependent on the accurate recollection of information over long time periods, they could be subject to recall bias. However, according to Grandin (cited by Iles, 1994b) Maasia informants seemed to have few problems describing the events affecting the lives of individual animals and could even discuss the mothers of each live female in the herd.

²⁹Observation, interviewing and subjective assessment are the foundation of ante mortem and post mortem veterinary diagnosis, and hence veterinary practice. In terms of knowledge systems, much veterinary practice in the real world is based on a combination of instrumental knowledge ('good science'), interactive knowledge (human behaviour and experience) and critical knowledge (ethics and values), rather than instrumental knowledge *per se*.

Box 5

The question list from the ethnoveterinary interview guide (source: Grandin and Young, 1994)

1. What species, breeds, ages and sexes of animals are affected by this disease?
2. Is there seasonality or other timing to the appearance of the disease?
3. Does it usually affect one animal or a group of animals at the same time? Does it spread from animal to animal (i.e. is it contagious or infectious)?
4. What causes the disease: natural/physical causes, supernatural/non-physical causes or both? Describe.
5. Are there ways to prevent/avoid this disease? If so, what are they?
6. Describe the main symptoms, if possible in order of progression and timing. What is the first symptom seen and when? Also, what is the symptom if any which makes you decide it is this specific disease?
7. Are traditional treatments available? Basically what are they? Where/how are they obtained? What happens when they are used (please be as specific as possible).
8. Are modern treatments available? What are they? Where/how are they obtained? What happens when they are used (please be as specific as possible).
9. What usually happens if the animal is not treated?
10. When did you last have, or hear of, an animal with this disease? What did you do and what happened to the animal?

In common with other PA methods, progeny histories could be a very useful way of approaching topics in an indirect manner. For example, veterinarians have used progeny histories to collect information on priority diseases affecting different types of livestock by questioning herders on the fate on animals which left the herd. According to Leyland (1999, personal communication) this approach resulted in more realistic estimates of mortality than direct questions such as "*How many animals died of rinderpest last year?*" which some veterinarians continued to use.

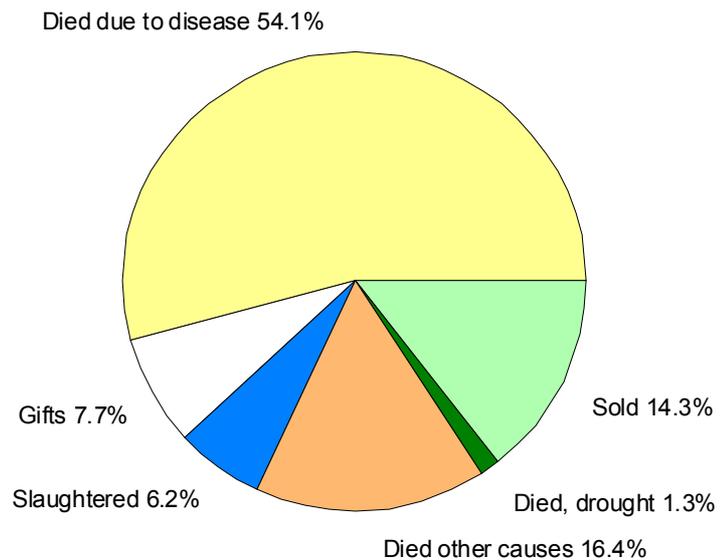
Box 6

The key questions in the progeny history method (adapted from Iles, 1994b)

1. Ask the livestock owner to give the names of six bloodlines of animals and from these ask them to choose two good ones, two average ones and two bad ones.
2. For one good animal, write down the name and ask:
 - C Where did it come from?
 - C How many pregnancies?
 - C How many abortions?
 - C If still in herd, is she pregnant, dry or barren?
3. The for each birth ask:
 - C Was it a single or a twin? (record twins separately)
 - C What happened to it?
 - C Why?
 - C Age now, or age when left herd?If it was female, still in the herd and had given birth record the name of the animal(s).
4. When you have finished all the births of the original animal, repeat questions 2 and 3 for each of the female offspring.
5. Repeat questions 2 and 3 for at least one average and one poor animal, and time-permitting, for another good, average and poor animal.

Figure 2

The use of the progeny history method to collect information on the fate of sheep and goats leaving flocks in Samburu District, Kenya (source: Iles, 1994b)



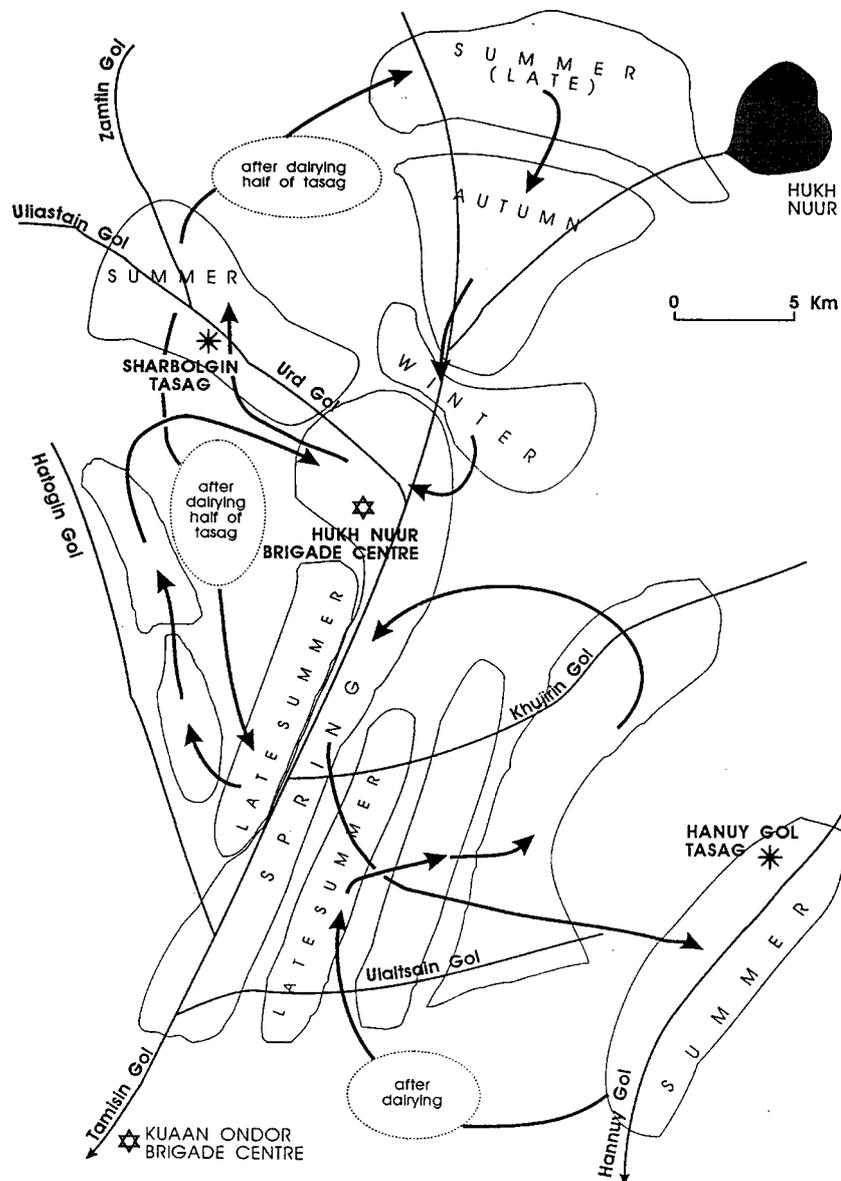
Notes: data derived from progeny histories of 121 sheep and goats.

6.2.2 Visualisation methods

a. Mapping

Mapping has been a popular PA method in animal health surveys and usually involved the construction of maps on the ground using locally-available materials. Hence, depending on the materials used maps can easily become three-dimensional models which might for example, show elevation in the area in question. Examples of maps include livestock mobility and grazing maps (Hadrill and Yusuf, 1994a; Mearns *et al.*, 1994), natural resource maps (Ahmed Aden and Catley, 1993; Mearns *et al.*, 1994), opportunities and service maps (IIED and Action Aid Ethiopia, 1992; Rees *et al.*, 1998) and social maps (IIED and Action Aid Ethiopia, 1992; Braganca, 1994).

Figure 3
Livestock mobility and annual grazing cycle, Mongolia (source: Mearns *et al.*, 1994)



An example of a livestock mobility and grazing cycle map from Mongolia is shown in Figure 3 (Mearns *et al.*, 1994). In pastoral communities, this type of diagram was useful for prompting discussion on topics such as animal health problems that were location-specific, and access to veterinary services when herds were in different places at different times of year. Natural resource maps could also describe the system boundaries for extensive pastoral systems.

In common with more general mapping in PA, animal health-related mapping can be useful during the early stages of local data collection and analysis. The method tends to prompt much discussion and activity among informants, and enables them to define the area under consideration. Although when copied to paper maps become useful outputs of mapping methods, it is important to note that maps can act as the focus for much discussion and follow-up questioning. The process of 'interviewing the map' enables researchers to learn more about the map and pursue interesting spatial features. Hence, when used imaginatively, mapping methods yield both diagrams and discussion of diagrams. Although not represented in the literature, it is also possible to use mapping to understand herders' perceptions of high-risk areas with respect to problems such as tick infestation or attack by biting flies. When livestock movements are associated with specific seasons, information arising from mapping tools can be cross checked using seasonal calendars.

b. Seasonal calendars

Seasonal calendars were used to illustrate temporal variations in disease incidence and parasite populations. The basic methodology for constructing a seasonal calendar is outlined in Box 7 and an example is provided in Figure 4.

Box 7

A methodology for constructing a seasonal calendar (source: Catley, 1997b)

Method: In order to use seasonal calendars the researchers should understand and use local names for seasons or months.

Stage 1 - Draw a horizontal line on the ground to represent 1 year. The line should be at least 1 metre in length. Divide the line according to local definitions of month and season.

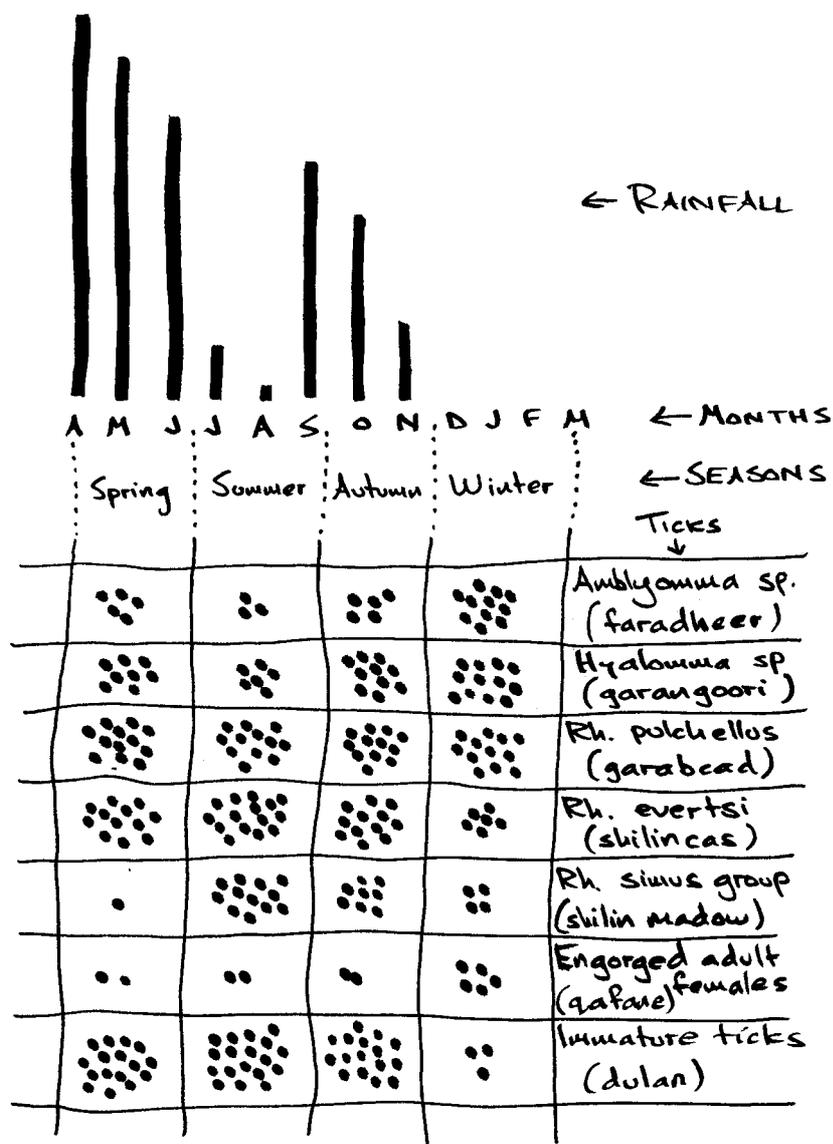
Stage 2 - It is useful (though not essential) to choose rainfall as the first event to be illustrated on the calendar. Take a stick of around 30cm in length and explain to the informants that the stick represents the month which receives the most rain in a year. Ask the informants to place the stick against the month which receives the most rain.

Stage 3 - Take a second stick of around 30cm in length. Explain to the informants that the stick represents the month which receives the second most rain in a year. Ask them to break the stick according to the amount of rain received in the second wettest month, and place the stick against the appropriate month. At this stage the informants will often compare the length of the second stick with the first, and break the second stick accordingly. Repeat this procedure until rainfall throughout the year has been illustrated using sticks. An alternative method uses piles or rows of stones to illustrate rainfall.

Stage 4 - Ask the informants to illustrate on the diagram the occurrence of the events under investigation. Events might be the livestock diseases identified during a livestock-disease scoring. The informants can simply draw on the ground to show the events or use sticks, stones or other materials to-hand.

Stage 5 - Ask the informants to explain the diagram i.e. the positioning and relative sizes of items illustrated. Use probing questions (e.g. *Why? How?*) to follow-up interesting leads.

Figure 4
 Seasonal calendar of tick populations on livestock (source: Catley and Ahmed Aden, 1996)

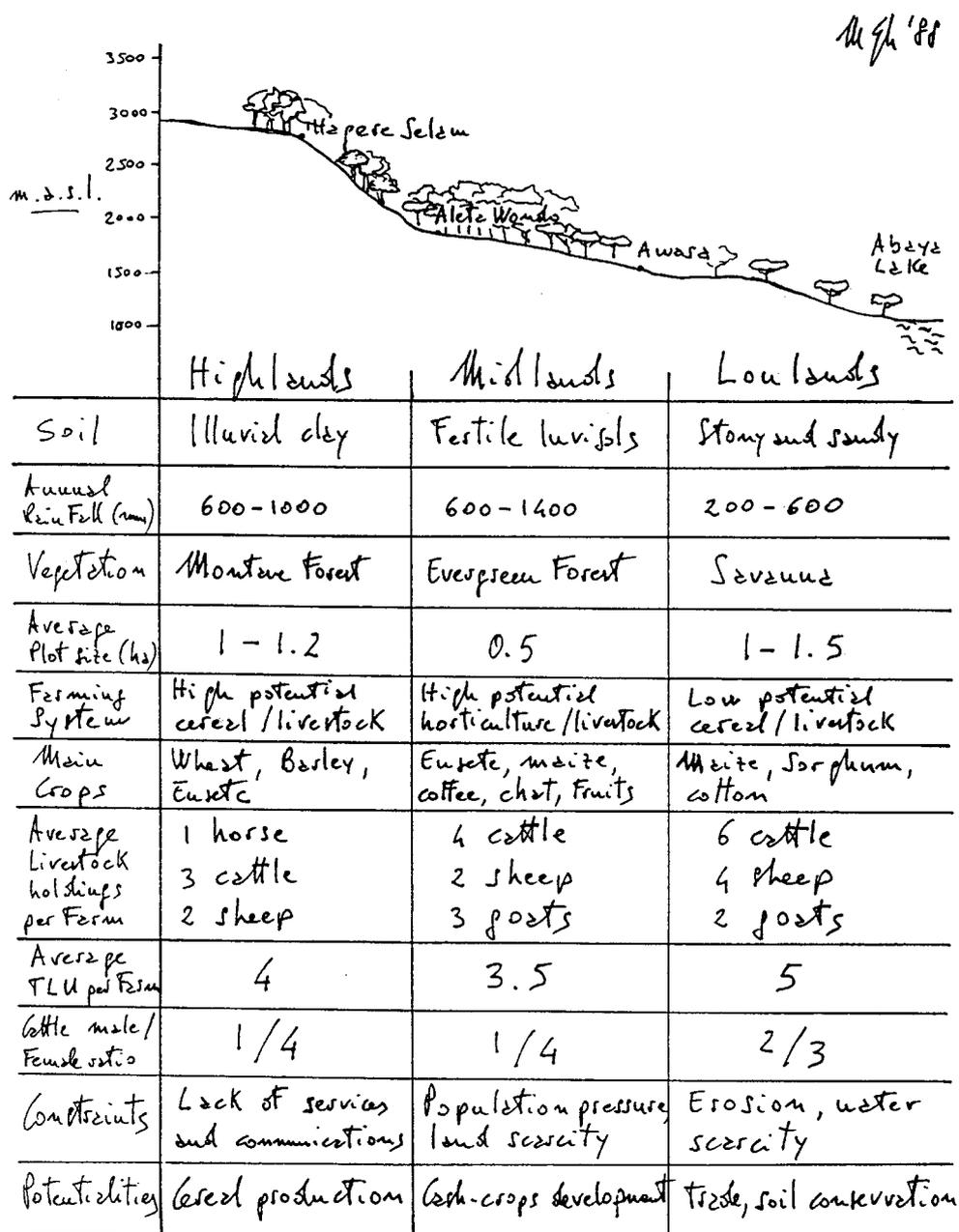


In addition to depicting livestock disease incidence, seasonal calendars could show virtually any item or activity which exhibited seasonal variation. Hence, many seasonal calendars also showed livestock movements, human labour patterns, key animal management practices and rainfall. Examples are available from Mongolia (Mearns *et al.*, 1994; Cooper and Gelezhamtsin, 1994), Nepal (Young *et al.*, 1994), Somaliland (Hadrill and Yusuf, 1994b; ActionAid-Somaliland, 1998), Ethiopia (Konde, 1993), Eritrea (Elos *et al.*, 1995), Guinea (Ghirotti, 1993), Kenya (Rees *et al.*, 1998) and India (Devavaram, 1994).

c. Transects

Transects were diagrams which showed a cross-sectional view of an area. The diagrams were created by walking through an area and entering sketches and notes on to a matrix, as illustrated in Figure 5 (Ghirotti, 1993). Transects had relatively few specific applications in animal health though were useful for obtaining background information on animal husbandry and management constraints in different ecological zones. Transects have been used to assess environmental change in different ecological zones over time.

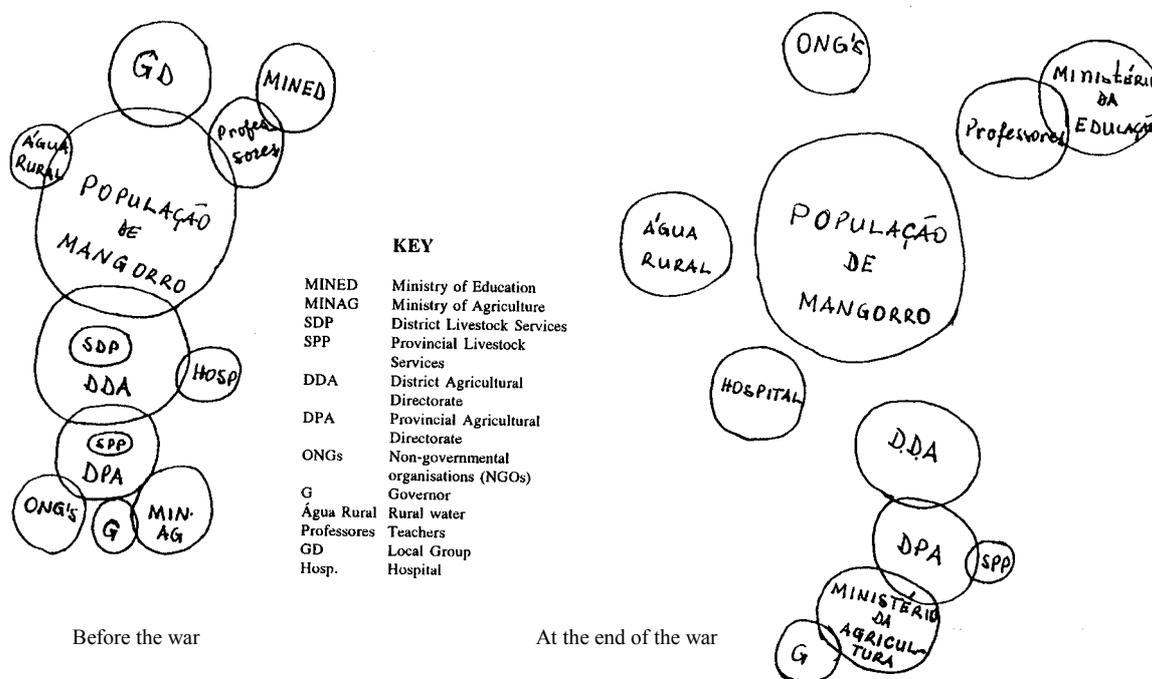
Figure 5
Example of a transect diagram (source: Ghirotti, 1993)



d. Venn diagrams

In animal health surveys and projects, and more general agricultural surveys, Venn diagrams were used to illustrate institutional relationships between different players in a particular community. Therefore, they were useful when analysing the relative roles and responsibilities of different organisation in providing services, and the links between these organisations. Working in Mozambique, Braganca (1994) used Venn diagrams to understand the effect of conflict on the relationships between communities, NGO, government and other bodies (Figure 6). Other examples of Venn diagrams are available in Rees *et al.*, (1998).

Figure 6
The use of Venn diagrams to visualise institutional relationships (source: Braganca, 1994)



e. Other diagrams

Other diagrams which were used in relation to animal health surveys included time-lines, flow diagrams, network diagrams, decision trees, and problem and solution diagrams (Kirsopp-Reed, 1994).

6.2.3 Ranking and scoring methods

Ranking and scoring methods required informants to assess the relative importance of different items. Ranking usually involved placing items in order of importance (1st, 2nd, 3rd etc.) whereas scoring methods used counters such as seeds, stones or beans to attribute a specific score to each item. In animal health surveys the most common items which were ranked or scored were livestock species, livestock diseases and problems associated with keeping livestock. A simple ranking tool was called pair-wise ranking and this required informants to compare items or problems in pairs and decide which was most important. The results were usually presented in a simple matrix and a total rank for each item calculated. An example of a pair-wise ranking for livestock problems is shown in Figure 7 (Rees *et al.*, 1998). A simple scoring tool is shown in Figure 8 in which informants were asked to score livestock diseases out of 10 for mortality and morbidity. In this example, morbidity and mortality were identified by the researchers as important aspects of livestock disease which could be used to compare one disease with other.

Figure 7

Pair-wise ranking of livestock problems, Nyatike Division, Migori District, Kenya (source: Rees *et al.*, 1998)

	SND	rabies	fleas	fmd	anaplas.	rdv	ticks	drought	overall rank
drought	drought	rabies	drought	drought	drought	rdv	drought	x	5
ticks	SND	rabies	fleas	fmd	anaplas.	rdv	x		0
rdv	rdv	rabies	rdv	rdv	rdv	x			6
anaplas.	SND	rabies	anaplas.	anaplas.	x				3
fmd	SND	rabies	fleas	x					1
fleas	SND	rabies	x						2
rabies	rabies	x							7
SND	x								4

anaplas. = anaplasmosis

rdv = rinderpest

fmd = foot and mouth disease

SND = swollen neck and diarrhoea

Other types of scoring methods enabled informants to identify and compare their own criteria for describing items such as livestock species or livestock diseases. These methods involved an initial stage called pair-wise comparison during which each item was compared with every other item using two key questions *viz.* "Which of these items is more important?" and "Why?". This form of questioning required informants to choose between two items and describe why one item was more important than another.

Figure 8
Scoring of livestock diseases in Abela Sipa, North Omo, Ethiopia (source: IIED and Farm Africa, 1991)

Disease	Mortality	Morbidity
trypanosomiasis	*****	*****
anthrax	*****	****
blackleg	*****	****
ticks and tick-borne disease	**	*****
internal parasites	-	*****

Notes: A group of 12 male farmers were asked to score the five most important diseases in Abela Sipa peasant association out of 10, in terms of mortality and morbidity.

Such descriptions included specific qualities of items that distinguished them from other items. These qualities were called indicators and each indicator was then scored against each item³⁰. A detailed methodology for using a scoring tool to understand local perceptions of important livestock diseases was described by Catley and Mohammed (1996) and is summarised in Box 8; an example of the results obtained is provided in Figure 9.

In this example a group of 5 male informants identified six important livestock diseases. Pair wise comparison of these diseases produced 25 indicators that were then scored against each disease using 30 stones. This method was considered to be useful for a number of reasons. For example, the method could be used with illiterate herders and they seemed to enjoy the challenge of placing the correct number of stones against each disease for each indicator. This process prompted much active discussion within the group and various contributions from different group members before they arrived at an answer that satisfied them all. This behaviour was in marked contrast to the boredom which is often associated with questionnaire surveys.

In addition, the results of scoring were thought to be of diagnostic value. In the example shown surra (a scientific name for trypanosomiasis due to *Trypanosoma evansi*) had not been confirmed by the project veterinarian prior to the use of the scoring method. The informants called this camel disease 'gendhi' and gave the disease high scores for their indicators 'emaciation', 'reduces milk yield' and 'thin, watery blood after death'. These scoring suggested that the disease was surra and this finding was later confirmed by examination of blood smears from affected animals.

³⁰Note that indicators can also be scored to weight their relative importance.

Box 8

A methodology for livestock disease scoring using indicators generated by pair-wise comparisons (adapted from Catley and Mohammed, 1996)

Method: This scoring tool involves three main stages:

Stage 1 - Identification of items to be scored. Ask the informants to name the items under investigation. For example, if investigating preferences for species of livestock reared ask the question, "*Which types of livestock do you keep?*". If investigating animal health problems, the researcher can limit the number of items by questions such as "*What are the six most important livestock diseases in your animals throughout the year?*" Write the items named by the informants on to separate pieces of card using the local language.

Check that at least one informant is literate. If all informants are illiterate use every-day different objects to represent each named item e.g. when investigating livestock species a stone could represent a cow, a leaf could represent a goat, and so on.

Stage 2 - Pair-wise comparison of the named items. First, choose two items (represented as name cards or objects) and ask the question "*Which of these two is most important and why?*" The informants will prioritise the items and provide reasons for their decision. Record the response and repeat the question until each item has been compared with every other item. At the end of the pair-wise comparison the researchers should have recorded a list of indicators or factors used by the informants to compare the different items.

Stage 3 - Scoring of items verses indicators. Place the name cards or objects in a row on the ground. Collect a pile of stones using 5 stones per item as a guide to the number of stones needed e.g. if 6 items are being scored, 30 stones are required. Remind the informants of the first indicator mentioned during the pair-wise comparison; ask them to distribute the stones according to degree of relationship between this indicator and each of the items represented by the name cards or objects. All stones must be used. After the stones have been allocated to each item, check the scoring with the informants and allow them to alter the scoring if they wish. Record the final number of stones allocated to each item, collect the stones and then repeat the scoring for each of the indicators.

Similarly, Nairobi sheep disease had not been seen by the project veterinarian. In the scoring this disease was called *humbul* and it was strongly associated with death of sheep and poverty among herders i.e. high mortality. The clinical signs of the disease included bloody diarrhoea and at post mortem the lymph nodes were black. Herders also made a strong association between this disease and ticks. All these associations indicated that the disease was Nairobi sheep disease. When questioned further about this disease, herders stated that they had not seen the disease for many years but lived in fear that it would return.

This example also illustrated the value of PA methods in producing information in an indirect or non-leading manner and allowing informants to analyse the information on their own terms. In comparison, a conventional questionnaire would probably have used direct questions about surra, Nairobi sheep disease or other problems. This more formal approach might have encouraged respondents to either exaggerate their replies, perhaps in expectation of assistance from the investigators, or reply according to what they believed the investigators wanted to hear (courtesy bias).

Ranking methods were used extensively during research on indigenous animal health practices in Samburu District, northern Kenya (Wanyama, 1997). By adapting a method called wealth ranking (Grandin, 1988), local perceptions of priority diseases were collected together with information on diseases which local people treated confidently using their own methods. The basic methodology

required individual informants from different areas to group livestock diseases into categories using a card-sorting method. Results from the different areas were summarised by averaging ranks.

Figure 9
Example of livestock disease scoring, northern Somalia (source: Catley and Mohammed, 1996)

Local indicators	Diseases					
	Nairobi sheep disease	Coughing in camels	Gut worms, all species	Surra	Ulcer. balano., sheep	Pox diseases
reduced local sale value	0	4	4	5	7	10
reduced export value	0	0	0	0	11	19
disease causes poverty	19	0	3	0	0	8
animals dies	15	0	6	0	0	9
animals lies down	7	0	23	0	0	0
animal becomes thin	0	0	17	13	0	0
animal aborts	0	24	0	0	0	6
skin is damaged	0	0	0	0	0	30
disease spread by ticks	30	0	0	0	0	0
disease in different species	0	0	0	0	0	30
milk yield falls	0	12	6	12	0	0
meat is inedible	4	0	8	0	0	18
disease cannot be treated	0	0	0	15	0	15
disease occurs in hot time	10	0	0	0	0	20
disease is contagious	0	11	0	2	4	13
disease spread by worms	0	0	30	0	0	0
disease affects sheep	22	0	0	0	8	0
disease causes s/c oedema	0	0	16	0	6	8
disease causes diarrhoea	8	0	22	0	0	0
causes bloody diarrhoea	9	0	21	0	0	0
disease causes coughing	11	19	0	0	0	0
disease affects breeding	0	0	0	0	30	0
black lymph nodes after death	21	0	0	0	0	9
thin watery blood after death	0	6	6	11	0	7
congested meat after death	15	0	15	0	0	0

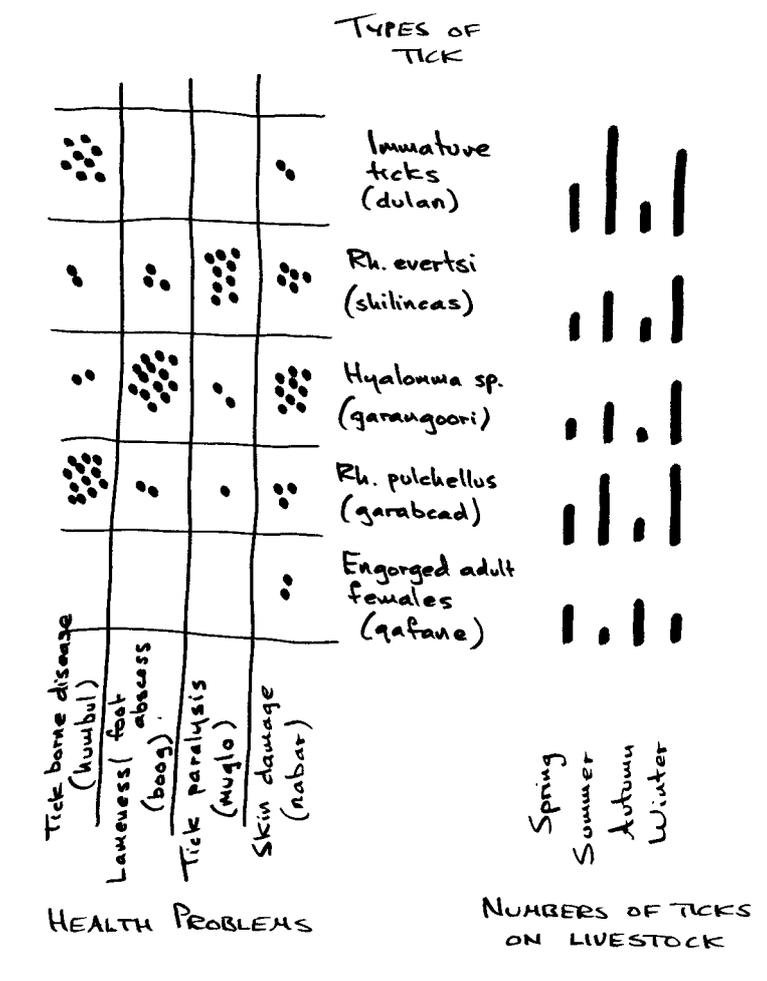
Ulcer. balano.= ulcerative balanoposhtis

Scoring methods could be made more visual by using at least two methodological variations. In matrix scoring, a matrix was drawn on the ground with items along one axis and indicators along the other axis. Counters such as stones were used to score the relationships between the items and indicators. Figure 10 is an example of a matrix scoring conducted in northern Somalia in order to understand associations between different types of ticks and animal health problems (Catley and Ahmed Aden, 1996). In this type of method, informants were left alone to complete the matrix and there was opportunity for them to alter the scores in different parts of the matrix until they were confident that the scores were correct. In common with other scoring methods, this process involved much discussion between informants.

When the matrix was completed, the researchers were able to use the visual display as an aid to further questioning about the different types of ticks and health problems which the informants had identified. For example, by physical reference to the matrix an open question such as *"Why does the tick called garangoori cause lameness and abscesses?"* elicited descriptions of the large size of these ticks (Hyalomma ticks) and the physical damage which they inflicted on livestock. Hence, a series of short semi-structured interviews evolved from the matrix in order to follow-up interesting results and cross-check information. A matrix drawn on the ground was also useful because it could easily be

expanded in order to illustrate other groups of indicators or items which arose from the follow-on questioning. This adaptability of the method is illustrated in Figure 10 by the representations of sticks on the right side of the diagram which showed seasonal variations in tick populations. This diagram was added to the original matrix after one informant mentioned that tick numbers on livestock varied according to the time of year. On the completion of this diagram, informants were asked to identify the most appropriate time of year to use tick control.

Figure 10
 Combined matrix scoring and seasonal calendar showing associations between ticks and health problems and seasonal variations in tick populations (source: Catley and Ahmed Aden, 1996)



A second visually-orientated scoring method was proportional piling. In this method a large pile of counters was used to represent a sum total of different items which shared similar features but varied in quantity or relative importance. The counters were then divided by the informants in order to show the relative sizes or importance of the different items. Typically, around 100 counters were used in the original pile and results were presented in pie charts.

An important component of participatory surveys has been comparison of perceptions of different informant groups and understanding the variations and similarities between groups. This approach has been particularly useful for assessing the views of veterinary staff in relation to those of livestock

owners, or comparing the priorities of different gender or wealth groups. Figure 11 shows how a scoring method identified differences and similarities in livestock diseases as perceived by farmers, traditional healers and veterinary personnel in Kenya (Grandin and Young, 1994). Figure 12 shows the use of ranking to compare options for treating sick livestock among different stakeholders in Ethiopia (Save the Children UK, 1997).

Figure 11
Common cattle diseases reported by different groups in Meru, Kenya (source: Grandin and Young, 1994)

Common local name	English names	Farmer groups	Traditional healers	Vets and animal health assistants
njoka	helminthiasis	+++	+++	+++
nthiana	anaplasmosis	+++	+	+++
mauri	pneumonia	++	++	++
meetho	conjunctivitis	++	+	+
ikai, itaa	theileriosis	+	++	+
mutombo	trypanosomiasis	++	-	+
kurema njau	dystochia	+	++	-
ugere	mange	++	-	-
nyongo	'liver'	++	-	-
ikunguri	foot and mouth	+	-	+
kunguru	gid	+	-	-

Code: +++ very common, ++ common, + uncommon, - not reported.

Figure 12
Ways to treat sick livestock: Understanding the options of different stakeholders (source: Save the Children UK, 1997)

Options for treating livestock	Ranking of options by stakeholder groups					
	Women		Livestock herders and traditional healers		Livestock traders	
	Zone 1	Zone 2	Zone 1	Zone 2	Zone 1	Zone 2
Koranic prayers	1 st	1 st	1 st	1 st	nm	nm
Traditional medicine	3 rd	2 nd	2 nd	2 nd	2 nd	nm
Private drug sellers	2 nd	3 rd	4 th	4 th	1 st	1 st
Government service	nm	nm	3 rd	3 rd	3 rd	2 nd

nm=not mentioned by informants

Another methodological adaptation of scoring methods has been their use in project reviews, impact assessments and evaluations by comparison of scores or proportions before a project with scores or proportions after project activities have taken place. ActionAid-Somaliland used this approach extensively during a review of their animal health programme and some summarised results are provided in Figure 13 (ActionAid-Somaliland, 1994). This example shows trends in the use of different types of veterinary service during the programme and resulted from the summation of 'before and after' scorings with different informant groups. Similarly, a paired proportional piling tool was used in Karamoja, northern Uganda in order to understand local perceptions of change in livestock disease incidence during an Oxfam UK/Ireland animal health project, as shown in Figure 14 (Catley, 1997a).

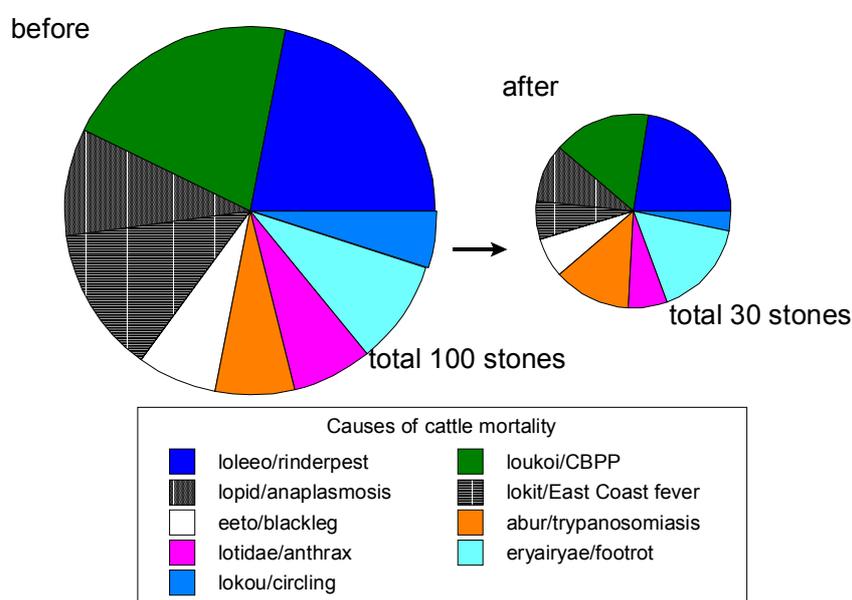
Relative to other PA methods which have been used in animal health surveys, scoring and ranking methods produced numerical data at an early stage in the investigative process. Therefore these methods are probably suitable for systematic, repeated use in order to produce data for statistical analysis (Catley and Mohammed, 1996). Although items to be scored, indicators and number of counters could be standardised to varying degrees, this procedure would not be strictly necessary provided that the key questions used in the method remained the same.

Figure 13
Summated scores of herders' use of different types of veterinary service 'before and after' the ActionAid Animal Health Programme (source: adapted from ActionAid-Somaliland, 1994)

Location	Indigenous veterinary practice		Animal health service introduced by programme	
	Indigenous medicine	Religious healing	CAHWs	Private veterinary pharmacies
	before/after	before/after	before/after	before/after
Yube	130/82	76/44	0/248	0/248
Jidali 1 (male informants)	123/82	83/47	0/233	0/233
Jidali 1 (female informants)	118/81	ns	ns	ns
Jidali 2	156/131	ns	ns	65/175

Notes: The numbers in the figure show the results of numerous scoring exercises which required informants in three areas (Yube, Jidali 1 and Jidali 2) to score treatment strategies for different diseases from 0 to 10 'before and after' the programme. The scores have been summated by the author for the sake of brevity and show trends only. ns = not scored.

Figure 14
Local perceptions of the impact of an animal health project on cattle mortality, Karamoja, Uganda (source: Catley, 1997a)



Scoring of factors affecting cattle mortality

Factor	Score
Provision of drugs and vaccines*	7
Construction of cattle crushes*	4
Peace and reduced raiding	3
Good water points	4
CAHW activities*	7
Good grazing	5

* = factor arising as a result of the animal health project.

Notes: Proportional piling with 11 men. The before situation i.e. 'before the crushes and CAHWs' was described first by dividing 100 stones according to the main causes of cattle death. The informants were then asked to increase, decrease, or leave the 100 stones according to the after situation i.e. 'after the crushes and CAHWs'. They reduced the pile to 30 stones and divided these 30 stones according to the causes of cattle death. The areas of the two pie charts are proportional. In order to prompt further discussion on the various factors which reduce cattle mortality, the group was asked to name and then score these factors by dividing a pile of 30 stones.

6.2.4 Validity, reliability and other issues

In participatory approaches and methods the trustworthiness of data was dependent on factors such as the ability and behaviour of the facilitators, and the use of triangulation to cross-check information (sections 3.5.4). An example of triangulation from an animal health project is detailed in Box 9. In this example, it should be noted the livestock disease scoring and matrix scoring methods were not used specifically to investigate the subject of the triangulation. Hence, at the time when the methods were used, the investigator was not purposely seeking information on Nairobi sheep disease and therefore it seemed unlikely that informants' responses and scorings were intended to please the

investigator by providing information on this topic. The triangulation process started as the information began to emerge and was partly informed by previous knowledge of the literature.

Box 9

An example of triangulation: Was *humbul* the same as Nairobi sheep disease?

When using PA methods with herders in Somaliland in 1993 the disease called *humbul* was often cited as an important problem. Information about this problem was triangulated by comparing data from livestock disease scoring (Figure 9, 5 informants), matrix scoring of ticks and health problems (Figure 10, 4 informants), formal identification of tick species and reference to secondary data.

Secondary data

Nairobi sheep disease had been confirmed in sheep in northern Somalia by a British veterinary team working between 1970 and 1972. Mortality reached 80% in affected flocks and at post mortem examination the disease was characterised by a haemorrhagic septicaemia and pneumonia. The tick *Rhipicephalus pulchellus* was considered to be the main vector of the disease (Edelsten, 1975). Nairobi sheep disease was described as "*the most pathogenic virus infection of sheep and goats in eastern Africa, with mortality rates in naive sheep of up to 90%*" (Scott, 1990).

Livestock disease scoring

The disease called *humbul* was associated with poverty, high mortality in sheep, transmission by ticks, bloody diarrhoea, coughing and congested carcasses. By reference to the secondary data, these findings were suggestive of Nairobi sheep disease.

Matrix scoring of ticks and health problems

A strong association between the tick called *garabcad* and the disease *humbul* was indicated. This finding matched the results from the livestock disease scoring.

Formal identification of ticks

Numerous samples of the tick *garabcad* were identified as *Rhipicephalus pulchellus*. Secondary data indicated that this tick transmitted Nairobi sheep disease in northern Somalia.

Although this example shows how information arising from different sources, methods and informants could be triangulated in PA, this level of detail was rarely if ever provided in reports of participatory animal health surveys. From accounts of the use of PA methods in veterinary medicine it was usually difficult for readers to relate a specific survey finding or conclusion to information which had clearly been cross-checked or had arisen from multiple sources or methods. Although *ad hoc* informal interviewing and follow-up questions about diagrams or scoring tools was an essential feature of PA, the outcome of such questioning was not well-described in the literature.

Regarding the affect of training in PA on an investigator's ability to use the approach and methods properly, the literature indicates that while it was straightforward to train people how to use PA methods, it was far more difficult for people to acquire communication and facilitation skills (Guijt and Cornwall, 1995). Other workers noted that inappropriate training was one cause of low quality PRA work (Anon, 1995). However, in terms of the presentation of PA findings and their interpretation by readers with a mainly technical interest in the information, the problem of demonstrating triangulation in PA reports has not been discussed. The assumption seems to have been that if a variety of PA tools were used, perhaps with different informants, then the process of triangulation automatically took place. In veterinary medicine, issues of validity and reliability of PA methods have not been addressed. This lack of attention to the scientific value of PA seems to have arisen for four main reasons:

1. During the early development of PA, researchers avoided quantification and statistical analysis because this was deemed unnecessary with respect to understanding key problems and formulating action plans. The concept of optimal ignorance was applied together with the belief that local problems required local solutions (section 3.2.5). The need to make probability statements about large populations based on the characteristics of sample populations was not considered to be a priority.
2. Despite the informal, qualitative nature of PA veterinarians at field-level recognised the value of the approach when supporting community-based projects (IIED, 1998). The success of these projects (as indicated in sections 6.1.2 and 6.1.3) was an indication that PA did produce useful information for project planning, regardless of its value in a strictly scientific sense. Hence the need to validate PA was not a priority.
3. PA was most commonly used by NGOs in more marginalised areas. Typically, NGOs were not well resourced and in some cases funding was erratic and short-term. In this situation, investments in validation studies were not a priority.
4. The holistic, inductive and context-specific aspects of PA were more typical of qualitative rather than quantitative systems of inquiry. Hence, it was argued that the tests of validity and reliability which were used in quantitative, hard science approaches did not apply to PA methods (section 3.5.4).

6.3 Veterinary applications of participatory appraisal

6.3.1 Animal health surveys, needs assessments and action plans

The earliest accounts of the use of PA methods to investigate animal health topics appeared in general participatory needs assessments which collected and analysed information on human livelihood strategies, work patterns, environment and agricultural practices. In these surveys, livestock problems were assessed in relation to other problems experienced by local people such as lack of water, human disease or poor education and the approach was intended to identify best-bet solutions with communities. The agencies responsible for initiating this work then tried to respond to key problems and used technical staff to follow-up the main areas of concern. Examples of this type of needs assessment include surveys in Ethiopia in which information on animal health was analysed in the field in comparison with other problems which were identified by local people (IIED and Farm Africa, 1991). Using various tools, data on patterns of livestock ownership, reasons for keeping different types of animals, relative importance of different livestock species and problems associated with keeping livestock were recorded. More recently, a similar integrated approach has also been used by research institutes such as the Kenya Agriculture Research Institute in south-west Kenya (Rees *et al.*, 1998).

As participatory methods began to be used more widely, more detailed information on livestock production and health began to emerge from surveys conducted by NGOs such as ITDG and FARM-Africa. This work was usually a component of community-based animal health projects. ITDG began using PA-type methods in 1986 when a base-line survey in Kamujini, Kenya included the use of methods such as wealth ranking, progeny histories, ethnoveterinary question lists and informal interviews (Young, 1999 - personal communication). Over the next few years other methods such as transect walks, mapping, and ranking exercises were also used. Maranga (1992) described how ITDG used wealth ranking, disease ranking and success ranking in projects in Zimbabwe and Kenya. In these projects, PA was used during the initial needs assessment or feasibility surveys and was intended to provide a rapid overview of key issues, relationships and services in communities, and locally-prioritised livestock diseases.

The first substantial review of the development of participatory approaches and methods and their potential applications in livestock development was conducted by Leyland (1991). This thesis described the conceptual basis for community participation in livestock development in relation to conventional development activities, and outlined PA tools for use in surveys and community-based livestock programmes. The ideas put forward in the review were applied in an animal health project in Daye Chopan district in south east Afghanistan from 1991 to 1992. PA methods used in this project included group and key informant interviews, livestock movement maps, transects, seasonal calendars, pair-wise ranking, direct matrix ranking, progeny histories and wealth ranking (Leyland, 1992; 1993). In common with ITDG's work in Kenya, this project was community-based and aimed to involve local people in the analysis of problems and design of a service using basic veterinary workers. A similar approach to service delivery was used soon afterwards in a large-scale animal health programme coordinated by UNICEF in southern Sudan (Leyland, 1996), as mentioned in section 6.1.3. In the late 1990s, a number of NGOs in Kenya, Uganda, Ethiopia, southern Sudan and Somalia use PA routinely in animal health projects³¹.

6.3.2 Monitoring and evaluation

Although PA has been widely used during the initial stages of project implementation, its use in project monitoring and evaluation has been less extensive. PA methods were used during an evaluation of the United Mission to Nepal's Paravet Project (Young *et al.*, 1994) and ActionAid-Somaliland used PA methods as part of a participatory and soft systems approach in programme reviews in 1994 and 1998 (ActionAid-Somaliland, 1994, 1998). The soft systems methodology was based on the ideas of Checkland (1981) as summarised in section 3.5.2c. A review of Oxfam UK/Ireland's community-based animal health project in Karamoja, Uganda (Catley, 1997a) also used PA methods and scoring tools were incorporated into a questionnaire-based assessment of Oxfam UK/Ireland's project in Wajir, Kenya in 1998 (Odhiambo *et al.*, 1998). Participatory approaches to project monitoring were also introduced to the Dutch Committee for Afghanistan's veterinary projects (Blakeway, 1998)³².

6.3.3 Ethnoveterinary data collection

An integral feature of the development of participatory approaches and methods has been acknowledgement of local knowledge systems, often termed rural people's knowledge (see section 3.2.3a). In community-based animal health services, rural people's knowledge including both technical knowledge and knowledge of social values and organisation, has been used extensively to design and implement services. Participatory appraisal has facilitated this process by assisting local analysis of animal health problems, existing services and resources, and opportunities for improving services. When implementing projects, activities such as the selection of people for training as CAHWs and means to supervise these workers at community-level was based on local knowledge of community structures and decision-making processes (Catley *et al.*, 1998). In these situations, it can be noted that PA methods were used because they automatically evoked rural people's knowledge and the approach recognised that local technical knowledge was intrinsically linked to other types of knowledge and social norms and behaviour.

Coinciding with the increasing use of community-based approaches to animal health service delivery was the emergence of 'ethnoveterinary medicine' as a distinct discipline based on the research and

³¹ These NGOs include ITDG, Oxfam UK/Ireland, Save the Children UK, ActionAid-Somaliland, ActionAid-Kenya, FARM-Africa and others.

³²In addition to these examples, David Hadrill has also used PA methods during reviews of livestock projects in India and FAO were developing a participatory livestock monitoring system in Afghanistan.

development of indigenous animal health knowledge and skills (McCorkle, 1986). This discipline attracted considerable interest from veterinary and other workers during the late 1980s and 1990s, and detailed accounts of ethnoveterinary medicine became available (Mathias-Mundy and McCorkle, 1989). Experiences and information from Africa were collated by McCorkle and Mathias-Mundy (1992) and Bizimana (1994).

As its name implied, ethnoveterinary medicine focussed on technical local knowledge, descriptions on indigenous language and practices, and to a lesser extent, validation of knowledge using western scientific principles. In comparison with the various PA methods used to understand rural people's knowledge during the development of community-based services, ethnoveterinary data collection has tended to use a narrow range of interviewing methods. Often these methods have been more formal than informal, with questionnaires and structured owner interviews forming the basis for data collection (e.g. Heffernan *et al.*, 1996; Delehanty, 1996). Although local ownership and analysis of information was evident in some ethnoveterinary studies (e.g. Wanyama, 1997), in some cases ethnoveterinary research and development was characterised by the collection and validation of knowledge by outsiders with a view to delivering proven, valid technology back to rural people. Chambers' criticism of FSR might apply here *viz.*, *"Information has been obtained from farmers by outsiders, and analyzed by them to decide what would be good for the farmers, leading to the design of experiments for testing and adaptation"* (Chambers, 1990). In other situations, ethnoveterinary research was conducted in an attempt to promote new technology. For example, ethnoveterinary data collection in coastal areas of Kenya was driven by the idea that extension materials could be made more effective if local disease terminology was understood by researchers and extension agents. The need to develop extension materials resulted from the development of a new method for controlling theileriosis (Delehanty, 1996). Hence, a technology had been developed without much attention to how it might be received by farmers or delivered to them. Arguably, the use of formal methods in ethnoveterinary investigation reflected a western, technical focus.

In terms of assessing participatory approaches and methods in ethnoveterinary research, the inherent links between PA and indigenous knowledge have sometimes been overlooked. For example, a study to investigate the role of participatory methods in ethnoveterinary medicine (Martin, 1996) seemed not to recognise that rural people's knowledge and PA approaches and methods were inseparable from an evolutionary perspective. As PA was partly designed to promote the analysis and use of local knowledge, its role in understanding ethnoveterinary medicine had already been established in community-based projects from the late 1980s.

Although ethnoveterinary research and development was heavily influenced by anthropological perspectives, to date very limited information is available on people's preferences for different types of animal health service in different situations and hence, the application of validated indigenous knowledge remains open to question. While health seeking behaviour has been a common point of discussion among medical anthropologists (Foster, 1975; Helander, 1990) relatively little has been written on this topic in the veterinary literature. As noted by Mathias and Perezgrova (1997), ethnoveterinary research and application had often been *"separated from each other"*.

6.3.4 Complementary methods

PA methods have been used in various combinations with conventional methods in veterinary research. Sonaiya (1992) used RRA and a questionnaire to study poultry problems in Nigeria and Nurhadi *et al.* (1994) conducted an economic assessment of losses due to malignant catarrhal fever in Indonesia using an abattoir survey followed by PRA. In southern Africa, PA methods were used as a component of a methodology to assess community animal health requirements. This methodology was termed 'Veterinary Needs Analysis' and comprised conventional questionnaire methods and RRA (McCrinkle *et al.*, 1996).

In 1996 the term 'participatory epidemiology' was used in relation to field-level investigation and searching for rinderpest in Africa (Mariner, 1996). The use of PRA methods specifically to collect information from pastoralists on rinderpest was viewed as a key adjunct to laboratory-based epidemiology, particularly as serological surveys were difficult to conduct and interpret in remote pastoral areas. The main PA method used was semi-structured interviews using checklists of questions related to rinderpest, and time-lines to build a historical picture of rinderpest outbreak in a given area (Mariner and Flanagan, 1996). The methodology was described in greater detail by Mariner (1999).

6.3.5 Other uses of participatory appraisal

A workshop organised by IIED in Nairobi in 1998 brought together 19 veterinarians who worked in organisational and operational settings varying from small-scale research with smallholder farmers in highland areas to large-scale, community-based animal health systems with pastoralists in conflict zones (IIED, 1998). During the workshop it was evident that PA was being used in increasingly diverse situations by veterinary and livestock workers, including:

1. the use of PA in community-based disease control programmes, including attention to disease information systems utilising CAHWs (e.g. PARC-VAC, UNICEF-OLS);
2. use of PA in scientific research on viral diseases (e.g. Kenya Agriculture Research Institute and Muguga studies on rinderpest, malignant catarrhal fever and lumpy skin disease) and validation of tick control methods (e.g. Kenya Agriculture Research Institute);
3. the use of PA in market research related to veterinary privatisation programmes and the formulation of business plans for private practitioners (e.g. FARM-Africa, Kenya).

This diversity of PA usage reflects both the value and flexibility of the methods, and the relatively limited resources that were required in order to use them. Regarding complementary methods, veterinarians are beginning to use PA (qualitative) in combination with conventional methods (quantitative e.g. questionnaires) and in holistic systems approaches involving combinations of PA, soft systems methods and conventional research methods (e.g. Thomas Gitau and colleagues, University of Nairobi). Combined and complementary methods were a common feature of discussion during the workshop.

6.4 Opportunities and constraints affecting the wider use of participatory appraisal in animal health services and research

According to Broadbent (1976) and Pfeiffer (1996) the development of sophisticated data processing techniques in veterinary epidemiology has not been accompanied by similar developments in field-level data collection methods in LDCs. This disparity raises fundamental questions regarding the validity of data generated at local level which is subsequently entered into analytical software to produce apparently trustworthy results at central level. Thrusfield (1995) summarised the main components of veterinary epidemiology as illustrated in Figure 1 and it was evident that all components were related to, if not dependant on data collection. Arguably, veterinary researchers in LDCs appeared to be fixated with questionnaires that were often poorly designed and administered, but yielded data which animal health services continued to use and journals continued to publish. While international bodies continue to propose the use of computer-supported quantitative epidemiology, including risk analysis, disease modelling, geographic information systems and decision support systems (Rweyemamu, 1998), ultimately these methods will be of little relevance in important pastoral areas unless information collected at field-level is accurate and timely. Experience from rinderpest control programmes indicates that eradicable livestock diseases persist in pastoral

herds partly because government veterinary services have limited information about these diseases in remote areas. In part, limited information is associated with inappropriate methods.

There is now a substantial body of evidence to show that PA methods produce information which accurately describes local perceptions of animal health problems. The methods are relatively resource-friendly and can be adapted at field-level to suit particular circumstances and information needs. When researchers have the correct approach, good rapport with livestock herders can be achieved leading to action to solve problems as they are identified. At present, the key constraints to the wider use of PA in official animal health information systems appear to be the largely qualitative nature of PA data and lack of formal validation of the methods. Therefore, assessments of the validity and reliability of PA methods for field-level veterinary uses are required (Catley and Mohammed, 1996) together with more detailed analysis of options for combining PA and conventional methods. For veterinary service development in marginalised areas with minimal modern infrastructure or resources, this approach assumes that current paradigms in veterinary epidemiology and a reliance on quantitative data are applicable in all situations regardless of context. In terms of the potential uptake of methods, existing animal health institutions such as government veterinary services could adopt validated PA methods with relatively minor or no changes in institutional behaviour and approach.

6.5 New paradigms in veterinary epidemiology?

An alternative approach to testing and adapting PA to fit existing paradigms in veterinary epidemiology would be to use PA to develop new paradigms. This review has argued that although veterinary epidemiological theory requires attention to complex relationships and holistic learning, to date much of this learning has focussed on the acquisition of instrumental knowledge. In veterinary epidemiology, reality is mostly described using methods based on positivism and a need to transform qualities into quantities before relationships can be analysed and understood. Although quantitative data processing and analysis have become more sophisticated, these developments *per se* do not necessarily result in improved human or animal welfare, and have had limited if any impact on veterinary services in more marginalised areas of developing countries. Veterinarians have already recognised the limitations of positivism. Meek (1993) noted that although scientific methods had been preferred in the physical and life sciences, *"This may not be in society's best interest, because the choice of method ought to be made on the basis of its appropriateness to the phenomenon being studied"*. In this paper it was suggested that more blending of qualitative and quantitative methods might improve the *"society relevancy"* of veterinary epidemiology.

As a new science, veterinary epidemiology has a history of borrowing methods from other disciplines and sciences. Experiences from the social sciences, mathematics, economics and astronomy have influenced epidemiological approaches and methods (Schwabe, 1982; Davies, 1985). Araujo *et al.* (1975) described an early collaboration between veterinarians and anthropologists and calls for similar partnerships have come from veterinarians working in developing countries generally (Waltner-Toews, 1988) and in pastoral areas of Africa (Sollod *et al.*, 1984). However, much of this transfer of ideas and practices has occurred within the positivist paradigm. Therefore, when borrowing PA methods from the participatory learning and action approach, veterinary epidemiology should also consider the framework that has been proposed for ensuring the trustworthiness of participatory data. This type of transfer, of both methods and tests of validity, avoids concerns over attempts to validate a qualitative approach and methodology using a quantitative value system and world view. It also acknowledges that human knowledge and behaviour, and hence the development of better veterinary services, is dependent on instrumental, critical and interactive knowledge. In terms of the potential uptake of alternative approaches, existing animal health institutions would probably require major changes in institutional aims and behaviour in order to incorporate new learning and action paradigms.

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