AHP
Animal Health Programme

DFID

Annual Report 2005 – 2006

Healthier livestock, wealthier people

The DFID Animal Health Programme

The research strategy of the UK Government's Department for International Development (DFID) is to generate new knowledge and to promote its uptake and application to improve the livelihoods of poor people. The bilateral component of the strategy is organised as research programmes covering agriculture, forestry, livestock and fisheries, managed by institutions contracted by DFID. The Animal Health Programme is managed by the Centre for Tropical Veterinary Medicine (CTVM), University of Edinburgh, Scotland, under the leadership of Professor Ian Maudlin.

The Animal Health Programme's mission statement

Livestock are vital to the lives and livelihoods of two-thirds of the world's rural poor – close to 700 million people. But chronic endemic diseases and zoonoses constrain livestock productivity and endanger human health, thereby contributing to the perpetuation of poverty. Bringing together veterinary, medical and social scientists from the UK, Africa and South Asia, DFID's Animal Health Programme (AHP) funds research leading to better control of these diseases. Effective dissemination and uptake of AHP research findings can enhance the livelihoods and health of poor livestock keepers.

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DFID ANIMAL HEALTH PROGRAMME

ANNUAL REPORT 2005–2006

Six years of working towards the Millennium Development Goals; sixteen years of poverty-focused research

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Executive Summary

Six years ago the Animal Health Programme (AHP) took up the challenge of working towards the Millennium Development Goals (MDGs) with an even more tightly poverty-focused research programme. The AHP's research has contributed to each of the MDGs by virtue of the fact that its research:

- affects both human and animal health, in particular through its very successful research cluster on zoonotic diseases (those diseases which can be transmitted from animals to people), but also because better animal health improves the nutrition of poor households
- impacts on crop production, through animal traction and the use of animal manure as fertiliser
- helps empower women, who are the main keepers of small stock such as sheep, goats and chickens
- helps protect the environment by addressing issues affecting livestock keepers in urban settings and by protecting wildlife.

Some of the AHP's projects have made significant breakthroughs, such as:

- demonstrating the importance of cattle as the main reservoir of acute human sleeping sickness in eastern Africa, and ensuring that this research influenced policy: in Uganda, cattle must now be treated before being moved from endemic to non-endemic areas
- finding ways to substantially reduce the cost of farmer-based methods to control tsetse; work jointly funded with the Livestock Production Programme (LPP) has demonstrated that the amount of insecticide needed to treat cattle can be reduced by 80%
- demonstrating that in those areas where the mosquitoes which transmit malaria to people also feed on cattle, treating the cattle with the same insecticide that is being used to control tsetse reaps a dual benefit by also reducing the incidence of malaria in people
- developing novel approaches for the delivery of animal health to poor communities, such as livestock farmer field schools (FFSs) and the computerised animal health kiosks used in India
- expanding knowledge on the incidence and epidemiology of neglected zoonotic diseases – brucellosis, bovine tuberculosis, cysticercosis, rabies and zoonotic sleeping sickness – and providing evidence of the extent to which they are under-reported, the risk factors involved, their link with poverty, refining affordable and acceptable control strategies, bringing veterinary and medical authorities together to deal with them, and raising their profile internationally.

Meanwhile, other projects have steadily chipped away at our ignorance and lack of tools to deal with these tropical diseases of livestock and people, testing and adapting disease control strategies, looking for new vaccines or diagnostics, and studying different routes for the dissemination of animal health knowledge. The AHP hopes that DFID's new research initiatives will take up

some of these themes and programmes, so that animal health research will continue to benefit the poor, especially in Africa where the bulk of its research work has been undertaken.

The AHP has also played a key role at every step of the process which has resulted in the creation of the Global Alliance for Livestock Vaccines (GALV). The need for such an organisation – to promote the creation of consortia which will invest in research to produce vaccines, diagnostics and other products for the control of tropical livestock diseases, which the private pharmaceutical sector is not currently funding – was highlighted by the AHP 5 years ago. It is hoped that GALV will be able to operate in a similar way to GAVI – the Global Alliance for Vaccines and Immunisation – which has been very successful in achieving this type of cooperation in the field of human medicine.

The AHP feels confident that it is leaving the successors to the Renewable Natural Resources Research Strategy (RNRRS) with an enduring legacy, not just of knowledge acquired, but, more importantly of highly motivated researchers in the UK and overseas. These are people who have embraced the novel, more adaptive, downstream, and multidisciplinary approach to tightly poverty-focused research with a significant social science component. Over the last decade, these individuals have shown themselves to be successful at integrating highly scientific approaches with practical field studies and pilot disease-control programmes. They have completed their research degrees and often built on these to obtain positions of respect in key institutions in Europe, Africa, Asia and South America. As well as their skills, knowledge and enthusiasm, they bring with them a network of contacts and relationships forged across continents and across disciplines. It is these people to whom DFID must look for good science translated into creative and adapted solutions to the animal health problems of the world's poor livestock-keeping communities.

Professor Ian Maudlin
Animal Health Programme Manager
The University of Edinburgh, April 2006

1. Introduction and General Overview

Six years of working towards the Millennium Development Goals; sixteen years of poverty-focused research

> "Despite our travails in the intervening years, the Millennium Declaration still inspires hope that the world, complicated and divided as it is, can come together to take on great challenges."
>
> Jeffrey Sachs, 2005[1]

Six years into the new millennium, with DFID-funded natural resources research taking new directions, it is time to take stock of the ways that the Animal Health Programme (AHP)'s research is contributing to the long-term aims to which we have all subscribed – the Millennium Development Goals (MDGs). Among the renewable natural resources research (RNRR) programmes, the AHP has particularly widespread impact as it directly affects the health of poor people living in livestock-keeping communities through its work on neglected zoonoses. Zoonoses are those diseases, like rabies, the acute form of sleeping sickness, tuberculosis and brucellosis, which can be transmitted between people and animals either by direct contact, via insect vectors or through food. The AHP's work thus spans the disciplines of veterinary public health and human health, animal health and productivity (including livestock, companion animals and wildlife) and, via livestock's use as draught animals and for providing manure, crop production. Directly or indirectly, the AHP's work thus has the potential to contribute to all of the MDGs (Figure 1.1).

MDG 1: Eradicate extreme poverty and hunger

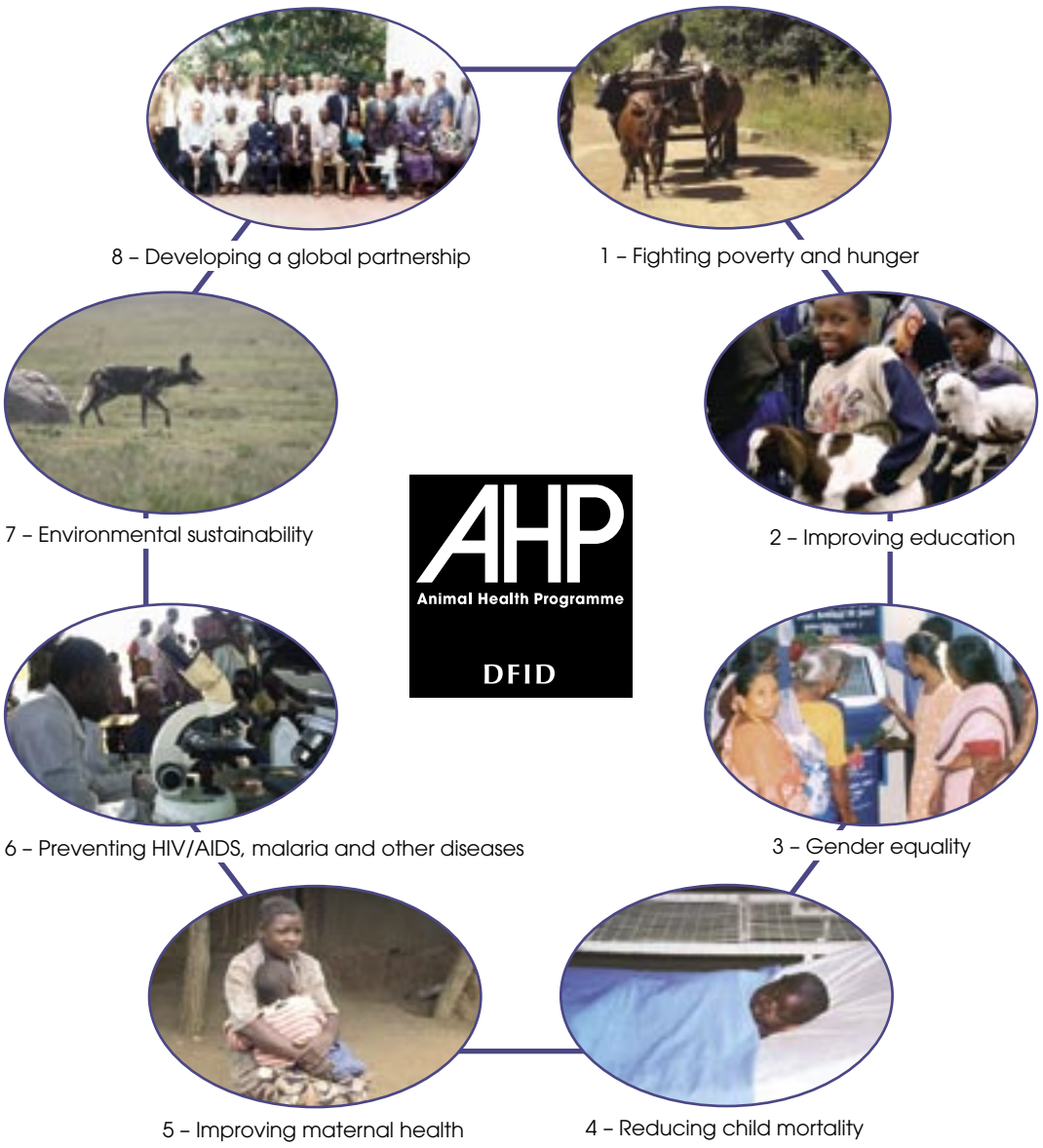
The ultimate aim of all the 110 research projects funded by the AHP since 1990 was to improve the health of livestock in Africa, Asia and parts of South America where the greatest concentrations of poor livestock keepers are found. Healthier livestock contribute to MDG 1 at five levels.

Photo: Sue Welburn

- The links between disease, poverty and hunger are well known. People in poor health find it difficult to work effectively, and those zoonotic diseases which target active adults – such as sleeping sickness (human African trypanosomiasis), cysticercosis and brucellosis – can deprive a poor family of its breadwinners. Furthermore, these diseases oblige other adults in the family to spend time caring for the sick individual.

[1] Sachs, J. (2005). The end of poverty: How we can make it happen in our lifetime. Penguin, London. 416 pp.

Figure 1.1 **The AHP – working towards the eight MDGs**



Also, because they are often difficult to diagnose correctly, a lot of time and expense may be spent on trying to obtain a correct diagnosis[2]. Zoonotic diseases thus perpetuate poverty. AHP has funded 12 projects dealing with zoonotic disease research, which have undertaken ground-breaking work on issues such as under-reporting, calculations of burden of disease and assessment of risk factors, and development of new and adaptation of existing control strategies.

- Livestock provide a direct source of income through products such as milk, eggs and meat – and where the family can afford to consume these products they increase the family's health and well-being.

[2] WHO and DFID/AHP (2006). The control of neglected zoonotic diseases – a route to poverty alleviation. WHO, Geneva, Switzerland. 55 pp.

- Livestock are a fundamental component of the coping strategy of poor households, to be sold when food is short or to meet family emergencies. Poor livestock health and high animal mortality not only deprive the family of a source of income but also remove its safety net.
- Keeping livestock is now widely recognised as a route out of poverty. If healthy, they grow and multiply and can be sold to supplement household income or increase the household's asset base.
- Livestock provide manure and animal traction, both major inputs into efficient and sustainable cropping that provides food and income. Trypanosomiasis is a particular problem for draught cattle in areas of Africa where the disease is endemic. Owners either have to spend regularly on drugs to treat and prevent the disease, or they have to accept poor draught productivity and frequently replace animals that die prematurely from the disease. Research into trypanosomiasis has been a major component of AHP's portfolio throughout the programme's life, involving some 22 projects, of which two were jointly funded with the Livestock Production Programme (LPP). These projects have made a major breakthrough in reducing the cost of farmer-based methods to control this disease.

> "Livestock have been under-utilised as a weapon for poverty alleviation."
> Perry *et al.*, 2002[3]

MDG 2: Achieve universal primary education

Poor attendance at school is often due to ill health. Children in poor livestock-keeping communities who suffer from zoonotic diseases are less likely to attend school and less likely to benefit fully from their schooling. Among its work on zoonotic diseases, the AHP has funded one project looking at tapeworm and other worm infections which may particularly affect children. All the other zoonoses studied can affect children.

Photo: Adriano Vatta

Poor nutrition is another reason for poor attendance and performance at school. In households with healthy and productive smallstock and dairy cattle, children are more likely to be well-nourished, benefiting from regular animal protein.

One of the main reasons for selling livestock is to pay school fees and other associated expenditures, as shown in recent fieldwork by AHP researchers in Kenya and Uganda. In this way livestock also help families to provide for their growing children's education.

MDG 3: Promote gender equality and empower women

In most of the developing world, it is the women who own and manage smallstock such as sheep, goats, pigs, chickens and guinea pigs. In pastoral societies it is often the women who undertake

[3] Perry, B.D., Randolph, T.F., McDermott, J.J., Sones, K.R. and Thornton, P.K. (eds) (2002). Investing in animal health research to alleviate poverty. International Livestock Research Institute (ILRI), Nairobi, Kenya. 130 pp.

the milking and marketing of milk and dairy products obtained from cattle and camels as well as goats and sheep. In these societies women also frequently own a proportion of the family herd. Numerous studies have shown that keeping these animals provides women with an independent source of income over which they have sole control. They can spend the money earned from sales of products such as milk, eggs and chickens directly on their children and themselves, or it can be used as a basis for setting up other small business activities or be reinvested in more livestock. Livestock thus serve to bolster women's independence, and contribute to their children's and their own health and well-being.

Information kiosk in use, Pondicherry, India.
Photo: S. Ramkumar

Most of AHP's projects have dealt with diseases affecting ruminant livestock. Smallstock, in particular the goats kept by women throughout Africa, have been specifically targeted by 12 projects, looking at problems such as liver fluke, which particularly affects sheep, and goat pox and contagious caprine pleuro-pneumonia, both of which cause substantial losses in goats. In the social sciences field, several projects have focused particularly on issues affecting women. The livestock farmer field schools (FFSs) have tended to recruit a high proportion of women. Other AHP studies have shown that women are far less likely than men to go to animal health assistants or sellers of veterinary products for advice, so the livestock FFSs have done something to redress the gender balance in access to animal health information. Other AHP delivery and dissemination projects have ensured that the voices of women are listened to.

MDG 4: Reduce child mortality

There are important links between animal health and child mortality. The most obvious is through those zoonoses that particularly affect children. Rabies is the most striking example: most of the 55,000 people dying annually from this fearful disease in Africa and Asia are children. Yet all these deaths are preventable through dog vaccination and access to effective post-exposure treatment. But poverty intervenes: overstretched veterinary services do not provide dog vaccination, and good quality post-exposure treatments, which can cost US$75 each, are not stocked in isolated rural clinics of poor countries. AHP has funded three projects on rabies, and this work has contributed to the creation of the global Alliance for Rabies Control, set up in 2005 to raise the profile of the disease and obtain funds for its control.

Girl with sleeping sickness, Uganda.
Photo: Eric Fèvre

Improving livestock health helps provide extra income for poor families and enables them to diversify their income sources and spread risk, all of which contribute to reduced child mortality. Livestock outputs, particularly milk, directly contribute to maintaining child health.

MDG 5: Improve maternal health

Better animal health can contribute to improved maternal health. In many societies where protein is scarce, women have difficulty in obtaining a good diet during pregnancy and when nursing children. Availability of animal protein, especially milk, from domestic livestock thus contributes to maternal health. The zoonotic diseases also take their toll on mothers, in particular those such as cysticercosis and sleeping sickness that mainly affect adults.

Photo: Sue Welburn

MDG 6: Combat HIV/AIDS, malaria and other diseases

At the international level, it is increasingly recognised that while attention has been focused on the major diseases of global importance, many other conditions are being ignored or forgotten – the 'neglected diseases of neglected populations'[4]. A number of international meetings have been called to address this problem[4,5] and the World Health Organization (WHO) now has a department for the control of neglected diseases. The zoonoses that AHP research has focused on – brucellosis, bovine tuberculosis, cysticercosis, rabies and zoonotic trypanosomiasis or sleeping sickness – all fall into the category of neglected diseases.

Field laboratory work in Uganda.
Photo: Eric Fèvre

AHP's 13 projects primarily targeting disease in people have made a significant contribution towards dealing with these diseases in Africa, through developing novel control strategies, and by raising international awareness. The Alliance for Rabies Control, the WHO working groups on the socio-economics of sleeping sickness and rabies, and the holding of a major international meeting (see Box 3.2) all arose, entirely or in part, as a result of AHP-funded research. AHP-funded research has also made an important contribution to finding a new way of dealing with malaria in certain regions, where the mosquitoes that transmit the disease to people also feed on cows. Research has shown that, in these areas, treating cows with insecticide to deal with trypanosomiasis also reduces the incidence of malaria (see Box 1.2).

> "The need to fight neglected diseases is incontestable –
> from a moral perspective, a human rights perspective
> and an economic perspective, as well as a global goods perspective."
>
> WHO/GTZ/KFW/TDR 2003[5]

[4] WHO/GTZ/KFW/TDR (2003). Intensified control of neglected diseases. Report of an international workshop, Berlin, 10–12 December 2003. World Health Organization, Geneva, Switzerland.

[5] WHO/FAO/OIE (2004). Report of the WHO/FAO/OIE joint consultation on emerging zoonotic diseases, 3–5 May 2004, Geneva. World Health Organization, Geneva, Switzerland.

MDG 7: Ensure environmental sustainability

Threatened by rabies: Tanzania's wild dogs.
Photo: Anne Hillborn

Measures to promote and support good animal husbandry will contribute to meeting this goal. Many of the situations which facilitate the spread and maintenance of zoonotic disease are also environmentally damaging. This is particularly true of the unsanitary conditions with free-ranging livestock which promote the spread of various tapeworms and the associated diseases of cysticercosis and cystic ecchinoccocosis. Better husbandry and better control of livestock disease, against the background of sustainable access to basic sanitation and clean water, will substantially improve the animal and human health situation in urban and peri-urban areas.

Many zoonoses also affect wildlife. Controlling these diseases in their domestic reservoir can help protect the planet's wild species. Rabies in particular affects many species, and it threatens the survival of Africa's highly endangered wild dogs and Ethiopian wolves. The AHP has funded two projects which specifically looked at the problem of rabies in wildlife. In all, the AHP has funded four projects directly dealing with wildlife issues.

MDG 8: Develop a global partnership for development

Photo: AHP

The AHP has been involved at various levels in the many types of activities which make up global partnerships for development. At the simplest level, its research networks span continents and bring together developing country scientists, national and international research institutes, scientists and research institutes from the UK and other European countries, international and national non-governmental organisations (NGOs), and veterinary, medical, agricultural and livestock ministries and departments. Together with the LPP, the AHP set up the Inter-Agency Group of Donors Supporting Research on Livestock Production and Health in the Developing World, which has met five times, bringing together international and bilateral donors. The workshops and international meetings held, funded or part-funded by the AHP have made important contributions, in particular to the policy debate on ways of dealing with tsetse, and the development of novel approaches for the dissemination and delivery of animal health knowledge and products. The bringing together of veterinary and medical doctors, researchers, institutions, government services and international organisations to combat neglected zoonotic diseases, culminating in the meeting held at WHO headquarters in Geneva in September 2005 (Box 3.2), was a particularly significant achievement.

The AHP has been instrumental in the creation of the Global Alliance for Livestock Vaccines (GALV). Looking to the future, in a similar way to GAVI (the Global Alliance for Vaccines and Immunisation), GALV hopes to promote the creation of consortia which will invest in research to produce vaccines for tropical livestock diseases which the private pharmaceuticals sector is not currently funding.

1.1 Overall vision and strategy

The AHP was set up in 1990, and over the past 16 years has commissioned a total of 110 R-numbered projects in Africa, Asia and South America, as well as funding numerous other activities to support this research, such as workshops, publications and other dissemination activities. The phases of the programme, like those of the other Renewable Natural Resources Research Strategy (RNRRS) programmes, have evolved in line with DFID policy. The first phase ran from 1990 to 1995, during which AHP's research focused on four key tropical livestock disease clusters which together affect all ruminants in all production systems: trypanosomiasis, tick-borne diseases, virology and helminthology. Fifty new research projects were commissioned, using funds averaging £2 million per year. The second phase began in 1995, following DFID's new research guidelines which introduced a new project classification by production system (semi-arid, high potential/peri-urban, forest–agriculture interface) along with a more focused approach, working towards clearer goals as given by researchable constraints identified in 1994. At this time a fifth subject area, socio-economics, was added to the AHP portfolio. During the following 5 years, the Programme commissioned 43 new projects, with funds averaging £1.6 million per year. Throughout this phase the need for more downstream and demand-led research was gradually recognised and reflected in the changing composition of the Programme's portfolio; for the first time projects exclusively looking at dissemination and delivery of animal health were commissioned – a total of six between 1996 and 2000. Following DFID's commitment to poverty elimination in 1997, AHP's aims evolved further and are summarised in the AHP's logframes as two outputs:

- the development of cost-effective and appropriate strategies to sustainably control diseases of livestock that affect the livelihoods of the poor
- the promotion of tested strategies to control diseases of livestock that affect the livelihoods of the poor.

The third phase began in 2000, with the adoption of the MDGs. The start of this phase saw AHP's portfolio being radically pruned to try and commission projects that were very clearly targeted at solving the animal health problems affecting poor people. The geographic focus was narrowed and the number of diseases being studied was cut. In particular, no new work on transboundary diseases was taken on, as these were seen to be catered for by other organisations, notably the Pan African Programme for the Control of Epizootics (PACE) in Africa, and often involved trade considerations and were thus of less relevance to poor livestock keepers.

AHP reorganised along new thematic lines with three adaptive themes:

- human health impacts of animal diseases: zoonoses
- point-of-care diagnostics and decision support tools
- dissemination and delivery of animal health knowledge

and one strategic theme:

- vaccine development for tick-borne diseases.

This reorganisation reflected both the need to tighten the programme focus by clustering the work and commissioning larger projects, as well as the shift towards more downstream, adaptive research. This third phase, initially designed to run for 5 years, was extended by a year. Funding was much more limited during this phase, with only £0.9 million available per year for new projects, and only 17 new projects were commissioned. During this period, DFID also funded a substantial strategic research project located at the International Livestock Research Institute (ILRI) on the development of a new vaccine for East Coast fever (ECF). This £4.5 million project was directly commissioned and funded by DFID's Rural Livelihoods Department (RLD) in 2001, but the AHP was asked to take on its management and to contribute £0.75 million to the total cost.

During the last 6 years, the AHP and its body of researchers have worked hard at transforming DFID-funded animal health research into something more targeted, closer to end-users and ready for uptake by them and, above all, more poverty focused. Two elements were vital in achieving this transformation. First, during the first half of this period, the AHP concentrated on refining the poverty focus. A recent report (LID, 1999[6]) had emphasised that "livestock contribute to the livelihoods of at least 70% of the world's poor", but little was known about where poor livestock keepers were located geographically, which livestock species they kept, and what livestock diseases represented a major problem for them. Therefore the AHP commissioned a report to investigate these issues, based on its pro-poor analytical framework (Figure 1.2). This report involved extensive consultation and was published in 2002 (Perry *et al.*, 2002)[3]. It addressed the questions above, and developed a scoring system for ranking different livestock diseases according to their impact on the poor. A second volume (Thornton *et al.*, 2002[7]), also funded by DFID, produced detailed maps showing where poor livestock keepers were located. These two books have been very widely distributed both as hard copies and electronically, and are now basic texts for all involved in the field of livestock development and research. The Inter-Agency Group of Donors Supporting Research on Livestock Production and Health in the Developing World, set up jointly by AHP and LPP, was instrumental in ensuring these reports were commissioned and in their promotion.

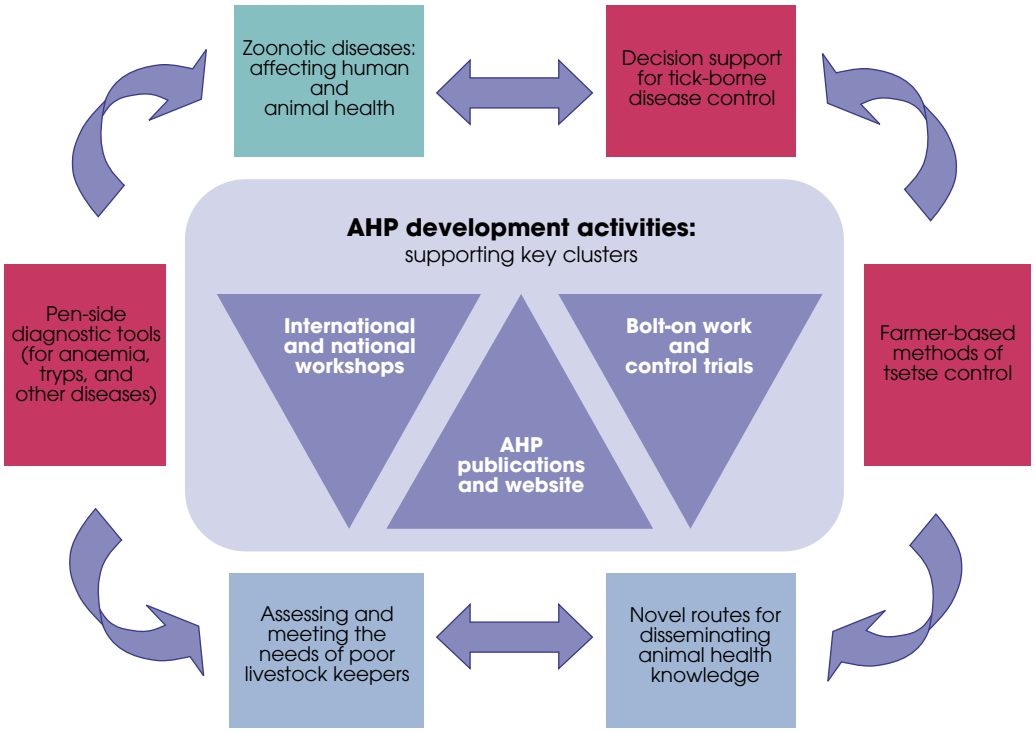
Figure 1.2 **AHP thematic groupings set within the AHP pro-poor analytical framework**

[6] LID (1999). Livestock in poverty-focused development. Livestock in Development, Crewkerne, United Kingdom.

[7] Thornton, P.K., Kruska, R.K., Henninger, N., Kristjanson, P.M., Reid, R.S., Atieno, F., Odero, A. and Ndegwa, T. (2002). Mapping poverty and livestock in developing countries. International Livestock Research Institute (ILRI) Nairobi, Kenya, 132 pp.

The second key element in this last phase of the AHP was the selection of key clusters where AHP effort over the years had produced interesting and innovative results with the potential to impact very favourably on the lives of poor livestock keepers (Figure 1.3). During the last 4 years of the programme these clusters were strengthened by commissioning projects that fed into them, extending particularly promising projects, commissioning separate bolt-on activities, and using programme development funds to supplement them with cross-cutting workshops and other dissemination activities. These activities were particularly intense during this last, extended year of the AHP.

Figure 1.3 **AHP's key clusters for impact**



Box 1.1 **Getting the message across: seven themed annual reports**

The programme's annual reports provide a full history of all AHP activities from its inception. Since 2000, the AHP has selected a theme for each annual report, reflecting the emphasis of that year's work and addressing topical issues of particular relevance to livestock research.

1999–2000	Providing animal health to underpin the Livestock Revolution
2000–2001	Making globalisation work for poor livestock keepers
2001–2002	Refining the poverty focus
2002–2003	Making research work for the poor
2003–2004	The 'slow magic' of research
2004–2005	Saving lives, securing livelihoods
2005–2006	Six years of working towards the Millennium Development Goals; sixteen years of poverty-focused research

1.2 Programme activities

The main programme activities which took place in 2005–2006 are summarised in Table 1.1. There were no significant variations from the activities planned for the year. Among the year's highlights was the joint WHO and AHP consultation on 'Control of zoonotic diseases – a route to poverty alleviation', which brought together researchers working on selected diseases from both the livestock and human health sectors, individuals involved in the control of these diseases in government and non-government organisations, as well as donors and representatives of UN agencies.

Table 1.1 **Summary of programme-level activities in 2005–2006**

Date	Activity
2005	
April	Prepare 2004–2005 Annual Report
	Meeting to discuss joint WHO/AHP meeting on neglected zoonotic diseases planned for September 2005
May	Wellcome Trust: Meeting to discuss GALV
	Copenhagen: Inter-agency meeting
	Geneva: Meeting with DiaMed, biotechnology company
	East Kilbride: Meeting with Joanna McGowan, DFID Economic Adviser
June	School of Oriental and African Studies, London: Conference on 'The research/practice interface in 2005: actions for the year and beyond'
	London: Interviews for GALV board chairperson
	Invitation to be lead author on the International Assessment of Agricultural Science and Technology for Development (IAASTD)
	Greenwich: UK forum on Agricultural Research for Development
	Meeting with Anil Patil, Wellcome Trust Project Manager for International Public Engagement
	Brussels: First meeting of the Steering Council of the European Technology Platform on Global Animal Health
July	Meeting with Gordon Conway, DFID Chief Scientific Adviser
	Interviews for GALV chief executive officer
August	GALV board meeting
	CTVM: Visit by Frank Almond to discuss the Capacity Building Synthesis Study
	East Kilbride: Meeting with Joanna McGowan and David McBeath to discuss GALV
September	Geneva: Joint WHO/AHP meeting on 'Control of zoonotic diseases – a route to poverty alleviation'
October	Meeting with Vétérinaires sans frontieres (Belgium, VSFB) to discuss farmer field schools (FFSs)
	Brussels: European Technology Platform – Technology Exchange and Transfer
	GALV board meeting
	East Kilbride: video conference with David McBeath (GALV), Rod Metherall and Jonathan Wadsworth
	Nairobi: Meeting with FFS manager
November	Istanbul: IAASTD first author meeting
	Brussels: European Technology Platform
December	Brussels: European Technology Platform
	ILRI, Nairobi: East Coast fever (ECF) Review
2006	
January	CTVM: Meeting with David Howlett, Team leader, DFID Growth and Livelihoods
	GALV meeting
February	Brussels: European Technology Platform
	London: Consultation on 'researching the development implications of highly pathogenic avian influenza'
	GALV Technical Advisory Committee meeting
March	DFID: Celebration of RNRRS achievements
	Prepare Annual Report 2005–2006

1.3 Research impact

Over the last 16 years AHP projects have produced a broad range of new and interesting results that have contributed to disease control strategies designed to benefit poor livestock keepers. Now, as the RNRRS comes to an end, it is an appropriate time for the AHP to look at the impact of some of its research projects. The reviews below consider seven clusters of AHP's projects, and examine both policy implications and impacts, and direct and likely future impacts on the poor.

Participatory epidemiology

DFID R no.	Title
7164	Indigenous knowledge, participatory appraisal and animal health information systems: options for complementary methods in public and private veterinary services in Africa (short title: Participatory Approaches to Veterinary Epidemiology, PAVE)

Policy implications and impact

By late 2000 the results of PAVE were recognised by the Organization of African Unity–Interafrican Bureau for Animal Resources (OAU/IBAR) as highly relevant to their emerging EC-funded Pan African Programme for the Control of Epizootics (PACE). The PACE programme, which covered 32 African countries, focused on the final eradication of rinderpest and strengthening government epidemiological capacities. Both of these aims were linked to improving livestock exports according to new World Organisation for Animal Health (OIE)/World Trade Organization (WTO) rules. There was a particular need to improve understanding of animal diseases in remote, pastoralist areas. Following demonstration by the PAVE project of the epidemiological value of participatory methods, the institutionalisation of participatory approaches became a core element of PACE through the DFID-funded Community-based Animal Health and Participatory Epidemiology (CAPE) Unit. The CAPE Unit started in early 2000 and used results from PAVE in international and national workshops, training courses and field studies in the Greater Horn of Africa region. In addition, the research results have encouraged international agencies, including the Food and Agriculture Organization of the United Nations (FAO), ILRI and the OIE, to adopt participatory approaches as a norm when working with poor livestock keepers and for epizootic disease surveillance in marginalised areas. By 2004, veterinary schools in Ethiopia, Kenya and Uganda had introduced teaching in participatory epidemiology into either undergraduate or postgraduate curricula.

Impact, especially on the poor

Although the project primarily aimed to assess the value of participatory epidemiology at policy level, the field research provided direct community-level benefits in three locations. In Southern Sudan, research results led to revision of training courses and materials for 700 community-based animal health workers under the United Nations Children's Fund (UNICEF) Operation Lifeline Sudan Livestock Programme. In Tanzania, extension leaflets in Swahili, Maasai and Sukuma were produced and disseminated by the project. The increasing uptake of participatory epidemiology by government veterinary services and research institutions in eastern Africa and the Horn is leading to improved understanding of both disease problems and local prioritisation of diseases, ultimately leading to better policies on animal disease control. Attention to the perceptions and needs of different wealth/interest groups is central to participatory epidemiology, hence its value in helping to address the animal health needs of the poor.

Impact of animal diseases on human health

Tuberculosis and brucellosis

DFID R no.	Title
7229	*Mycobacterium bovis* infection of cattle and man in Tanzania
7357	Quantifying costs and risk factors of bovine tuberculosis in Tanzania
7985	Investigating the impact of brucellosis on public health and livestock reproduction in Tanzania
5408	A cross-sectional study of bovine and human tuberculosis in the Monze District of Zambia
5498	Bovine tuberculosis in the tropics
6104	A field trial in Usanga Plains Area, Mbeya, Tanzania, to validate the performance of the tuberculin tests and evaluate different ELISA assays to determine their potential as complementary tests for the diagnosis of bovine tuberculosis

Rabies

DFID R no.	Title
4418	The development of a procedure for the oral vaccination of dogs and jackals against rabies in Zimbabwe
4907	Jackal ecology – rabies and wildlife later: behavioural ecology of the side-striped jackal (*Canis adjustus* Sundevall): implications for the epidemiology and control of rabies
5406	Rabies in the Serengeti Region, Tanzania

Policy implications and impact

The sustained support for zoonotic disease research has had substantial impacts in Tanzania. For the first time, a critical mass of highly trained veterinary and medical research staff, with appropriate laboratory facilities and a wide network of international collaborators, share a common interest and capacity to address zoonotic disease problems in the country. The improved integration between sectors is seen by the establishment of an inter-ministerial commission for zoonosis control and prevention, as well as the growing number of collaborative research projects under development within Tanzania.

Research into wildlife aspects of these diseases has contributed to the recognition of disease surveillance and control as an important part of wildlife management in Tanzania, resulting in the recent establishment of veterinary units within Tanzania National Parks and the Ngorongoro Conservation Area Authority, with control of infectious diseases (such as rabies) incorporated into management plans for the national parks.

For the first time, issues relating to zoonotic tuberculosis and non-*Mycobacteria* tuberculosis forms of the human disease are starting to achieve recognition in the WHO Global TB programme, as well as in the medical community in Tanzania.

Models developed to evaluate the burden of rabies have been adopted as a methodology by WHO to improve rabies surveillance and rabies advocacy in developing countries. Findings from rabies epidemiological studies in Tanzania contributed substantially to an expert consultation, held in 2004, on rabies. A National Programme for Rabies Control has now been developed for Tanzania.

Current impact, especially on the poor

The very existence of research projects on rabies, brucellosis and tuberculosis serves to provide messages for public health education and awareness. Various media have been used to disseminate information about the control of zoonotic diseases in Tanzania, including leaflets, posters and murals that have been distributed throughout Arusha Region in northern Tanzania, and both local and international radio (BBC World Service) and television (BBC World, CNN) programmes.

Increasing recognition of brucellosis among doctors, and improvements in the clinical and serological diagnosis of human brucellosis, are resulting in more immediate and appropriate treatment of the disease, leading to more rapid recovery for people who would otherwise be debilitated by the disease and unable to work or support their families.

The successful implementation of dog vaccination programmes as part of rabies research has reduced human rabies mortality, especially in children, and lowered the economic and psychological burden as a result of a decline in dog-bite injuries. This is mostly benefitting the poor, since they currently suffer most from rabies as they are unable to afford post-exposure treatment. These research projects have also stimulated rabies control initiatives by central and local government and parastatals in other parts of Tanzania (e.g. district councils, Tanzania National Parks, Ngorongoro Conservation Area), with similar benefits for local communities.

Potential impact, especially on the poor

It is anticipated that recognition of the zoonotic component of human tuberculosis will lead to the development of more appropriate treatment, prevention and control strategies, thus reducing the burden of the human disease. The recognition that tuberculosis (in all its forms) predominantly affects those living in remote, marginalised and impoverished households should stimulate increased efforts to provide appropriate educational material and medical and veterinary support to these families.

Improvements in the clinical and serological diagnosis of human brucellosis should result in more immediate and appropriate treatment of the disease, leading to more rapid recovery. Research findings are likely to result in increased attention to control of livestock disease (for example, vaccination) in high-risk communities, most notably pastoralist communities. Since pastoralists are among the most impoverished and marginalised communities in Tanzania, and depend most heavily upon livestock for their livelihoods, any control of brucellosis should have significant impacts on their health and well-being.

The increased rabies advocacy within WHO arising, in part, from Tanzanian rabies research is likely to yield important results, with initiatives underway to develop large-scale (national, regional) dog rabies control programmes throughout Africa and Asia, and to result in substantial impact, particularly on the poor.

Assessing and meeting the demands of poor livestock keepers

DFID R no.	Title
7359	The delivery of animal health services to the rural poor: a framework for analysis
8152	Dissemination of animal health knowledge for development of landless dairy cattle owners in the peri-urban regions of Pondicherry, India
8213	Including the voices of the poor: developing a decision-making framework for livestock disease prioritisation and the uptake of animal health technologies by poor livestock keepers

In 1999, the AHP funded project R7359, 'The delivery of animal health services to the poor: a framework for analysis'. The study revealed that lack of access to knowledge was the factor most disabling to successful livestock keeping. For the majority of poor livestock keepers, the first source of information regarding their livestock was friends and relatives; many participants recognised that their knowledge sources were limited and often inaccurate. A livelihood analysis also revealed that perceptions of the poor regarding the importance of constraints such as livestock disease varied greatly from the views of the experts. The study illuminated the simple reason behind the poor adoption rates of many animal health technologies: uptake levels relied on a direct correspondence with the priorities of the poor.

The study then evaluated the accessibility, affordability and acceptability of both human and animal healthcare for the poor. From the analysis it became clear that the poor were largely marginalised from formal healthcare provision and that development projects and programmes were missing opportunities to support change. Therefore, the researchers canvassed major donors to collaborate and better inform efforts in this area. Project R7359 was the driving force behind the Global Initiative for Livestock Services and the Poor, a multi-donor, global forum funded by the World Bank, the International Fund for Agricultural Development (IFAD) and the Danish International Development Agency (DANIDA) to support livestock services among the most vulnerable populations.

The final output of the study involved creating specific methodological tools, including the Livestock and Poverty Assessment Methodology, a toolkit comprised of 17 participatory methods specifically created for the livestock sector. To date, over 500 manuals have been distributed to practitioners and students at a wide variety of both northern and southern institutions.

Two questions raised from R7359 were: can the knowledge needs of the poor be addressed in a neutral manner that is not subject to power dynamics and other biases present at the community level?; and, how can the global community of animal health researchers respond to the actual, rather than the perceived, disease priorities of the poor?

To address these issues, the AHP funded project R8213, 'Including the voices of the poor: developing a decision-making framework for livestock disease prioritisation and the uptake of animal health technologies by poor livestock keepers', and R8152, 'Dissemination of animal health knowledge for development of landless dairy cattle owners in the peri-urban regions of Pondicherry, India'. The first project collected data regarding the livestock disease priorities and knowledge needs among 1700 poor farmers in Kenya, India and Bolivia. The project has been instrumental in creating new knowledge technologies regarding animal health, management and production, and disseminating the results to its southern collaborating partners. The study created the Livestock Guru Programme, an interactive software programme for illiterate users, that disseminates information about animal health, production and management. To date, the programme has generated a lot of interest, and has demonstrated higher levels of uptake of information compared to other forms of media. Further, the software captures and stores user choices. This means that the priorities of the poor on animal health can be immediately collated and passed on to decision makers. An additional output of the study is the Livestock and Poverty Impact Model, which utilises data collected from 5372 households on three continents to derive the actual impact of different livestock diseases on the livelihoods of the households involved.

Finally, the research team has supported their southern collaborating partners in the implementation of R8152. This project explores knowledge delivery among landless cattle keepers in Pondicherry, India, and is being implemented by Rajiv Gandhi College of Veterinary and Animal Sciences. The project has sponsored a number of workshops, bringing together participants from

across India, which have informed decision makers of the potential benefits and constraints of livestock keeping for the poor. The project has also developed a number of different media to deliver key messages on livestock production, management and health to landless women livestock keepers.

This cluster of projects has thus informed both global and local livestock policy and practice. Indeed, the cluster has taken the demands of the poor directly to decision makers in areas ranging from the priorities of the poor, to donor collaboration, to the design and delivery of sustainable livestock projects and programmes for the communities involved. The impact of the cluster in total is greater than the sum of its individual parts. Indeed, the outputs address issues fundamental to enhancing the effectiveness of development decision making, and as such have impact beyond the livestock sector.

Livestock farmer field schools

DFID R no.	Title
7986	Development of FFS methodology for smallholder dairy farmers

Policy implications and impact

Following the adaptation of the FFS approach to livestock by this project, the Government of Kenya's (GoK) National Agricultural and Livestock Extension Programme (NALEP) developed an approach including FFS methodology and has implemented it in six divisions of Bomet District. The FFS groups formed focus on a range of topics including dairy goats, dairy cows, poultry and bee-keeping as well as various crops. At a workshop entitled 'FFS: the Kenyan experience', which was organised jointly by ILRI, FAO and the Kenya Agricultural Research Institute (KARI) in March 2003, the GoK's Senior Assistant Director of Agriculture (Extension Division) noted "Historically, extension advice has been applied with varying degrees of success. Certain attributes are needed to improve the success ratio: services need to be demand driven; extension agents need to be accountable to the farmer for the services they provide; it is important to collaborate with others as no one can meet all the needs from production through to marketing; and participatory approaches to planning and implantation are desirable. FFS has all these characteristics and therefore appears to be a good approach to extension."

Current impact, especially on the poor

An impact assessment study carried out by the project in 2003 (Mango *et al.*, 2003[8]) used participatory techniques to determine farmers' and extension workers' perceptions of the technological and social impact of livestock FFSs on smallholder dairy farmers in Kenya. The main findings were:

Farmers' perceptions:

- Improved family welfare and increased household incomes
- Improved milk production

[8] Mango, N., Buyu, G. and Minjauw, B. (2003). The social and technical impact of livestock Farmer Field Schools on small-holder dairy farmers in Kenya. Cases from Nakuru and Nyandarua Districts. An evaluation report. ILRI, Nairobi, Kenya. 49 pp.

- Reduced cost of keeping cattle through increased fodder availability
- Improved disease control, i.e. more frequent spraying of cattle against ticks and adoption of routine deworming practices
- Establishment of fodder crops on farms
- Strong influence on social cohesion, sharing of information and exchange of resources such as fodder planting materials
- Increased access to milk by all community members
- Training of non-FFS members by FFS participants
- Increased ability of farmers to experiment with alternative technologies
- Enhanced participation by women in dairy farming activities
- Some FFS graduates now becoming facilitators of farmer-led FFS groups.

Extension workers' perceptions:

- Livestock FFS facilitators rated this extension approach highly
- FFS considered cost effective and sustainable
- Technologies introduced through FFSs can be integrated into farmers' practices
- Enhanced interaction between farmers and extension workers.

The project has received extensive coverage in both local and international media, and through participation of the project's researchers, in national, regional and international workshops and conferences. This has generated considerable interest within the livestock sector. The FFS approach has now been extended beyond cattle to include groups focusing primarily on pastoralists' livestock, goats, sheep, pigs and poultry as well as mixed livestock/crop farming. Expressions of interest in livestock FFSs have been received from many countries in Africa, including Benin, Ethiopia, Kenya, Lesotho, Madagascar, Nigeria, Sudan, Swaziland, Tanzania, The Gambia, Uganda, and, from further afield, Afganistan and Pakistan. Following the lead of AHP, other organisations have now invested in livestock FFSs. As a result, building on the AHP's initial investment, the project has achieved widespread impact and leveraged significant additional investment. A more recent impact assessment study (see Box 1.7) has generated useful lessons which can serve as guidelines for the establishment of future livestock FFS projects and programmes throughout the developing world.

Potential impact, especially on the poor

It is too soon to determine the long-term impact of FFSs among smallholder dairy farmers in Kenya, but the fact that some dairy FFS graduates are proceeding to become facilitators of farmer-led FFS groups bodes well for the sustainability and scaling out of the approach. Also, some of the dairy FFS groups have continued to meet long after the initial 52-week FFS cycle and graduation. As mentioned earlier, the GoK is also establishing FFS groups under its mainstream extension activities. Currently a cadre of 'master facilitators' is being recruited who will remain based in various NGOs, to run training-of-trainers courses for future FFS facilitators. The initial investment by the AHP in livestock FFS has leveraged considerable additional funding for this approach. For example, a joint AHP/Belgian Survival Fund (BSF)-supported project is to be implemented by VSF Belgium in Kenya, which will adapt the FFS approach for pastoralists in northern Kenya; US$150,000 investment by AHP helped secure a US$850,000 grant from BSF. Thus livestock FFS has progressed from an experimental approach within the context of a research project and is well on the way to being institutionalised within both the Kenyan extension services and the livestock NGO sector.

Tsetse control

DFID R no.	Title
6559	Preliminary study of the effects of host physiology on the efficacy of cattle as baits for tsetse control
7173	Cattle management practices in tsetse-affected areas
7364	Improving the control of tsetse: the use of DNA profiling to establish the feeding responses of tsetse to cattle
7539	Environmental risks of insecticide-treated cattle in South African livestock systems
7987	Message in a bottle: disseminating tsetse control technologies
8214	Integrated vector management: controlling malaria and trypanosomiasis with insecticide-treated cattle
6625	The effect of control operations against tsetse on the incidence of bovine trypanosomiasis in Zimbabwe

Policy implications and impact

The most important policy implication of this research relates to the computer program Tsetse Plan, which provides a rigorous framework for designing and implementing tsetse control programmes using bait technologies. The program synthesises knowledge from 20 years of research and, with a user-friendly interface, allows non-specialist users to assess the feasibility of various tsetse control strategies. Earlier versions of this program have been used in the design of several tsetse control programmes undertaken, for example, by NGOs (e.g. FARM-Africa) and national institutions (Southern Tsetse Eradication Programme, Ethiopia). The models within Tsetse Plan are confined to bait-based methods of tsetse control, but the approach could be broadened to include aerial spraying, ground spraying and the sterile-insect technique. Such a model could provide a powerful tool for assessing national and regional tsetse control strategies and policies.

The research also provides important implications for the integrated management of vector-borne diseases, for example, how tsetse control can be implemented without undermining the sustainable management of tick-borne diseases, and whether malaria in Africa might be controlled by pyrethoid-treated cattle.

Finally DFID's tsetse research programme is contributing towards an emerging framework for understanding the social and economic factors governing the success and sustainability of community-based actions designed to control tsetse and trypanosomiasis.

Current impact, especially on the poor

The 1999 review of DFID's trypanosomiasis research programme[9] makes it clear that DFID has been the most important supporter of the development of bait technology for controlling tsetse, which is now the mainstay of farmer-based methods of tsetse control. There are many published examples of bait technology reducing the incidence of trypanosomiasis and improving the productivity of cattle in various countries, including Burkina Faso, Ethiopia, Kenya, South Africa

[9] LPP, AHP and NRSP (1999–2002) DFID-funded tsetse and trypanosome research and development since 1980. L.T. Budd (ed) Volume 1 – scientific review, p. 378; Volume 2 – economic analysis, p. 123; Volume 3 – summary of projects p. 150. Aylesford, UK: Natural Resources International Limited.

and Zambia. In Zimbabwe, for example, bait technologies made an important contribution towards eliminating tsetse from 50,000 km^2 of the country and reducing the national incidence of trypanosomiasis from over 10,000 cases per year in 1984 to less than 100 in 1995. Virtually every tsetse control operation currently being undertaken in any part of Africa is using at least some components of technology developed or refined by DFID-funded research.

The cluster of projects considered in this review represents more recent work and thus their current impact is as yet relatively limited. Nonetheless, we are aware of projects in Ethiopia, Uganda and Zambia that are promoting the restricted application of pyrethroids to control tsetse, and the tsetse.org website and CD-ROM have been used by institutions and individuals concerned with controlling tsetse in Ethiopia, Kenya, South Africa, Tanzania, Uganda, Zambia and Zimbabwe.

Potential impact, especially on the poor

On a continental scale, the extent and impact of trypanosomiasis is probably worse than it was 50 years ago – reducing this would have an enormous impact on the livelihoods of the poor in sub-Saharan Africa. Currently, sustainable community-based control of tsetse is proving elusive largely because of the difficulty of deploying and maintaining baits over relatively large areas (more than 500 km^2) and for extended periods (over 12 months). A large part of this problem is that individual farmers cannot afford the costs of bait technology and hence prefer to invest in trypanocidal drugs, which provide clear private benefits in their cattle's health compared to the less immediate and obvious but ultimately greater public benefit of controlling tsetse. A combination of the research outlined in this review and changes in the market price of pyrethroids is reducing the cost of treating cattle to around US$0.1 per treatment per animal compared to around US$1 for a trypanocide, making tsetse control a more attractive alternative. By explicitly linking tsetse control to benefits in animal productivity, the control of ticks and, possibly, malarial mosquitoes, it is likely that livestock keepers would be willing and able to treat their cattle regularly and hence accrue the massive benefits of area-wide tsetse control.

Trypanosomiasis and improved diagnostics

DFID R no.	Title
6560	Development of sustainable control methods and diagnostic tools for Western Kenya where trypanosomiasis is a developmental constraint
7360	Field methods and tools for resource-poor farmers and extension workers to improve targeting and appropriate use of drugs used for control of African bovine trypanosomiasis
7596	Decision support system for the control of trypanosomiasis in south-eastern Uganda: improving public health and livestock productivity through the cost-effective control of trypanosomiasis in livestock
7597	Development of a low-cost haemoglobinometer and other diagnostic tools for bovine disease in sub-Saharan Africa
8318	Decision support for endemic diseases in sub-Saharan Africa – private sector drivers for technology adoption by poor livestock keepers

Policy implications and impact

As a direct result of research on the spread of sleeping sickness and the link to livestock movements in Uganda, national and district government policy in Uganda has been revised to ensure that cattle traded as part of restocking programmes are given a single dose of trypanocide at the point of sale

(the National Tsetse and Trypanosomiasis Control/Eradication Policy). District livestock officials (who have overall responsibility for the cattle markets) are required to oversee the national directive. For now, livestock farmers and traders are required to purchase, as part of the overall market fee, the injectable drug which is administered by the district veterinary officials before a permit is issued allowing the animals to leave the market. This reduces the risk of parasites spreading to previously unaffected areas.

A second important policy message relates to the poor access to good diagnostic and health-care facilities for sleeping sickness patients, who made an average of five visits to different health-care facilities before appropriate diagnosis was made. Reducing the burden of the disease requires government action to improve this situation, with more emphasis on collaboration between government and private sector health providers in rural areas. Members of the teams working on this project cluster are now well positioned within the Ministry of Health in Uganda and able to directly impact on government policy in this regard (although the process of doing so is slow).

The new Uganda Government Policy on the control of trypanosomiasis has been implemented[10], and an active programme for screening human patients and treating livestock for trypanosomiasis by a central government-funded programme is now in progress in Uganda.

A joint AHP/ICPTV (Integrated Control of Pathogenic Trypanosomes and their Vectors) workshop on 'Recent advances in the control of human and animal trypanosomiasis: diagnosis, epidemiology, modelling and decision support', held in April 2003 in Nairobi, Kenya, brought together key stakeholders, including policy makers, field veterinarian and public health officials, NGOs, national agricultural research system (NARS) and research scientists. As a follow-up to the 2001 DFID-sponsored meeting on tsetse eradication, a meeting was held in October 2003 entitled 'Recent advances in tsetse control – the way forward', which again brought these key players together. Policy outputs will impact at all levels.

Potential impacts from AHP-funded project outputs include:

- a decision-support tool which will have most impact on local veterinary services, animal husbandry assistants and livestock health care providers with low to medium levels of veterinary training
- improved diagnostic services to sleeping sickness patients in rural areas
- reduced costs to farmers of treating animals using the restricted application of insecticides, and a concurrent improvement in animal health. By explicitly linking tsetse control to benefits in animal productivity and the control of ticks, it is likely that livestock keepers would be willing and able to treat their cattle regularly
- transfer of diagnostic developments to NARS, veterinary departments and NGOs
- the taking up of information provision on the role of farmer treatment of livestock for public health benefit by the responsible veterinary and public health departments.

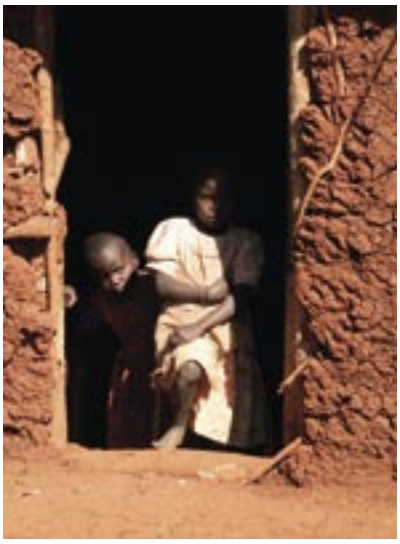


Photo: Dave Elsworth

[10] Wendo, C. (2002). Uganda revises cattle treatment to protect humans from sleeping sickness. *Lancet*, 359, 239.

East Coast fever vaccine research

DFID R no.	Title
8042	Integrated control of East Coast fever constraining livelihoods of smallholder farmers in sub-Saharan Africa

Policy implications and impact

Not applicable at this stage of the project cycle.

Current impact, especially on the poor

Since the project is still at the 'proof-of-concept' stage, direct impacts on the poor have yet to be realised. However, during the project many African scientists and technicians have benefited from training which has significantly boosted the capacity of animal health research organisations throughout the continent.

Another important impact is that the project has developed a successful model for a public–private partnership to address a major constraint to cattle rearing in developing countries – perhaps the first such partnership. Since the disease is found only in a number of poor African countries, there was no incentive for the private sector alone to develop a vaccine against ECF. Public sector research organisations are not well placed to turn research results into commercial products, such as vaccines. This collaborative ECF research programme brings together expertise from both the public and private sectors in Africa, Europe and the USA. Researchers from The Institute for Genomic Research (TIGR) based in Maryland took the lead in sequencing the parasite's genome – its genetic 'blueprint'; scientists from the Nairobi-based ILRI supply expertise in bovine immunology and also have excellent large animal containment facilities; KARI provides a wealth of knowledge of field sites for testing of experimental vaccines; a team from Oxford University provided expertise in and proprietary technology for antigen delivery systems originally developed for human vaccine research; and a multinational veterinary pharmaceutical company (Merial, USA) – a world leader in the development, manufacture and distribution of animal vaccines – completes the team to provide proprietary technology and to ensure the research findings are turned into an effective, safe, user-friendly and affordable vaccine. By developing this pioneering public–private partnership model, the project has demonstrated a new, better way of organising and managing research to maximise the likelihood of research results being turned into useful products for the benefit of the poor.

Potential impact, especially on the poor

It is anticipated that the project will have both direct and indirect impacts. The former will arise from the benefits of an effective, cheap, safe and convenient vaccine for ECF that can be stored at room temperature. Such a vaccine could prevent one million cattle deaths a year in eastern and central Africa, and save the 11 affected countries an estimated US$300 million a year. But these impacts, impressive though they are, pale in comparison to the anticipated spill-over benefits.

The *Theileria parva* parasite has some properties that are of great interest to biomedical researchers. It is closely related to the organisms that cause malaria in humans. Like the organisms that cause malaria, HIV/AIDS and tuberculosis, it invades its host's cells – the parasites that cause ECF enter cattle's white blood cells. Having invaded the white cells, *T. parva* causes them to keep on dividing – in this way the infected white cells start to behave very like cancer cells. The immune response engendered by the ECF vaccine candidates, killer T-cell responses, are precisely the immune responses researchers working to develop vaccines for HIV/AIDS, tuberculosis, malaria and cancer are striving to achieve.

The development of an effective new vaccine against ECF would be a highly significant scientific breakthrough. It would be the first example of a sub-unit vaccine successfully protecting a mammalian host against intracellular protozoan pathogens. It is hoped that this will pave the way for the development of similar vaccines against HIV/AIDS, malaria and tuberculosis.

1.4 New knowledge and innovations

Over the past year, AHP research projects have continued to generate new knowledge and innovations for the benefit of poor livestock farmers. These include the research work on the use of insecticide to simultaneously control tsetse and tick-borne diseases in animals and mosquitoes, thus controlling malaria in humans (Box 1.2) and the development of alternative approaches to controlling sleeping sickness (Box 1.4). As well as new knowledge and innovations, the end of the AHP provides an opportunity to evaluate the strengths, weaknesses and lessons that can be learnt from some of the projects.

Box 1.2 **Novel research methods reveal potential of 'mosquito-killing cattle'**

Around one million people, mostly children, die of malaria in Africa each year. In previous AHP annual reports, interesting results have been reported suggesting that treating cattle with insecticide could control mosquitoes and hence impact on malaria in people. (Spray, dip or pour-on formulations of synthetic pyrethroid insecticides are routinely applied to cattle in parts of Africa to control tsetse and tick-borne diseases.)

The earlier work, carried out in Konso, Ethiopia, showed that when the mosquito species *Anopheles arabenesis* was offered a choice between cattle and human odours, more than 80% opted for humans. Despite this clear preference, up to 91% of bloodmeals were taken from cattle. Careful observation suggested that the explanation was that cattle were more available to mosquitoes than people: the local practices of sleeping on raised platforms or indoors in huts surrounded by cattle reduced the number of mosquitoes biting people.

The scope of this project has now been extended. Studies undertaken with the same mosquito species in Burkina Faso, Madagascar, Tanzania and Zimbabwe have revealed a high degree of variability in host preference: in Tanzania 87% of mosquitoes preferred cattle odour whereas in Zimbabwe just 21% preferred cattle over human odour. However, as the earlier results from Ethiopia have shown, human behavioural factors can markedly affect the feeding behaviour of mosquitoes. This has now also been confirmed in Zimbabwe, where it has been shown that when people sleep indoors the probability of being bitten is reduced.

A desk study undertaken by the project team combined available spatial data on the distribution and density of people, cattle and mosquitoes, collated using a geographical information system, with modelling of the possible impact of insecticide-treated cattle. The study indicated that spraying cattle would have a significant impact on malaria over substantial areas of Africa including the Sahel, East Africa and the savannah areas of southern Africa.

The results obtained to date are very encouraging, and discussions are underway with potential collaborators and investors with a view to carrying out a large-scale field trial in Tanzania or Ethiopia to confirm the impact of insecticide-treated cattle on malaria.

In the course of the project, novel approaches have been developed or adapted for studying the behaviour of malaria-transmitting mosquitoes. These include the use of genetic markers to assess feeding patterns, and electrocuting nets – previously developed for use in studies of wild tsetse flies – to measure the attraction of different hosts. These new methods can also be applied to the study of other established and emerging vector-borne diseases – such as blue tongue, African horse sickness and West Nile virus – thereby contributing towards the development of better methods of controlling these important diseases.

Project R8214

Netted *boma.* *Photo: Steve Torr*

Box 1.3 **Brucellosis confirmed as serious public health threat in Guinea**

With their often heavy dependence on livestock and cheap, often unregulated livestock products, such as informally traded raw milk and uninspected meats, the poor are particularly at risk from zoonoses – those diseases that can be transmitted from animals to people. Poor hygiene practices, close contact with their livestock and lack of awareness of the associated risk among livestock keepers and consumers, and lack of capacity for effective diagnosis and treatment in stretched veterinary and medical services, all contribute to this situation.

The AHP has recently sponsored the first major survey of brucellosis in people and livestock in the West African country of Guinea – one of the world's poorest countries. The survey included urban and rural areas, combining research with capacity building in local hospitals and awareness raising amongst people at risk.

The study demonstrated a high prevalence of brucellosis in cattle, sheep, goats and people – both rural and urban dwellers – and established that the disease represents a major threat to public health. It also revealed that a number of high-risk practices associated with transmission of brucellosis to people were common: more than 80% of hospital patients reporting with fever regularly drank raw milk; livestock keepers routinely handled animal placentas and aborted foetuses; and sheep and goats are kept in and around the home.

Cow with hygroma, an indicator of brucellosis infection, Guinea Bissau. *Photo: Fred Unger*

The project organised a series of sessions to increase awareness about the disease, targeted at medical and veterinary personnel as well as livestock farmers. In addition to passing on the study findings and WHO recommendations for treatment of brucellosis, an important objective was to encourage vets and medics to work more closely together to improve diagnosis and treatment in both animals and people, thereby reducing transmission of the disease. A major problem with zoonotic diseases, reported at length in previous AHP annual reports, is that they tend to fall between veterinary and medical camps, and are prioritised by neither. Livestock farmers were also introduced to simple control measures, such as boiling milk and using gloves and plastic bags when handling and burying aborted foetuses.

Project AHP-BO-04/05

Box 1.4 **New approaches to controlling sleeping sickness in Uganda**

Conventional ways of controlling sleeping sickness focus on either detection and treatment of human cases or large-scale tsetse control campaigns. Both approaches have disadvantages. Diagnosis and treatment of patients is difficult and the treatment regime is both unpleasant and dangerous – around 1 in 20 patients dies of treatment-related complications. Large-scale tsetse control operations are expensive and logistically challenging, and prone to reinvasion of cleared areas by tsetse once the operation ends, negating any gains.

Calf examination, Uganda.
Photo: Andrew Brownlow

Two complementary AHP-funded projects in Uganda have developed and tested alternative approaches to controlling the acute form of sleeping sickness, caused by the parasite *Trypanosoma brucei rhodesiense*.

Previously, AHP-sponsored researchers have shown that people are around 1000 times more likely to acquire infection transmitted via tsetse from cattle, than via the bite of a tsetse which has fed on a human sleeping sickness case. Also, it has been shown that a large proportion of cattle – in the region of 40% – carry the human infective parasites. These findings focused attention on controlling the 'animal reservoir': the cattle infected with the parasites that cause sleeping sickness in humans, which can be transmitted to people via the bite of blood-sucking tsetse flies.

In the first trials, block treatment of cattle with a trypanocidal drug – isometamidium chloride, a cheap drug that has been used for more than 40 years to control the form of sleeping sickness that affects animals (*nagana*) – was tested to evaluate its impact on the animal reservoir. Results from field trials and subsequent modelling studies have shown that so long as a sufficiently large proportion of cattle are treated – around 80% of the total population – human infective parasites in cattle can be totally eliminated after just one cycle of treatment.

A second series of trials investigated the efficacy of spraying cattle using a 'restricted application' approach. This builds on previous DFID-funded work carried out in Zimbabwe that showed that, because tsetse feed primarily on the legs of cattle, applying insecticide only to the legs, belly and ears (the latter to also control ticks) is almost as effective as conventional whole-body application, but uses one-fifth as much insecticide, significantly reducing the cost of treatment. The Ugandan trial has shown that the restricted application approach is equally effective against tsetse in Uganda.

Together these two new approaches to controlling human sleeping sickness and tsetse offer an attractive new direction for future control of this disease. A campaign that combines block treatment of cattle with the introduction and promotion of the restricted application method of spraying cattle could both eliminate the source of sleeping sickness infections and minimise the risk of new infections by providing a cheap, simple way of controlling the tsetse population. Exploratory discussions have begun with potential public and private sector partners, with a view to utilising this combined approach to eliminate sleeping sickness from several previously sleeping sickness-free districts of Uganda that have recently reported their first human cases.

Projects R7596 and R8318

Box 1.5 **Greening the AHP: mitigating greenhouse gas emissions from AHP-sponsored flights**

It is now almost universally accepted that climate change is occurring as a result of emission of greenhouse gases due to human activity. A recent DFID publication[11] highlights the threat this represents to the world's poor and efforts to combat poverty:

> "The world's poor will suffer most from climate change, and international action to eradicate poverty will be at risk… While uncertainties remain…predicted outcomes have a major impact on poor countries and poor people. This sends a clear signal that development activities should integrate responses to climate risks and thereby minimise the impacts on climate change."

The AHP has operated since 1990 with the objective of enhancing the livelihoods and health of poor livestock keepers through research leading to better control of livestock diseases. It helps to bring together veterinary, medical and social scientists from the UK, Africa and South Asia so they can work together on field and laboratory research projects and associated activities, such as attending international workshops. As a direct result, AHP-funded researchers often take flights between and within Europe, Africa and Asia. Over the 16 years of the programme this will have amounted to several hundred flights. CO_2 and other emissions from aircraft are a significant source of greenhouse gases and hence impact on climate change.

Increasingly, organisations, individuals, events, programmes and projects – including DFID-funded research programmes – are taking steps to minimise their carbon footprints. It is estimated that a return flight from UK to East Africa produces around 1.5 tonnes of carbon, as CO_2, per passenger. This is approximately equivalent to the amount of carbon locked up in three medium-sized trees[12]. Assuming AHP has sponsored the equivalent of 300 long-haul flights over the last 11 years, and a survival rate of 1 in 4 trees, this means that 3600 trees need to be planted to mitigate the associated carbon emissions.

UK-based organisations exist that will calculate carbon emissions related to specific activities and arrange for trees to be planted in mitigation. However, in preference to this option the AHP has worked directly with a community-based organisation in Africa. The Kenyan NGO Youth Building Green Programme (YBGP) is a small, lean, low-cost organisation which seeks to 'improve the environment by planting trees' and 'to promote a tree planting culture among children, schools and communities countrywide'. It does this through working with environmental clubs in schools, mainly in slum areas of Nairobi. In addition to teaching the pupils about environmental issues, it organises clean-up campaigns around the schools and involves pupils in planting and maintaining trees. Where possible indigenous species are planted – such as Nandi flame (*Spathodea campanulata*), red stinkwood (*Prunus africanum*), croton (*Croton macrostachyus*) and Thika palm (*Filicium decipiens*; not a palm but an evergreen tree). Tree species are selected that are most suited to the proposed site and are purchased from tree nurseries run by local community-based organisations, such as women's and church groups, to encourage these enterprises and so that benefits remain within the community. Local labourers are also hired to dig the 1-metre deep holes into which the schoolchildren plant each tree.

Teaching school children to plant trees.
Photo: Dave Elsworth

The AHP has sponsored YBGP to plant 3600 trees in schools in Nairobi and Nyeri districts of Kenya during 2005 and 2006. In total, 30 schools have been involved, with 120 trees being planted in, around or near each school. At each school YBGP instructed pupils on the value of trees and provided practical instruction on how to plant and maintain them.

Working directly with the Kenyan NGO enabled AHP to get great value for money: a comparable tree planting programme implemented through a specialist UK-based company would have cost around 10 times more. Working with YBGP has not only meant that the AHP has reduced its carbon footprint but has also helped inculcate a tree planting culture in thousands of Kenyan schoolchildren, a win–win result that will continue to reap dividends in the future.

Project Development Activity

[11] DFID (2004). Key sheet 01, Climate change deepens poverty and challenges poverty reduction strategies. www.dfid.org

[12] Source: www.futureforests.com/explainmore/gocarbonneutral.asp

Box 1.6 **ECF vaccine development: lessons learned from an experiment in high-tech research**

Over a period of 4½ years, DFID invested £5.3 million in a high-tech research project with the ultimate aim of producing a vaccine against the cattle disease East Coast fever. This project, managed by the AHP and implemented by ILRI, has just come to an end without delivering the much anticipated vaccine. What lessons can DFID, other donors and research managers learn from this?

Firstly, with hindsight the project was overly ambitious. The project was carved out from an earlier 6-year, £15 million proposal and set itself an unachievable goal in the time and funding limits available. Despite not yet leading to a vaccine, the external scientific review team have commended ILRI's scientists for their excellent scientific and technical achievements – including identifying candidate antigens which represents a key stage of any vaccine development programme. The overambitious nature of the project was recognised at an early stage by the external review team; there are currently no sub-unit vaccines available for any parasitic disease, despite vast R&D expenditure on the search for vaccines against parasitic diseases, including malaria. The tendency to over-sell the project's potential achievements was itself driven by the realisation that more modest – more realistic – predictions of likely outputs would most probably have resulted in funding difficulties.

Secondly, high-end, cutting-edge, multi-partner research – arguably precisely the sort of science that an international agricultural research centre such as ILRI should be undertaking – does not fit well into the restrictive framework of a time-bound project. High-end science is by its very nature unpredictable and high-risk. A project such as this is perhaps better seen as a contribution to longer-term scientific progress than a contract to deliver a defined product – in this case a vaccine – within a set timeframe.

Although the ECF vaccine project represented a major investment by DFID, it was still relatively small-scale in terms of contemporary high-tech science. In comparison, the budgets allocated by the major pharmaceutical companies to tackle problems of this complexity would be vastly bigger: estimates of the cost of developing a new drug, arguably simpler than developing a novel vaccine, are in the order of US$300–500 million. It should not therefore be surprising that even after the completion of the project there remains much still to do before the goal of a vaccine is realised. The simple lesson here is that this sort of science is costly, and without realistic and adequate funding will inevitably fail to achieve its ultimate goal.

ECF is a major cattle killer in eastern and southern Africa.
Photo: Dave Elsworth

Besides the impressive scientific and technical achievements of the project, there were other benefits. The project was led by African scientists and as a result they have enhanced their scientific capacity and confidence. The project succeeded in attracting a private sector partner – a major multinational veterinary pharmaceutical company – which provided all parties with valuable experience of operating within a public–private partnership. As a result a strong team has been established, which will be able to play an effective role in future vaccine development partnerships. The annual external peer review process was judged to be highly useful by all concerned. In particular, the scientists themselves benefited from the guidance and mentoring provided by the highly experienced members of the review team, and such an approach is recommended in future comparable projects.

Project R8042

Box 1.7 **Five years of livestock farmer field schools: strengths, weaknesses and lessons learned**

The FFS movement began as a group-based participatory approach to problem-solving and learning among Asian rice farming communities which had become very pesticide dependent. The FFS became a vehicle for introducing concepts of integrated pest management. Subsequently FFSs focusing on different types of crop production were set up in Asia, Africa and South America. Farmers meet, decide which subjects or problems concern them and, with some financial support from a donor organisation, ask local experts to come in and demonstrate solutions to the problem. However, apart from some work on chickens, the FFS approach had never been applied to livestock production. We wondered whether the demonstration and experimentation approach could work with animals, where the lag between input and impact is much longer than with crops. In 2001 AHP commissioned a research project testing the FFS approach among smallholder dairy farmers in Kenya's Nakuru and Nyandarua districts.

The work was greeted with great enthusiasm, and eight livestock FFSs were set up. In 2002 the project produced a manual 'Training of trainers: manual for livestock farmer field schools'. The main themes covered were deworming, fodder production and tick control. A further 12 local FFSs asked for the manual and training materials. Internationally, the project has attracted some attention, with requests for information and collaboration being received from various countries, and organisations such as the United States Agency for International Development (USAID)-funded Land o' Lakes, IFAD and Centro Agronomica Tropical de Investigacion y Ensenanza (CATIE), the Tropical Agricultural Research and Higher Education Centre. The key element, 'proof of concept', that the FFS approach could successfully be applied to livestock production has definitely been obtained.

The project was based at ILRI in Nairobi, which commissioned an impact assessment in 2005. This used a carefully designed double-blind approach, where neither the interviewers nor the interviewees were told that the object of the study was to look at the FFSs. Interviews were conducted with 60 livestock FFS members, 180 non-FFS members living in the same communities, and a further 180 farmers living in communities where there were no livestock FFSs. The results were very interesting. All farmers in the areas were able to make use of a wide range of sources of information: private supplies of livestock products, dairy companies, government extension and veterinary services and neighbours as well as some NGOs and faith-based organisations. Asked to score FFSs and other sources as providing them with useful information and techniques they actually used, FFS farmers overwhelmingly rated the FFSs far higher (between 3 and 30 times higher) than any other source. Furthermore, the single score they gave to the FFSs was far higher than the scores other farmers assigned to other individual sources (between 2 and 15 times). It was also interesting to note that before the FFSs were set up, the FFS members apparently had weaker links to the other sources of information than the other groups of farmers – this could reflect that those recruited to the FFSs had weaker social networks and this may have been a reason why they found joining the FFS so attractive. A high proportion of FFS members were women, who, other AHP studies have shown, are often less likely to consult those selling veterinary products or animal health assistants and thus would particularly benefit from the opportunities provided by the FFS. However, the impact analysis also

Photo: Steve Torr

indicated that there had been very little onward diffusion of FFS results to neighbours or other farmers in the community. This could be because this function was not emphasised during the FFS sessions at the time of recruitment. Since FFSs, as a form of adult education, are relatively expensive when compared to the provision of sources of information such as extension workers who cover a large area, it is vital that the sharing of information and methods to do so are incorporated from the start. ILRI's own monitoring indicated that in the 30 months that had elapsed since the FFS members 'graduated', a number of spin-off activities had taken place, including cooperative formation, communal dip management, collective milk marketing and saving schemes.

Now that the viability of FFSs in the livestock field has been proven, it would be useful to test them in a setting where other sources of information are scarcer and where livestock farmers are undertaking new forms of production or facing new challenges. The FFS approach might be of great value, for example, in areas such as western Kenya and south-eastern Uganda where pig keeping has increased very rapidly in recent years and farmers have little knowledge of how to feed pigs, or of the health problems that pigs face – still less of those that might affect people, such as cysticercosis.

Project R7986

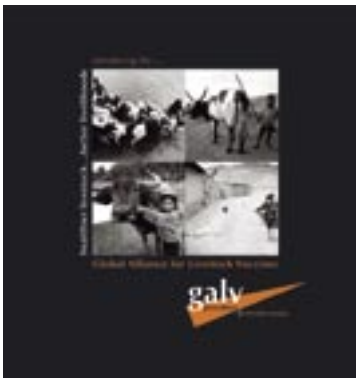
2. Programme Management Strategy

2.1 Management structure

During this last year the AHP maintained the organisation of its research portfolio under the four themes it has used since 2000:

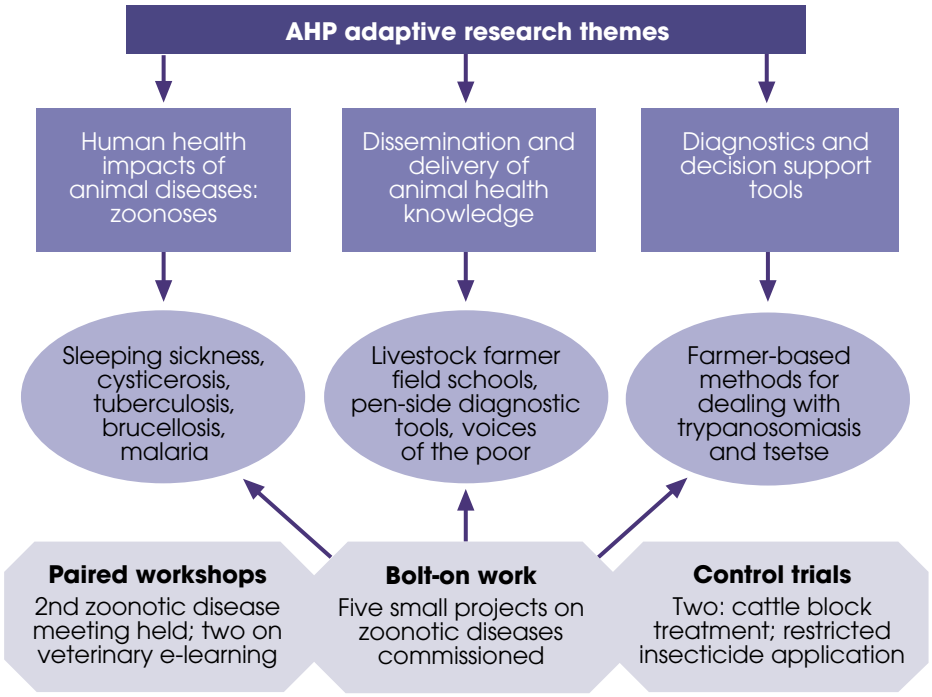
- Human health impacts of animal diseases: zoonoses
- Point-of-care diagnostics and decision support tools
- Dissemination and delivery of animal health knowledge, and
- Vaccine development for tick-borne diseases.

The first main concern for the year was to ensure that all the ongoing research programmes were aware that AHP funding and management would end in March 2006, so that all outputs were met and documented and all reports submitted in good time. Where possible, advice on further sources of funding and appropriate new directions for ongoing research were given. Secondly, a number of initiatives were undertaken with a view to ensuring that, independently of DFID's new research strategy, aspects of AHP's mission would continue. The most important of these was to put GALV, the Global Alliance for Livestock Vaccines, on a secure footing by appointing a chief executive and starting to look for suitable projects and funding. A new initiative to promote distance learning for African veterinarians was also undertaken (see Box 3.1 in Chapter 3), and lastly, some 3600 trees were planted in Kenya as part of AHP's commitment to mitigate the effect of its carbon emissions (see Box 1.5 in Chapter 1).



The management plan outlined last year for this 1-year extension to the AHP was successfully adhered to (Figure 2.1). The work undertaken under each of the three adaptive themes took place: the bolt-on activities for the zoonotic disease work and the winding up of the three projects on animal health and human health (see Boxes 1.2 and 1.4 in Chapter 1). The livestock FFS impact assessment took place, and the other remaining projects completed their tasks. The two planned control trials investigating novel approaches to tsetse and trypanosomiasis control were successfully undertaken. One consisted of block treating animals to see if this effectively lowered the proportion carrying human-infective trypanosomes, and the other investigated the effect on tsetse populations of the new restrictive insecticide application regime for cattle. The programme of paired workshops was completed with the second, in this case international, meeting on zoonotic diseases being held (see Box 3.2 in Chapter 3) as well as two workshops on veterinary e-learning. The ECF vaccine development project commissioned by DFID's Rural Livelihoods Department in 2002 was evaluated and its future direction discussed.

Figure 2.1 **AHP Strategy 2004–2006**



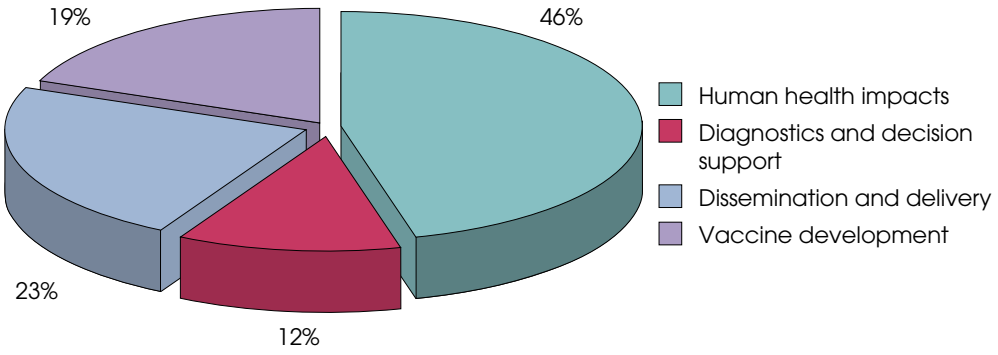
In 2005–2006, AHP's project portfolio reflected the gradual running down of the programme and consisted of eight projects, five bolt-on activities and the programme development activities detailed in Section 2.2 below. The number of research projects had been declining over these last years of the strategy, following the decision in 2002 not to commission a further round of 3-year projects in preparation for the anticipated end of the programme in March 2005 and in the light of DFID's less fluid financial situation. The total expenditure by the AHP in 2005–2006 was £1.44 million. This was subdivided as follows:

- £0.72 million on AHP's projects, plus a further £0.10 million on bolt-on activities, making total project expenditure in 2005–2006 of £0.82 million, out of a total allocation during these projects' lives of £4.05 million
- £0.15 million direct transfer from DFID to AHP for the funding of the RLD-commissioned project R8042 to develop a vaccine for ECF; over its life this project was allocated a total of £5.3 million, of which £4.56 million was contributed directly by DFID and £0.75 million was provided by the AHP out of AHP funds
- £0.57 million of programme development expenditure incurred by the AHP, which includes the bolt-on activities to existing project clusters (see Section 2.2).

The charts below show how the core AHP-funded portfolio of £4.05 million for projects and bolt-on activities was divided between themes (Figure 2.2) and between regions (Figure 2.3). The AHP's geographic and disease focus was refined 3 years ago in the light of the report on animal health and poverty it commissioned (Perry *et al.*, 2002[3]) and the livestock and poverty mapping study (Thornton *et al.*, 2002[7]). As can be seen from Figure 2.2, this year the largest share of the AHP allocation was to the human health impacts of livestock diseases theme, reflecting its importance as a cross-cutting theme with high poverty impact in an area which is gaining increasing international prominence. The projects dealing with the human health impacts of livestock

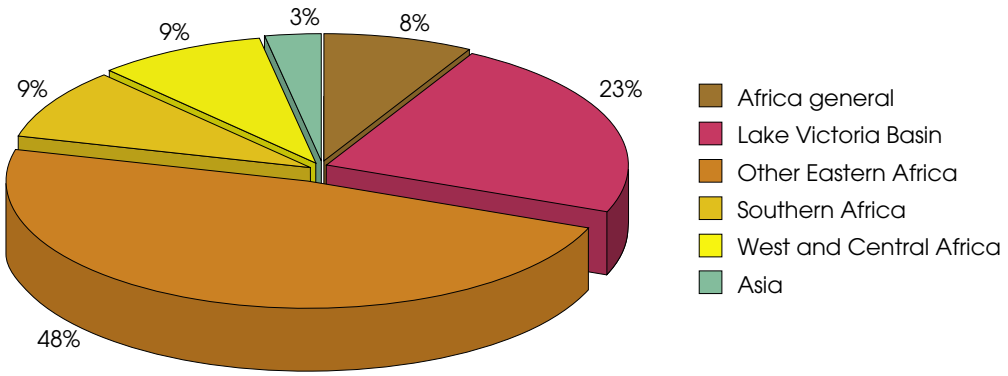
diseases spent £0.48 million in 2005–2006 out of an allocation of £1.89 million. The diagnostics and decision support projects accounted for the lowest share, spending £0.10 million out of an allocation of £0.48 million. In 2005–2006, AHP spent £0.25 million out of a total allocation of £0.92 million on dissemination and delivery projects. Evaluating the share going to vaccine development is more complex, since this is funded from two sources, with a direct contribution from DFID amounting to £0.15 million in 2005–2006 and £4.56 million over the project's life, as compared to £0.75 million from the AHP over the project's life.

Figure 2.2 **Current AHP funding by themes**
Total AHP allocation to current projects: £4.05 million



AHP's geographical focus has remained very much the same over the last 3 years, as illustrated in Figure 2.3. Excluding DFID's contribution to the ECF vaccine development project, which further biases the figures towards Africa and the Lake Victoria Basin, the AHP's own project portfolio currently allocates 97% of its funds to Africa, with 23% going to the Lake Victoria Basin, which was identified by the Thornton *et al.* report[7] as a key area for poverty alleviation through supporting poor livestock keepers. A further 48% of AHP funding targets other parts of eastern Africa. This focus on Africa and on those parts of the continent where large numbers of poor livestock keepers are to be found echoes the priorities and preoccupations both of DFID and outlined by the Commission for Africa in their 2005 report.

Figure 2.3 **Geographical target areas**
As a proportion of total AHP allocation to current projects



2.2 Programme development

Programme development activities this year consisted of the usual expenditures on promotion and dissemination of AHP outputs in the form of publications and reports, and a number of special activities including bolt-on activities, capacity building and a monitoring and evaluation study. Expenditure is summarised in Table 2.1. The AHP's commitment to capacity building was reflected in the significant spending on a distance learning initiative for professionals working in the African animal health sector. This initiative aims to offer a new and effective means of ensuring that the latest research results are included in high-quality, relevant courses aimed at animal health professionals in Africa – enhancing awareness of important findings and increasing their impact on the lives of poor livestock keepers. The AHP also continued support to the European Union (EU) Technology Platform, whose aim is to create a global livestock development partnership to promote research into diseases affecting animals in Europe; and GALV, which was set up to promote public–private partnerships in the production of animal health products for poor livestock keepers.

Table 2.1 **Breakdown of programme development expenditure 2005–2006**

	UK £ '000
Capacity building (distance learning)	153.5
Five bolt-on projects	100.0
Zoonoses workshop	60.0
Workshops and meetings	28.5
Monitoring and evaluation synthesis study	22.9
EU Technology Platform and GALV	12.2
AHP goes green	3.1
Promotion and dissemination	128.6
Publications and reports	53.6
Travel	5.8
Total	**568.2**

This year saw three more productions in the AHP 'blue' series, one reporting on the workshop on capacity building[13], another reviewing the situation and research needs for contagious bovine pleuro-pneumonia in Africa[14] and the third, the study which AHP funded on mapping the benefits to be expected from effective control of tsetse and trypanosomiasis in five West African countries[15]. This work was presented at the biennial International Scientific Council for Trypanosomiasis Research Council meeting held in Addis Ababa in October 2005 and attracted a lot of interest. FAO's Pro-Poor Livestock Policy Initiative has expressed interest in extending the

[13] DFID-AHP (2006). Capacity building for the African animal health sector: addressing the need for new learning opportunities. Report of a workshop organised jointly by the DFID Animal Health Programme, the University of Edinburgh, UK and Makerere University, Uganda, held in Naivasha, Kenya, 3–5 October 2005. DFID-AHP, Centre for Tropical Veterinary Medicine, Edinburgh, UK.

[14] Thomson, G.R. (2005). Contagious bovine pleuropneumonia and poverty. DFID-AHP, Centre for Tropical Veterinary Medicine, Edinburgh, UK.

[15] Shaw, A., Hendrickx, G., Gilbert, M., Mattioli, R., Codjia, V., Dao, B., Diall, O., Mahama, C., Sidibé, I. and Wint, W. (2005). Mapping the benefits: developing a new decision tool for tsetse and trypanosomiasis interventions. La cartographie des bénéfices – un nouvel outil de prise de décision dans le cadre de la lutte contre les glossines et la trypanosomose. DFID-AHP/FAO-PAAT.

methodology to parts of Uganda and eastern Africa, and work has started on trying to map the costs of dealing with tsetse and trypanosomiasis using various technologies.

During the year the AHP funded several workshops. The international meeting organised by WHO and held in Geneva attracted senior figures in the field of zoonoses research and control from 17 countries and four continents (see Box 3.2 in Chapter 3)[2]. Two other workshops were held in Africa, as part of AHP's outreach work in this last phase, with the aim of broadening the scope of veterinary education through distance learning (see Box 3.1 in Chapter 3).

Five bolt-on activities were commissioned, all within the theme of zoonotic disease research, investigating cysticercosis in Uganda, a study of risk factors for brucellosis in Guinea, a study of the burden of zoonotic diseases in selected communities of western Kenya, and investigations of pulmonary forms of bovine tuberculosis and of the epidemiology of sleeping sickness in Tanzania. As planned, all five bolt-ons were managed by overseas institutions.

2.3 Collaboration with institutions

Over the past 6 years, AHP has tried to ensure that a large proportion of its funds are both spent and managed overseas, with over a third of its current projects led by institutions based outside the UK and all of its bolt-on activities commissioned from overseas partners. The proportion of AHP's total outgoings in 2005–2006 which went to collaborators in developing countries (that is, including not just research projects but also programme development expenditure and the full contribution from DFID to the ECF vaccine project) was 35%.

The AHP has been very successful in maintaining research links with a large number of organisations. When projects have ended the links have often been maintained, so that over time AHP researchers have formed a large network spanning several continents. The AHP's research projects and programme development activities thus involved collaboration with a wide range of organisations over the period since 2000, including:

- ILRI, a member of the Consultative Group on International Agricultural Research (CGIAR), which implemented the main vaccine development research project, the identification of research opportunities in the field of animal health to alleviate poverty[3] and the livestock poverty mapping[7] studies, as well as being a partner in a number of individual research projects.
- UK-based collaborators including the Natural Resources Institute (NRI), NR International Ltd (NRIL), the universities of Edinburgh and Glasgow, and the University of Reading's Livestock Development Group. In the recent past they also included Cambridge, Oxford, Liverpool and Warwick universities, the Institute of Animal Health, the Natural History Museum, the Moredun Research Institute, the Medical Research Council and the Royal Veterinary College
- Various national and international overseas institutions, including, since 2000, FAO; the International Trypanotolerance Centre (ITC) in West Africa; the International Atomic Energy Authority (IAEA); the Belgian Survival Fund (BSF); the US Agency for International Development (USAID); Sokoine University of Agriculture (SUA) and the National Institute for Medical Research (NIMR) in Tanzania; KARI; the Rajiv Gandhi College of Veterinary and Animal Science (RAGACOVAS) in Pondicherry, India; Onderstepoort Veterinary Institute (OVI) in the Republic of South Africa; the Département national d' élevage (DNE) and the Institut de recherche agronomique de Guinée (IRAG) in Guinea; the Direcção Geral da Percuária (DCP) of Guinea Bissau; the Department of Livestock Services (DLS) of The Gambia; Institut sénégalais

de recherche agricole (ISRA) of Senegal; the Livestock Health Research Institute (LIRI) in Uganda; and the University of Zambia Medical School and the Tsetse and Trypanosomosis Control Section of the Department of Veterinary and Livestock Development in Zambia.

- In the recent e-learning initiative, the veterinary faculties of the universities of Addis Ababa in Ethiopia, Nairobi in Kenya, Pretoria in South Africa, Makerere in Uganda, Sokoine Agricultural University in Tanzania, the University of Zimbabwe, the University of Zambia, and the African Virtual University which is situated in Nairobi.
- Private sector partners including the Ludwig Institute for Cancer Research (LICR) in Brussels and The Institute for Genome Research (TIGR) as well as the veterinary pharmaceutical companies Merial, Intervet, Pfizer and CEVA.
- NGOs which became increasingly active collaborators in projects. These currently include FARM-Africa, Land o'Lakes and Vétérinaires sans frontières in Belgium (VSFB) and in the recent past VETAID and the International Institute for Environment and Development (IIED). AHP researchers are also working directly with some development projects, for example, Farming in Tsetse Controlled Areas (FITCA).
- LPP, through promotion of joint initiatives, a shared Programmes Advisory Committee (PAC) and a selection of jointly funded projects.

2.4 Livestock Programmes Advisory Committee

This year, with the AHP and LPP winding down in preparation for the end of the RNRRS, the programme managers agreed not to hold a meeting of the Livestock Programmes Advisory Committee (LPAC). Instead, the programme managers called on the resources of PAC members as and when needed, but without a formal meeting. At the end of the programme, the managers thanked the outgoing LPAC for its support and advice over the last 4 years.

3. Uptake Promotion

The AHP has, over the years, used a number of different routes to promote its research outputs and to facilitate their uptake. This final year has been no different, with the programme sponsoring two workshops on the potential for e-learning in African veterinary institutions. The aim of the workshops was to look into the possibilities for new and creative learning opportunities for animal health professionals in Africa, thus providing an effective means of transferring new research findings for the benefit of livestock keepers across the continent. Also during the year, the AHP in partnership with WHO, hosted a meeting aimed at raising the profile of endemic zoonotic diseases, a major cause of death and chronic illness in much of the developing world. The Programme has over the years funded research on a number of these diseases and one key message from this work is that zoonotic diseases can only be effectively tackled by using an integrated human and animal health approach. This meeting brought together a diverse group of researchers and professionals from both fields to provide them with an opportunity to collectively consider the most effective strategies for controlling these diseases.

3.1 Promotion of project outputs

Box 3.1 **Integrating research results into veterinary education: the potential of e-learning**

The African animal health and livestock sectors, and the broader policy, institutional and economic frameworks in which they sit, have changed considerably over the past few decades. Emerging and re-emerging diseases, many with serious public health implications, add to the complexity of the situation. The resultant new challenges require, in many cases, different skills and knowledge to those provided through traditional undergraduate veterinary courses. This leaves many African animal health professionals poorly equipped to rise to the challenges posed by the rapidly changing environment in which they find themselves.

To address this problem, the AHP sponsored a workshop, held in Naivasha, Kenya in October 2005[13], which focused on the need for new postgraduate learning opportunities for professionals working in the African animal health sector, including public and private veterinarians, university teachers and researchers. The objective was to bring together a broad cross-section of animal health professionals from across anglophone Africa, together with participants drawn from further afield who had experience of new approaches to learning, especially so called 'e-learning'. Although often considered to stand for 'electronic', participants were encouraged to think of the 'e' as standing for 'enhanced'. The workshop participants worked through a process which in turn considered the demand for new learning opportunities, surveyed the current supply, compared demand and supply to see how well they matched, considered opportunities and constraints associated with new learning approaches, and mapped out a way forward.

Participants considered that there was a need for two types of postgraduate learning opportunities: formal MSc courses and less formal, shorter training opportunities that meet the growing demand for 'continuing professional development' (CPD). However, it was noted that the two could overlap with, for example, some individual components of MSc courses being suitable for study as stand-alone CPD modules. Similarly, if appropriately structured and regulated, CPD modules could represent credits, eventually leading to formal, recognised qualifications, including Masters and diplomas. Participants also recognised the need for flexible learning opportunities which enabled students to remain in their home environments and continue working.

The survey of supply for postgraduate learning opportunities revealed a preponderance of traditional, full-time, residential MSc courses with few opportunities for CPD. Many veterinary schools reported that uptake of the traditional MSc courses they offered was low and declining.

Comparison of demand and supply showed a clear mismatch, with greater demand for flexible courses delivered through distance learning formats and, in particular, a strong but largely unmet demand for CPD opportunities.

Drawing on experiences from the universities of Florida, Edinburgh and Strathclyde, participants saw for themselves the power of e-learning approaches such as those based on virtual patients. Inspired by exposure to high-quality examples of what was possible, participants considered the opportunities and constraints associated with such an approach in the African context.

Opportunities identified included the considerable existing demand, advantages offered by flexible, convenient learning arrangements which would lead to broader access to and greater numbers of trained professionals, and the potential for greater collaboration between veterinary schools and other institutions – both North–South and South–South. Also discussed was the potential cost saving to the mutual benefit of students and teaching institutions, the potential to produce high quality and relevant teaching resources which could be informed by the latest research findings – including outputs of AHP-funded research – and the existence of strong political support for greater use of information and communication technology (ICT) amongst governments, regional bodies, donors and commercial service providers.

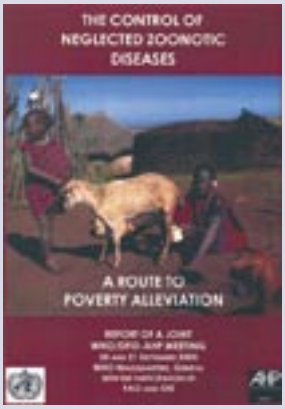
Constraints identified included lack of capacity for e-learning in African universities, poor and/or expensive internet connectivity, lack of ICT infrastructure, high cost of establishing new e-learning courses, risks associated with internet and computer security, and the challenge for busy professionals of successfully combining work and study.

At a follow-up workshop, also sponsored by AHP, held in Entebbe in March 2006 an umbrella body – the African Universities Veterinary E-learning Consortium (AUVEC) – was formed. The founding members of AUVEC include the vet schools in Ethiopia, Kenya, Republic of South Africa, Tanzania, Zambia and Zimbabwe represented by their respective deans; the African Virtual University; the Malawi Veterinary Service (there is no vet school in Malawi); and the University of Edinburgh. The aim of this consortium is to create a common e-learning framework, which will develop, deliver and share learning resources across the African veterinary network in order to improve the quality of delivery of animal health and production services for the poor. AUVEC is now scoping a roadmap to enable it to develop online learning opportunities. Steps in this will include development of skills and capacity in authoring and delivering e-learning, sharing of e-learning courses and content, and development and delivery of online Masters programmes and CPD courses.

Both the African Virtual University and the University of Edinburgh will play key support roles in building the infrastructure needed by the consortium, and sharing knowledge and expertise to develop world-class e-learning. An advantage of e-learning courses is that they can be updated much more easily and cheaply than conventional courses. This initiative therefore offers a new and effective means of ensuring that the latest research results can be included in high quality, relevant courses aimed at animal health professionals in Africa – enhancing awareness of important findings and increasing their impact on the lives of poor livestock keepers.

3.2 Uptake promotion

Box 3.2 **Raising the profile of neglected endemic zoonoses: bringing together medical and veterinary researchers, developers and donors in an international forum**



In September 2005, some 50 scientists, representatives of donor and international organisations and others directly working on disease control met at WHO headquarters in Geneva. They came from 17 countries of Africa, Asia, North and South America, the Middle East and Europe. The meeting, funded by the AHP, was organised by the Department of Food Safety, Zoonoses and Foodborne Diseases at WHO. Its aim was to bring together diverse groups active in both the veterinary and human health fields to consider ways of raising the profile of neglected zoonotic diseases, devising cost-effective control strategies, and mobilising the resources needed to control them.

About 60% of human pathogens are zoonotic, in that they can be transmitted between people and vertebrate animals, and some 75% of emerging diseases are estimated to fall within the category of zoonotic diseases. Currently emerging zoonoses, such as avian flu, are attracting much international attention. However the focus of this meeting was on endemic zoonoses, most of which are among the oldest diseases known to humans. Seven focus diseases were selected: anthrax, brucellosis, bovine tuberculosis, cysticercosis, cystic echinococcosis (also known as hydatid disease), rabies and zoonotic human African trypanosomiasis (sleeping sickness). AHP has funded research on all of these with the exception of anthrax and hydatid disease. Except for sleeping sickness, which is confined to Africa, these diseases have a worldwide distribution. These and other neglected endemic zoonoses have mostly been controlled in the industrialised countries or barely affect human or animal health there, while in the developing world they still cause deaths and chronic illness in people and substantial losses in livestock. They have become neglected diseases of marginalised communities, being typically found in isolated rural areas where the poorest individuals in the community are most at risk of contracting them, because they often live in close proximity with livestock in conditions of poor hygiene. The poor are also least likely to be correctly diagnosed and treated. Increasingly, these diseases are also becoming endemic in urban and peri-urban slums(see below). Effective control is usually through the animal reservoir – by vaccinating dogs against rabies and deworming them so that they do not pass the immature tapeworm in the form of a hydatid cyst to people, or by vaccinating cattle against brucellosis and anthrax. However, over-stretched and under-funded veterinary services are reluctant to take this work on, since despite the losses these diseases cause in livestock, their control is seen as mainly benefiting human health. Many of these diseases are inherently difficult to diagnose so that they are consistently under-reported, further limiting the resources allocated to dealing with them.

The meeting recommended that next steps to achieve an integrated animal–human health approach should include:

- promoting the concept of 'one health' by dealing with health problems in both people and animals, through the development of integrated control packages that address several health problems and deliver interventions to both people and livestock, for example sending joint medical/veterinary teams to remote pastoral areas to vaccinate mothers, children and cattle
- systematically collecting data on the incidence of these diseases, supported by studies to estimate their dual burden on people and on livestock, quantify under-reporting and identify communities and groups at risk
- investing in the development of new tools needed to effectively control these diseases, particularly in the field of diagnostics.

3.3 Programme outputs

Human health impacts of livestock: zoonoses

R7596: Decision support for trypanosomiasis control in south-eastern Uganda

Photo: Dave Elsworth

The project has developed technologies and tools applicable to the control of human and animal trypansomiasis at a number of levels in the animal and human health sectors. It has contributed to basic laboratory science and field methodologies, and has directly affected national policy for trypanosomiasis control in Uganda. In its final year (project and extensions) the project has been consolidating the results and working to ensure adequate dissemination of outputs. It is envisaged that the information and tools generated in Uganda for decision support for trypanosomiasis will be transferred to other East African countries.

R7985: Emerging zoonoses in East Africa

Zoonotic diseases affect almost exclusively poor and powerless people living in rural parts of low-income countries. These diseases can cause immense suffering, life-long disabilities and death in people, and many also result in production losses in livestock. These impacts contribute significantly to the vicious cycle of poverty. For most zoonoses, effective, safe and cost-effective interventions which have the potential for substantial impacts on poverty are available. Economic benefits are gained directly through improvements in public health ('clinical economics'), and also through reduction in livestock production losses (e.g. trypanosomiasis, cysticercosis, brucellosis and rabies). However, for most zoonotic diseases in Africa very little information is available on the true magnitude and impact of the disease problems, resulting in a lack of awareness among policy makers and practitioners, and little political will generated for disease control measures. This project aimed to evaluate the burden of disease, to investigate the importance of different animal hosts as reservoirs and sources of infection for people, to identify problems associated with under-reporting and misdiagnosis of zoonotic diseases, and to assess risk factors for infection in different communities.

R8214: Controlling malaria and trypanosomiasis with insecticide-treated cattle

In Africa it is estimated that one million people, most of them young children, die from malaria each year. In the more arid zones of east and southern Africa, malaria is transmitted by *Anopheles arabiensis* which feeds on both humans and cattle. It is therefore theoretically possible that by treat-

Collecting mosquitoes from an odour-baited entry trap in Moshi, Tanzania.

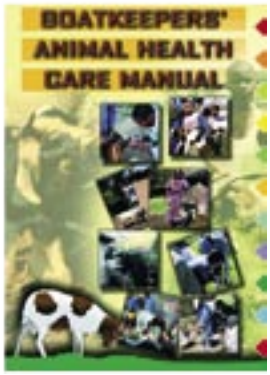
Photo: Steve Torr

ing cattle with insecticide, malaria might be controlled. This approach has been successfully used in Pakistan but it has not been tested in Africa, even though insecticide-treated cattle are used to control tick- and tsetse-borne diseases in areas where *A. arabiensis* is the main vector of malaria. This coincidence raises the exciting possibility that in many areas of sub-Saharan Africa, the most important vector-borne diseases of humans and livestock might be controlled by a single intervention. This project has been investigating the likely impact of insecticide-treated cattle on malaria in Konso, southern Ethiopia, where tsetse-borne trypanosomiasis and malaria are the most important diseases affecting cattle and humans respectively. More generally, the project is carrying out research to identify those areas of sub-Saharan Africa where the use of insecticide-treated cattle is most likely to have a significant impact on malaria.

Point-of-care diagnostics and decision support systems

R8151: Improving the livelihoods of resource-poor goat farmers in southern Africa

In South Africa, goats are very important to the economy of resource-poor communities. Farmers in these areas are concerned that their goats generally have poor health, do not produce many kids, and die prematurely. Parasitic gastro-intestinal worms (locally known as 'izikelemu' or 'dibokwana') are a contributing factor. For this reason, the project studied the effect of improved feeding and treatment with worm remedies on the health and productivity of goats. The project has improved our understanding of the relative benefits of these treatments against worms and will help



veterinarians and farmer advisors to provide appropriate information on how to optimise goat production, enabling farmers to use their limited resources to best effect. The project targeted the resource-poor goat farming communities of Hlafuna, Njobokazi and Nkwezela (Bulwer), in KwaZulu-Natal Province, South Africa. Important elements of the project are the dissemination of a field-tested information package for goatkeepers consisting of booklets and manuals and a simple test for anaemia in goats, the FAMACHA© system. The farmers' opinions have been positive throughout the course of the project and the collaboration has worked very well.

R8213: Including the voices of the poor

For the global community of the poor, livestock are a vital component to successful and sustainable livelihoods. However, for households dependent upon livestock, the presence of disease can mean the difference between economic success and destitution. Sick animals result in increased labour and drug costs, and at worst, loss of an important capital asset to households. Over the course of the last two decades, a variety of animal health technologies and interventions have been developed to address both present and emerging disease threats in developing countries. Unfortunately, many technologies have not been appropriate to the specific animal health requirements of the poor, nor have they surmounted key delivery constraints. As such, there is an urgent need to develop and deliver animal health technologies that address the needs of the poor. First, and most critically, however, a better understanding of the livestock diseases which directly impact the livelihoods of the poor is required. Therefore, the objective of the project was to develop and promote an integrated, animal health prioritisation framework. Many efforts at prioritisation are simply based upon the perceptions of those involved; therefore, to increase the validity and reliability of prioritisation processes, the study created an evidence-based framework which delineates the actual poverty impact of different diseases on the poor.

Dissemination and delivery of animal health knowledge

R7986: Livestock farmer field schools

This project has aimed to build the training capacity of local partners in Kenya in the FFS approach for local livestock keepers. These partners will in turn be able to train local livestock keepers in starting up an FFS. The FFS method helps livestock keepers improve the way they keep their livestock by locally testing and applying new and improved techniques. The

Livestock keepers at a FFS.

Photo: Dave Elsworth

successful development and application of livestock FFSs in Kenya during the first phase of the project generated a growing demand for support in implementing FFSs for livestock in Africa and elsewhere from our research and development partners. The scaling up of the methodology has been constrained by the number of FFS experts available and a lack of specific tools for very poor, illiterate and non-sedentary farmers.

The next phase of the project has moved on to adapting the FFS approach for the nomadic populations in Turkana, and it is envisaged that the tools developed for the Turkana population will serve nomadic livestock keepers elsewhere. The pastoralist production systems of the Turkana region of Kenya differ greatly from small-scale dairy systems, and provide an excellent opportunity to develop effective tools to allow adaptation of the livestock FFS methodology to pastoralist production systems and to the poorest of the poor. The project has supported in-depth studies of the local livestock sector in Turkana to serve as a base for developing the FFS tools required, and as a means of identifying the key areas in which the skills of the very poor livestock keepers need to be built up so as to reduce poverty in the area. Twenty Turkana community-based animal health workers have been trained, and studies on local markets, the animal health situation and on monitoring tools have been conducted.

Pastoralist livestock keeper.

Photo: Steve Torr

R8318: Decision support for endemic disease control

Insecticide treatment of cattle for control of the tsetse fly in Africa is safe, environmentally benign and can be applied by individual farmers. The cost of the insecticide is, however, a significant constraint to its use. This project has examined the use of haemoglobin and clinical measures to assess the effect on animal health of applying insecticide only to the legs and belly of cattle, the preferred feeding sites of tsetse. This uses 80% less insecticide and is much cheaper. In addition, leaving the rest of the animal untreated may help preserve 'endemic stability', a form of natural herd immunity to many tick-borne diseases.

Restricted spraying of cattle legs and bellies provides protection from tsetse flies and saves costly insecticide.
Photos: Andrew Brownlow

Vaccine development for tick-borne diseases

R8042: Integrated control of East Coast fever

ECF is a major cattle killer in 11 countries of eastern and southern Africa. Currently the only vaccination option available to protect cattle from ECF is the infection and treatment method (ITM), which though highly effective is complicated, inconvenient and expensive. It involves injecting cattle with live *Theileria parva* parasites (the organism that causes ECF), carefully monitoring the animals, and then treating them with drugs. The *T. parva* parasites need to be maintained in a liquid nitrogen cold chain, which adds to the cost and logistical complexity. Price – around US$10 per animal – and availability constitute major barriers to its wider use, especially amongst poorer livestock keepers, many of whom survive on less than US$1 per day. An effective vaccine against the disease would be a powerful tool in the continent's up-hill fight against poverty.

This project has been working to produce a new generation sub-unit vaccine that will be simpler and safer to use, will not require a cold chain, and will be substantially cheaper than the current option. The search for this better vaccine combined the comparative advantages, skills and resources of both public and private sector partners – a rare example in the animal health sector of a public–private partnership – and it has drawn on the latest developments in the biosciences.

3.4 Progress towards achievement of outputs

During 2005–2006 the AHP was working towards a log frame with the following two outputs:

- Cost-effective and appropriate strategies developed in the fields of human health impacts, diagnostics and decision support, dissemination and delivery for the sustainable control of livestock diseases that affect the livelihoods and health of the poor
- Promotion of proven strategies in the fields of human health impacts, diagnostics and decision support, dissemination and delivery for the sustainable control of livestock diseases that affect the livelihoods and health of the poor.

Of the eight projects funded, six were working towards the first output, one towards the second and one towards both outputs. Many of the project successes have been described in other sections of this report.

3.5 Progress towards impact

Table 3.1 **Progress along the uptake pathway**

DFID R No.	Short title	(a) Uptake pathway	(b) Likely direct beneficiaries
Human health impacts of animal diseases: zoonoses			
7596	Decision-support system for the control of trypanosomiasis in south-eastern Uganda	A B C D E F G	B C D E F G H K M
7985	Emerging zoonoses in East Africa	A B C D E F G	B C D E F G H I J K M
8214	Controlling malaria and trypanosomiasis with insecticide-treated cattle	A D	B C G H I K M
Point-of-care diagnostics and decision-support tools			
8151	Improving the livelihoods of resource-poor goat farmers in southern Africa	A B C D E F G H I K M	A E F H K M
8213	Including the voices of the poor	A B C D E F G H	A B E G H I J K
Dissemination and delivery of animal health knowledge			
7986	Livestock farmer field schools	A B C D E F G	B C D E F G H I J K
8318	Decision support for endemic disease control	A B C D E	E F G H I J K
Vaccine development for tick-borne diseases			
8042	Integrated control of East Coast fever	A B	A B C D E F G H I J K M

(a) Key to scoring for uptake pathway:

A – Generation of relevant research results
B – Formal/informal agreement with target institutions
C – Development of appropriate research-based products through adaptation/packaging
D – Promotion of products into target institutions
E – Adoption of products by target institutions
F – Application and replication of results in target institution programmes
G – Promotion of technology or behavioural change among end-users by target institutions
H – Adoption of technology by end-users and generation of economic benefits, i.e. developmental impact

(b) Key to categories of likely direct beneficiaries:

A – Donors
B – Strategic researchers in developed countries
C – Strategic researchers in international agricultural research centres (IARCs; includes national institutions working overseas)
D – Applied researchers in IARCs (includes national institutions working overseas)
E – Applied researchers in national agricultural research systems
F – Training (institutions and individuals)
G – Planners at national/regional levels
H – National extension and other technical support services
I – NGOs
J – Pastoralists
K – Smallholders (largely subsistence-based)
L – Landless or land-poor people
M – Consumers of meat and milk products and others at risk from zoonotic diseases or other human health problems mitigated by measures to control animal diseases

3.6 Programme achievements reported in the media

Radio

In the course of the year, WRENmedia, a UK-based company that specialises in producing radio programmes focusing on development issues, recorded a number of interviews with AHP researchers. These were distributed to national, regional and international radio stations. The AHP workshop on e-learning (described in Box 3.1) was one of the events covered, with interviews held with the deans of various African vet schools. A feature on pigs as a reservoir for sleeping sickness, including interviews with two leading researchers from Uganda and southern Sudan, was broadcast in August 2005.

In November 2005, the BBC *Focus on Africa* programme broadcast interviews on rabies in Africa and Asia, given by one of AHP's researchers. This interview was also aired on the BBC Scotland News.

Print media and the internet

Learning from posters.

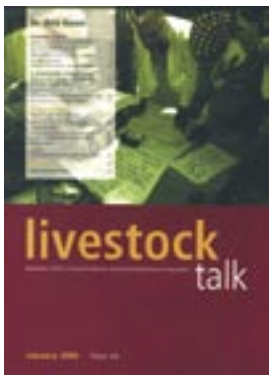
Photo: Scientitic Roests (Pty) Ltd

Articles on rabies, one of the zoonotic diseases under research in project R7985, appeared in the *Edinburgh Evening News* and the *Scotsman* newspapers in November 2005.

AHP's zoonotic diseases research was also featured in an article in the *East African*, a leading weekly newspaper in East Africa. This article described the convergence of two different types of sleeping sickness in Uganda, and highlighted research by AHP researchers that has been published in the medical journal *The Lancet*.

The South African farming newspaper the *Nufarmer* featured two items on the project 'Improving goat farmers' livelihoods' in October and November 2005.

The AHP website (www.dfid-ahp.org.uk) has had a major make-over this year. It has been redesigned and reorganised to make the vastly increased content more readily accessible. These improvements will help ensure that AHP research findings and outputs will continue to be available after the Programme has come to an end. Summaries of all AHP research projects funded during the course of the Programme are grouped under the four AHP themes:



- Zoonotic diseases: human health impacts of animal diseases
- Vaccine development
- Diagnostics and decision support tools
- Dissemination and delivery of animal health knowledge

AHP annual reports and other publications can be downloaded as pdf files.

4. Progress Review

4.1 Progress against milestones for 2005–2006

1 All themes

Compile dossier of completed work.

Activity: The new AHP website (www.dfid-ahp.org) has been developed and is now available on the internet. The site includes a section containing listings and details of all research projects funded by AHP since 1990. Projects are categorised under the four current research themes with information provided under the following headings: executive summary, background, objectives, highlights and impact. Also, as part of DFID's evaluation of the RNRRS, a briefing document was prepared highlighting promising clusters of AHP-funded projects; this too is available on the website.

Output and impact: The new and improved AHP website, launched in 2005, makes the findings of all AHP-sponsored research projects freely available via the internet, and arrangements have been made for the site to continue to be hosted after the closure of the Programme. The individual projects have high visibility to enquiries made via the popular search engines, such as Google. This will enable all interested parties with adequate internet connectivity to access and use research findings which will increase impact. The briefing document included seven project clusters: participatory epidemiology, impacts of zoonotic diseases, assessing and meeting the demands of poor livestock keepers, livestock farmer field schools, tsetse control, trypanosomiasis and improved diagnosis, and East Coast fever vaccine. For each cluster, information is presented in relation to linked projects, research context, research achievements, policy implications and impact, current impact especially on the poor, potential impact especially on the poor, and a list of publications.

2 Zoonoses theme

Hold international workshop.

Activity: An international workshop funded by AHP and hosted by WHO at their Geneva headquarters was held in September 2005. The aim was to bring together diverse groups active in both the veterinary and human health fields to consider ways of raising the profile of neglected zoonotic diseases, devising cost-effective control strategies, and mobilising the resources needed to control them.

Output and impact: The meeting was attended by around 50 scientists, representatives of donor and international development organisations, and others directly working on disease control, drawn from 17 countries. The meeting made a number of recommendations for the next steps required to achieve an integrated approach to animal and human health (see Box 3.2 in Chapter 3).

3 Zoonoses theme

Commission and manage bolt-on activities.

Activity: The availability of additional funds for bolt-on activities was announced at the AHP's workshop on zoonotic diseases, held in Nairobi, Kenya in February 2005 (reported in the previous Annual Report). Bolt-on funding is a mechanism to fund additional work that adds value to previously funded work, for example by extending the geographical scope or increasing coverage to reach new beneficiaries.

Output and impact: Nine proposals for bolt-on activities were received of which five were selected for funding. These were: epidemiology of sleeping sickness in western Tanzania, pigs as reservoirs of sleeping sickness and cysticercosis in south-eastern Uganda, prevalence of pulmonary tuberculosis in Tanzania, brucellosis risk in Guinea, and burden of zoonotic diseases. Final reports are awaited for four of the five bolt-on studies; the fifth, on brucellosis in Guinea, has been submitted. It reports that brucellosis is a major public health risk in Guinea and linked high prevalence in livestock and people to risky practices, such as consuming raw milk and handling aborted foetuses. The study combined research with capacity building for staff in health clinics and hospitals and training for livestock keepers. The latter included raising awareness of the value of simple preventive measures, such as boiling milk and using plastic gloves and bags when burying aborted foetuses.

4 Dissemination and delivery theme

Conduct impact assessment of livestock FFSs.

Activity: A rigorous, independent impact assessment of the livestock FFSs was commissioned by ILRI. The study was carried out using a double-blind methodology which meant that neither the interviewers nor interviewees knew the evaluation was focused on FFS: questions were asked about the full range of information sources farmers used to access information about dairy cattle health and productivity.

Output and impact: The impact assessment report provides some useful insights into the FFS project and provides lessons which can be used to guide the establishment of future livestock FFS initiatives (see Box 1.7 in Chapter 1).

5 Dissemination and delivery theme

Further refine poverty focus.

Activity: The AHP-funded project 'Listening to the voices of the poor' has made further progress towards refining the poverty focus of animal health research. This has entailed carrying out interviews with more than 1500 households in Africa, Asia and South America to explore their attitudes, values and priorities in animal health and to identify the priority livestock species of the poor.

Output and impact: The project has developed a decision-making framework and a computer program – the Poverty Assessor – which facilitates inclusion of the voices of the poor in disease priority-setting exercises. The immediate impact of this work will be that actual rather than perceived needs of the poor will be able to directly influence policy dialogues through the development of enhanced communication pathways with decision makers. In the longer term, animal health will

be improved through the development of better livestock policies, projects and programmes which are driven by the real priorities of poor livestock keepers.

6 Diagnosis and decision support theme

Undertake trials to validate methodologies developed for tsetse and trypanosomiasis control.

Activity: Field trials have been carried out in Uganda to validate two tsetse and trypanosomiasis control measures: block treatment of cattle with drugs to control the animal reservoir of the parasite that causes acute sleeping sickness in people; and spraying cattle with insecticide following the 'restricted application' approach to control tsetse and ticks, whilst maintaining endemic stability (a state of natural immunity to diseases transmitted by ticks for which regular exposure to low numbers of infected ticks is essential) to tick-borne diseases.

Output and impact: The trials and subsequent modelling studies have shown that the animal reservoir of acute sleeping sickness can be eliminated if around 80% of cattle in an area are simultaneously treated with trypanocidal drugs. Also, restricted application spraying of cattle – where one-fifth as much insecticide is used, applied only to the legs, belly and ears rather than to the whole body – was shown to effectively control tsetse populations in Uganda. These findings pave the way for large-scale campaigns based on a combination of the two approaches to eliminate acute sleeping sickness from newly affected districts of Uganda and to significantly reduce the risk in the long-term sleeping sickness foci in south-eastern Uganda. These new approaches to the control of sleeping sickness – tackling the source of infection and preventing infections occurring in people – offer major advantages over the conventional approaches.

7 Vaccine development theme

Promote setting up of GALV.

Activity: The AHP has continued to be involved in fostering the establishment of GALV – the Global Alliance for Livestock Vaccines.

Output and impact: GALV is now formerly incorporated in the UK as a not-for-profit company. The CEO and Chair of the Board have been appointed and support staff and board members recruited. GALV is now engaged in refining its strategic focus, selecting its first portfolio of projects and fund raising. This paves the way for the development of new and improved animal health products and also initiatives for better delivery and use of existing products. GALV's strict poverty focus will mean that benefits – better control of priority diseases -– will be enjoyed by poor livestock keepers and the communities in which they live. Continuity with the inception phase is enhanced by the AHP Programme Manager serving on the GALV Board and chairing GALV's Technical Advisory Committee.

8 Vaccine development theme

Ensure the ECF vaccine initiative is adequately funded beyond the end of the RNRRS.

Activity: AHP's stewardship of the ECF vaccine development project ended with the final technical review, held at ILRI in Nairobi in December 2005.

Output and impact: ILRI management report that USAID has shown strong interest in the continued funding of the ECF vaccine development project. This project has generated useful lessons for donors and programme managers as to how such projects should be managed (see Box 1.6 in Chapter 1).

9 All themes

Attend the 6th livestock donors interagency meeting.

Activity: The AHP Programme Manager attended the 6th livestock donors interagency meeting, held in Copenhagen in May 2005, and gave a presentation on GALV.

Output and impact: Presentation on GALV increased awareness of this initiative, which is one of the major legacies of the AHP.

10 All themes

Manage Programme closure.

Activity: During the last year, the final set of projects have been brought to an orderly close and FTRs and PCSs obtained. The new, improved website has been launched. In response to a request from DFID, the AHP has compiled and submitted selected 'success stories' from the Programme.

Output and impact: Details of all projects supported by the AHP since 1990 have been posted on the website, making research findings freely available to all interested parties. The compilation of success stories will feed into DFID's new strategy on sustainable agriculture, providing potential leads for both the forthcoming Research into Use Programme (which will focus on scaling up outputs from DFID's RNRRS) and the new Eco-regional Research Programmes (which will focus on increasing agricultural productivity in Africa and Asia).

4.2 Programme management response to recommendations made by the assessment panel

Last year's annual reports from DFID's RNRR programmes were assessed by DFID's Central Research Department, and feedback on the AHP report was received in the form of a letter from the DFID Research Manager. The Research Manager commended the Programme for demonstrating "some imaginative high-level outreach", citing examples of control of sleeping sickness in Uganda and the design of the EU Technology Platform for global animal health, both of which items were highlighted in the annual report. The letter also commented on a section of the report that focused on AHP's lessons learned in turning research findings into impact, noting that it gave a "useful summary of the problems and some solutions to getting research into practice". The scoring summary report rated the 'overall progress assessment' as 1/5 (likely to be completely achieved), and commented that the output targets have been exceeded through producing five as opposed to the indicated three new acceptable disease control strategies. The summary report also noted that AHP's impact in creating and influencing the policy environment has been very visible and the emphasis on zoonotic diseases has transported the Programme's research from narrow veterinary fields into people-based livelihood outcomes.

5. Conclusion

5.1 Taking stock

Six years ago, when the AHP took up the challenge of working towards the Millennium Development Goals with an even more tightly poverty-focused research programme, it led its annual report with a quotation from Jeffrey Sachs: "at the core of the global divide is the vast inequality of innovation and diffusion of technology"[16]. Over the intervening years since 2000, the AHP has tried to help bridge that gap, with both downstream and upstream research.

In Chapter 1, we outlined how the AHP's research has contributed to each of the MDGs by virtue of the fact that its research:

- affects both human and animal health, in particular through its very successful research cluster on zoonotic diseases, but also because better animal health improves the nutrition of poor households
- impacts on crop production, through animal traction and the use of animal manure as fertiliser
- helps empower women, who are the main keepers of smallstock such as sheep, goats and chickens
- helps protect the environment by addressing issues affecting livestock keepers in urban settings and by protecting wildlife.

Some of the AHP's projects have made significant breakthroughs, such as:

- demonstrating the importance of cattle as the main reservoir of acute human sleeping sickness in eastern Africa, and ensuring that this research influenced policy – in Uganda, cattle must now be treated before being moved from endemic to non-endemic areas
- finding ways to substantially reduce the cost of farmer-based methods to control tsetse; work jointly funded with the LPP has demonstrated that the amount of insecticide needed to treat cattle can be reduced by 80%
- demonstrating that in those areas where the mosquitoes which transmit malaria to people also feed on cattle, treating the cattle with the same insecticide that is being used to control tsetse reaps a dual benefit by also reducing the incidence of malaria in people
- developing novel approaches for the delivery of animal health to poor communities, such as livestock FFSs and the computerised animal health kiosks used in India
- expanding knowledge on the incidence and epidemiology of neglected zoonotic diseases – brucellosis, bovine tuberculosis, cysticercosis, rabies and zoonotic sleeping sickness – and providing evidence of the extent to which they are under-reported, risk factors, their link with poverty, refining affordable and acceptable control strategies, bringing veterinary and medical authorities together to deal with them, and raising their profile internationally.

[16] Sachs, J. (2000). A new map of the World, *The Economist*, 22 June 2000.

Other projects have steadily chipped away at our ignorance and lack of tools to deal with these tropical diseases of livestock and people, testing and adapting disease control strategies, looking for new vaccines or diagnostics, and studying different routes for the dissemination of animal health knowledge.

Lastly, AHP has played a key role at every step of the process which has resulted in the creation of the global alliance GALV. The need for such an organisation was highlighted by the AHP 5 years ago; and also very much emphasised in Sachs' writings.

Harnessing science

"Science has empowered technological advances in food production, health, environmental management, and countless other basic sectors of production and human need. Yet science tends to follow market forces as well as to lead them. It is not surprising… that the rich get richer in a continuing cycle of endogenous growth, whereas the poorest of the poor are often left outside of this virtuous circle. When their needs are specific – by virtue of particular diseases, or crops, or ecological conditions – their problems are bypassed by global science. Therefore a special effort of world science, led by global scientific research centers of governments, academia and industry, must commit specifically to addressing the unmet challenges of the poor. Public funding, private philanthropies, and not-for-profit foundations will have to back these commitments, precisely because market forces alone will not suffice."

Jeffrey Sachs, 2005[1]

5.2 Looking to the future

In his most recent book, Sachs again emphasises that "harnessing science" is an essential, perhaps even the key, element in overcoming poverty[1]. The challenge remains, for all of us involved in research and for those who take on the mantle of managing and commissioning DFID-funded natural resources research in the future.

Over the last 2 years, as well as taking steps to ensure that its most successful research work is brought to fruition or that researchers build connections which allow it to continue, the AHP has been much involved in the evaluation processes and debate at DFID. As we all look to the future, there are a number of key points which have emerged from this period of reflection and stock-taking.

Training

"The society as a whole should promote a significant cohort of university-trained graduates. These teachers, medical officers, agricultural extension officers, and engineers will be needed to harness technologies for local use… Indeed, rapid economic development requires that technical capacity suffuse the entire society, from the bottom up. The trick is…, to train very large numbers of people at the village level, in creative and targeted ways, specifically for the main tasks at hand."

Jeffrey Sachs, 2005[1]

Photo: Sue Welburn

"The public sector at all levels – national, district, village – lacks the talent to oversee the scaling up process. This is not a case for evading the public sector, which will not work, but for building the capacity of the public sector. Training programs for capacity building should be part of the overall strategy."

Jeffrey Sachs, 2005[1]

One is the importance of training at all levels, if we are to meet the challenge of overcoming extreme poverty in the developing countries, again as emphasised by Sachs[1]. The AHP has consistently argued the case for more capacity building. Over the past 16 years, its projects have been very successful in training a new generation of overseas scientists in the field of animal health and also, in some areas, providing them with laboratories and field equipment needed to successfully pursue their work and to train more people in the skills they have acquired. Many AHP-trained individuals have gone on to work in the public sector in ministries of health or livestock development.
The AHP, through its livestock FFSs, has also been working at village-level training.

Social marketing

"Social marketing… has been unrealistic about what the poor can afford to pay, which is usually little or nothing. The extreme poor don't have enough to eat, much less to pay for electricity or water or bednets or contraceptives. The history of user fees being imposed on the poor is a history of the poor being excluded from basic services."

Jeffrey Sachs, 2005[1]

While working towards ensuring that the many improvements and research results produced by the RNRRS are taken up and are able to really benefit the poor, it is important to bear in mind the stark realities of poverty. Many animal health improvements, while demonstrably both very effective and cost-effective, are nevertheless not taken up by many poor people. This is not because they are inappropriate, but because poor people have so many demands on their time and so little spare funds that even the most nominal payments are unaffordable. We have seen this with research on medical inputs – for example in the field of sleeping sickness, people are unable to make even token contributions to some costs for human health inputs, much less for animal inputs. Taking on board the core of Sachs' message means realising that financial support may still be needed since, for the poor, even the cheapest technologies may initially be inaccessible.

Comparative advantage

"In order to harmonise aid, the various aid agencies should operate on the basis of their true comparative advantage… The bilateral agencies are much better when it comes to matters that require individual small-scale projects, such as specific kinds of technical assistance…or small-scale experiments or people-to-people exchanges."

Jeffrey Sachs, 2005[1]

Another point, which AHP emphasised at the time of the RNRRS evaluation, is the crucial importance of recognising and building on DFID's existing comparative advantage in certain fields. DFID has an international reputation for research excellence in certain subjects. An example in the animal health field is tsetse control, where DFID (and formerly Overseas Development Administration, ODA) researchers collaborated with overseas institutes, notably the Tsetse and Trypanosomiasis Department in Zimbabwe, from which much of the original research of the last three decades has come. As well as excellence in subject areas, DFID RNR research has, especially in recent years, developed excellence in designing and managing small, modestly financed, focused adaptive projects which study a situation affecting poor communities and test and implement solutions, working in close conjunction with local authorities and often, NGOs.

Lastly, AHP feels confident in that it is leaving the successors to the RNRRS with an enduring legacy, not just of knowledge acquired, but more importantly of highly motivated researchers in the UK and overseas. These are people who have embraced the novel, more adaptive, downstream, and multidisciplinary approach to poverty-focused research with a significant social science component. Over the last decade, these individuals have shown themselves to be very successful at integrating highly scientific approaches with practical field studies and pilot disease control programmes. They have completed their research degrees and often built on these to obtain positions of respect in key institutes in Europe, Africa, Asia and South America. As well as their skills, knowledge and enthusiasm, they bring with them a network of contacts and relationships forged across continents and across disciplines. It is to these people that DFID must look for good science translated into creative and adapted solutions to the animal health problems of the world's poor livestock keeping communities.

Annex A
Peer and non-peer reviewed publications

Publications are cited by project and the bold letters in square brackets refer to the publication in the following categories.

Key to publication categories

A – Papers in refereed journals, book chapters, edited international conference proceedings or bulletins (published or accepted for publication)
B – Scientific abstracts, oral presentations, posters, non-edited conference proceedings
C – Internal reports
D – Newsletters, technical leaflets, lecture presentations, manuals, handbooks, etc
E – PhD theses
F – MPhil/MSc theses
F* – Undergraduate-level theses
G – Miscellaneous (e.g. radio/TV programmes, video, oral presentations to non-scientific audiences)
H – Computer software (including databases) and websites

Human health impacts of animal diseases: zoonoses

R7596 Decision support for trypanosomiasis control in South-East Uganda: improving public health and livestock productivity through the cost-effective control of trypanosomiasis in livestock

Fèvre, E.M., Fyfe, J., Waiswa, C., Picozzi, K., Odiit, M., Coleman, P. and Welburn, S.C. (2005). Animal health interventions for human health benefits. Presented at the TDR/WHO/ Stakeholders meeting on the spread of sleeping sickness in Uganda, Addis Ababa, Ethiopia, September 2005. [**B**]

Fèvre, E.M., Picozzi, K., Fyfe, J., Waiswa, C., Odiit, M., Coleman, P.G. and Welburn, S.C. (2005). A burgeoning epidemic of sleeping sickness in Uganda. *The Lancet* 366: 745–747. [**A**]

Fèvre, E.M., Picozzi, K., Jannin, J., Welburn, S.C. and Maudlin, I. (2006). Human African trypanosomiasis: epidemiology and control. *Advances in Parasitology* 61 (in press). [**A**]

Fèvre, E.M., Tilley, A., Picozzi, K., Fyfe, J., Anderson, I., Magona, J.W., Shaw, D.J. Eisler, M.C. and Welburn, S.C. (2006). Central point sampling from cattle in livestock markets in areas of human sleeping sickness. *Acta Tropica* 97: 229–232. [**A**]

Fyfe, J., Fèvre, E.M.,Waiswa, C., Picozzi, K. and Welburn, S.C. (2005). The effects of a sleeping sickness intervention programme in Eastern Uganda. Poster presented at the International Scientific Council for Trypanosomiasis Research and Control (ISCTRC) meeting, Addis Ababa, Ethiopia, September 2005. [**B**]

Kaare, M.T., Picozzi, K., Fèvre, E.M., Cleaveland, S., Mtambo, M.M., Mellau, L.S., Mlengeya, T. and Welburn, S.C. (2006). Sleeping sickness – a re-emerging disease in the Serengeti? *Travel Medicine and Infectious Diseases* (in press). [**A**]

McOdimba, F.A. (2006). Epidemiology of vector-borne diseases in cattle from SE Uganda. PhD thesis, University of Edinburgh, Edinburgh, UK. [**E**]

Odiit, M., Coleman, P.G., Liu, W.-C., McDermott, J., Fèvre, E.M., Welburn, S.C. and Woolhouse, M.E.J. (2005). Quantifying the level of under-detection of *Trypanosoma brucei rhodesiense* sleeping sickness cases. *Tropical Medicine and International Health* 10: 840–849. [**A**]

Odiit, M., Bessell, P.R., Fèvre, E.M., Robinson, T., Kinoti, J., Coleman, P.G., Welburn, S.C., McDermott, J. and Woolhouse, M.E.J. (2006). Using remote sensing and geographic information systems to identify villages at high risk for rhodesiense sleeping sickness in Uganda. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 100: 354–362. [**A**]

Picozzi, K., Fèvre, E.M., Odiit, M., Carrington, M., Eisler, M., Maudlin, I. and Welburn, S.C. (2005). Sleeping sickness in Uganda: a thin line between two fatal diseases. *British Medical Journal* 331: 1238–1241. [**A**]

Picozzi, K., Kaare, M., Matemba, L.E., Cleaveland, S., Fèvre, E.M., Mtambo, M., Mellau, L., Mlengeya, T. and Welburn, S.C.(2005). Sleeping sickness – A remerging disease in the Serengeti. Poster presented at the 1st International conference of Travel Medicine and Infectious Disease, London, 10–11 November 2005. [**B**]

Simo, G., Herder, S., Njiokou, F., Asonganyi, T., Tilley, A. and Cuny, G. (2005). *Trypanosoma brucei* s.l.: characterisation of stocks from Central Africa by PCR analysis of mobile genetic elements. *Experimental Parasitology* 110: 353–362. [**A**]

Welburn, S.C. (2005). From PCR to policy: a novel control strategy for zoonotic sleeping sickness. Presented at WHO/DFID-AHP Meeting on Control of Zoonotic Diseases: A Route to Poverty Alleviation among Livestock-keeping Communities, Geneva, 20–21 September 2005. [**B**]

Welburn, S.C., Picozzi, K., Kaare, M., Fèvre, E.M., Coleman, P.G. and Mlengeya, T. (2005). Control options for human sleeping sickness in relation to the animal reservoir of disease. Presented at the World Conservation Union (IUCN) Species Survival Commission Conservation and Development Interventions at the Wildlife/Livestock Interface: Implications for Wildlife, Livestock and Human Health, Durban, South Africa, 8–17 September 2003. [**B**]

Welburn, S.C., Coleman, P.G., Maudlin, I., Fèvre, E.M., Odiit, M. and Eisler, M.C. (2006). Control of *T. b. rhodesiense* sleeping sickness – crisis what crisis? *Trends in Parasitology* 22: 123–128. [**A**]

Wissmann, B.v., Machila, N., Picozzi, K., Fèvre, E.M., Eisler, M. and Welburn, S.C. (2005). Spatial distribution of trypanosomiasis in domestic animals on the household level in Busia, Kenya. Poster presented at the 28th Meeting of the International Scientific Council for Trypanosomiasis Research and Control, Addis Ababa, Ethiopia, September 2005. [**B**]

Wissmann, B.v., Picozzi, K., Fèvre, E. M., Fison, T. and Welburn, S.C. (2005). Animal and human infective trypanosomes in domestic livestock in South Sudan. Presented at the British Society for Parasitology, Joint Malaria and Spring Meeting, Nottingham, UK, April 2005. [**B**]

R7985 Investigating the impact brucellosis on public health and livestock reproduction in Tanzania Phase II: Emerging zoonoses in East Africa

Cleaveland, S. (2005). Going global: extending a methodology for quantifying under-reporting of rabies from Tanzania's Mara District to Africa and Asia. Presented at WHO/DFID-AHP Meeting on Control of Zoonotic Diseases: A Route to Poverty Alleviation among Livestock-Keeping Communities WHO Headquarters, Geneva (Salle D), 20–21 September 2005. [**B**]

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Cleaveland, S., Mlengeya T., Kazwala R.R., Michel A., Kaare M.T, Jones S.L., Eblate, E., Shirima G.M. and Packer, C. (2005). Tuberculosis in Tanzanian wildlife. *Journal of Wildlife Diseases* 41(2): 446–453. [**A**]

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Cleaveland, S., Shaw, D.J., Shirima, G., Kazwala, R.R., Mfinanga, S.G, Eblate, E. and Sharp, M. (2006). *Mycobacterium bovis* in rural Tanzania: risk factors and patterns of infection in human and cattle populations. *Tuberculosis* (in press). [**A**]

Edinburgh Evening News (2005). City team steps up dog jabs in bid to save thousands from killer rabies. 21 November.

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Fèvre, E. (2005). Trypanosomiasis: The human-animal interface. Presented at the Swiss Tropical Institute, Basel, Switzerland, 9 December. [**B**]

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Kaare, M.T., Picozzi, K., Fèvre, E.M., Cleaveland, S., Mtambo, M.M., Mellau, L.S., Mlengeya, T. and Welburn, S.C. (2006). Sleeping sickness – a re-emerging disease in the Serengeti? *Travel Medicine and Infectious Diseases* (in press). [**A**]

Knobel, D., Kaare, M., Fèvre E. and Cleaveland, S. (2006). Dog rabies and its control. In: Rabies, Second Edition (Eds. Alan C. Jackson and William H. Wunner), Academic Press, London, UK (in press). [**A**]

Medical News Today (2005). Edinburgh vet's bid to cut deaths from rabies in Africa. http://www.medicalnewstoday.com, http://www.medilexicon.com, http://www.hospitalsworldwide.com 21 November. [**G**]

WRENMedia (2005). A testing time for bovine tuberculosis. Available at www.new-agri.co.uk and radio.oneworld.net/article/frontpage/251/4907. [**G**]

R8214 Integrated vector management: controlling malaria and trypanosomiasis with insecticide-treated cattle

Coleman, P.G. (2005). Modelling the effects of insecticide treatment of livestock on the transmission of malaria in Ethiopia. Presented at a National Meeting of the Royal Entomological Society, University of Sussex, UK, 12–15 September 2005. [**B**]

Costantini, C., Vale, G., Santolamazza, F., della Torre, A. and Torr, S. (2005). Intrinsic host odor preferences of *Anopheles arabiensis* and *An. quadriannulatus* from a remote game area of Zimbabwe. Presented at a meeting of the American Society for Tropical Hygiene and Medicine, Washington, DC, December 2005. [**B**]

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Tirados, I., Costantini, C., Gibson, G. and Torr, S.J. (2005). The blood-feeding and resting behaviours of the malaria vector *Anopheles arabiensis* in southern Ethiopia. [**C**]

Point-of-care diagnostics and decision support tools

R8151 Improving the livelihood of resource-poor goat farmers in southern Africa through strategic drug and nutritional interventions against gastro-intestinal nematode infections

Max, R.A., Vatta, A.F., Jayaswal, L., Kimambo, A.E., Kassuku, A.A. and Mtenga, L.A. (2006). Technical manual for worm management in small ruminants. Sokoine University of Agriculture, Morogoro, Tanzania. [**D**]

Max, R.A., Mtenga, L.A., Kassuku, A.A., Vatta, A.F., Jayaswal, L. and Kimamabo, A.E. (2006). Management of anthelmintic resistance in gastro-intestinal nematodes of small ruminants – a technical brief for veterinarians. Sokoine University of Agriculture, Morogoro, Tanzania. [**D**]

Pearson, R.A. and Harrison, L.J.S. (2006). British Council higher education links with the Centre for Tropical Veterinary Medicine, University of Edinburgh. Presented to the British Council at a meeting held to celebrate 25 years of British Council links and to plan for the future, 24 February 2006. An output of the British Council Higher Education Link Project JHB/17/2003, Improving the livelihoods of resource-poor goat-keeping families in South Africa. [**B**]

Smith, T., Vatta, A.F., Buttery, P.J. and Owen, E. (eds) (2006). Making a difference: improving the livelihoods of resource-poor smallstock keepers. Proceedings of an International Workshop on Improving the Well-being of Resource-poor Communities – the Contribution of Small Livestock, Howick, South Africa, 12–15 September 2005. NRIL, Aylesford, Kent, UK. [**A**]

Vatta, A.F. (2006). Worms in your goats, sheep and cattle. Extension booklet. IsiNdebele, Sepedi, Siswati, Tshivenda and Xitsonga versions. Onderstepoort Veterinary Institute, Pretoria, South Africa[**D**]

Vatta, A.F. (2006). Improving goat farmers' livelihoods and technology transfer and worm control strategies for the resource poor farming sector. Annual Review Report 2005/2006. Onderstepoort Veterinary Institute Annual Project Progress Report for Project OV 021/008 for the period April 2002 to March 2006. [**C**]

Vatta, A.F., de Villiers, J.F., Gumede, S.A., Krecek, R.C., Mapeyi, N., Pearson, R.A., Stenson, M.O. and Harrison, L.J.S. (2005). Benefits of urea-molasses block supplementation and strategic anthelmintic treatments of communally grazed indigenous goats in the Bulwer area, KwaZulu-Natal Province, South Africa. In: T. Smith, A.F. Vatta, P.J. Buttery and E. Owen (Eds) Making a difference: improving the livelihoods of resource-poor smallstock keepers. Proceedings of an International Workshop on Improving the Well-being of Resource-poor Communities – the Contribution of Small Livestock, Howick, South Africa, 12–15 September 2005. pp. 77–80 NR International Ltd., Aylesford, Kent, UK. [**A**]

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Vatta, A.F., Harrison, L.J.S., Krecek, R.C. and Pearson, R.A. (2005). Relative benefits of strategic urea-molasses block supplementation and anthelmintic treatment of extensively grazed Boer goats in South Africa. Poster presented at the 20th International Conference of the World Association for the Advancement of Veterinary Parasitology, Christchurch, New Zealand, 16–20 October 2005. [**B**]

Vatta, A.F., Abbott, M.A., de Villiers, J.F., Gumede, S.A., Harrison, L.J.S., Krecek, R.C., Letty, B.A., Mapeyi, N. and Pearson, R.A. (2006). Goatkeepers' animal health care manual. Onderstepoort Veterinary Institute with KwaZulu-Natal Department of Agriculture and Environmental Affairs, South Africa. ISBN 1-86849-313-X (in press). [**D**]

R8213 Including the voices of the poor: developing a decision-making framework for livestock disease prioritisation and the uptake of animal health technologies by poor livestock keepers

Livestock Development Group (2005). The Poverty Assessor. Presented at Gatsby Foundation Conference on Technologies in Africa, September 2005. [**B**]

Livestock Development Group (2005). Animal health services and demand. Presented at the Development Studies Annual Conference, Open University, Milton Keynes, UK, September 2005. www.devstud.org.uk [**B**]

Livestock Development Group (2005). Workshop Proceedings: Bio-technologies and Demand. 4th All African Conference on Animal Agriculture, September 2005. [**B**]

Livestock Development Group (2005). Workshop Proceedings: Animal Health Research and Demand, British Society of Animal Science, Khon Kaen, Thailand, November 2005. www.bsas.org.uk [**B**]

Livestock Development Group (2005). Designing the species gap and global prioritisation: feasibility assessment. [**C**]

Livestock Development Group (2006). Avian influenza and engaging the poor. WHO, Geneva, Switzerland, March 2006. [**B**]

Dissemination and delivery of animal health knowledge

R7986 Development of the Farmer Field School methodology for smallholder dairy farmers

None

R8318 Decision support for endemic disease control in sub-Saharan Africa – private sector drivers for technology adoption by resource-poor farmers

Cox, A., Tilley, A., McOdimba, F., Fyfe, J., Eisler, M., Hide, G. and Welburn, S.C. (2005). A PCR based assay for detection and differentiation of African trypanosome species in blood. *Experimental Parasitology* 111: 24–29. [**A**]

Eisler, M. C., Magona, J. W., Jonsson, N.N. and Revie, C.W. (2006). A low-cost decision support tool for the diagnosis of endemic bovine infectious disease in the mixed crop–livestock production system of sub-Saharan Africa. *Epidemiology and Infection* (in press). [**A**]

Vaccine development for tick-borne diseases

R8042 Integrated control of East Coast fever constraining livelihoods of smallholder farmers in sub-Saharan Africa

Bishop, R., Shah, T., Pelle, R., Hoyle, D., Pearson,T., Haines, L., Brass, A., Hulme, H., Graham, S.P., Taracha, E.L., Kanga, S., Lu, C., Hass, B., Wortman, J., White, O., Gardner, M.J., Nene, V. and de Villiers, E.P. (2005). Analysis of the transcriptome of the protozoan *Theileria parva* using MPSS reveals that the majority of genes are transcriptionally active in the schizont stage. *Nucleic Acids Research* 33: 5503–5511. [**A**]

Graham, S.P., Pelle, R., Honda, Y., Mwangi, D.M., Tonukari, N.J., Yamage, M., Glew, E.J., de Villiers, E.P., Shah, T., Bishop, R. *et al.* (2006). *Theileria parva* candidate vaccine antigens recognized by immune bovine cytotoxic T lymphocytes. *Proceedings of the National Academy of Sciences of the United States of America* 103: 3286–3291. [**A**]

Shah, T., de Villiers, E., Nene, V., Hass, B., Taracha, E., Gardner, M.J., Sansom, C., Pelle, R. and Bishop, R. (2006). Using the transcriptome to annotate the genome revisited: application of massively parallel signature sequencing (MPSS). *Gene* 366: 104–108. [**A**]

Annex B
AHP's logical framework

B.1 AHP's logical framework 2005–2006

SUPERGOAL	INDICATORS OF ACHIEVEMENT	MEANS OF VERIFICATION	RISKS AND ASSUMPTIONS
Poverty eliminated in poorer countries through sustainable development	Measures of empowerment	National and international poverty monitoring	
GOAL			
Livelihoods of poor people improved through sustainably enhanced production and productivity of RNRs	Measures of change in capabilities, assets and activities	DFID-commissioned external reviews of DFID impact FAO and other agency datasets	Livelihoods of the poor are not disrupted by political upheaval, economic turmoil, civil unrest or unusual climatic conditions
PURPOSE			
Benefits for poor people in target countries generated by application of improved management of livestock disease	By 2006, in Kenya, India, , South Africa, Tanzania or Uganda, evidence of: 1. Increased sustainable production of livestock by the resource-poor 2. Decreased production costs for resource-poor livestock keepers 3. More reliable supply of safe livestock products to the poor 4. A reduction in the incidents of zoonoses	AHP-commissioned external reviews of programme impact Reports of in-country institutions National statistics	Livestock keepers are able to maintain access to feed and water resources and to markets Poor people invest benefits to improve livelihoods
OUTPUTS			
1. Cost-effective and appropriate strategies developed in the fields of human health impacts, diagnostics and decision support, dissemination and delivery for the sustainable control of livestock diseases that affect the livelihoods and health of the poor	1.1 New methods for the control of trypanosomiasis, tick-borne diseases, helmithiasis and other diseases – particularly zoonoses that are important to poor livestock keepers – produced by the AHP, validated, locally adopted and accepted by policy makers	AHP reports External referee reports Project FTRs Annual reports of delivery systems Systematic evidence-based reviews	Intermediary organisations able and willing to produce and deliver new technologies to poor livestock keepers

Outputs (continued)

2. Promotion of proven strategies in the fields of human health impacts, diagnostics and decision support, dissemination and delivery for the sustainable control of livestock diseases that affect the livelihoods and health of the poor	2.1 Disease management strategies acceptable for use by the poor adopted and promoted by appropriate delivery systems, including livestock FFS, to end-users by 2006

Activities	Inputs
1. Contracted projects brought to completion	1.1 Remaining seven extended projects completed by March 2006 ***Human health impacts*** *(R7596, R7985, R8214)* ***Diagnostics and decision support*** *(R8151, R8213)* ***Dissemination and delivery*** *(R7986, R8318)*
2. Bolt-on activities and control trials to selected high value project clusters	2.1 Activities to extend project scope: bolt-on activities to existing projects, which either extend scope of project to new geographical areas or to new beneficiary groups, completed 2.2 Control trials: control trials further validating research outputs and control techniques or confirming and quantifying their cost-effectiveness completed
3. New and existing knowledge effectively disseminated	3.1 International workshops held bringing together researchers and policy makers for selected project clusters within diagnostics and decision support, dissemination and delivery and human health impacts of livestock diseases 3.2 AHP badged 'blue' series extended by several volumes and disseminated to circa 1000 locations

Annex C
Useful websites and contact groups

Websites

AHP website	www.dfid-ahp.org.uk
Tsetse Muse	www.tsetse.org
Global Alliance for Livestock Vaccines	www.galv.org
European Technology Platform for Global Animal Health:	www.ifah.be/Europe/EUplatform/platform.html

Contact groups (major collaborating institutions)

Cysticercosis Working Group in Eastern and Southern Africa	workinggroup_2000@yahoo.com
Rajiv Gandhi College of Veterinary and Animal Science (RAGACOVAS), Pondicherry, India	http://ragacovas.com
Kenya Agricultural Research Institute (KARI), Kenya	www.kari.org
International Livestock Research Institute (ILRI), Kenya	www.ilri.cgiar.org
Ondersterpoort Veterinary Institute (OVI), South Africa	www.arc.agric.za/institutes/ovi/
World Health Organization (WHO) Zoonoses, Switzerland	www.who.int/zoonoses
Sokoine University of Agriculture (SUA), Tanzania	www.suanet.ac.tz
National Institute for Medical Research (NIMR), Tanzania	www.nimr.or.tz
Tanzania Wildlife Research Institute, Tanzania	www.tawiri.org
Tanzania National Parks, Tanzania	www.tanzaniaparks.com
International Trypanotolerance Centre (ITC), The Gambia	www.itc.gm
Livestock Health Research Institute (LIRI), Uganda	www.naro.go.ug

Makerere University, Uganda	www.makerere.ac.ug
Alliance for Rabies Control (ARC), Edinburgh, UK	www.rabiescontrol.org
University of Zambia Medical School, Zambia	www.unza.zm
Tsetse and Trypanosomiasis Control Section of the Department of Veterinary and Livestock Development, Zambia	

Acronyms and abbreviations

AHP	Animal Health Programme (DFID)
AIDS	aquired immune deficiency syndrome
ARC	Alliance for Rabies Control (UK)
AUVEC	African Universities Veterinary E-learning Consortium
BSF	Belgian Survival Fund
CAPE	Community-based Animal Health and Participatory Epidemiology
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza (Tropical Agricultural Research and Higher Education Centre, Central America)
CGIAR	Consultative Group on International Agricultural Research
CPD	continuing professional development
CRT	Central Research Team (DFID)
CTVM	Centre for Tropical Veterinary Medicine (University of Edinburgh, UK)
DANIDA	Danish International Development Agency
DCP	Direcção Geral da Percuária (Guinea Bissau)
DFID	Department for International Development (UK)
DLS	Department of Livestock Services (The Gambia)
DNE	Département national d'élevage (Guinea)
ECF	East Coast fever
ELISA	enzyme-linked immunosorbent assay
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FFS	farmer field school
FITCA	Farming in Tsetse Controlled Areas
FTR	Final Technical Report (DFID)
GALV	Global Alliance for Livestock Vaccines
GAVI	Global Alliance for Vaccines and Immunisation
GoK	Government of Kenya
HIV	human immunodeficiency virus
IAASTD	International Assessment of Agricultural Science and Technology for Development
IARC	international agricultural research centre
ICPTV	Integrated Control of Pathogenic Trypanosomiases and their Vectors
ICT	information and communication technology
IFAD	International Fund for Agricultural Development
IIED	International Institute for Economic Development
ILRI	International Livestock Research Institute
IRAG	Institut de recherche agronomique de Guinée
ISRA	Institut sénégalais de recherche agricole
ITC	International Trypanotolerance Centre (The Gambia)
ITM	infection and treatment method
KARI	Kenya Agricultural Research Institute

LICR	Ludwig Institute for Cancer Research (Belgium)
LIRI	Livestock Health Research Institute (Uganda)
LPAC	Livestock Programmes Advisory Committee (DFID)
LPP	Livestock Production Programme (DFID)
MGD	Millennium Development Goal
MPhil	Master of Philosophy
MSc	Master of Science
NALEP	National Agricultural and Livestock Extension Programme (Kenya)
NARS	national agricultural research system
NGO	non-governmental organisation
NIMR	National Institute for Medical Research (Tanzania)
NRI	Natural Resources Institute (UK)
NRIL	NR International Ltd (UK)
NRSP	Natural Resources System Programme
OAR/IBAR	Organization of African Unity–Interafrican Bureau for Animal Resources
ODA	Overseas Development Administration (now DFID)
OIE	World Organisation for Animal Health
OVI	Onderstepoort Veterinary Institute (South Africa)
PAAT	Programme against African Trypanosomiasis
PAC	Programme Advisory Committee (DFID)
PACE	Pan African Programme for the Control of Epizootics
PARC	Performance Assessment Resource Centre (UK)
PAVE	Participatory Approaches to Veterinary Epidemiology
PCS	Project Completion Summary (DFID)
PhD	Doctor of Philosophy
RAGACOVAS	Rajiv Gandhi College of Veterinary and Animal Science (Pondicherry, India)
RLD	Rural Livelihoods Department (DFID)
RNR	renewable natural resource
RNRR	renewable natural resources research
RNRRS	Renewable Natural Resources Research Strategy (DFID)
SUA	Sokoine University of Agriculture (Tanzania)
TIGR	The Institute for Genomic Research
UN	United Nations
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VSFB	Vétérinaires sans frontières (Belgium)
WHO	World Health Organization (UN)
WTO	World Trade Organization
YBGP	Youth Building Green Programme (Kenya)

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