AHP
Animal Health Programme

DFID

Annual Report 2004–2005

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.

For more information contact the AHP:
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DFID ANIMAL HEALTH PROGRAMME

ANNUAL REPORT 2004–2005

Saving lives, securing livelihoods

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Centre for Tropical Veterinary Medicine

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Executive Summary

The year 2004–2005 saw a number of Animal Health Programme (AHP) activities and research initiatives coming to fruition and others continuing to develop, test and refine novel approaches towards ensuring that the animal health problems affecting the poor are more effectively controlled. This year the annual report features the AHP's work on zoonotic diseases, which can be transmitted to people from animals, and not only endanger poor people's livelihoods by affecting their livestock, but also compromise their own health and very survival. These diseases are recognised as being among the most seriously under-diagnosed diseases in humans. Some are inherently difficult to diagnose, others tend to be forgotten since their control falls between the two stools of medical and veterinary responsibility, requiring overstretched veterinary services to commit resources to deal with diseases which mainly affect people. Whatever the reasons for their neglect, the burden of these diseases falls disproportionately on the poor, as is increasingly being demonstrated by AHP researchers who have both developed new and adapted existing disease control strategies to come up with cost-effective solutions. A very successful workshop on the subject was held in Nairobi in February 2005, which brought together veterinary and medical researchers from eleven countries. An AHP-funded international meeting, to be hosted by the World Health Organization, is planned for September 2005, to include high-profile donors and policy makers, to increase advocacy for related diseases and bring these research achievements to their attention. Dealing with zoonotic diseases effectively not only secures poor people's livelihoods, but can also save their lives.

From the management aspect, the year was marked by two major administrative milestones. The first, which was announced in March 2004, was the decision by DFID to extend the current Renewable Natural Resources Research Strategy (RNRRS) by a year. The second was the evaluation of the RNRRS that DFID commissioned and which lasted from October 2004 to March 2005. The evaluation of the RNRRS was not only useful in ensuring that past projects were documented, scored and assessed, but above all in bringing to the fore key issues which it turns out, concerned not just the AHP, but the management of all of the RNRR programmes and Programme Advisory Committees (PACs). The 1-year extension was approved and provided AHP and its researchers with a very welcome opportunity to take their work forward in two directions: firstly, to pursue some key scientific topics which had arisen out of their research and, secondly, to take the promotion of uptake and adoption several steps further. During 2003–2004, AHP identified research clusters that it particularly wanted to promote during the last year of the programme, these are the work on zoonotic diseases featured in this annual report, on farmer-based methods of controlling both tsetse and trypanosomiasis and on dissemination, particularly the AHP's flagship dissemination project: livestock Farmer Field Schools (FFSs). In order to consolidate the work that has been done and achieve impact, AHP has identified three types of activity that will be promoted in the final year of the programme:

- Completing the series of paired workshops for each key cluster: one primarily for AHP researchers, collaborators and stakeholders, and the other directed at an international audience
- Commissioning bolt-on activities designed to extend projects' scope either by investigating new geographical areas or involving new beneficiary groups
- Conducting control trials to further validate and test the disease control techniques that have been developed as a result of AHP research results.

Turning to the research activities, AHP has been impressed by the ingenuity and enthusiasm with which its researchers have responded to the opportunity of the extra year's funding and, in particular, by the way in which its UK constituency has gradually devolved both funds and responsibility to overseas colleagues. The AHP has issued a restricted call for small bolt-on activities to its zoonotic disease work; these concept notes will be judged not just on scientific merit but also on the extent to which they provide opportunities for African scientists. A number of trials are validating and testing the efficacy of various novel control strategies, in particular the treating of cattle around outbreaks of sleeping sickness, the restrictive application of insecticide to the legs and bellies of cattle to control tsetse, and controlling both malaria and trypanosomiasis with insecticide-treated cattle. Work on diagnostics is continuing, at both strategic and adaptive levels. Polymerase chain reaction (PCR) diagnostics, which have made it possible to differentiate definitively between human- and animal-infective trypanosomes, have been further refined during the course of the year. The project responsible for this work has now had its third paper in as many years accepted in the high-impact medical journal, *The Lancet*. At the applied end of the research spectrum, the diagnostic card developed to help animal health workers in the field to diagnose different endemic diseases correctly on the basis of apparent clinical signs is undergoing validation. Innovative software (Tsetse Plan and Tsetse Muse) has been produced to help non-governmental organisations (NGOs) and communities plan and cost tsetse control and to assist those involved in both research and development work in the field of animal health to assess the impact of measures on the poor (Poverty Assessor™). The livestock FFSs project has been highly successful in leveraging extra funds, with the Belgian Survival Fund (BSF) providing 85% of the funds for the expansion of this approach into a pastoralist zone of northern Kenya.

So, looking towards 2005–2006 the AHP anticipates that, as in 2004–2005, whilst the management emphasis will continue to be on consolidation and dissemination, its researchers will continue to be highly innovative.

Professor Ian Maudlin
Animal Health Programme Manager
The University of Edinburgh, April 2005

1. Introduction and General Overview

Saving lives, securing livelihoods

The year 2005 sees the United Kingdom undertaking a leading international role in the fight against poverty through its presidency of the European Union (EU) and heading the Group of Eight (G8) industrialised nations. At the time of writing, the end of the financial year for the Animal Health Programme (AHP) has coincided with the highly anticipated publication of the findings of the UK government's Commission for Africa. The Commission's report[1] presents a careful, structured and realistic analysis of Africa's problems, their causes and their solutions. It argues for a multi-faceted approach to dealing with these problems, ranging from supporting good governance and an end to conflict to removing trade barriers, investing in capacity building, providing funds for agricultural innovation, improving health services and supporting the Global Alliance for Vaccines and Immunisation (GAVI).

> 'African poverty and stagnation is the greatest tragedy of our time.'
>
> Commission for Africa report (March 2005)

Since 1999, when it reviewed its geographical coverage, AHP has focused almost exclusively on Africa; 98% of its research funding is directed at finding solutions to Africa's animal health problems. This emphasis was further endorsed by the results of studies undertaken in 2002 (Perry *et al.*, 2002[2]; Thornton *et al.*, 2002[3]) that highlighted particular areas of Africa, notably the area around the Lake Victoria Basin, as containing large numbers of poor livestock keepers. As a result of this report, AHP consolidated its work in that area but also redirected some funding towards West Africa.

> 'Strengthening the assets of poor people – including their human capital, such as health and skills, physical capital, such as land and property, access to finance and their natural environment – enables them to participate more effectively in markets, while the economic, legal and governance environments shape the opportunities open to them.'
>
> Commission for Africa report (March 2005)

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[1] Commission for Africa report (March 2005). www.commissionforafrica.org

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

[3] 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.

Two of the key areas for intervention highlighted by the Commission for Africa are agriculture and human health. Agriculture is seen as a significant driver of the economic growth needed to alleviate poverty. The Commission mentions the "huge burdens from pests, weeds and diseases affecting crops and livestock" faced by African farmers. It points to the need to strengthen poor people's physical capital, which, for as many as half of poor rural households, includes livestock. Turning to the problems of human health, the Commission highlights the fact that cost-effective solutions already exist for many of the diseases endemic to Africa. In some cases it is a lack of funds that prevents these treatments from being administered, but more often the health services are simply ill-equipped to deliver the remedies required. These problems of access and affordability of healthcare particularly affect the poor.

> 'Eliminating preventable diseases: Africa is afflicted by a number of diseases that are entirely preventable... Disease burden and economic growth are intimately related. Healthy people are more productive and more likely to be able to take care of their children, benefit from education, and contribute to society... Poor people are the worst affected. Health centres may be too far away or have no staff. Many health workers do not have transport to reach patients. Often the available funds are not equitably shared between services reaching the poorest and the better off… Many parasitic diseases, which largely affect poor people, have simple, cost-effective solutions… but remain untreated.'
>
> Commission for Africa report (March 2005)

There is, however, one group of human diseases where lack of uptake of the available control strategies is constrained by more than just access and affordability. These are the diseases that are shared by both people and animals and that have a dual impact on both human and animal health; if effectively undertaken, their control can generate a double benefit by making both people and livestock healthier. Yet despite this potential for wider impact, the dual nature of these 'zoonotic diseases' has tended to mean that they lag behind all other disease groups in attracting funding and effective control measures. The reasons, as outlined by Schwabe (1984)[4], are very simple. Often the most effective control strategy is to deal with the animal reservoir, for example by vaccinating dogs for rabies or dealing with tuberculosis (TB) or brucellosis in cattle herds. The responsibility for this and its cost thus fall predominantly on the veterinary services. The major beneficiaries are people and the human health services, who therefore save the resources needed to treat them. Since Africa's veterinary and health services are both greatly over-stretched and under-funded, it is not surprising that zoonosis control is, as described by Schwabe, "falling between sectoral chairs".

The second point Schwabe highlights is the problem of under-diagnosis. In Africa, most human diseases are frequently not diagnosed, particularly among the poor, reflecting the limited capacity and coverage of the health services. However, in the case of the zoonoses, this problem of under-diagnosis is further aggravated by their uneven geographical distribution and the inher-

[4] Schwabe, C.W. (1984). Veterinary medicine and human health (3rd edition). Williams and Wilkins, Baltimore, USA. 680 pp.

> 'Because zoonosis management involves participation of both the economic (agriculture–food) and human health sectors, and each sector sets its priorities differently, it is not difficult to see why many zoonoses may not receive sufficiently high control priorities through either process for control to be justified. This fact is heightened by the second fact that zoonoses are among the most seriously under-diagnosed diseases in man in most countries.'
>
> Veterinary medicine and human health (Schwabe, 1984)

ent difficulties in diagnosing some of these diseases. To cite some examples, brucellosis, whose principal symptom in people is recurrent fever (hence its popular name in the United Kingdom, 'undulant fever') is almost always thought to be drug-resistant malaria in Africa. Trypanosomiasis (or 'sleeping sickness') is very difficult to diagnose since the parasites in the blood are not always evident, and screening tests often generate a high proportion of false positives. Few hospitals have the diagnostic capacity to distinguish bovine TB from the more common form of human TB. The symptoms caused by the various tapeworms and cysts transmitted via cattle, pigs, dogs and sheep are not easily differentiated from the many other intestinal problems and tumours found in various human populations.

Unsurprisingly, the low priority accorded to the control of zoonotic diseases together with the difficulties and often high cost of diagnosing and treating them means that the ultimate outcome for poor people infected with these diseases is particularly bleak. Those who fail to get the expensive post-exposure treatment for rabies, or who are incorrectly diagnosed as having AIDS rather than sleeping sickness, simply die.

It is also likely that poor people actually run a higher risk of exposure to and infection with zoonoses. As discussed in Coleman (2002)[5], one of the main reasons is that the poor, particularly in rural and peri-urban settings, often live in close contact with their livestock, making them more likely to be infected by direct contact or by vectors. Many zoonotic diseases such as cysticercosis and food and water-borne zoonoses are associated with unsanitary living conditions for both animals and people. The deterioration of veterinary services and the shift to private-sector delivery mean that poor people are less likely to be able to invest in treatment or preventive measures for their livestock, and therefore their animals are often less healthy. Poor consumers are also those most likely to be buying cheaper meat and milk from outlets where it is not inspected, refrigerated or, in the case of milk, pasteurised.

> 'More than 200 zoonoses have been described… Many of them are significant public health threats, yet are neglected. They affect hundreds of thousands of people, especially in developing countries, although most of them can be prevented.'
>
> World Health Organization[6]

[5] Coleman, P. (2002). Zoonotic diseases and their impact on the poor. In: B.D. Perry, T.F. Randolph, J.J. McDermott, K.R. Sones and P.K. Thornton (eds) Investing in animal health research to alleviate poverty, International Livestock Research Institute (ILRI), Nairobi, Kenya. 130 pp. plus annexes.

[6] Taken from www.who.int/zoonoses/en

Thus zoonotic diseases impose a disproportionately high burden on poor people's health, both in terms of severity and incidence. Returning to the concept of the dual burden, these diseases then also affect their livestock, causing death or chronically lowering productivity. As the WHO states (see page 3) there are ways of preventing or controlling most of these diseases that are not being used. In many cases, control measures that have worked well in Europe cannot easily be applied in developing countries. For example, in the United Kingdom, brucellosis has been eradicated and bovine TB is controlled by slaughtering infected cattle. This approach would not be feasible in Africa, where people depend on their animals for their livelihoods and replacements are hard to obtain. However, public awareness campaigns on the importance of boiling milk and better diagnosis of human diseases could be undertaken, but are rarely implemented because health policy makers are unaware of the burden imposed by these diseases. Research is needed to establish where these diseases are present, identify the risk factors that make particular groups of people or livestock likely to contract them, and work out cost-effective ways of dealing with them.

AHP's researchers have worked on these zoonotic diseases intermittently throughout the programme's history. However, in the last 5 years this research cluster has been accorded increasing prominence. In particular, the work on zoonotic diseases has shifted in focus from predominantly studying the effects of these diseases on livestock to a broader, overarching view that examines their impact on humans, the risk factors for people, and how control of these diseases in both people and animals can be most cost-effectively carried out. To that end, AHP has been working on three aspects of the problem, bringing together researchers in laboratories with field workers studying these diseases in livestock, and examining the incidence of zoonoses and their burden on humans, as illustrated in Figure 1.1.

Figure 1.1 **Dealing with the dual burden imposed by zoonotic diseases: combining innovative laboratory work with epidemiological studies in people and livestock**

Clockwise from top: scientists working in the DFID-equipped veterinary laboratory at Sokoine University of Agriculture in Tanzania (*Photo: Alex Shaw*), girl with sleeping sickness, and cattle, which are carriers of this disease in Uganda (*Photos: Sue Welburn*).

Thus by tackling the dual burden on people's health and that of their livestock, controlling zoonotic diseases provides a unique opportunity for alleviating poverty by 'saving lives and securing livelihoods'.

1.1 Overall vision and strategy

The welcome news that the renewable natural resources research (RNRR) programmes, including AHP, were to be extended for a further year came just as last year's annual report went to press. For the AHP this has provided an opportunity to select, focus on and consolidate the work done by its most successful research clusters with a view to ensuring that it advances a step further, is effectively disseminated and taken up. AHP's project portfolio continues to be organised under the four themes established in 1999, three of which are adaptive:

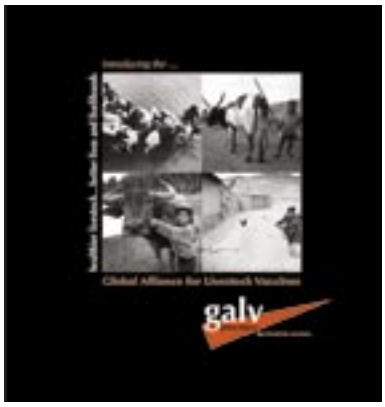
- Point-of-care diagnostics and decision-support systems, with an emphasis on cost-effective pen-side tools that can be used by farmers
- Human health impacts of animal diseases that can be transmitted between humans and animals
- Dissemination and delivery of animal health knowledge

while the fourth, vaccine development, is a strategic theme.

In preparation for this year's evaluation of the RNRRS, AHP completed its impact tracking exercises using the models proposed in the Performance Assessment Resource Centre report[7] (PARC, 2003), and went on from this to select the research clusters that will attract particular support in 2005–2006.

Strategic research now consists of a single project, the East Coast fever (ECF) vaccine project (see Section 4.3). This project was commissioned by the Rural Livelihoods Department of the Department for International Development (DFID), which directly provided 85% of the funding. AHP has managed the project and provided the other 15% of the funds. The project officially ends in 2005, although discussions are in progress as to how it will be followed up. The work on ECF has been complemented by other projects, now completed, in AHP's tick-borne diseases (TBDs) cluster.

Meanwhile, the AHP has been instrumental in the creation of GALV – the Global Alliance for Livestock Vaccines. In a similar way to GAVI, the Global Alliance for Vaccines and Immunisation, the initiative commended in the Commission for Africa report, GALV hopes to promote the creation of consortia that will invest in research to produce vaccines for tropical livestock diseases that is not currently funded by the private pharmaceutics sector. AHP has also played a key role in funding the creation of a European technology platform supporting a global livestock development partnership. The aim of this platform is to promote research into diseases that affect European livestock, including those that are also endemic in tropical countries and capable of spreading to Europe, for example, bluetongue. This work is expected



[7] Performance Assessment Resource Centre (PARC) (2003). Benchmarking Impact Assessment. PARC, Birmingham, UK. 68 pp.

to have have a knock-on effect on poor livestock keepers by increasing awareness and attracting funding to problems which concern them.

Accordingly, for this last phase of the AHP, it was decided to focus on adaptive themes, and a particularly successful project cluster from each theme was selected. These are essentially the same project clusters that were highlighted in last year's annual report, when a preliminary selection was made. This selection has been reinforced by the AHP specialist's review, undertaken in November 2004 as part of a DFID-commissioned evaluation of the RNRRS. The evaluation report[8] also noted that effective clustering can "only be achieved by planning for larger projects with smaller satellites working together in a coherent manner aiming towards a common goal but from different angles". While the commissioning of large projects is not within AHP's current remit, this comment has encouraged the programme to be more proactive in continuing to commission 'bolt-on activities' that directly build on existing research work in order to add value, achieve critical mass or disseminate results.

The first project cluster selected was tsetse and trypanosomiasis, which was featured in the 2002–2003 annual report following an international workshop on the future of tsetse control. To a lesser extent this cluster also appeared in the 2003–2004 report when particularly interesting research results were beginning to emerge, notably with respect to the use of insecticide-treated cattle to control tsetse, that were also the subject of a second, in-house workshop.

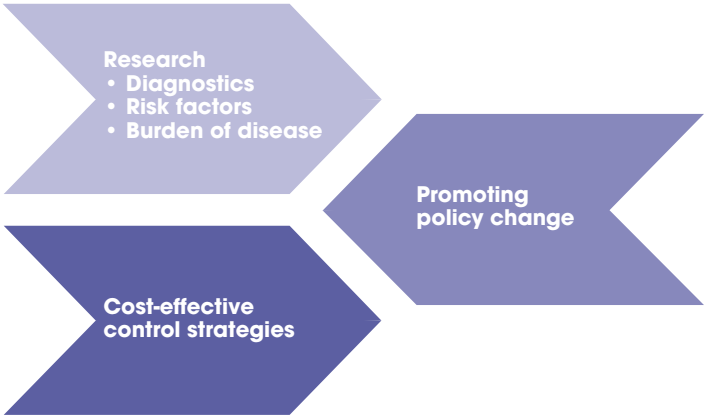
Within the dissemination and delivery theme, two projects have been selected. The main one is the continued development of the livestock Farmer Field Schools (FFSs), which are the keystone of AHP's dissemination strategy. Work on the FFSs began in 2001, and since then livestock FFSs have been shown to be highly effective tools for helping farmers to acquire livestock production and animal health knowledge, leading to considerable international interest in the idea. An FFS impact study has since been commissioned. The second project selected is AHP's recently completed project in India that has pioneered the development of the 'animal health information kiosk', an interactive terminal with a touch-screen, that can be interrogated about various animal health problems and livestock production issues. Dissemination and delivery will be featured in AHP's 2005–2006 annual report, at the conclusion of this current phase of the RNRR.

The third group of projects selected are those undertaken under the human health impacts of animal diseases, or zoonotic disease theme, that is featured in this annual report. Within this theme, AHP will concentrate mainly on the work done on sleeping sickness, brucellosis and TB. This highly innovative research has examined whether, in certain circumstances, controlling tsetse flies can also control mosquitoes and hence malaria in people, and will be included along with some of the work on rabies and cysticercosis.

[8] Evensen, Ø. (2004). DFID Animal Health Programme – Expert Report. Department for International Development (DFID), London, UK. 29pp.

During this past year, AHP has worked on consolidating and publicising its achievements in the field of zoonotic disease research. In February 2005 at a workshop in Nairobi, it brought together 33 of the researchers who have worked, directly or indirectly, on brucellosis, cysticercosis, rabies, sleeping sickness and bovine TB as part of AHP projects (see Box 1.1, p. 9). The researchers reviewed the work done on these diseases and looked at the factors that have influenced their success; Figure 1.2 illustrates the crucial components. As with all research work, the generation of new knowledge is a major requirement, and in these projects it directly led to the development of cost-effective control strategies. Two components have particularly characterised the successful work undertaken in this field. The first is the original work undertaken to estimate the zoonotic disease burden on people, especially on the rural poor. The second, and more important, is the need to successfully influence policy. This acts as the bridge between disease research and control. Within this, as the earlier quotation from Schwabe emphasises, the vital factor is the need to get the veterinary and medical authorities to work together to tackle the dual burden of these diseases. This issue was given particular prominence at the February workshop (see Box 1.1) and generated a checklist of 'dos and don'ts' (see Box 1.3, p. 13). Box 1.2 a–c (p. 11) lists the key achievements of the AHP zoonoses research projects under each of these headings.

Figure 1.2 **Three key components of AHP's successful zoonotic disease research clusters**



Building on this workshop and on its successes in this field to date, AHP issued a restricted call for concept notes, with the dual purpose of commissioning bolt-on activities under its zoonosis theme and encouraging young African researchers to design research projects and lead the work. Finally, in order to influence policy further, AHP is funding an international conference jointly organised with WHO under the 'Saving lives, securing livelihoods' theme, to be held at WHO headquarters in Geneva in September 2005. Its aim will be to bring together donors and researchers in zoonoses to raise the international profile of these diseases. The hope is that demonstrating how widespread zoonotic diseases are, how they particularly affect the poor, studying their risk factors and emphasising the potential for control via the animal reservoir will reinforce the message that controlling zoonoses is a highly cost-effective contribution to poverty alleviation.

1.2 Programme activities

The main programme activities that took place in 2004–2005 are summarised in Table 1.1. The latter half of the year was dominated by the DFID-commissioned evaluation of the RNRRS, covering the period 1995–2005. This was undertaken by a core team, supported by a team of

Table 1.1 **Summary of programme-level activities in 2004–2005**

Date	Activity
2004	
April	Prepare 2003–2004 Annual Report
	Visit to East Africa: reviewing East African projects
May	CTVM: Michael Scott, Rural Livelihoods Consultant. Meeting to discuss DFID future research capacity
June	House of Commons: Invitation to give evidence to the Science and Technology Committee on the use of science in UK international development policy
	EU Brussels: discussion on development of an EU technology platform for animal health research
	DFID: Bob Carlisle, Sarah Holden, John McDermott. Meeting to discuss development of public–private partnership for animal health research
July	Brussels: Meeting with Vétérinaires sans frontières (VSFB) and Belgian Survival Fund (BSF) to discuss co-funding the next phase of the FFS project
	DFID consultative workshop
	Submission of tender to DFID for one-year extension to the AHP
August	University of Reading: Claire Heffernan, Alex Shaw, meeting to discuss Project R8213 Extension
September	DFID: Discussion on EU Technology Platform with Sarah Holden, Jim Scudamore
	DFID: Programme Managers meeting
October	International Livestock Research Institute (ILRI), Nairobi: Meeting to establish GALV
	Brussels: European Technology Platform for Global Livestock Development Partnership
	DFID: Introductory meeting with the RNRRS evaluation team
November	DFID: Meetings with animal health specialist of the RNRRS evaluation team, Prof. Øystein Evensen
	Meeting with the RNRRS evaluation core team
	Brussels: European Technology Platform for Global Livestock Development Partnerships
	International Trypanotolerance Centre (ITC), The Gambia: Keynote speech on role of donors at ITC international conference 'Animal Agriculture in West and Central Africa'
December	ILRI, Nairobi: East Coast fever (ECF) review
	CTVM: Dr Sarah Bronsdon, The Wellcome Trust. Meeting to discuss animal health research
2005	
January	London: Meeting with Cambridge Economic Policy Associates (CEPA), discussion on launching of GALV
February	DFID: Livestock Programme Advisory Committee (PAC) Meeting
	Programme Managers and PAC chairs meeting with RNRRS evaluation core team
	Nairobi: Zoonotic diseases workshop
March	Prepare Annual Report 2004–2005

specialists in particular fields, whose brief was to evaluate each programmes' management and governance, the poverty impact of its research and the quality of its science. The evaluation lasted from October to February. The establishment of GALV has now reached the point where it is being formalised, initially under the aegis of the International Livestock Research Institute (ILRI). To round the year off, in February a major workshop on zoonotic disease research was held in Nairobi, bringing together some 33 researchers from 11 countries to pool their experiences (see also Boxes 1.1, 1.2 and 1.3).

1.3 Research impact

As this phase of AHP and DFID's RNRRS draws to a close, it is very encouraging to see that the different research projects are still coming up with new and interesting results that feed directly into disease control strategies designed to benefit poor people, especially poor livestock keepers. This year, the annual report is being written a month after the highly successful bringing together of researchers from Ethiopia, The Gambia, Guinea, Kenya, Sudan, Tanzania and Uganda to meet and exchange their experiences of research into zoonotic diseases. The lessons that have emerged from this workshop are summarised in Boxes 1.1 and 1.3. Box 1.2 gives an overview of the core components of AHP-funded research that have contributed new knowledge, influenced policy and been translated into cost-effective disease control strategies.

Box 1.1 **Turning research findings into impact: lessons learned from AHP's zoonotic research projects**

AHP's slogan is "healthier livestock, wealthier people" and its mission statement says that "effective dissemination and uptake of AHP research findings can enhance the livelihoods and health of poor livestock keepers". But how easy is it to translate research findings into tangible impacts? And how well equipped are veterinary and medical researchers to achieve this?

Photo: AHP

A recent AHP workshop, focusing on zoonotic diseases, addressed just these issues. First, teams of researchers working on a range of zoonotic diseases, including sleeping sickness, bovine TB, brucellosis, rabies and cysticercosis, considered how successful they had been in achieving tangible outcomes at various levels in their projects. Examining individual cases revealed a number of common factors and experiences. These included some of the following points:

- **Support of high level champions.** It was noted that having the support of a well-placed champion, such as an influential politician, was invaluable, especially if the goal was to influence policy. However, it was also noted that this is very difficult to deliberately build into a project.

- **Putting an idea into effect.** It is difficult to make the leap from research findings to influencing and changing policy.
- **Reaching the right people.** It is difficult to disseminate research findings at the grassroots level: to local livestock keepers and the communities in which they live.
- **Luck.** Luck played an important role in projects that had achieved good endpoints. For example, it is sheer luck to be in the right place at the right time to attract the attention of a well placed individual – who might then go on to become your champion; or to publish a paper at a time when research findings are especially newsworthy.
- **Support mechanisms.** Even if research findings can successfully be used to influence policy, it may have no impact if implementation and enforcement mechanisms are weak.
- **Visibility.** Publishing in specialist, peer-reviewed journals, especially prestigious ones such as *The Lancet*, can lead to more mainstream media picking up the story for mass consumption and hence achieve greater impact. In this regard it was suggested that if an important paper is to be published in such a journal it would be a good idea to ensure that the lead authors are available to talk to journalists immediately after the publication date. Researchers also noted that sometimes journals prepare and distribute press releases in advance drawing attention to important papers.
- **Measured results.** It is important to have clear, unambiguous results that can be translated into clear extension or policy messages; conversely it is dangerous to rush to disseminate preliminary findings that could simply confuse potential beneficiaries.
- **Time.** In many projects, further work is needed to achieve field- or policy-level impact and extract the full value from the research done to date. This point recognised that converting research findings into tangible impacts is neither easy nor fast, and is especially difficult to achieve within the confines of a relatively short – often 3-year duration project.
- **Early stage alliances.** Inclusion of decision makers in the validation of possible control methods, interventions or new tools is a good tactic. For example, one project involved the local district veterinary officer who could then formally report to the national veterinary authority.
- **Commercial awareness.** The involvement of the private sector is often essential, especially if a new or existing manufactured product is involved. Someone will have to make, distribute and support the new product, or include new findings in user recommendations for existing products, beyond the lifetime of the project. The sooner commercial partners are identified and brought on board the better.

Having identified these factors, a broader discussion followed that considered how well equipped veterinary and medical researchers were to deal with the challenges of translating research findings into impact. A whole new set of skills and knowledge is required, such as dealing with the media, understanding policy processes, communicating with policy makers including producing effective policy briefing papers, communicating at grassroots level including producing effective extension messages, and forging links with the private sector. This raised the question of what can/should researchers do for themselves and how much should they rely on 'experts' who already have skills, knowledge and, perhaps more importantly, the network of contacts? No definitive answers were put forwards during the workshop, but the discussion raised interesting points, that research managers need to consider carefully if future research is going to be successful at translating interesting findings into impact.

Photo: AHP

Box 1.2 **Key components of AHP's research on zoonotic diseases**

(a) New knowledge

Burden of disease

- For the first time in tropical Africa, it was demonstrated that bovine TB contributes to the human TB epidemic, with about 10% of pulmonary and 4% of extra-pulmonary cases caused by *Mycobacterium bovis*
- Research showed that the number of people actually dying untreated of acute sleeping sickness is 12 times higher than the number of recorded deaths from the disease
- Disability-adjusted life years (DALYs) calculated for acute sleeping sickness, showed that it mainly strikes active adults, whose death often deprives a family of a breadwinner, and that the loss per untreated or unsuccessfully treated case is 23 DALYs
- Research building on AHP-funded projects demonstrated that the number of human deaths from rabies in Tanzania is 150 times higher than previously thought
- For rabies, where children are the most likely to be bitten, the loss per human rabies case is 31 DALYs
- Analysis of healthcare-seeking behaviour for zoonotic sleeping sickness revealed the extent of delays and mistaken diagnoses. Those patients who were fortunate enough to be successfully diagnosed still needed to make at least three visits to health units and typically experience a two-month delay in obtaining a diagnosis

Risk factors and epidemiology

- Research demonstrated that for all forms of brucellosis and extra-pulmonary tuberculosis, the risk of disease was greatest among remote, marginalised and impoverished households
- Poverty is a major risk factor for cysticercosis, the risk being 4 times higher among illiterate people, 2 times higher among those whose houses have no toilet, 50% higher in women and 20% higher in those whose houses had earthen floors
- Isolated rural clinics often run out of stocks of rabies post-exposure treatment, meaning infected people will die
- Cattle imported from parts of Uganda where sleeping sickness is endemic were shown to have introduced the disease to the Ugandan district of Soroti, where it had never been seen before

Diagnostics

- Development of an antigen-detection enzyme-linked immunosorbent assay (ELISA) diagnostic test for neurocysticercosis – where the immature tape-worm lodges in the human brain producing mental disturbances and epileptic-like symptoms
- Using polymerase chain reaction (PCR) tests to enable particular strains of *Trypano-soma brucei rhodesiense*, the parasite causing acute sleeping sickness to be iden-tified for the first time, thus scientifically demonstrating that most human infections come from cattle

Photo: Mark Eisler

(b) Promoting policy change

1995 Tanzania recognises for the first time that some of its TB patients are suffering from the bovine strain of the disease and need different treatment to survive, and subsequently amends its health manual accordingly

1995 Tanzanian veterinary and medical researchers sign a memorandum of understanding, initiating the first cooperation between the two groups for dealing with zoonotic diseases, leading to joint research work from 1998 onwards. This is later followed by meetings between the veterinary and medical establishments to devise joint strategies for controlling these diseases

1999 Based on knowledge generated and successfully tested by AHP researchers, Uganda makes treating cattle around outbreaks of sleeping sickness official policy

2001 WHO sets up a socio-economic working group on sleeping sickness

2002 Medical and veterinary organisations in The Gambia, Guinea and Guinea Bissau undertake joint work studying zoonotic diseases

2002 WHO sets up a working group to study the epidemiology and economics of rabies in Africa and Asia

2004 Ugandan government tables legislation on the treatment of cattle around sleeping sickness outbreaks

2005 An AHP workshop brings together veterinary and medical researchers to highlight the issues of zoonotic disease control for a wider audience. A further meeting is planned.

(c) Cost-effective control

- Acute sleeping sickness: treating cattle prevents humans becoming infected; human lives saved account for some 500,000 DALYs. Control is very cost-effective, since treating cattle increases their productivity and prevents the disease from reaching people, saving the cost of expensive treatment for those lucky individuals who are correctly diagnosed – the financial benefits outweigh the costs before considering the benefits to human health
- Rabies: dog vaccination in Serengeti and Mara districts of Tanzania, a follow-on from AHP-funded research, has saved lives likely to represent some 20,000 DALYs averted at a cost per DALY gained of about US$25; a cost level regarded by the World Health Organization (WHO) as very good value for money. Resulted in savings as a result of reduced demand for prophylaxis
- Sleeping sickness: farmer-based methods of tsetse control using pour-on treatments and, more recently, the restricted application of insecticides to cattle's legs and bellies dramatically reduces the cost of controlling tsetse and interrupts transmission between cattle and people.

Photo: Sue Welburn

Box 1.3 **Bringing together medics and vets: lessons learned from zoonosis research**

One of AHP's four research themes focuses on the impact of zoonotic diseases on human health – that is, diseases that can spread from animals to people. Projects within this cluster are concerned with sleeping sickness, bovine TB, brucellosis and rabies.

In early February 2005, AHP hosted a workshop in Nairobi and invited the zoonosis project leaders and key partners together with other participants who had a particular interest in zoonotic diseases. The latter group included representatives of WHO and The Wellcome Trust, together with researchers from around the world who worked on various aspects of zoonotic diseases. Participants were drawn from veterinary and medical organisations and included both researchers and practitioners.

Photo: AHP

In the past, zoonotic diseases have often been relatively neglected as they tended to 'fall through the cracks' between the veterinary and medical worlds. An important objective of the workshop was to see what lessons had been learned from carrying out zoonosis research and assessing how successfully the projects had been able to accommodate the different – perhaps competing and conflicting – needs and priorities of medical and veterinary researchers and practitioners.

Factors identified by the workshop participants were clustered into 'bridges' and 'barriers' to organising and managing zoonotic research involving both veterinary and medical researchers and practitioners. It was perhaps telling that far more barriers were identified than bridges.

Bridges	**Barriers**
Collaboration, integration, networking and partnership from inception to completion of research projects and bringing together both medics and vets and basic and applied research	Rivalry (institutional and professional), competition, institutional separation, poor linkages (e.g. between the Ministry of Health and the veterinary authorities)
	Bureaucratic bottlenecks: who makes the decisions?
	Control of zoonotic diseases based on fire-fighting/crisis management
	Unregulated international trade in livestock and livestock products hampers control

Bridges	**Barriers** (continued)
Buy-in from professional associations	Lack of clarity of the roles of public and private sector partners
	Confusion: who pays, who gains?
Sufficient money in budget(s)	Lack of resources
	Budgetary separation: veterinary and medical costs not pooled
Capacity building: common training in zoonotic diseases for both vets and medics	Training gap: lack of emphasis on zoonotic diseases
	Weak veterinary public health infrastructure
Dual benefit: gains for animal and human health	Difference of emphasis: medics focus on individual patients; vets on populations
	Malaria: though not a zoonosis, cattle can be important in its epidemiology, yet it is not a zoonosis so is not included in zoonotic initiatives
Demand driven, problem-led research	Research being not demand-driven but donor-led
	Applied research is not recognised/rewarded as being as important as basic research
Advocacy for zoonotic diseases	Inadequate resources for dissemination of results and raising public awareness
	Lack of consensus on priority setting

In drawing up these lists, it is hoped that they can be used as checklists to guide planning, organisation and management of future zoonosis research and also to allow veterinary and medical authorities to identify and tackle some of the overarching problems, such as the lack of emphasis on zoonotic diseases in the training of both medics and vets.

The need for well managed, well-organised and effective zoonosis research has never been greater: it has recently been suggested that 75% of emerging diseases (including SARS, avian influenza, HIV, Ebola, West Nile virus and Nipah) are zoonotic. A recent consultation organised by WHO[9] concluded: "Emerging zoonotic diseases are increasingly recognized as a global and regional issue with potentially serious human and economic impacts, and their current upward trends are likely to continue".

1.4 New knowledge and innovations

In addition to the zoonotic disease work featured this year and whose impact is discussed in the previous section, many of AHP's other research projects have, this year, provided new insights or added value to the work in which they are engaged. Three in particular are described in this section. The research work investigating whether insecticide-treated cattle will reduce the mosquito as well as the tsetse fly population, and hence the impact of both malaria and sleeping sickness in people,

[9] WHO/FAO/OIE (2004). Report of the WHO/FAO/OIE joint consultation on emerging zoonotic diseases. WHO/FAO/OIE (World Health Organization/Food and Agriculture Organization of the United Nations/ International Office of Epizootics), Geneva, Switzerland.

is finally coming to fruition and showing some startling results (see Box 1.4). Box 1.5 (p. 16) outlines further evidence of the difficulties faced by livestock keepers in dealing with endemic disease and their high cost of treatment. The improvements in efficacy and cost-effectiveness offered by more targeted insecticide-treatment of cattle to kill tsetse, are presented in Box 1.6 (p. 17). These all describe how AHP researchers have been trying to find ways of empowering African farmers to deal with the major health problems faced by their livestock in today's environment of limited veterinary and extension support.

Box 1.4 **Mosquito-killing cattle: a novel approach to controlling tsetse and mosquitoes**

Photos: Steve Torr

Use of insecticide-treated cattle to kill ticks and tsetse flies has become an increasingly important approach to the control of tick-borne and tsetse-transmitted diseases over recent years. And with cheaper, generic versions of synthetic pyrethroid insecticides now available, this approach has become accessible even for poorer livestock keepers. Not content with using one insecticide to manage two important groups of livestock diseases, a group of AHP-funded researchers have been investigating whether it is also possible to control mosquitoes at the same time, and thereby also have an impact on malaria.

In the more arid parts of eastern and southern Africa, the main vector of malaria is a species of mosquito called *Anopheles arabiensis*. This mosquito obtains a significant proportion of its bloodmeals from cattle, raising the intriguing possibility that, in areas where malaria is mainly transmitted by this vector, insecticidal treatment of cattle could reduce malaria incidence. This concept is being tested in Konso district, southern Ethiopia. Konso is well suited to the trial: *A. arabiensis* is the main vector of malaria; more than 70% of households own livestock; and the local farmers already use synthetic pyrethroids on their cattle to control tsetse and trypanosomiasis.

The project has shown that in Konso, mosquitoes take up to 91% of their bloodmeals from cattle, even when people are available as alternative hosts. This is an interesting result because experiments carried out in laboratory conditions, in which the mosquitoes were offered a choice between human and cattle odours, showed that more than 80% of the *A. arabiensis* mosquitoes opted for humans. Careful observation, however, showed that when people sleep on platforms raised a metre or more from the ground, or when cattle surround the hut at night – both of which are common practices locally – the number of mosquitoes biting people is reduced.

The project has demonstrated that, while it would be possible to significantly curtail malaria incidence by applying insecticide, the way the insecticide is currently used will need some modification in order to maximise impact. Further research is now planned to devise a cost-effective application regime that allows the simultaneous control of tsetse and mosquitoes. At the same time, another research project is attempting to determine the feeding preferences of populations of *A. arabiensis* in Tanzania and Zimbabwe. Furthermore, analysis of existing data on the

Photo: Steve Torr

distribution of malaria vectors, people and cattle across Africa is expected to identify areas where the use of insecticide-treated cattle could make a significant contribution to the control of malaria.

In Ethiopia, AHP-funded researchers, working closely with the NGO FARM-Africa, are planning to produce a local-language radio programme to aid the dissemination of information on malaria and its control to communities and health practitioners in southern Ethiopia.

Project R8214

Box 1.5 **Further insights into the problems facing cattle-keepers in western Kenya**

Trypanosomiasis is a major constraint to cattle productivity in tsetse-infested western Kenya. One AHP-funded project has spent the last few years striving to improve the use of trypanocidal drugs by local farmers. During the last 12 months, the researchers have turned their attention to the specific problem of estimating the correct weight of cattle.

It is believed that under-dosing is a major factor in the development of drug-resistant populations of trypanosomes. Since no new trypanocidal drugs for use in cattle have been introduced for more than 40 years, it is especially important to try to ensure that existing drugs continue to remain effective for as long as possible. Reasonably accurate weight estimation is essential if trypanocidal drugs are to be administered at the correct dosage.

The project has shown that both local farmers and animal health workers (AHWs) tended to consistently underestimate the weight of cattle. On average, farmers underestimated bodyweight by close to 50%. In contrast a weigh-band produced and distributed by a veterinary pharmaceutical company, overestimated the weight of cattle by an average of 35%. These findings are alarming in view of the association between under-dosing and development of drug resistance and also the narrow therapeutic range of trypanocidal drugs.

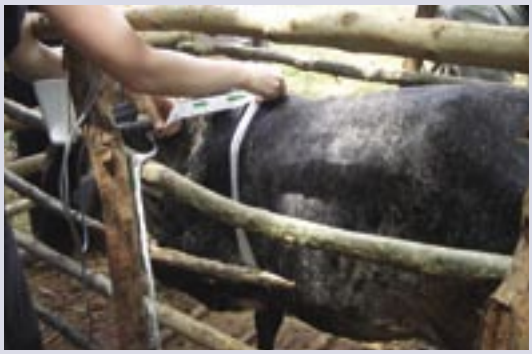


Photo: Noreen Machila-Eisler

The AHP-supported researchers also produced shocking data demonstrating the enormous impact that livestock diseases have on the benefits that local farmers derive from their cattle. Nearly a third of livestock die in a given year, even though no major epidemic diseases have been recorded. The overwhelming majority of these losses are caused by disease and must therefore be ascribed mainly to endemic problems: trypanosomiasis and TBDs. In the town of Busia, for the 2 years studied, the cost of disease-related mortality in cattle was shown to be equivalent to about 80% of the total value of livestock output in livestock-keeping households. This clearly illustrates the pressing need to improve the standard of disease management and control.

Project R7360

Box 1.6 **Don't splash it on all over: cutting the cost of treating cattle with insecticide**

Photo: Andrew Brownlow

In previous AHP annual reports, promising results have been reported from Zimbabwe showing that, because the tsetse species *Glossina pallidipes* takes its bloodmeals mainly from the front legs of cattle, this species could be effectively controlled by applying insecticide only to that part of the body (Less is more: restricted application of insecticides on cattle, AHP Annual Report 2002–2003). This approach uses much less insecticide than the conventional whole-body application, offering the opportunity for considerable cost savings as well as environmental benefits.

During the last year the researchers have gone on to show that the Zimbabwean *G. pallidipes* is not the only type of tsetse fly to prefer taking its bloodmeals from bovine legs. Studies carried out in South Africa, Tanzania and Zimbabwe involving four different species of tsetse – representing two of the three main groups of tsetse – have shown that for all the species and countries observed, more than three-quarters of tsetse bloodmeals were taken from the cattle's legs or bellies, with almost half were taken from the legs.

Further trials in Zimbabwe have shown that the most cost-effective regimen is to apply insecticide to the legs and bellies at 2–3 week intervals. This is slightly more frequent than the monthly interval usually recommended for whole-body treatment, but restricting application to just the legs and bellies halves the cost of insecticide used while simultaneously improving overall efficacy. The researcher suggests this regimen is appropriate for all four species of tsetse so far studied. It also offers amazing value for money: effective control of tsetse for less than US$1 per animal per year.

Projects R7539, R7987 and R8318

Photo: Andrew Brownlow

2. Programme Management Strategy

2.1 Management structure

AHP continues to organise its research portfolio under four themes:

- 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 (TBDs).

The projects included in the first three are, for the most part, adaptive projects, although some do include basic research components, for example in developing diagnostics (R7596, to differentiate between livestock and human infective trypanosomes). The vaccine development theme currently contains only one project, that undertaking the ECF vaccine development work commissioned by DFID's Rural Livelihoods Department (RLD), to be managed by AHP with most of the funding coming directly from DFID.

These themes reflect AHP's commitment to focus on those diseases which are of greatest importance to poor livestock keepers, which are the endemic diseases rather than the transboundary diseases or those diseases which affect trade. AHP's geographic and disease focus was refined in the light of the report on animal health and poverty it commissioned (Perry *et al.*, 2002[2]) and the livestock and poverty mapping study (Thornton *et al.*, 2002[3]).

In mid-2004, as part of its preparation for the tendering process for the 2005–2006 extension, AHP reviewed those project clusters it had identified at the end of the previous year as being particularly promising. The first cluster consisted of the current and recently completed projects in the human health impacts of animal diseases theme, which are featured in this year's annual report. AHP researchers have studied three diseases that are transmitted to people by livestock, primarily cattle: sleeping sickness, bovine TB and brucellosis. In the past, AHP has also worked on cysticercosis (associated with keeping pigs in conditions of poor hygiene) and rabies (mainly transmitted to people by dogs). AHP researchers have demonstrated that these zoonoses have a much higher incidence (10 to 100-times greater) than is officially recorded and that the main victims are the isolated rural poor.

The second cluster centred on those projects that aimed to empower farmers to deal with trypanosomiasis, the endemic disease of livestock that spans the African continent. This cluster involved AHP and DFID's Livestock Production Programme (LPP) working in tandem on various aspects of the disease. The focus has been on studying farmers' knowledge of this disease and their treatment practices, and also looking at simple, farmer-based methods of controlling the vector, the tsetse fly, in particular the treatment of cattle with an insecticidal spray or pour-on formulation. It is only very recently that researchers have shown that the cost of this approach could be

substantially reduced by applying insecticide only to the bellies and legs of cattle (Projects R7539[10], R7987 and R8318; see Box 1.6 in Chapter 1). Other AHP-funded work on trypanosomiasis has looked at the ways in which farmers in poor livestock-keeping communities deal with the disease, and has tested ways of enhancing their ability to do so through better knowledge and improved pen-side, low-cost diagnostic capacity (R7360 and R7597[11]). The heavy losses that endemic diseases inflict on farmers in these communities have also been quantified (R7360). This cluster of projects was highly commended by last year's evaluation[12] of DFID's RNRRS for illustrating "the importance of addressing a major constraint from different perspectives".

The third cluster chosen for prioritisation is within the theme of dissemination and delivery of animal health knowledge, and includes the keystone of AHP's dissemination strategy – the livestock FFS. AHP research has already achieved proof-of-concept by showing that it is possible to adapt the highly successful FFS approach to livestock, enabling farmers to ask for, access and test information about improving their animals' health and productivity (R7986 plus bolt-on activities). Now, with the 'graduation' of the first groups of FFS farmers, there has been great international interest in this approach, and half-a-dozen African countries have asked for help in setting up their own livestock FFSs. Also included in this cluster is the project developing touch-screen information kiosks – terminals that local farmers visit and interrogate about livestock health problems, that have been developed for India where information technology is widely used and understood (R8152[13]). To support this and other work within the dissemination theme, AHP is funding the continued collection and collation of information on the animal health needs of poor livestock keepers.

Looking at the work on vaccines, AHP is promoting the continuation of vaccine development activities through the setting up of GALV, the Global Alliance for Livestock Vaccines. The future funding of the East Coast fever (ECF) vaccine development project (R8042), which was directly commissioned by DFID, needs to be assured; AHP is investigating various routes by which this might be done. It should, however, be emphasised that although AHP has selected certain project clusters for further work in this last phase of the RNRRS, this does not mean that it is not continuing to promote past and present work in other areas, for example, helping goat farmers deal with worms, or any of its other work on TBDs.

AHP has thus formalised its management strategy for the last 2 years of the RNRRS. Commissioning new lines of research is obviously not viable within the framework of a 1-year extension, therefore AHP has concentrated on promoting three activities for each cluster, as illustrated in Figure 2.1. These are designed to ensure that the clusters either achieve end-user impact or are delivered to target groups who will in turn ensure that the results reach their ultimate beneficiaries. The activities consist of:

- Holding paired workshops: one that is primarily for AHP researchers, collaborators and stakeholders and one that is directed at an international audience

[10] R7539 – Environmental risks of insecticide-treated cattle in semi-arid livestock systems. Project finished in 2003.

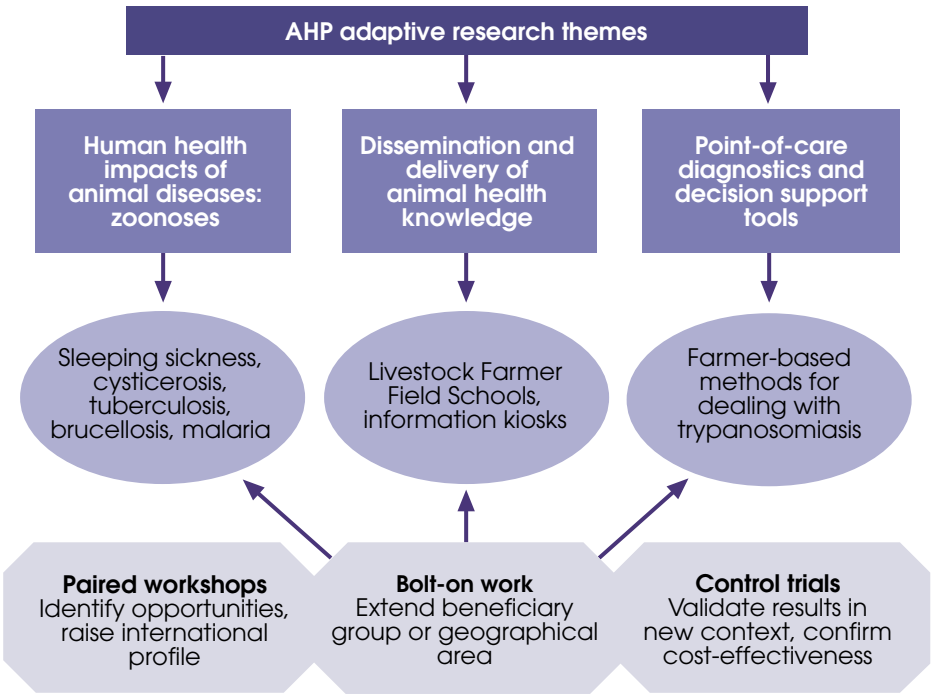
[11] R7597 – A low-cost haemoglobinometer and a decision-support tool for bovine disease diagnosis in sub-Saharan Africa. Project concluded in 2003.

[12] LTS International (2004). Evaluation of DFID Renewable Natural Resources Research Strategy. LTS International, Edinburgh, UK. 92 pp. plus annexes.

[13] R8152 – Dissemination of animal health knowledge for the development of landless livestock owners in the peri-urban regions of Pondicherry, India. Project concluded in March 2004.

- Commissioning bolt-on activities that are designed to extend a project's scope either by investigating new geographical areas or involving new beneficiary groups
- Conducting control trials to further validate and test the disease control techniques that have been developed as a result of AHP research.

Figure 2.1 **AHP's management strategy 2004–2006**



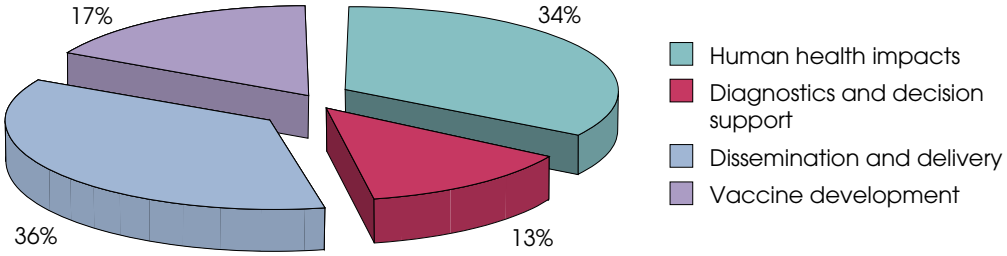
Over the past year, AHP's project portfolio has consisted of 11 R-numbered projects and a number of programme development activities as detailed in Section 2.2. The number of research projects has been declining over these last years of the RNR strategy following the decision in 2002 not to commission 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 on projects and work managed by the AHP in 2004–2005 was £2.14 million. This was subdivided as follows:

- £0.94 disbursed in 2004–2005 on AHP's R-numbered project portfolio. Total portfolio allocation during these projects' lives comes to £4.51 million
- £0.81 million, provided by DFID to AHP, for the funding of the RLD-commissioned project R8042 to develop a vaccine for ECF. To date, this project has been allocated a total of £5.16 million, of which £4.41 million was contributed directly by DFID and £0.75 million came from AHP funds
- £0.40 million of programme development expenditure incurred by the AHP in 2004–2005, mainly on dissemination and delivery, but including several bolt-on activities to existing project clusters (see Table 2.1).

The charts below show how the core AHP-funded portfolio of £4.51 million was divided between themes (Figure 2.2) and regions (Figure 2.3). As can be seen from Figure 2.2, the bulk of the

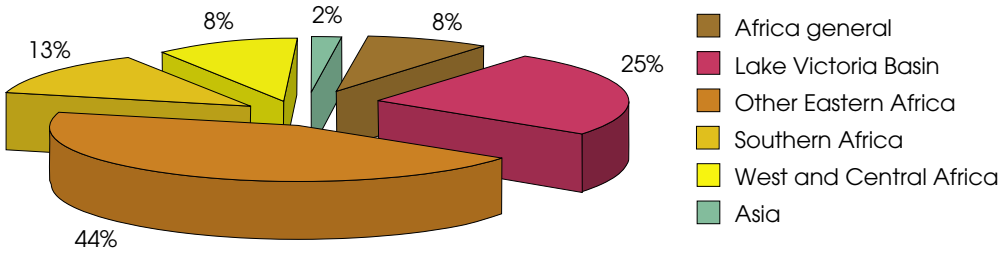
AHP allocation went to dissemination and delivery projects, as would be expected at this stage in the RNRRS. The dissemination and delivery theme projects have a total of £1.64 million allocated to them, out of which £0.38 million was spent in 2004–2005. The projects dealing with the human health impacts of livestock diseases spent £0.37 million in 2004–2005 out of an allocation of £1.53 million. The diagnostics and decision-support projects currently have a much lower allocation of £0.60 million, of which £0.13 million was spent in 2004–2005. Evaluating the share going to vaccine development is more complex, since this is funded from two sources: a direct contribution from DFID amounting to £0.81 million in 2004–2005 and £4.41 million allocated over the project's life, and £0.06 million from AHP in 2004–2005 and £0.75 million allocated in total over the project's life. The share of direct AHP funding going to this vaccine development work is what is included in Figure 2.2.

Figure 2.2 **Current AHP funding by themes**
Total AHP allocation to project portfolio: £4.51 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, AHP's own project portfolio currently allocates 98% of its funds to Africa. Specifically, 25% is going to the Lake Victoria Basin, which was identified by the Thornton *et al.* report[3] as being a key area where helping poor livestock keepers can lead to poverty alleviation. A further 44% 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 found echoes the priorities and preoccupations both of DFID and those outlined by the Commission for Africa in its report (see Chapter 1).

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



2.2 Programme development

Programme development activities during the course of 2004–2005 consisted of both the usual expenditures on travel, promotion and dissemination of AHP outputs, and publications and reports as well as a number of special activities falling under the headings outlined above of paired workshops, bolt-on activities and control trials (see Table 2.1). Last year saw an additional publication in the AHP 'blue' series, which detailed the workshop on farmer-based approaches to tsetse control[14]. Several others are in the pipeline. In addition to AHP's ongoing in-house promotion and dissemination activities, other major AHP inputs to dissemination activities included support for the EU Technology Platform for Global Animal Health and the Integrated Control of Pathogenic Trypanosomiasis and its Vectors (ICPTV). The aim of the Technology Platform is to create a global livestock development partnership to promote research into diseases affecting animals in Europe, including tropical diseases that can spread to Europe. In this way, it is hoped that the platform will benefit poor livestock keepers in the tropics by raising the profile of the endemic diseases that affect them and attracting funds for research on and control of these diseases. The activities of ICPTV, which plays a valuable role in bringing together policy makers and researchers in the tsetse and trypanosomiasis field, has been consistently supported by AHP.

Table 2.1 **Breakdown of programme development expenditure 2004–2005**

	UK £ '000
Zoonoses workshop	13.5
EU Technology Platform	92.0
Prioritising animal health constraints faced by the poor	60.0
FFSs – The Gambia	13.0
Assessing the experience of FFSs in Kenya	20.0
Trypanosomiasis control impact assessment study, Uganda	55.8
Financial support for the EU-funded ICPTV	50.0
Promotion and dissemination	69.2
Publications and reports	13.0
Travel	8.5
Total	**395.0**

The major workshop funded during the year focused on zoonoses, as reported in Section 1.3. Bolt-on activities consist of the further work done on setting up livestock FFSs in The Gambia and an impact assessment of trypanosomiasis control strategies in Uganda. In response to feedback on the Perry *et al.* report[2], a further study has been commissioned that will try to provide a more quantitative underpinning to the prioritisation of livestock diseases, based on their impact on poor people. This study will particularly revisit the species ranking, under the heading of prioritising animal health constraints faced by the poor. The work being undertaken by project R8213 'Including the voices of the poor', which has been granted an extension, will add further insights to this study.

[14] AHP-DFID (2004). Recent advances in livestock keeper-based tsetse control: the way forward. Report of a workshop organised by the DFID Animal Health Programme, held in Nairobi, Kenya, 21–23 October, 2004. DFID-AHP, Centre for Tropical Veterinary Medicine, Edinburgh, Scotland. 68 pp.

The Nairobi zoonoses workshop brought together veterinary and medical researchers

Photo: AHP

2.3 New initiatives and scaling up

The new activities being commissioned by AHP during these last 2 years of the current RNRRS are outlined under three headings, as explained in Section 2.1.

Paired workshops

For each project cluster, two workshops are being held. One is an 'in-house' workshop, focusing on AHP researchers and other people working in the same sub-region or on closely related investigations. The objective is to exchange ideas, understand how the different strands of work complement each other, and above all to brainstorm about how the existing research is delivered to end-users and to identify opportunities that would enable it to be extended to other end-user groups or geographical areas. The other workshop is an international event, attracting a high-profile audience of policy makers and researchers to enable the former to become aware of what the latter have achieved, and ensure that these new innovative approaches become firmly established on the international development agenda. So far, both workshops have been held for the cluster concerning farmer-based methods of controlling trypanosomiasis. One of the workshops on zoonotic diseases was held in February 2005, as reported in Section 1.3, while in September 2005 a second, international, workshop will be held in Geneva to be hosted by WHO. For the third cluster, AHP hopes to build on the international interest in the livestock FFSs by holding a workshop for those countries that have enquired about help to start their own FFSs. Such a workshop would provide both a forum for discussion and also information about how to embark on and fund this activity. The AHP approach to holding workshops is, as far as possible, to run them on innovative participatory lines with a trained moderator – this approach is particularly important for brainstorming in the in-house workshops.

Bolt-on activities

AHP has been promoting bolt-on activities to existing research projects or clusters for the past 2 years. This approach has already been used for brucellosis and TB for projects in Tanzania and four countries in West Africa. These new activities will test whether the dual control of malaria and tsetse flies, which has been tested in Ethiopia, is feasible with the same species of mosquito and tsetse in a region of Tanzania. The work showing the importance of cattle as a reservoir of sleeping sickness is being reinforced with a parallel study on pigs in Tanzania and Uganda where data will also be collected on the incidence of cysticercosis, the cystic stage of the pork tapeworm that also infects humans. Cysticercosis appears to be an emerging health problem for people in Uganda and western Kenya, where pig-keeping has increased rapidly in recent years. Having demonstrated their effectiveness in the smallholder dairy sector of Kenya, the livestock FFSs are being extended to

pastoralists and small-scale farmers keeping indigenous stock in the Turkana region of Kenya and to southern Sudan. In both of these regions, extension and veterinary services are virtually non-existent; the extent to which the livestock FFSs can replace them is being investigated. The establishment of livestock FFSs in The Gambia was also taken a stage further in 2004–2005 with AHP funding (see Box 2.1).

Box 2.1 **Development of Farmer Field School methodology for small-ruminant producers in The Gambia**

A collaborative programme from the International Trypanotolerance Centre (ITC) and the Gambian Ministry of Agriculture, Department of Livestock Services, led to the establishment of four small-ruminant FFSs in the Central River Division (CRD) of The Gambia in 2004. Most of the small ruminants in The Gambia are owned by women, who also form the majority of the FFS members. Almost all participants are illiterate, so development of a common recording system based on symbols and pictures was required. A pictorial training manual with guidelines for improved small-ruminant production in The Gambia was also produced as reference material. The FFS developed group action plans around the main areas of concern and intervention: housing small ruminants and its relationship to diseases (ectoparasites and footrot), *peste des petits ruminants* (PPR) and dry-season feed shortages. In 2005, with DFID-AHP support, a Training-of-Trainers course will be held to refresh the 'dormant' FFS facilitators, the number of FFS sites will be increased in CRD and interventions will expand to the Western Division.

Further commissioning of bolt-on activities for AHP's zoonotic disease cluster was formally undertaken in February 2005. AHP believes that this area of research holds great potential for poverty alleviation by dealing cost-effectively with diseases that affect both human and livestock health. To this end, at the workshop on zoonotic disease control held in Nairobi, AHP issued a restricted call asking for small proposals (costing £20,000, with a 1-year duration) that would add value to existing work on zoonotic disease control, either through refining the work already done or by extending the work to new geographic locations. Nine proposals were submitted: three on sleeping sickness; two on brucellosis; one each on rabies, cysticercosis and bovine TB; and one combining work on sleeping sickness and cysticercosis. These will be judged on their scientific merit, contribution to the development of sustainable cost-effective control strategies and on the extent to which they provide opportunities for African scientists to manage the work and develop their own research skills.

Control trials

Although all the research clusters chosen have already undertaken field-level experiments to validate their results, conducting larger-scale control trials to demonstrate that these can be successfully implemented and that they have developmental impact is an important next step on the uptake pathway. Therefore, a number of trials are in progress or are planned. For instance, R8318 is examining the impact of restricted application of insecticide to cattle's legs on the prevalence of trypanosomiasis in cattle. This project is also validating two diagnostic tools: the haemoglobin meter and the decision support card. The effect of block treatment of cattle with trypanocidal drugs is being tested in R7596, in collaboration with FITCA Uganda (one component of the multi-country project FITCA – Farming in Tsetse Controlled Areas).

Trusting in the future – children in Uganda – our ultimate beneficiaries
Photo: Sue Welburn

2.4 Collaboration with institutions

AHP has continued to maintain a project portfolio that emphasises overseas collaboration and leadership; a third of its current projects are led by institutions based outside the UK. The proportion of AHP's total outgoings (i.e. including research projects, programme development expenditure and the full contribution from DFID to the ECF vaccine project) that went to collaborators in developing countries in 2004–2005 was 54%. AHP is pleased that it has been able to maintain this high share, and it intends to ensure that a substantial proportion of any bolt-on activities commissioned in the next year will also go to overseas collaborators in this way. AHP's view, which was strongly endorsed by the RNRRS evaluation report[12], is that it is a major and serious responsibility of 'northern'-funded research such as that supported by the RNRRS to try to foster and develop longstanding partnerships with 'southern' research institutes, and to ensure that it plays a major role in capacity building, notably by funding PhD work (see Section 3.4 and earlier annual reports). The Commission for Africa report[1] also highlights the need for long-term partnerships and for investment in scientific capacity building.

> 'The shortage of skilled professionals in Africa is a critical issue… There is a particular shortage in the science skills that are fundamental to addressing Africa's problems… A long-term programme of investment is needed, both to revitalise African universities and to support the development of centres of excellence in science, engineering and technology, including African institutes of technology.'
>
> Commission for Africa report (March 2005)

Although the number of projects in AHP's portfolio is gradually being reduced as the end of the current RNRRS approaches, AHP's research projects and programme development activities continue to involve collaboration with a wide range of organisations, including:

- The International Livestock Research Institute (ILRI), a member of the Consultative Group on International Agricultural Research (CGIAR), which is implementing the main vaccine development research project and is undertaking some further bolt-on work to the disease prioritisation study published in 2002, as well as being a partner in a number of individual research projects
- UK-based collaborators such as the Natural Resources Institute (NRI), Natural Resources International Ltd (NRIL), the Universities of Edinburgh and Glasgow, and the University of Reading's Livestock Development Group
- Various national and international overseas institutions including: the Food and Agriculture Organization of the United Nations (FAO) in Rome; the ITC in West Africa; the Ludwig Institute for Cancer Research (LICR) in Brussels; the BSF; Sokoine University of Agriculture (SUA) and the National Institute for Medical Research (NIMR) in Tanzania; the Kenya Agricultural Research Institute (KARI); Onderstepoort Veterinary Institute (OVI) in South Africa; the Département national d'élevage (DNE) and the Institut de recherche agronomique de Guinée (IRAG) in Guinea; the Direcção Geral da Pecuária (DCP) of Guinea Bissau; the Department of Livestock Services (DLS) of The Gambia; the 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
- NGOs, which are increasingly active collaborators in projects, including FARM-Africa and VSFB. AHP researchers are also linking directly with some development projects, for example, Land o'Lakes and FITCA
- Other DFID programmes such as LPP in joint initiatives, in particular the work arising out of the jointly funded project R7539, which, along with other AHP and LPP-funded projects, developed the 'restrictive application' technology and led to the Tsetse Plan interactive software program for planning tsetse control interventions (R7987), wholly funded by AHP. Researchers from the two programmes have also jointly attended workshops, in particular LPP researchers joined the AHP-funded zoonoses workshop reporting on the problems of zoonoses revealed by LPP's scoping study on urban livestock keeping, while AHP researchers attended LPP workshops on goat keeping.

2.5 Livestock Programmes Advisory Committee

As in the previous 2 years, the Livestock Programmes Advisory Committee (LPAC) met once during 2004–2005 to update itself on progress at both the AHP and LPP. Neither programme issued a general call for concept notes in 2004–2005, although both issued restricted calls asking for concept notes addressing specific issues. These were put out for review, in part to LPAC members. The major event affecting both AHP and LPP last year was an evaluation of the whole of the RNRRS, covering all 10 programmes over the past 10 years. This was the main subject addressed by the PAC at its annual meeting. PAC members first submitted individual comments to DFID on the initial draft of the report, and a joint PAC statement was drafted and sent to DFID immediately after the PAC meeting in February. The PAC chair attended an initial briefing meeting held for all PAC chairs on the evaluation at DFID headquarters. This meeting was in fact the first formal meeting ever held that brought together members of the different RNRR PACs, although many informal

contacts existed. The PAC chairs made use of this occasion to compare notes and exchange views, and commented on how useful this occasion had been. This was noted in the evaluation team's report, which suggested that, were the RNRR system to continue on similar lines to the present system, such linkages between PACs should be formalised by holding occasional joint meetings. Each PAC chair was also individually interviewed by the evaluation team and invited to the final meeting where the team's results were presented. The LPAC chair attended this meeting together with the LPP and AHP programme managers. During the course of the year, individual PAC members also provided advice to the programme managers and attended meetings on their behalf as requested.

Animal to human

controlling diseases which affect poor people and their livestock

Photo: Andrew Brownlow

AHP work is reported in the May 2004 issue of *Insights Health*

3. Delivery of Outputs

3.1 Projects completed in 2004–2005

With AHP's smaller portfolio and the ending of several projects in 2003–2004, only one project was completed in 2004–2005.

R7360: Improved targeting and use of trypanocidal drugs

This long-running project's aim was to achieve a better understanding of how farmers in tsetse-infested areas deal with endemic diseases, with a focus on trypanosomiasis, and to investigate ways in which they could make better use of trypanocides to control this disease. Studies were conducted in Busia District in western Kenya and in Kwale District in coastal Kenya. The project initially investigated farmers' attitudes to trypanosomiasis and other livestock diseases, their veterinary care-seeking behaviour and their knowledge of the use of trypanocidal drugs. The project went on to study the socio-economic factors that influence and condition livestock-keeping in these areas. The study showed that the major factors influencing farmers' animal health management practices were their personal characteristics such as level of education, location and household resources. Extension messages were found to be a useful resource; farmers who received messages on trypanosomiasis control showed higher knowledge scores than those who did not. More recently, the project showed that farmers, and to a lesser extent AHWs, tend to underestimate the weight of cattle, leading to concerns about underdosing sick cattle with trypanocides. The enormous impact of livestock diseases on smallholder farmers was revealed by results showing that nearly a third of livestock die of disease-related causes every year. Endemic diseases were estimated to cost individual livestock-keeping households an amount equivalent to 81% of the total value of outputs from their livestock per year.

3.2 Programme reporting

Reporting by the project leaders was generally adequate and timely. The AHP produced quarterly reports for DFID as required. There are now no outstanding Project Completion Summaries (PCSs) or Final Technical Reports (FTRs). Those submitted during 2004–2005 are detailed in Tables 3.1 and 3.2.

Table 3.1 **Project Completion Summaries received 2004–2005**

DFID R No.	Short title	End date	Date due	Date sent to DFID
	Dissemination and delivery of animal health knowledge			
8152	Dissemination of animal health knowledge to peri-urban landless livestock owners	Mar 2004	May 2004	Aug 2004
	Point-of-care diagnostics and decision-support tools			
8022	Cerebral theileriosis	Mar 2004	May 2004	Aug 2004

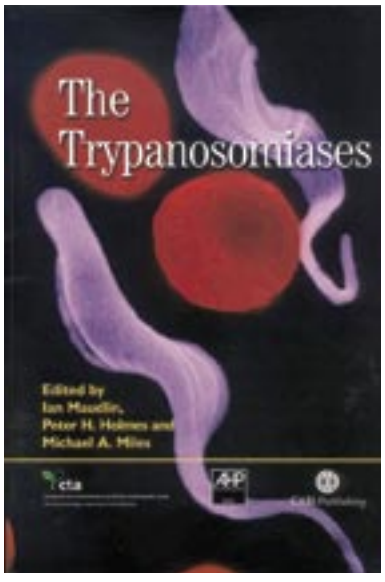
Table 3.2 **Final Technical Reports received 2004–2005**

DFID R No.	Short title	End date	Date due	Date sent to DFID
	Dissemination and delivery of animal health knowledge			
8152	Dissemination of animal health knowledge to peri-urban landless livestock owners	Mar 2004	May 2004	Aug 2004
	Point-of-care diagnostics and decision-support tools			
8022	Cerebral theileriosis	Mar 2004	May 2004	Aug 2004

3.3 Publications and dissemination outputs

The year 2004–2005 has been a particularly successful one from the point of view of projects' dissemination outputs and publications. The projects are doing an excellent job of producing a wide selection of outputs targeted at different audiences. In particular, the various information products listed at the end of this chapter contain two highly innovative interactive web-based packages. Tsetse Plan, produced by R7987, is an interactive program that helps users to design and implement community-based operations to control tsetse. A successor, Tsetse Muse, is being developed to enable users to create their own general model of the cost and impact of any control technique (i.e. ground or aerial spraying, bait technologies and the sterile insect technique) applied singly or in combination on any tsetse population. The other web-based package supports AHP's ongoing commitment to focus on poverty within its animal health work and to develop outputs and tools that other donors, developers and researchers can use to better understand the animal health needs of poor livestock keepers. Poverty Assessor™, the output of R8213, enables users to evaluate the poverty impact of both livestock and non-livestock livelihood strategies and specific livestock diseases.

The DFID-commissioned evaluation of its RNRRS examined the quality of science produced by the different RNRR programmes, specifically looking at innovation, risk-taking and scientific impact. In particular, the evaluation commended AHP's combination of adaptive and basic research, and in this context the high impact value of some of AHP's recent publications also received favourable comments. At the time of going to press, AHP learned that project R7596 had just had yet another paper accepted by *The Lancet*, the high-impact independent British medical journal, bringing the total published to three in as many years. The ECF vaccine development project (R8042) has had a paper on the sequencing of *Theileria parva* genome accepted by *Science*, the prestigious American journal.



In 2004 the long-awaited book entitled *The Trypanosomiases* that updates the classic text edited by Mulligan (1970)[15] was published. It consists of 33 chapters providing definitive analyses of all aspects of the disease, its vector and

[15] Maudlin, I., Holmes, P.H. and Miles, M.A. (eds.) (2004) *The Trypanosomiases*. CAB International, Wallingford, UK. pp 614; Mulligan, H.W. (ed.) (1970) *The African Trypanosomiases*. George, Allen and Unwin, London, UK, pp 950.

their control. Of the chapters, 9 were written by researchers funded by the AHP over the last decade and 5 are cited as project outputs in Annex A. However, virtually every chapter reflects or reports on work funded by DFID and its predecessor, the Overseas Development Administration (ODA), over the past 35 years, thus paying a huge tribute to the contribution this funding has made to knowledge on this subject.

Table 3.3 summarises the publications and dissemination outputs produced by AHP's current projects. A full list of all their publications and dissemination materials can be found in Annex A and the information products that have been completed are listed at the end of this Section.

Table 3.3 **Publications and dissemination outputs 2004–2005**

DFID R No.	Short title	A	B	C	D	E	F	G	H
	Human health impacts of animal diseases: zoonoses								
7596	Decision support for trypanosomiasis control in south-eastern Uganda	12	5	1	0	0	0	0	0
7985	Emerging zoonoses in East Africa	7	6	0	0	0	0	0	0
8214	Controlling malaria and trypanosomiasis with insecticide-treated cattle	1	2	0	0	1	0	0	0
	Point-of-care diagnostics and decision-support tools								
8151	Improving the livelihoods of resource-poor goat farmers in southern Africa	0	3	1	18	0	0	0	0
8213	Including the voices of the poor	1	4	0	0	0	1	0	2
	Dissemination and delivery of animal health knowledge								
7360	Improved targeting and use of trypanocidal drugs	1	1	0	0	2	0	0	0
7986	Livestock Farmer Field Schools	1	0	1	0	0	0	2	0
7987	Message in a bottle: disseminating tsetse control technologies	6	1	0	1	0	1	0	2
8318	Decision support for endemic disease control	5	3	0	0	0	0	0	1
	Vaccine development for tick-borne diseases								
8042	Integrated control of East Coast fever	1	3	0	0	0	0	0	0

Key to scoring for publication categories (see also Annex A)

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

Information products

R7596

Reports: Fèvre, E.M., Picozzi, K., Fison, T., Wissmann, B.v. and Welburn, S.C. (2005). Human trypanosomiasis surveys in southern Sudan and northern Uganda: final report. Centre for Tropical Veterinary Medicine, Edinburgh, UK. [**C**]

Wissmann, B.v., Fison, T., Picozzi, K., Fèvre, E.M. and Welburn, S.C. (2005). Animal trypanosomiasis survey in southern Sudan: final report. Centre for Tropical Veterinary Medicine, Edinburgh, UK. [**C**]

R7986

Report: Groeneweg, K. (2004). Monitoring and backstopping report on the implementation of FFS methodology within FITCA: provision of training services on Farmer Field Schools to AU/IBAR's Farming in Tsetse Controlled Areas Regional Programme. FITCA, Kenya, Tanzania and Uganda. [**C**]

R7987

Website: Vale, G.A. and Torr, S.J. (2004). Tsetse Plan 2004. An interactive computer program to help in the planning of operations to control tsetse using bait technologies. Available at www.tsetse.org [**H**]

Vale, G.A. and Torr, S.J. (2005). Tsetse Muse. A decision support system to assist in the planning of operations to control tsetse. Available at www.tsetse.org [**H**]

R8151

Report: Vatta, A.F. (2003) Improving the livelihoods of resource-poor goat farmers in southern Africa through strategic drug and nutritional interventions against gastro-intestinal nematode infections. Onderstepoort Veterinary Institute Annual Project Progress Report for Project OV 021/008 for the period September 2002 to November 2004. Hard copy and oral presentation on 29th November 2005. [**C**]

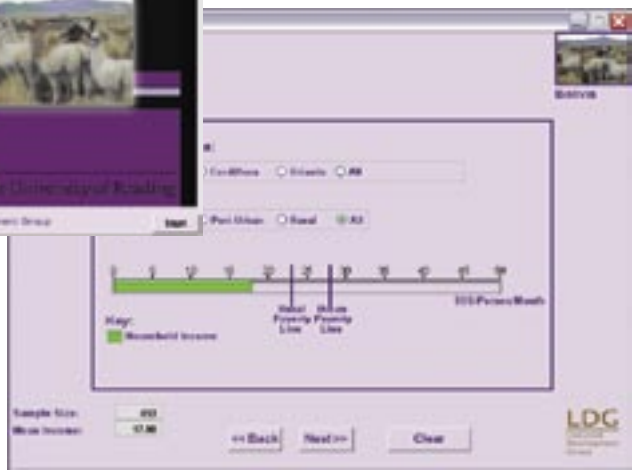
R8151 FAMACHA© system CD in Zulu and English

R8151 Small ruminant health series

R8213

Database: The Poverty Assessor™. An evidence-based tool for decision making in the livestock sector. [**H**]

Global Livestock and Poverty Dataset, compiled using data from 5,372 households. [**H**]



R8318

Database: Project data held at CTVM, Edinburgh, UK. [**H**]

4. Uptake Promotion

4.1 Promotion of project outputs

Radio plays an especially important role in the lives of many poor people in developing countries. Newspapers and other print media are often unavailable owing to difficulties with distribution to remote rural areas, and indeed many people lack either the cash to buy them or the reading skills to understand them. Television is similarly both unaffordable and unavailable to the vast majority. However, radio is accessible to almost all of the rural poor and programmes are often broadcast in a range of local languages, further increasing its reach. Project R7360 recently reconfirmed the importance of radio: a survey conducted by the project identified this media as being among the most important sources of animal health information for farmers in western Kenya.

AHP works closely with WRENmedia, a UK-based company that specialises in producing radio programmes focusing on development issues. Among WRENmedia's information products is the Agfax radio service, now in its 10th year of operation. Agfax consists of themed packs containing recordings of edited radio interviews, transcripts and suggested voiceover introductions that are sent out regularly to broadcasters across Africa. Local re-broadcasting of these interviews represents a cost-effective means of disseminating information to a broad audience, widely dispersed throughout the continent. Section 4.6 describes the media work done in 2004–2005.

A WRENmedia staff member attended AHP's recent workshop on zoonotic diseases and conducted a series of interviews with key participants. The interviews were subsequently edited into a number of Agfax packs, each dedicated to one zoonotic disease, and these will be sent out at monthly intervals. So far two packs have been distributed, one dealing with rabies and one with bovine TB, and others will follow during the coming months. In this way, key messages from AHP-supported zoonotic research projects will be made widely available.

Meanwhile another AHP-funded project in South Africa has used a wide range of dissemination approaches, engaging with both public and private sector partners to ensure the extension messages derived from its research on goats reach the intended beneficiaries (see Box 4.1 Getting the message across: dissemination of field-tested extension messages in South Africa).

4.2 Uptake promotion

The flagship of AHP's dissemination projects is one concerned with adapting and testing the FFS approach for smallholder dairy farmers. The FFS 'learning by doing approach' was originally developed in the 1980s to introduce rice farmers in Asia to the benefits of integrated pest management. Since then the approach has spread geographically and has also been used in a wide range of other farming systems and related activities but, prior to the AHP-funded project R7986, had seldom been applied to livestock. The adaptation of FFSs for livestock by this project has generated

Box 4.1 **Getting the message across: dissemination of field-tested extension messages in South Africa**

Resource-poor farmers in South Africa have problems with their goats, which they say 'don't multiply' and they suspect that 'izikelemu' and 'dibokwana' (worms) are a major cause of mortality. Similar problems are encountered by goat keepers across much of the African continent. An AHP-supported project based in South Africa has been addressing the farmers' concerns by combining an investigation into the benefits of seasonal nutritional supplementation consisting of urea–molasses blocks and targeted anthelmintic treatment, with dissemination of field-tested extension messages. The extension messages have been disseminated using imaginative and appropriate approaches through a variety of media and formats and taking full advantage of the comparative advantages of both public- and private-sector partners.

Initial trials of the urea–molasses blocks and anthelmintic treatments were carried out at a research facility and were later extended to on-farm trials. The trials were participatory in nature, bringing together local farmers, researchers and staff of the KwaZulu-Natal Department of Agriculture and Environmental Affairs. This approach – unthinkable in South Africa little more than a decade ago – worked well and had the additional benefit that farmers involved in the trials gained considerable first-hand knowledge about improved goat management even beyond the immediate focus of the trial.

The project produced a goat keepers' manual and field-tested draught versions with local communities before the text was finalised and copies printed in Africaans, IsiXhosa and Sesotho. The booklet entitled *Worms in your goats, sheep and cattle* has been distributed to the Northern Cape Department of Agriculture and Land Reform, Scientific Roets (a company with a focus on the commercialisation of goats within the Eastern Cape Province) and the Public Veterinary Services Eastern Cape Province. Booklets in Setswana produced during the previous financial year were distributed by Intervet South Africa in Botswana. (Booklets were also translated into IsiNdebele, Siswati, Tshivenda, Xitsonga and Sepedi during the previous financial year and are ready for printing, once resources are identified.)

The project also contributed a series of 12 monthly articles in English and Zulu on small ruminant health to a newspaper, the *Nufarmer and African Entrepreneur*, which is targeted at emerging farmers. It also supported the translation of a video into Zulu on the use of the FARMACHA© system (a simple colour comparison chart to help farmers identify those animals which are anaemic, a common symptom of certain worm infections). In addition, the project organised a series of workshops for both farmers and extension workers.

FAMACHA© training in Sun City Village KwaZulu Natal, South Africa

Photo: Adriano Vatta

The South African project has taken dissemination of extension messages very seriously, setting a good example to other projects with the wide range of different approaches employed and partners engaged with. In doing so, they have gone a long way to getting their field-tested messages across, thereby equipping local goat keepers to manage their goats better, and hopefully solving the problem of goat herds that 'don't multiply', to the mutual benefit of local goat keepers and goat-meat consumers.

R8151

Farmer field day in Kagaa, Kenya *Photo: Dave Elsworth*

enormous interest and as a result a wide range of organisations are now investing in livestock-focused FFSs, targeting a wide range of livestock species both within Africa and further afield. Most recently the multi-country research organisation Centro Agronómico Tropical de Investigación y Enseñanza (CATIE) in Central America has requested support for setting up livestock FFSs.

The FFS approach has clearly proven to be extremely popular with both group members and organisations concerned with livestock development. Having shown that FFSs can apply to the livestock sector, the AHP-funded project is now commissioning a major independent impact-assessment study. This is designed to test how successful the approach has been in improving the level of knowledge and promoting the adoption of best practice in relation to livestock health and production. More broadly, it will also determine how exposure to the approach affects relationships between farmers and the extension services, input suppliers, commercial dairies and researchers. It is envisioned that this study will make a significant contribution to the development of effective impact assessment methodologies applicable to FFSs. In the past, it has proven to be very difficult to develop methodologies for assessing the impact of such projects, particularly when only relatively short periods of time have elapsed, so this study will help fill a generally acknowledged gap. It is hoped that the impact assessment will also provide clear, evidence-based lessons that future livestock-focused FFS projects can use during their project design to increase their chances of success.

4.3 Programme outputs

Human health impacts of animal diseases: zoonoses

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

This project has been concerned with improving the health status of the human population and their livestock in tsetse-affected areas in south-eastern Uganda. Considerable progress has been made in improving understanding of the epidemiology of the disease, and this information has been used to help improve sleeping sickness and animal trypanosomiasis control, mainly by targeting treatments to livestock to improve both their health and that of the poor farmers who keep them. The research has been published in high-ranking peer-reviewed journals and has been the subject of considerable media attention, both within Uganda and internationally. The project

has also significantly advanced basic laboratory science and field methodologies. The Ugandan national policy for trypanosomiasis control has been directly influenced by the project findings, and project staff were asked to contribute to the formulation of this policy – meaning that DFID research outputs are now directly influencing policy-making. In its final year (project and extension), R7596 will consolidate the results and ensure adequate dissemination of the remaining outputs. The information and tools generated in Uganda for decision support for trypanosomiasis are being transferred to other East African countries.

FTA cards are a convenient way of storing blood samples from animals
Photo: Dave Elsworth

R7985: Emerging zoonoses in East Africa

Zoonotic diseases affect almost exclusively poor and powerless people living in rural parts of low-income countries. They can cause people immense suffering, life-long disabilities and even death, 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 are available, which have the potential for substantial impacts on poverty reduction. 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 aims 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, as well as to assess risk factors for infection in different communities.

Sampling blood from a lion
Photo: Sarah Cleaveland

R8214: Controlling malaria and trypanosomiasis with insecticide-treated cattle

Each year in Africa there are up to 450 million cases of malaria, with associated economic losses of approximately US$2 billion. In the more arid zones of eastern and southern Africa, the malaria vector is *Anopheles arabiensis*, a mosquito that feeds, at least in part, on cattle. It is therefore possible that by treating cattle with insecticide, this vector, and hence malaria, could be controlled. This approach has been shown to effectively control cattle-feeding vectors of malaria in Pakistan, but it has not been tested in Africa. However, paradoxically in Africa, insecticide-treated cattle are already being used in areas where *A. arabiensis* is the main vector of malaria, but for the control of tick- and tsetse-borne diseases. This 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 is 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 aims to identify those areas of sub-Saharan Africa where the use of insecticide-treated cattle is most likely to have an impact on malaria transmission.

Testing feeding patterns of mosquitoes

Photo: Steve Torr

Point-of-care diagnostics and decision support tools

Goat keepers' workshop in Nkwezela KwaZulu-Natal, South Africa

Photo: R.C. Krecek

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 often die. Parasitic gastro-intestinal worms (locally known as 'izikelemu' or 'dibokwana') are a contributing factor. For this reason, the project is studying the effect of improved feeding together with treatment with worm remedies on the health and productivity of goats. By improving the understanding of the relative benefits of both the treatments against worms and better feeding, veterinarians and those advising farmers will be able to provide appropriate information on how to optimise goat production and how the farmers may use

their limited resources to the best effect. In the first instance, the project is targeting the resource-poor goat farming communities of Hlafuna, Njobokazi and Nkwazela (Bulwer), KwaZulu-Natal Province, South Africa. Important elements of the project are the dissemination of a field-tested extension information package for goat keepers consisting of booklets and manuals and a simple test for anaemia in goats – the FAMACHA© system. The farmers' opinions and participation have been sought throughout the course of the project.

R8213: Including the voices of the poor

Project R8213 has interviewed 5372 poor livestock keepers in India, Bolivia and Kenya

Photo: Federica Misturelli

For the global community of the poor, livestock are a vital component to successful and sustainable livelihoods. However, for households dependent on livestock, the presence of disease can mean the difference between economic success and destitution. At best, sick animals mean increased labour and drug costs, and at worst, households may lose an important capital asset. 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 neither been appropriate to the specific animal health requirements of the poor, nor have they surmounted major 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 foremost, the most important thing to do is gain a better understanding of the livestock diseases that directly affect the livelihoods of the poor. Therefore, the objective of the research was to develop and promote an integrated, animal health prioritisation framework. However, 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 to delineate the actual poverty impact of different diseases on the poor.

Dissemination and delivery of animal health knowledge

R7360: Improved targeting and use of trypanocidal drugs

Researchers in this project have been investigating the ability of smallholder farmers and local AHWs to estimate the body weight of live cattle, in order to assess whether cattle are being underdosed with trypanocidal drugs and other veterinary pharmaceuticals. Weights of 324 local East African zebu cattle were measured on a calibrated scale (AELP pallet beams) in Busia District, western Kenya. It was found that farmers underestimated the live weights of 85.7% of the cattle by an average of 46.9% of the true weight, with the remaining 14.3% of cattle having been overestimated

by an average of 25.5%. By contrast, the proportion of cattle whose weight was underestimated by AHWs was not so high as in the case of farmers. AHWs underestimated the live weight of 63.3% of weighed cattle, by an average of 12.8%, with the remaining cattle's weights having been over-estimated by an average of 14.8%. Farmers' underestimation of cattle weights when compared to true weight raises concerns that sick cattle are being under-dosed with trypanocidal drugs. This project has also been looking into the factors influencing livestock-keeping dynamics among smallholder farmers in order to gain an understanding of how livestock keepers make decisions on the allocation of household resources and how this affects their ability to own and successfully look after livestock. Initial results show that livestock enterprises have very low inputs and outputs with a mean total annual output equivalent to £21.75 per household, and a mean total annual input equivalent to £3.40 per household. Animal deaths from disease were found to be a major burden on livestock keepers and were estimated to cost individual households per year an amount equivalent to 81% of the total value of annual output from livestock.

Interviewing smallholder farmers in Busia
Photo: Dave Elsworth

R7986: Livestock Farmer Field Schools

The successful development and application of livestock FFSs in Kenya during the first phase of the project generated a strong demand from our research and development partners for support in implementing FFSs for livestock in Africa and elsewhere. The scaling up of the methodology is constrained only by the number of FFS experts available and the lack of specific tools for very poor, illiterate and non-sedentary farmers. The pastoralist production systems of the Turkana region of Kenya differ considerably from the 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.

Participants at a farmer field day in Dagoretti, Kenya
Photo: Bruno Minjauw

R7987: Message in a bottle: disseminating tsetse control technologies

In Africa, animal trypanosomiasis, transmitted by tsetse flies, causes the death of about 3 million cattle each year, and the related annual losses in animal productivity are estimated to amount to up to £3 billion. Following economic crises, structural adjustment and the decline of veterinary services, the onus for controlling tsetse has fallen on livestock keepers themselves. However, partly as a consequence of the disease, livestock keepers are often too poor to afford the cost of control. This project is therefore developing more cost-effective means of controlling tsetse. Most tsetse feed mainly on the legs and bellies of the larger cattle within a herd. By applying insecticide selectively to

these parts of the cattle, tsetse control can be achieved at an annual per capita cost of just US$1. This new regimen can form part of an integrated vector management package to control a range of vector-borne diseases with minimal impact on the environment. Pushing the technology to these extreme levels of cost effectiveness demands careful planning. This project has therefore also developed a 'virtual entomologist' in the form of an interactive computer software program that allows users to specify the local tsetse problem. The program then uses the information to produce a customised plan, shopping list, budget and implementation notes.

Studies have shown that the use of insecticide-treated or untreated netting can reduce the numbers of tsetse biting cattle by 50–90%

Photo: Steve Torr

R8318: Decision support for endemic disease control

This project was set up to further validate, test in new locations, promote and deliver three technologies developed by earlier AHP research projects to empower farmers to deal cost-effectively with the problem of common endemic diseases in their cattle. The target region is the tsetse-infested area around Lake Victoria, a crucial intervention area for poverty alleviation among livestock keepers. The technologies included are the restricted application of insecticides to cattle's legs and bellies (in order to control tsetse and trypanosomiasis with minimal adverse effects on cattle's natural immunity to TBDs and the environment), and two diagnostic aids: a haemoglobin meter for assessing the degree of anaemia suffered by animals, and a decision support card based on recognition and evaluation of apparent clinical signs.

To validate this work, a longitudinal study was conducted in Uganda in 2003 to assess the effect on cattle health and productivity of restricted application of insecticide, as compared to

New users trying out and discussing the decision support card

Photo: Andrew Brownlow

other more conventional interventions. Over 2004–2005, the study was repeated in eastern Zambia, testing trypanosomiasis and TBD control strategies in a region with similar constraints to those in Uganda but with different ecology and animal husbandry systems. Initial analyses show a more complex picture than that seen in Uganda. The study villages exhibited more heterogeneity in terms of initial disease prevalence and also in incidence of infection during the study. Detailed validation of the decision support card by local veterinarians in southern Uganda is being undertaken, involving comparison of diagnoses made without the card with those made after training in its use, followed by a period of monitoring and recording of diagnostic decisions.

Vaccine development for tick-borne diseases

R8042: Integrated control of East Coast fever

At the annual project review meeting, held at ILRI in Nairobi, December 2004, the scientific advisers appointed by DFID concluded that the ECF vaccine project team had made "significant progress" towards proof-of-concept. The partners involved in the project, including the commercial partner from a leading veterinary pharmaceutical company, reaffirmed their belief that it was possible to succeed in producing an effective sub-unit vaccine against ECF.

During the review meeting the way forward for the project was mapped out. It was agreed that this would constitute a 'technical feasibility phase', i.e. proof-of-concept. This was defined as: "demonstrating induction of killer T-cell responses in vaccinated cattle which translated into significant protection from lethal challenge with ECF". This has already been demonstrated in a recent vaccine trial in which 30% of vaccinated cattle mounted killer T-cell responses against ECF and were protected; what is required now is to obtain the killer T-cell-associated protection in a greater proportion of vaccinated cattle. Once this has been achieved, the practicality of developing a viable vaccine will be determined through a series of laboratory and field trials that establish the vaccine dose, safety, duration of protection and efficacy against different strains of the ECF parasite to facilitate registration and licensing of the vaccine.

Looking to freedom from ECF
Photo: Steve Torr

4.4 Progress towards achievement of outputs

During 2004–2005, AHP worked towards a log-frame with the following two outputs:

1. Cost-effective and appropriate strategies developed to sustainably control diseases of livestock in semi-arid, high potential and peri-urban production systems that affect the livelihoods of the poor
2. Promotion of proven strategies in semi-arid, high potential and peri-urban production systems to control diseases of livestock that affect the livelihoods of the poor.

Of the 11 projects in the AHP portfolio, eight were working towards the first output, two towards the second and one towards both. Many of the project successes have been described elsewhere in the report; key outputs achieved this year include the following:

Development of cost-effective and appropriate strategies for disease control

- In southern Ethiopia it has been shown that it is feasible to have a significant impact on malaria incidence by application of insecticide to cattle. This finding is likely to be relevant in the other arid and semi-arid parts of eastern and southern Africa where the major vector of malaria is the mosquito *Anopheles arabiensis*, that feeds on both cattle and humans. The project is now devising a cost-effective regimen for applying insecticide to cattle that will allow the simultaneous control of both tsetse and mosquitoes (R8214)
- Previously, researchers in Zimbabwe have shown that restricting application of insecticide to just the legs and bellies of cattle can control one species of tsetse as effectively as conventional whole-body application. This allows significant cost savings to be made as well as having environmental benefits. The researchers have now shown that this restricted application regimen works effectively for a range of other tsetse species found in eastern and southern Africa. They have also calculated that by using this approach, cattle can be protected against tsetse for less than US$1 per animal per year (R7359, R7987 and R8318)

AHP organised a workshop on farmer-based tsetse control in Nairobi

- The biggest and perhaps most ambitious project in AHP's portfolio is the development of a sub-unit vaccine against the fatal cattle disease ECF. During the past year, this project has made further progress towards proof-of-concept of what could be the world's first sub-unit vaccine against a parasitic disease. In a recent trial of experimental vaccines, 30% of cattle were protected from lethal challenge with the ECF parasite. All the protected cattle had mounted a specific vaccine-generated immune response, known as a killer T-cell response. The research team are now working to generate this protective immune response in a greater proportion of vaccinated cattle. If they can achieve this they will have successfully demonstrated proof-of-concept and can then proceed to the challenge of developing a practical vaccine (R8042)
- In western Kenya, research has shown that on average farmers underestimate the weight of their animals by around 50%, and, though better in this regard than farmers, AHWs also consistently underestimate bodyweight. This has serious implications for the correct use of drugs, including drugs used to treat and prevent trypanosomiasis. Under-dosing is believed to be a major factor

Cattle and goat herders from Manga village, eastern Zambia, in front of their community cattle crush

Photo: Andrew Brownlow

in the emergence of drug-resistant populations of trypanosomes, the blood-borne parasites that cause trypanosomiasis. The researchers also revealed the shocking fact that in western Kenya, 80% of the potential economic benefits of keeping livestock are wiped out by disease-related mortality. This very clearly demonstrates the pressing need for better disease control in this poverty hot-spot (R7360)

- A new method of detecting African trypanosomes in whole blood samples has been developed. The method, known as the Internal Transcribed Spacer (ITS)-PCR, is intended for routine laboratory use and is capable of detecting all the African trypanosome species. It is more efficient in this regard than existing technologies. Blood samples collected in the field are simply and conveniently spotted onto commercially available cards. The cards are then stored at room temperature until they can be transported to a laboratory for analysis (R7596)

The old-fashioned way: looking for trypanosomes in a blood smear
Photo: Mark Eisler

- A simple model has been developed that allows assessment of the impact of different livestock diseases on livelihoods and household poverty levels. Application of the model can help identify factors that enhance or reduce a household's vulnerability to poverty. In addition, the model has informed the Poverty Assessor™, a software program that enables users to evaluate the poverty impact of both livestock and non-livestock livelihood strategies and specific livestock diseases (R8213)

Promotion of proven strategies for disease control

- The project concerned with adapting the FFS approach for livestock continues to attract considerable interest. It has inspired a wide range of organisations, both in Africa and beyond, to establish their own livestock-focused FFSs. A major impact assessment study has recently been commissioned that will provide evidence-based lessons to guide future initiatives in this area (R7986)
- A project based in South Africa has been particularly innovative in disseminating extension messages developed from its laboratory and field-based research on the use of seasonal nutritional supplements and targeted anthelmintic treatments for goats. The project team have worked with both public- and private-sector partners and used a variety of media approaches and local languages to ensure its research-based messages reach resource-poor goat keepers throughout southern Africa (R8151)


Children and kids. Sun City Village KwaZulu-Natal, South Africa
Photo: Adriano Vatta

4.5 Progress towards impact

AHP continues to use the DFID uptake pathway scoring categories, and the results for the portfolio of projects funded this year are given in Table 4.1. This also shows the groups of likely direct beneficiaries as identified by AHP and the project leaders for each project.

Table 4.1 **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 H	C E F G H I J K M
7985	Emerging zoonoses in East Africa	A B C D E F G	A D E F G H I J K L M
8214	Controlling malaria and trypanosomiasis with insecticide-treated cattle	A B C	A B C D E F G H I J 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	A E F H K
8213	Including the voices of the poor	A B C D H	A B C D E F G H I J K L M
Dissemination and delivery of animal health knowledge			
7360	Improved targeting and use of trypanocidal drugs	A B C D G	D E F G H I K
7986	Livestock Farmer Field Schools	A B C D E F G H	A D E F G H I J K
7987	Message in a bottle: disseminating tsetse control technologies	A B C D E F G	A D G I J K L M
8318	Decision support for endemic disease control	A B C D E	E F G H I J K L
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 in 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

4.6 Programme achievements reported in the media

Radio and television

During the course of the year, WRENmedia, with whom AHP maintains close links, as described in Section 4.1, recorded a number of interviews with AHP researchers that are distributed to national, regional and international radio stations. Two radio programmes featuring R7986 have been broadcast.

This annual report has featured AHP's work on zoonotic diseases and discussed its workshop on the subject in Nairobi in February 2005, where WRENmedia recorded a series of interviews. The interviews featured policy makers and researchers working on brucellosis, cysticercosis, rabies, sleeping sickness and TB, as well as more general discussions on the issues of funding zoonotic disease control and research and its cost-effectiveness. A feature on bovine TB, including an interview with a leading researcher at Tanzania's NIMR was broadcast in March 2005. All these interviews will be included in WRENmedia's Agfax packs and distributed to radio stations throughout Africa and Asia.

Print media and the Internet

The Small Ruminant Health Series, published in the monthly newspaper *Nufarmer and African Entrepreneur*, was completed. The series consisting of information on 12 topics, with one topic published each month, was produced by the project working on resource-poor goat farmers in southern Africa (R8151). Two articles in the *New Agriculturist* featured the livestock FFSs (R7986). The first, 'Lifelong learning for livestock farmers', which describes how the FFS approach was extended from integrated pest and soil management to livestock production, can be accessed at http://www.new-agri.co.uk/04-3/focuson/focuson4.html. The second, 'A partnership for pastoralists', discusses how the livestock FFS approach is being extended from smallholders to pastoralists through a partnership with the Belgian VSFB and can be found at http://www.new-agri.co.uk/04-5/develop/dev03.html.


insights health

DEVELOPMENT RESEARCH

Natural resource management and human health:

the forgotten link?

AHP's zoonotic disease research work was also featured in the May 2004 issue of *Insights Health*, published by the ID21 group[16], which was dedicated to articles exploring the link between natural resource management and human health. ID21 has also produced a piece about AHP's work, focusing on its study on the impact of TBDs[17]. These articles can be accessed on the ID21 website at http://www.id21.org/health/InsightsHealth5art5.html and http://www.id21.org/society/r2bm1g1.html respectively.

[16] ID21is a free service that communicates the latest UK-based international development research to decision-makers and practitioners working in developing countries, its website is: http://www.id21.org. It is hosted by the Institute of Development Studies at the University of Sussex and enabled by DFID.

[17] Minjauw, B. and McLeod, A. (2003). Tick-borne diseases and poverty – the impact of ticks and tick-borne diseases on the livelihoods of small-scale and marginal livestock owners in India and eastern and southern Africa. DFID Animal Health Programme, Edinburgh, UK. 116 pp.

5. Progress Review

5.1 Progress against milestones for 2004–2005

1 All themes

Promote and disseminate research outputs.

Activity: Appropriate media and formats will be used in creative ways to ensure research outputs, generated throughout the lifetime of the AHP, are widely and effectively promoted and disseminated and remain accessible after March 2006.

Output and Impact: Work on disseminating research outputs is ongoing. One further book in the AHP 'blue series'[18] was produced in 2004–2005, and several others have been commissioned. The livestock FFS continues as a major vehicle for the dissemination of animal health knowledge. The AHP website has been overhauled and improved and arrangements have been identified to allow it to continue to be available after March 2006.

2 All themes

Track impact using the matrix format recommended in the PARC report.

Activity: AHP will follow PARC's recommendation that all the RNR programmes use a 'structured inventory matrix' to track impact across their project portfolios. This will supplement AHP's own initial tracking exercise, given as Annex C of this report.

Output and Impact: The matrix was compiled as suggested in the PARC report and submitted to PARC for forwarding to the RNRRS evaluation team. The exercise was useful in compiling an inventory of the projects undertaken over the past decade. However, it was felt that the scoring system itself was less helpful, incorporated a number of contradictory elements and had insufficiently clear guidelines. AHP's in-house impact tracking, however, continues to work effectively and annual report guidelines have been modified to ask project leaders to submit more detail about impact, beneficiaries and position on the A–H uptake pathway. The timeline and the impact pathways suggested by PARC have also been implemented by AHP – the timeline was presented in the 2003–2004 Annual Report, and the impact pathways are shown in Annex C.

3 Zoonoses theme

Hold a workshop focusing on lessons learned from AHP's research on zoonotic diseases.

Activity: Holding an international workshop to review the achievements of AHP-funded research on zoonotic diseases and to draw out the broader lessons on how to effectively manage research that brings together veterinary and medical researchers and practitioners.

[18] AHP-DFID (2004). Recent advances in livestock keeper-based tsetse control: the way forward. Report of a workshop organised by the DFID Animal Health Programme, held in Nairobi, Kenya, 21–23 October, 2004. DFID-AHP, Centre for Tropical Veterinary Medicine, Edinburgh, Scotland. 68 pp.

Output and Impact: This workshop was held in Nairobi in February 2005. It brought together 33 researchers from 11 countries who between them had worked on brucellosis, cysticercosis, rabies, sleeping sickness and TB, as well as on integrated vector control and dealing with both malaria and tsetse using insecticide-treated cattle. The researchers tracked AHP research achievements in their field, highlighted recent developments and discussed the importance of cooperation between the veterinary and medical sectors.

4 Dissemination and delivery theme

Promote livestock FFSs and facilitate start-ups.

Activity: Capitalising on the enormous interest that the livestock FFS approach has generated, opportunities will be identified for the transfer of expertise and experience from the AHP-funded projects to livestock FFS start-ups.

Output and Impact: This year saw a major up-scaling in the livestock FFS programme, with the BSF now co-funding the new project, investing more than 5 times as much as AHP. The work will be taken forward by VSFB and an expanded livestock FFS programme, that will continue to be hosted at ILRI. AHP has also provided further funding for the start-up of livestock FFSs in The Gambia. In addition to widespread interest in Africa, a request has now been received from a Central American multi-country educational research institute (CATIE) for information on how to set up livestock FFSs.

5 All themes

Identify opportunities to commission short-duration bolt-on research initiatives.

Activity: Opportunities will be identified where short-term research activities can be commissioned that add value to previous AHP investments, by addressing critical gaps or facilitating dissemination and uptake.

Output and Impact: During 2004–2005, a number of bolt-on activities were commissioned, either as programme development activities or as extensions to existing projects. These activities, for the most part either widened the work to new geographical areas (e.g. FFSs in Turkana, Kenya and The Gambia, joint control of tsetse and malaria in Tanzania, and studying the extent to which cattle are a reservoir of sleeping sickness in Tanzania) or to new groups of end-users (e.g. FFSs for pastoralists or keepers of small ruminants). A restricted call for concept notes for small bolt-on activities in the field of zoonotic disease research was issued at the February workshop, and nine proposals were received, of which it is likely that just over half will be funded.

6 All themes

Devise closure and exit strategies.

Activity: Ensure that all projects are completed by March 2006 and that appropriate exit strategies are in place to ensure promising research can continue beyond the lifetime of the programme.

Output and Impact: Having obtained a 1-year extension to the programme, the management of exit strategies in 2004–2005 has been less urgent than originally anticipated. The AHP has continued to let its project portfolio run down, from 14 projects in 2003–2004 to 11 in 2004–2005. Several projects have been allowed 1-year extensions to accomplish specific tasks designed either to further validate results, test them in new areas/beneficiary groups or to promote rapid uptake and adoption of their work.

5.2 Programme management response to recommendations

Feedback on last year's annual report was received in the form of a letter from the DFID Research Manager, Central Research Department and an 'Ongoing programme scoring summary report' from the DFID Lead Advisor for livestock. The letter commented that the report was attractive and "clear, concise and effective in putting its messages across". Accordingly, this year's AHP annual report is again presented using the same format. The AHP's research history timeline, which was produced for last year's report was commended in both the letter and the programme scoring and therefore AHP will produce an updated version for next year. In the scoring, AHP's 'purpose rating' was scored as 3/5 (likely to be only partially achieved) reflecting the need to ensure a favourable policy environment for the adoption of the various approaches to controlling zoonotic diseases, tsetse and trypanosomiasis. AHP will continue its work to influence policy makers and donors in 2005–2006, notably by holding a high profile international workshop on zoonotic diseases (see Milestone 2). The scoring summary report rated the 'aggregate output achievement' as 2/5 (likely to be largely achieved), and commented that the programme is likely to "exceed achievement of these outputs" since it has developed at least five new disease control strategies – whilst only three were specified in the log-frame. AHP will direct its efforts next year to ensuring that these are packaged and disseminated in such a way as to maximise adoption and uptake.

5.3 Proposed milestones for 2005–2006

1 All themes

Compile dossier of completed work.

Research past activities and collate report of activities undertaken by the key research clusters that AHP has funded since 1999. Investigate recent publications and activities that have followed on from this work and look for evidence of impact.

2 Zoonoses theme

Hold international workshop.

A workshop will be held in Geneva, under the aegis of WHO, bringing together researchers and donors with the objective of raising the profile of the zoonotic diseases on which AHP has worked. The workshop will also show how research has demonstrated that these diseases place a high burden on poor people and that the interventions that have been developed to control these diseases offer a highly relevant and cost-effective opportunity for poverty alleviation.

3 Zoonoses theme

Commission and manage bolt-on activities.

Respond to the zoonotic disease concept notes submitted; commission as many activities as funding will permit, with the objective of promoting sound scientific approaches managed by or involving overseas researchers.

4 Dissemination and delivery theme

Conduct impact analysis of livestock FFSs.

An impact analysis of the livestock FFSs will be conducted, following agreement on modalities and the key parameters to be assessed.

5 Dissemination and delivery theme

Further refine poverty focus.

In order to leave behind clear guidelines to those researching in this field, especially those involved in the successor to DFID's current RNRRS, further work will be undertaken to find out what are the real animal health constraints as perceived by the poor and on how these can be quantified in socio-economic terms.

6 Diagnostics and decision support theme

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

AHP will ensure that trials are undertaken that underpin the main control strategies that have been developed by AHP-funded research in the field of tsetse and trypanosomiasis control.

7 Vaccine development theme

Promote setting up of GALV.

AHP will continue its involvement in ensuring that GALV is set up, with an appropriate legal and institutional framework, and is ready to begin operations.

8 Vaccine development theme

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

AHP will attend end-of-project evaluation of the ECF vaccine development project and make recommendations as to an appropriate continuation and follow-up, to include how the next phase should be funded.

9 All themes

Attend the 6th livestock donors inter-agency meeting.

The programme manager will attend this meeting at which it is hoped, once again, that an international group of research, development and policy-making organisations in the field of animal health and livestock development will be brought together.

10 All themes

Manage programme closure.

Once DFID has unveiled its strategy and priorities for RNRR in the future, AHP will undertake all necessary steps to manage the closure of its research projects while ensuring that useful and promising lines of research, researchers and collaborating institutes, especially those in Africa and Asia are empowered to continue.

6. Conclusion

Screening human sera for brucellosis in Tanzania: collaboration between medical and veterinary professionals is a key element in the investigation and control of zoonotic diseases
Photo: Sarah Cleaveland

This year the annual report features the AHP's work on zoonotic diseases which can be transmitted to people from animals and not only endanger poor people's livelihoods by affecting their livestock, but also compromise their own health and survival. These diseases are recognised as being among the most seriously under-diagnosed diseases in humans. Some are inherently difficult to diagnose, others tend to be forgotten since their control falls between the two stools of medical and veterinary responsibility, requiring overstretched veterinary services to commit resources to deal with diseases which mainly affect people. Whatever the reasons for their neglect, the burden of these diseases falls disproportionately on the poor, as is increasingly being demonstrated by AHP researchers who have both developed new and adapted existing disease control strategies to come up with highly cost-effective solutions. Their recent work in the fields of sleeping sickness, brucellosis and tuberculosis has been reported in previous annual reports; this year it was decided to consolidate this theme by bringing together its researchers at a workshop.

This very successful workshop was held in Nairobi in February 2005 and was attended by both veterinary and medical researchers from eleven African countries. They reported on their findings, exchanged views and identified lessons learned, both on how to conduct research and how to promote greater awareness and more effective control of zoonotic diseases. Rabies and cysticercosis, diseases on which AHP has worked previously, were also analysed, as was the work on integrated vector management to deal with both trypanosomiasis and malaria. The experience of AHP researchers and, in particular, their estimates of the real burden posed by these diseases, has highlighted the fact that dealing with zoonotic diseases effectively not only secures poor people's livelihoods, but can also save their lives.

The two main events affecting the management of the AHP this year were the very welcome announcement of the 1-year extension to the programme for 2005–2006 and the DFID-commissioned evaluation of the RNRRS that occupied the second half of the year. The evaluation of the RNRRS was not only useful in ensuring that past projects were documented, scored and assessed, but above all it brought to the fore key issues which, it turns out, concerned not just the AHP, but all the RNRR programmes' managements and PACs. The meetings, discussions and debate around the evaluation process revealed a general concern with the importance of capacity

building overseas, the building of long-term links with southern research institutions and a recognition of the value of clustering research activities over longer periods so as to achieve a less-fragmented portfolio with the ability to reach critical mass and achieve real impact. All of these have been particular concerns of the AHP, which has succeeded in nearly doubling the share of its funds going to collaborators outside the UK and has consistently worked to achieve a clearly focused project portfolio

Looking at the research activities, AHP has been impressed by the ingenuity and enthusiasm with which its researchers have responded to the opportunity afforded by the extra year's funding and, in particular, by the way which its UK constituency has gradually devolved both funds and responsibility to overseas colleagues. Work on diagnostics is continuing, both at the strategic and adaptive level. PCR diagnostics that have made it possible to differentiate definitively between human- and animal-infective trypanosomes have been further refined during the course of the year; the project responsible for this work has now had its third paper in as many years accepted in the high-impact medical journal, *The Lancet*. At the applied end of the research spectrum, the diagnostic card developed to help AHWs in the field to diagnose different endemic diseases correctly on the basis of apparent clinical signs is undergoing validation. Some highly innovative interactive software has also been produced. Tsetse Plan was designed to help NGOs and communities plan farmer-based tsetse control, and is now being followed up by Tsetse Muse, which takes a wider view of the options for dealing with tsetse. Poverty Assessor™ is a software program that enables users to evaluate the poverty impact of both livestock and non-livestock livelihood strategies and specific livestock diseases. The livestock FFS project has been highly successful in leveraging extra funds, with the BSF producing 85% of the funds for the expansion of this approach into a pastoralist zone of northern Kenya.

6.1 Key points for the year ahead

The 1-year extension has provided an excellent opportunity to ensure that the work undertaken by AHP researchers during this last management cycle is properly completed, fully validated and taken several steps closer to achieving real developmental impact. For this year, AHP's approach will be to concentrate on key clusters that have been identified as particularly successful not just scientifically, but above all in their potential to provide real support to poor livestock keepers and those at risk from diseases transmissible by livestock. AHP's new log-frame for 2005–2006 emphasises this and is included in Annex B. AHP has reviewed the work being undertaken by each of its three adaptive themes and accordingly selected one cluster from each for further work:

- Work on the human health impacts of livestock diseases and joint approaches to controlling disease in both people and livestock
- Achievements of the tsetse and trypanosomiasis cluster in developing farmer-based methods of controlling both the disease and its vector, that were commended in the RNRRS evaluation
- Dissemination work, in particular the AHP's flagship dissemination project, livestock FFSs.

AHP's analysis of the impact pathways for these three clusters is given in Annex C.

Within the framework of a 1-year extension, commissioning new lines of research is not viable, so AHP will concentrate on promoting three activities for each cluster. These are designed to ensure that these key research clusters either achieve end-user impact or are delivered to target institutions who will ensure that the results reach their ultimate beneficiaries. The activities consist of:

Policy on the control of trypanosomiasis, brucellosis and other zoonoses will impact livestock-keeping communities

Photo: Sarah Cleaveland

- Completing the series of paired workshops for each key cluster, of which one is primarily for AHP researchers, collaborators and stakeholders, and the other is directed at an international audience
- Commissioning bolt-on activities which are designed to extend projects' scope either by investigating new geographical areas or involving new beneficiary groups, in particular the AHP will be selecting from among the concept notes submitted for bolt-on work on zoonotic diseases
- Conducting control trials to further validate and test the disease control techniques developed as a result of AHP research.

To meet these targets AHP has issued a restricted call for small bolt-on activities to its zoonotic disease work. These concept notes will be judged not just on scientific merit but also on the extent to which they provide opportunities for African scientists. A second AHP workshop on zoonotic diseases is already planned for September 2005, to be hosted by WHO, to which high-profile donors and policy makers will be invited, so as to increase advocacy for these diseases and to bring AHP research achievements to their attention as representing a cost-effective route to poverty alleviation. Proposals for trials and validation have already been received and commissioned, either as project extensions or separate activities. Specifically, work has begun on a number of trials further validating and testing the efficacy of various novel control strategies, in particular the treating of cattle around outbreaks of sleeping sickness, the restrictive application of insecticide to the legs and bellies of cattle to control tsetse and the control of both malaria and trypanosomiasis with insecticide-treated cattle. As is appropriate in this final year, 2005–2006 will see a strong emphasis placed on those projects that disseminate the results of AHP research. These will include not just the livestock FFSs, but also the interactive software programs mentioned above, touch-screen kiosks and the work on goats.

Looking to its strategic research work, AHP will be involved in the final review of the ECF vaccine development project and in ensuring that this work is followed up, as well as actively promoting the launching of GALV. Lastly, AHP will work to ensure that promising lines of research can be extended beyond the life of the current RNRRS, by helping its researchers in the UK and overseas to secure funding from other sources and create links with other institutions and donors so that its researchers and collaborating institutions, especially those in Africa and Asia, are empowered to continue.

Annex A
Peer and non-peer reviewed publications

Publications are cited by project and the bold letters in square brackets refer to the publication categories as given in the key on page 30.

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

Coleman, P.G. and Welburn, S.C. (2004). Is there a cost to *T. b. rhodesiense* of being human serum resistant when not in humans. *Trends in Parasitology* 20: 311–315. [**A**]

Cox, A., Tilley, A., McOdimba, F., Fyfe, J., Eisler, M., Hide, G. and Welburn, S.C. (2004a). A sensitive and specific nested PCR-based assay for differentiation of African trypanosome species in blood. Paper presented at the British Society for Parasitology Malaria/Spring Meeting. Chester, UK. 4–7 April 2004. [**B**]

Cox, A., Tilley, A., McOdimba, F., Fyfe, J., Hide, G. and Welburn, S.C. (2004b). A sensitive and specific nested PCR-based assay for differentiation of African trypanosome species in blood (poster). Trypanosomiasis and Leishmaniasis Seminar, 27–30 August 2004. Ceské Budejovice, Czech Republic. [**B**]

Cox, A., Tilley, A., McOdimba, F., Fyfe, J., Hide, G. and Welburn, S.C. (2004c). Efficient methods for detection and differentiation of African trypanosomes in blood. Trypanosomiasis and Leishmaniasis Seminar. 27-30 August 2004, Ceské Budejovice, Czech Republic. [**B**]

Cox, A., Tilley, A., McOdimba, F., Fyfe, J., Hide, G. and Welburn, S.C. (2005). A PCR-based assay for detection and differentiation of African trypanosome species in blood. *Experimental Parasitology* (in press) [**A**]

Eisler, M., Dwinger, R., Majiwa, P. and Picozzi, K. (2004). Diagnosis and epidemiology of animal trypanosomiasis. In: I. Maudlin, P.H. Holmes and M.A. Miles (eds), *Trypanosomiasis*, pp. 253–267: CAB International, Wallingford, UK. [**A**]

Fèvre, E.M., Coleman, P.G., Welburn, S.C. and Maudlin, I. (2004). Reanalyzing the 1900–1920 sleeping sickness epidemic in Uganda. *Emerging Infectious Diseases* 10: 567–573. [**A**]

Fèvre, E.M., Picozzi, K., Fison, T., Wissmann, B.v. and Welburn, S.C. (2005). *Human Trypanosomiasis Surveys in Southern Sudan and Northern Uganda: Final Report.* Centre for Tropical Veterinary Medicine, Edinburgh, UK. [**C**]

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* (in press). [**A**]

Hutchinson, O.C., Smith, W., Jones, N.G., Chattopadhyay, A., Welburn, S.C. and Carrington, M. (2003). VSG structure: similar N-terminal domains can form functional VSGs with different types of C-terminal domain. *Molecular and Biochemical Parasitology* 130: 127–131. [**A**]

MacLean, L., Chisi, J.E., Odiit, M., Gibson, W.C., Ferris, V., Picozzi, K. and Sternberg, J.M. (2004). Severity of human African trypanosomiasis in East Africa is associated with geographic location, parasite genotype and host inflammatory cytokine response profile. *Infection and Immunity* 72: 7040–7044. [**A**]

Odiit, M., McDermott, J.J., Coleman, P.G., Fèvre, E.M., Welburn, S.C. and Woolhouse, M.E.J. (2004). Spatial and temporal risk factors for the early detection of *T. b. rhodesiense* sleeping sickness patients in Tororo and Busia districts, Uganda. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 98: 569–576. [**A**]

Odiit, M., Shaw, A., Welburn, S.C., Fèvre, E.M., Coleman, P.G. and McDermott, J.J. (2004). Assessing the patterns of health-seeking behaviour and awareness among sleeping-sickness patients in eastern Uganda. *Annals of Tropical Medicine and Parasitology* 98: 339–348. [**A**]

Picozzi, K. Fèvre, E., Coleman, P. and Welburn, S. (2004) Fitness costs associated with resistance to human serum in *Trypanosoma brucei rhodesiense*: theoretical predictions and field data. Presented at the British Society for Parasitology Trypanosomiasis and Leishmaniasis Seminar, Ceské Budejovice, Czech Republic, 27–30 August 2004. [**B**]

Simo, G., Herder, S., Njiokou, F., Asonganyi, T., Tilley, A. and Cuny, G. (2005). Characterisation of *Trypanosoma brucei* s.l. stocks from Central Africa by PCR analysis of Mobile Genetic Elements (MGE–PCR). *Experimental Parasitology* (in press). [**A**]

Welburn, S.C., Fèvre, E.M., Coleman, P.G. and Maudlin, I. (2004). Epidemiology of human African trypanosomiasis. In: I. Maudlin, P.H. Holmes and M.A. Miles (eds) The Trypanosomiases, pp. 219–232. CAB International, Wallingford, UK. [**A**]

Welburn, S.C., Picozzi, K., Kaare, M., Fèvre, E.M., Mlengeya, T. and Coleman, P.G. (2004). Control options for human sleeping sickness in relation to the animal reservoir of disease. In: Proceedings of the 5th IUCN World Parks Congress, Durban, South Africa, 8–17 September 2003. [**A**]

Wissmann, B.v., Fison, T., Picozzi, K., Fèvre, E.M. and Welburn, S.C. (2005). *Animal Trypanosomiasis Survey in Southern Sudan: Final Report*. Edinburgh: Centre for Tropical Veterinary Medicine. [**C**]

Wissmann, B.v., Picozzi, K., Fèvre, E.M., Fison, T. and Welburn, S.C. (2004). Animal trypanosomiasis in a focus of Gambian sleeping sickness in South Sudan. British Society for Parasitology Trypanosomiasis and Leishmaniasis seminar, Ceské Budejovice, Czech Republic, 27–30 August 2004. [**B**]

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

Cleaveland, S., Laurenson, M.K. and Mlengeya, T. (2005). Impact of wildlife infections on human and wildlife health: implications for protected area management. In: Proceedings of the 5th IUCN World Parks Congress, Durban, South Africa, 8-17 September 2003. [**A**]

Cleaveland, S., Mfinanga, G.S., Shirima, G., Kunda, J., Sharp, M., Shaw, D. and Kazwala, R.R. (2005). Bovine tuberculosisis in Tanzania. Paper presented at the 20th Annual Joint Scientific Conference, National Institute of Medical Research, Arusha, Tanzania, 1–4 March 2005. [**B**]

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) (in press). [**A**]

Coleman, P., Fèvre, E. and Cleaveland, S. (2004) Estimating the public health burden of rabies. *Emerging Infectious Diseases* 10: 140–142. [**A**]

Fèvre, E., Kaboyo, R.W., Persson, V., Edelsten, M., Coleman, P. and Cleaveland, S. (2005). The epidemiology of animal bite injuries in Uganda and projections of the burden of rabies. *Tropical Medicine and International Health* (in press) [**A**]

Kibona, S.N., Matemba, L., Kaboya, J.S and Lubega, G.W. (2005). Drug resistant *Trypanosoma brucei rhodesiense* isolates from Tanzania. Paper presented at the 20th Annual Joint Scientific Conference, National Institute of Medical Research, Arusha, Tanzania, 1–4 March 2005. [**B**]

Knobel, D., Cleaveland, S., Coleman, P.G., Fèvre, E., Meltzer, M.I. Miranda, M.E.G., Shaw, A., Zinsstag, J. and Meslin, F-X. (2005). Re-evaluating the burden of rabies in Asia and Africa. *Bulletin of the World Health Organization* (in press). [**A**]

Kunda, J., Cleaveland, S., Fitzpatrick, J., French, N., Kambarage, D., Shirima, G. and Kazwala, R.R. (2005). Brucellosis in Arusha and Manyara Regions, Tanzania: a challenge to public health. *Tanzania Medical Journal* 19(2) (in press). [**A**]

Kunda, J., Cleaveland, S., Fitzpatrick, J., French, N., Shirima, G. and Kazwala, R. (2005). Preliminary findings of a matched case-control study on brucellosis in Arusha and Manyara Regions, Tanzania. Poster presented at the 20th Annual Joint Scientific Conference, National Institute of Medical Research, Arusha, Tanzania, 1–4 March 2005. [**B**]

Matemba, L.E., Swilla, J. and Sahani, K. (2005). Prevalence of human African trypanosomaiasis in and around refugee camps in Kasulu district, Tanzania. Paper presented at the 20th Annual Joint Scientific Conference, National Institute of Medical Research, Arusha, Tanzania, 1–4 March 2005. [**B**]

Mfinanga, G.S., Morkve, O., Kazwala, R.R., Cleaveland, S., Sharp, J.M., Kunda, J. and Nilsen, R. (2005). Mycobacgerial adenitis: role of *Mycobacteria bovis*, non-tuberculous mycobacteria, HIV infection and risk factors in Arusha, Tanzania. Paper presented at the 20th Annual Joint Scientific Conference, National Institute of Medical Research, Arusha, Tanzania, 1–4 March 2005. [**B**]

Mfinanga, G.S., Morkve, O., Kazwala, R.R., Cleaveland, S., Sharp, J.M., Shirima, G. and Nilsen, R. (2005). The role of livestock keeping in tubercuolosis trends in Arusha. Paper presented at the 20th Annual Joint Scientific Conference, National Institute of Medical Research, Arusha, Tanzania, 1–4 March 2005. [**B**]

Mfinanga, G.S., Morkve, O., Kazwala, R.R., Cleaveland, S., Kunda, J., Sharp, J.M. and Nilsen, R. (2005) Mycobacterial adenitis: role of *Mycobacterium bovis*, non-tuberculous mycobacteria, HIV infection and risk factors in Arusha, Tanzania. *East African Medical Journal* 81 (in press). [**A**]

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

Gibson, G. (2004). Identifying 'natural environments' from an insect's point of view. Can we be sure we are asking them the right behavioural questions with our bioassays? Presentation at a symposium on Chemical Ecology of Mosquitoes: Sensory Capacity, Resource Utilization and Manipulation for Vector Control (ACME 2, 53rd Annual Meeting of the American Society of Tropical Medicine and Hygiene), Miami, Florida, USA, 7–11 November 2004. [**B**]

Habtewold, T. (2005). Interactions between *Anopheles*, cattle and humans: exploration of the effects of various cattle management practices on the behaviour and control of *Anopheles arabiensis* in Ethiopia. PhD thesis, University of Greenwich, UK. [**E**]

Habtewold, T. and Tirados, I. (2004). Interaction between *Anopheles*, cattle and humans: effects of cattle management practices on the behaviour of *Anopheles arabiensis* in Ethiopia. Presentation (by Habtewold) at a workshop convened by the Royal Entomological Society (Medical and Veterinary Entomology Special Interest Group/North Region Meeting), University of Durham, UK, 17 November 2004. [**B**]

Habtewold, T., Prior, A., Torr, S.J. and Gibson, G. (2004). Could insecticide-treated cattle reduce Afrotropical malaria transmission? Effects of deltamethrin-treated Zebu on *Anopheles arabiensis* behaviour and survival in Ethiopia. *Medical and Veterinary Entomology* 18: 408–417. [**A**]

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

Harrison, L.J.S. (2004). The Edinburgh University/Pretoria University Higher Education Link Project and Complementary Research in Animal Health and Productivity. Seminar presented in the Department of Zoology and Entomology, University of Pretoria, 29 October 2004. 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. [**D**]

Pearson, R.A. (2004). Research and extension activities related to animal husbandry. Seminar presented in Department of Zoology and Entomology, University of Pretoria, 29 October 2004. 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. [**D**]

Vatta, A.F. (2004). (Compiler) Worms in your goats, sheep and cattle. Extension booklet, Afrikaans, IsiXhosa and Sesotho versions. March 2004. [**D**]

Vatta, A.F. (2004). Improving the livelihood of resource-poor goat farmers in southern Africa through strategic drug and nutritional interventions against gastro-intestinal nematode infections. Onderstepoort Veterinary Institute Annual Project Progress Report for Project OV 021/008 for the period September 2002 to November 2004. [**C**]

Vatta, A.F., Harrison, L.J.S., Krecek, R.C. and Pearson, R.A. (2004). Economic benefit of strategic anthelmintic treatment and urea–molasses block supplementation of Boer goats raised under extensive grazing conditions at Onderstepoort, Pretoria, South Africa. Poster presented at the 8th International Conference on Goats, Pretoria, South Africa, 4–9 July 2004. [**B**]

Vatta, A.F., Harrison, L.J.S., Krecek, R.C. and Pearson, R.A. (2005). Economic benefit of strategic anthelmintic treatment and urea–molasses block supplementation on Boer goats raised under extensive grazing conditions at Onderstepoort, Pretoria, South Africa. *South African Journal of Animal Science* (in press). [**B**]

Vatta, A.F., Harrison, L.J.S., Krecek, R.C. and Pearson, R.A. (2004). Relative economic benefits of strategic anthelmintic treatment and urea–molasses block supplementation of Boer goats raised under extensive grazing conditions at Onderstepoort, Pretoria, South Africa. Proceedings of the International Workshop on Enhancing the Contribution of Small Livestock to the Livelihoods of Resource-poor Communities, Masaka, Uganda, 15–19 November 2004. [**B**]

Vatta, A.F., Krecek, R.C. and Letty, B.A. (2005). (Compilers) Goatkeepers' manual. Extension manual, Xhosa version (draft). [**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

Global Livestock and Poverty Dataset. Containing data from 5372 households. [**H**]

Heffernan, C.H. (2004). Livestock and the livelihoods of the poor. In: A. Kitali, E. Owen and W. Richards (eds) *Livestock and Poverty*. Livestock Production Programme, DFID, London. [**A**]

Heffernan, C.H. (2004). Demand, Knowledge and ICTs: Current Perpectives in the Livestock Sector. Workshop Proceedings: Animal Health Knowledge Transfer, 12–15 March 2004. Ramkumar, S. (ed.). Rajiv Ghandi College of Veterinary and Animal Science, Pondicherry, India. [**B**]

Heffernan, C.H. (2005). Livestock, Disease Prioritisation and Poverty. Presented at ILRI Workshop on Livestock Disease Prioritisation. Nairobi, Kenya, February 2005 [**B**]

Livestock Development Group (2005). The Poverty Assessor™. Presented at Northwest University of Agriculture, China, March 2005. [**B**]

Livestock Development Group (2005). The Poverty Assessor™. Presented to DFID Stakeholders. British Council, Beijing, China. March, 2005. [**B**]

Livestock Development Group (2004). The Poverty Assessor™. An evidence based tool for decision-making in the livestock sector. Livestock Development Group, University of Reading, Reading, UK. [**H**]

Pilling, D. (2005). Livestock disease prioritisation and the poor: findings from India. MPhil Dissertation, University of Reading, Reading, UK. [**F**]

Dissemination and delivery of animal health knowledge

R7360 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

Machila, N. (2005). Improved targeting and appropriate use of trypanocidal drugs for the control of African bovine trypanosomiasis in tsetse endemic areas of western and coastal Kenya within the context of primary veterinary care. PhD thesis, University of Edinburgh, UK. [**E**]

Machila, N. and Thuranira, C. (2004). Seasonal and socio-economic factors influencing smallholder farmers' animal health and disease management practices in a trypanosomiasis endemic area of western Kenya. Poster presented at the Focus on Livelihoods meeting, University of Reading, UK, 16 October 2004. Hosted by the Livestock Development Group, on behalf of the Development Studies Association. [**B**]

Shaw, A.P.M. (2004). Economics of African trypanosomiasis. In: I. Maudlin, P.H. Holmes and M.A. Miles (eds) *The Trypanosomiases*, pp. 369–402. CAB International, Wallingford, UK. [**A**]

Thuranira, C. (2005). Socio-economic factors influencing livestock keeping dynamics in a smallholder crop-livestock system in western Kenya. PhD thesis, University of Edinburgh, UK. [**E**]

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

Groeneweg, K. (2004). Monitoring and backstopping report on the implementation of FFS methodology within FITCA: provision of training services on Farmer Field School to AU/IBAR's 'Farming in Tsetse Controlled Areas' Regional Programme in Kenya, Tanzania and Uganda (7 ACP RPR 578). [**C**]

Minjauw, B., Muriuki, H.G. and Romney, D. (2004). Development of Farm Field School methodology for small-holder dairy farmers in Kenya. In: E. Owen, T. Smith, M.A. Steele, S. Anderson, A.J. Duncan, M. Herrero, J.D Leaver, C.K. Reynolds, J.I. Richards and J.C. Ku-Vera (eds) *Responding to the Livestock Revolution – The Role of Globalisation and Implications for Poverty Alleviation*, pp. 299–313. British Society of Animal Science, Publication No. 33. Nottingham University Press, Nottingham, UK. [**A**]

Wren Media (2004). A partnership for pastoralists: extending the message. *New Agriculturist*, September 2004. Available at www.new-agri.co.uk. [**G**]

Wren Media (2004). Lifelong learning for livestock farmers. *New Agriculturist*, March 2003. Available at www.new-agri.co.uk. [**G**]

R7987 Message in a bottle: disseminating tsetse control technologies

Barclay, H.J. and Hargrove, J.W. (2005). Probability models to facilitate a declaration of pest-free status, with special references to tsetse (Diptera: Glossinidae). *Bulletin of Entomological Research* 95: 1–11. [**A**]

Foil, L.D., Coleman, P., Eisler, M., Fragoso-Sanchez, H., Garcia-Vazquez, Z., Guerrero, F.D., Jonsson, N.N., Langstaff, I.G., Li, A.Y., Machila, N., Miller, R.J., Morton, J., Pruett, J.H. and Torr S. (2004). Factors that influence the prevalence of acaricide resistance and tick-borne diseases. *Veterinary Parasitology* 125: 163–181. [**A**]

Hargrove, J.W. (2005). Extinction probabilities and times to extinction for populations of tsetse flies *Glossina* spp. (Diptera: Glossinidae) subjected to various control measures. *Bulletin of Entomological Research* 95: 13–21. [**A**]

Kovacic, V. (2004). Landing sites of tsetse (*Glossina*) on cattle. MSc thesis, London School of Hygiene and Tropical Medicine, UK. [**F**]

Torr, S.J. (2004). Less is more: restricted application of pyrethroids on cattle to control tsetse. Presentation at a workshop convened by the Royal Entomological Society (Medical and Veterinary Entomology Special Interest Group/North Region Meeting), University of Durham, UK, 17 November 2004. [**B**]

Torr, S.J. (2005). Selfish herds and biting flies: the implications of host defensive behaviour for tsetse control. Presentation at Cardiff University, UK, 8 March 2005. [**D**]

Vale, G.A. and Torr, S.J. (2004). Development of bait technology to control tsetse. In: I. Maudlin, P.H. Holmes and M.A. Miles (eds) *The Trypanosomiases*, pp. 509–523. CAB International, Wallingford, UK. [**A**]

Vale, G.A. and Torr, S.J. (2004). Tsetse Plan 2004. An interactive computer programme to help in the planning of operations to control tsetse using bait technologies. Available at http://www.tsetse.org. [**H**]

Vale, G.A. and Torr, S.J. (2005). Tsetse Muse. A decision support system to assist in the planning of operations to control tsetse. Available at http://www.tsetse.org. [**H**]

Vale, G.A. and Grant, I.F., Dewhurst C.F. and Aigreau D. (2004). Biological and chemical assays of pyrethroids in cattle dung. *Bulletin of Entomological Research* 94: 273–282. [**A**]

Zollner, G.E., Torr, S.J., Amman, C. and Meixner, F.X. (2004) Dispersion of carbon dioxide plumes in African woodland: implications for host-finding by tsetse flies. *Physiological Entomology* 29: 381–394. [**A**]

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

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

Eisler, M.C. (2004). Endemic disease burdens on African livestock – new solutions to Old World problems. Centre for Infectious Diseases Annual Symposium, Royal Society of Edinburgh, UK, 22 June 2004. [**B**]

Eisler, M.C. (2005). Integrated control of endemic diseases of livestock in Africa. Invited Speaker. Institute of Biological and Life Sciences, University of Glasgow, UK, 25 January 2005. [**B**]

Eisler, M.C., Dwinger R.H., Majiwa, P. and Picozzi, K. (2004). Diagnosis and epidemiology of animal trypanosomiasis. In: I. Maudlin, P.H. Holmes and M.A. Miles (eds) *The Trypanosomiases*, pp. 253–267. CAB International, Wallingford, UK. [**A**]

Foil, L.D., Coleman, P., Eisler, M., Fragoso-Sanchez, H., Garcia-Vazquez, Z., Guerrero, F.D., Jonsson, N.N., Langstaff, I.G., Li, A.Y., Machila N., Miller R.J., Morton J., Pruett J.H. and Torr, S. (2004). Factors that influence the prevalence of acaricide resistance and tick-borne diseases. *Veterinary Parasitology* 125: 163–181. [**A**]

Holmes, P.H., Eisler, M.C. and Geerts S. (2004). Current chemotherapy of animal trypanosomiasis. In: I. Maudlin, P.H. Holmes and M.A. Miles (eds) *The Trypanosomiases*, pp. 431–444. CAB International, Wallingford, UK. [**A**]

Magona, J.W., Walubengo, J., Anderson, I., Olaho-Mukani, W., Jonsson N.N. and Eisler, M.C. (2004). Portable haemoglobinometers and their potential for penside detection of anaemia in bovine disease diagnosis: a comparative evaluation. *The Veterinary Journal* 168: 343–348. [**A**]

Welburn, S.C., Fèvre, E., Magona, J.W., Odiit, M., Picozzi, K., Wissman, B.v., Fyfe, J., Coleman, P. and Eisler, M. (2004). Interventions for sleeping sickness control. 8th Meeting of Treatment and Drug Resistance Network for Sleeping Sickness, WHO, Geneva, 6–8 September 2004. [**B**]

Vaccine development for tick-borne diseases

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

Gardner, M.J., Bishop, R., Shah, T., de Villiers, E.P., Carlton, J.M., Hall, N., Ren, Q., Paulsen, I.T., Pain, A., Berriman, M., Wilson, R.J.M., Sato, S., Ralph, S.A., Mann, D.J., Xiong, Z., Shallom, S.J., Weidman, J., Jiang, L., Lynn, J., Weaver, B., Shoaibi, A., Wasawo, D., Crabtree, J., Wortman, J.R., Haas, B., Angiuoli, S., Creasy, T., Lu, C., Suh, B., Silva, J., Utterback, T., Feldblyum, T., Pertea, M., Allen, J., Taracha, E.L.N., Salzberg, S.L., White, O., Fitzhugh, H.A., Morzaria, S., Venter, J.C., Fraser, C.M. and Nene, V. (2005). Genome sequence of *Theileria parva* a bovine pathogen causing a lymphoproliferative disease. *Science* (in press). [**A**]

Mwangi, D., Graham, S.P., Honda, Y., Yamage, M., Pelle, R. and Taracha, E.L.N. (2004). Novel vaccines against important livestock diseases. Proceedings of the 4th Faculty of Veterinary Medicine Biennial Scientific Conference 3–5 November 2004. University of Nairobi, Kenya. [**B**]

Taracha, E.L.N., Graham, S., Pelle, R., Honda, Y., Mwangi, D., Yamage, M., Saya, R., Awino, E., Nyanjui,J., Osaso,J.,Muthiani,A., van der Bruggen, P., Nene, V.,Gardner, M., Morzaria, S., de Villiers, E. and Shah, T. (2004). Exploiting host immunity and parasite genomics to develop a robust sub-unit vaccine against *Theileria parva* in cattle. International Veterinary Immunology Symposium, Quebec City, Canada, 24–31 July 2004. [**B**]

Taracha, E.L.N., Graham, S., Pelle, R., Honda, Y., Mwangi, D., Yamage, M., Saya, R., Awino, E., Nyanjui, J., Osaso, J., Muthiani, A., van der Bruggen, P., Nene, V., Gardner, M., Morzaria, S., de Villiers, E. and Shah, T. (2004). Exploiting host immunity and parasite genomics to develop a robust sub-unit vaccine against *Theileria parva* in cattle. Integrated Consortium on Ticks and Tick-borne diseases (ICTTD-3), Maputo, Mozambique, 27 September–1 October 2004. [**B**]

Annex B
AHP's logical framework

B.1 AHP's logical framework 2004–2005

During 2004–2005, the AHP worked to the logical framework given below, a combined framework agreed with DFID covering the semi-arid high-potential peri-urban production systems.

SUPERGOAL	VERIFIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
Poverty eliminated in poorer countries through sustainable development	Measures of empowerment	National and international poverty monitoring	
GOAL			
1. Livelihoods of poor people improved through sustainably enhanced production and productivity of RNR	1.1 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			
1. Benefits for poor people generated by application of improved management of livestock disease	By 2005, in Bangladesh, India, Kenya, South Africa, Tanzania or Uganda, evidence of: 1.1 Increased sustainable production of livestock by the resource-poor 1.2 Decreased production costs for resource-poor livestock keepers 1.3 More reliable supply of safe livestock products to the poor	AHP-commissioned external reviews of AHP impact Reports of in-country organisations 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 to sustainably control diseases of livestock in semi-arid, high-potential and peri-urban production systems that affect the livelihoods of the poor	1.1 Three new, validated and acceptable methods for the control of TBDs, trypanosomiasis, helmithiasis and other diseases, particularly zoonoses that are important to poor livestock keepers (by 2003)	AHP reports External referee reports Final technical reports of projects Annual reports of delivery systems	Intermediary organisations able and willing to produce and deliver new technologies to poor livestock keepers

Outputs (continued)

2. Promotion of proven strategies in semi-arid, high-potential and peri-urban production systems to control livestock diseases that affect the livelihoods of the poor	2.1 Disease management strategies, acceptable for use by the poor, adopted and promoted through appropriate delivery systems to end-users (by 2004)	Systematic evidence-based reviews	

Activities	**Inputs**		
1.1 Current projects brought to contracted completion	24 projects completed by end March 2003, including: ***Diagnostics*** *(R6554, R7196, R7364, R7599, R7361, R7362, R7356, R7597)* ***Delivery/dissemination*** *(R7538, R7595, R7598, R7164, R7271, R7359, R7360)* ***Human zoonoses*** *(R7596, R7229, R7357)* ***Tick-borne disease vaccines*** *(R7358, R7363, R7365)* ***Wildlife interface*** *(R7050, R6625)* ***Environmental risk*** *(R7539)*	AHP and projects' research reports	Scientists able and willing to undertake research that addresses, and is assessed in terms of AHP objectives National and other in-country partners able and willing to effectively collaborate Researchers able to conduct activities in target countries
1.2 New projects and activities commissioned to achieve Output 1	Three new projects in Bangladesh, India, Kenya, South Africa, Tanzania or Uganda that identify and quantify the economic cost of animal disease constraints that are important to the poor (by 2005) Three new projects in Bangladesh, India, Kenya, South Africa, Tanzania or Uganda to develop rapid, reliable and cheap field diagnostic tests for TBDs, trypanosomiaisis or helminthiasis and other diseases, particularly zoonoses (by 2005) Three new projects in Bangladesh, India, Kenya, South Africa, Tanzania or Uganda on user-acceptable field-level decision-support tools for control of TBDs,		

Activities	***Inputs*** (continued)
1.2 New projects and activities commissioned to achieve Output 1 (continued)	trypanosomiaisis or helminthiasis and other diseases, particularly zoonoses (by 2005) Two new projects in Bangladesh, India, Kenya, South Africa, Tanzania or Uganda on novel vaccines for effective control of TBDs and other diseases, particularly zoonoses (by 2005)
2.1 New and existing knowledge effectively disseminated	Four new projects that identify appropriate methods and use acceptable promotional pathways for increasing the impact of animal health knowledge on the livelihoods of the poor (by 2005)

B.2 AHP's logical framework 2005–2006

As part of its tender to manage the AHP during the course of its 1-year extension, the following new log frame was prepared and approved by DFID. It will come into force in 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 Bangladesh, India, Kenya, 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. Evidence of a reduction in the incidence 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, TBDs, 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 Final technical reports of projects Annual reports of delivery systems Systematic evidence-based reviews	Intermediary organisations able and willing to produce and deliver new technologies to poor livestock keepers

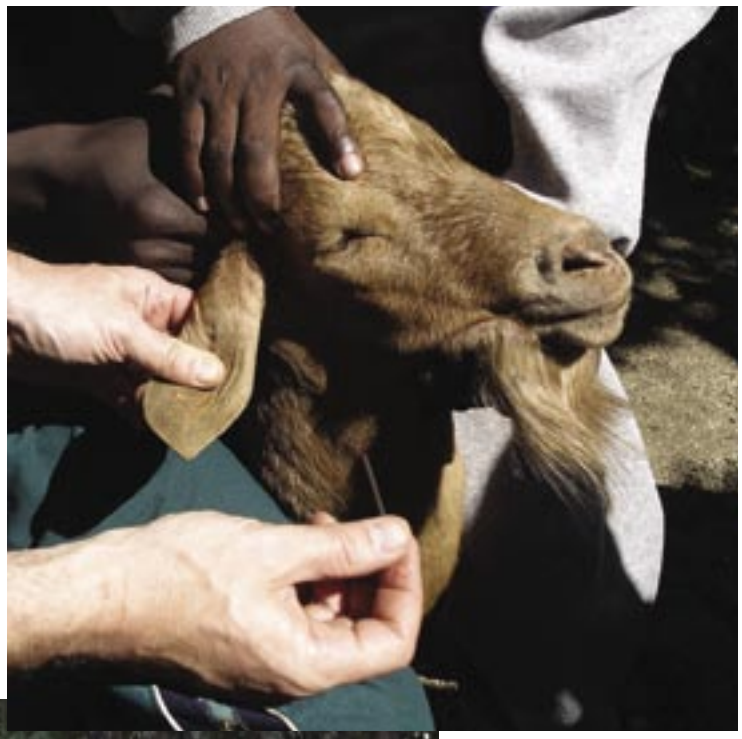
Outputs (continued)

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, R8124)* ***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 that either extend scope of project to new geographical areas or to new beneficiary groups 2.2 Control trials: control trials further validating research outputs and control techniques or confirming and quantifying their cost-effectiveness
3. New and existing knowledge effectively disseminated	3.1 International workshops held to bring together researchers and policy makers for selected project clusters within diagnostics and decision support, dissemination and delivery and human health impacts 3.2 AHP's blue series extended by several volumes and disseminated to circa 1000 locations

Annex C
AHP impact pathways for key research project clusters

During the course of the year, as part of the suite of activities promoted by the recommendations included in the PARC report[7], the AHP analysed the impact pathways for its three key project clusters, with a view to better understanding and reinforcing these in order to promote more effective uptake and impact.



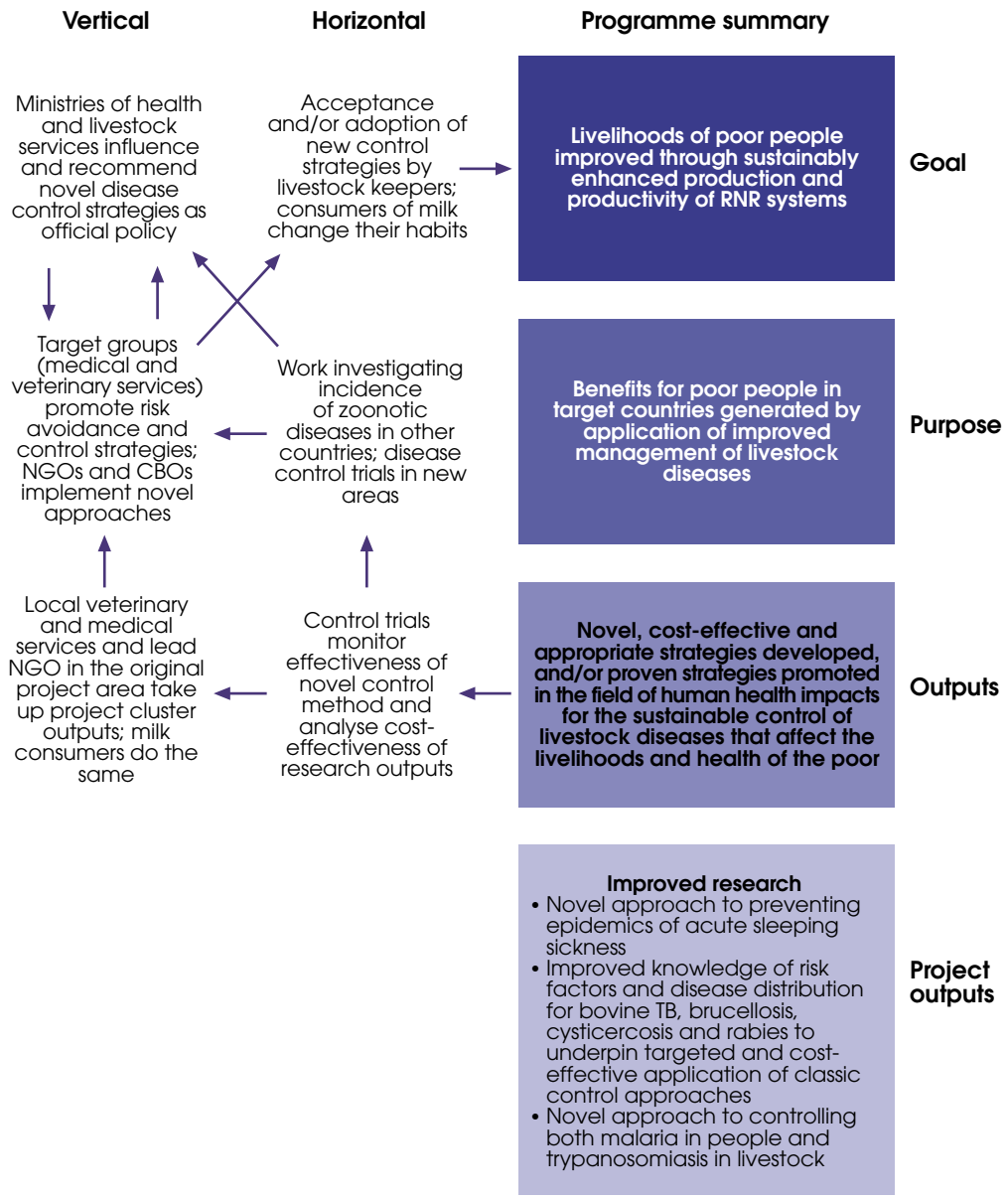
Sampling blood from a goat (right) and a village woman with her mortar (below) in Uganda, where most goat keepers are women

Photos: Sue Welburn

C.1 Human health impacts: zoonotic disease cluster

The main impact pathways for this cluster are as illustrated in Figure C.1, with each of its three components taking slightly different routes. For bovine TB and brucellosis, on the one hand, both the ministries of health and consumers need to be persuaded by the evidence from research that these diseases present a threat to human health and need dealing with. For sleeping sickness, a high-level policy commitment to adopting a strategy of treating the livestock reservoir is required, and has been achieved in Uganda. The work studying the potential for dealing with both malaria and animal trypanosomiasis is extending its geographic range and works in partnership with FARM-Africa to ensure that the technology is taken up and adopted.

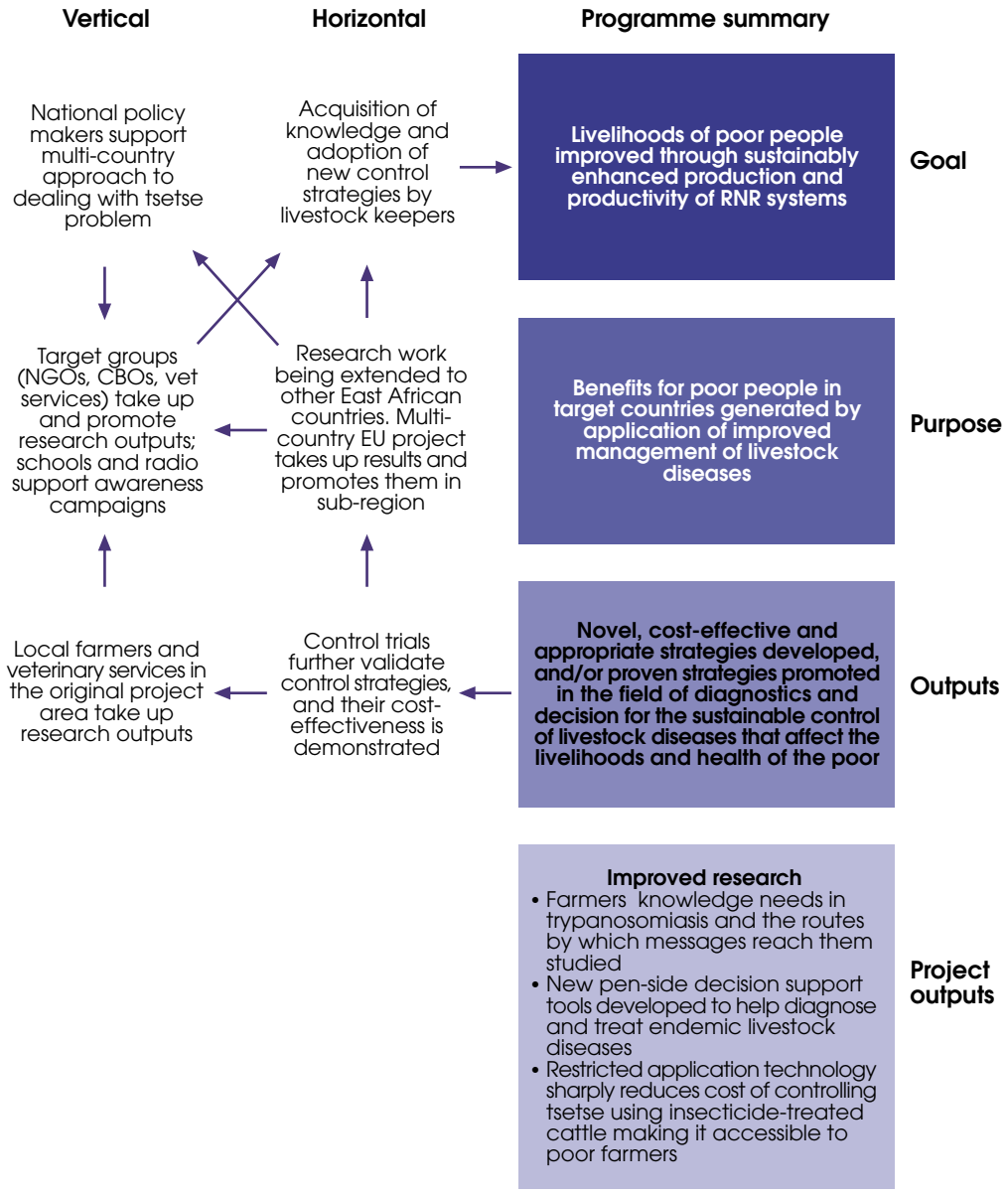
Figure C.1 **Impact pathways for AHP Human Health Impacts cluster**



C.2 Diagnostics and decision support: farmer-based control of trypanosomiasis

This project cluster follows a more uniform pathway and relies heavily on its collaboration with the multi-country EU FITCA project, which is both taking up and contributing to AHP research work on all aspects of empowering farmers to deal with the problem of trypanosomiasis in their livestock. Widespread high-level policy support exists, creating a favourable environment for the uptake of these technologies, which are being locally adopted and will now be tested in other locations.

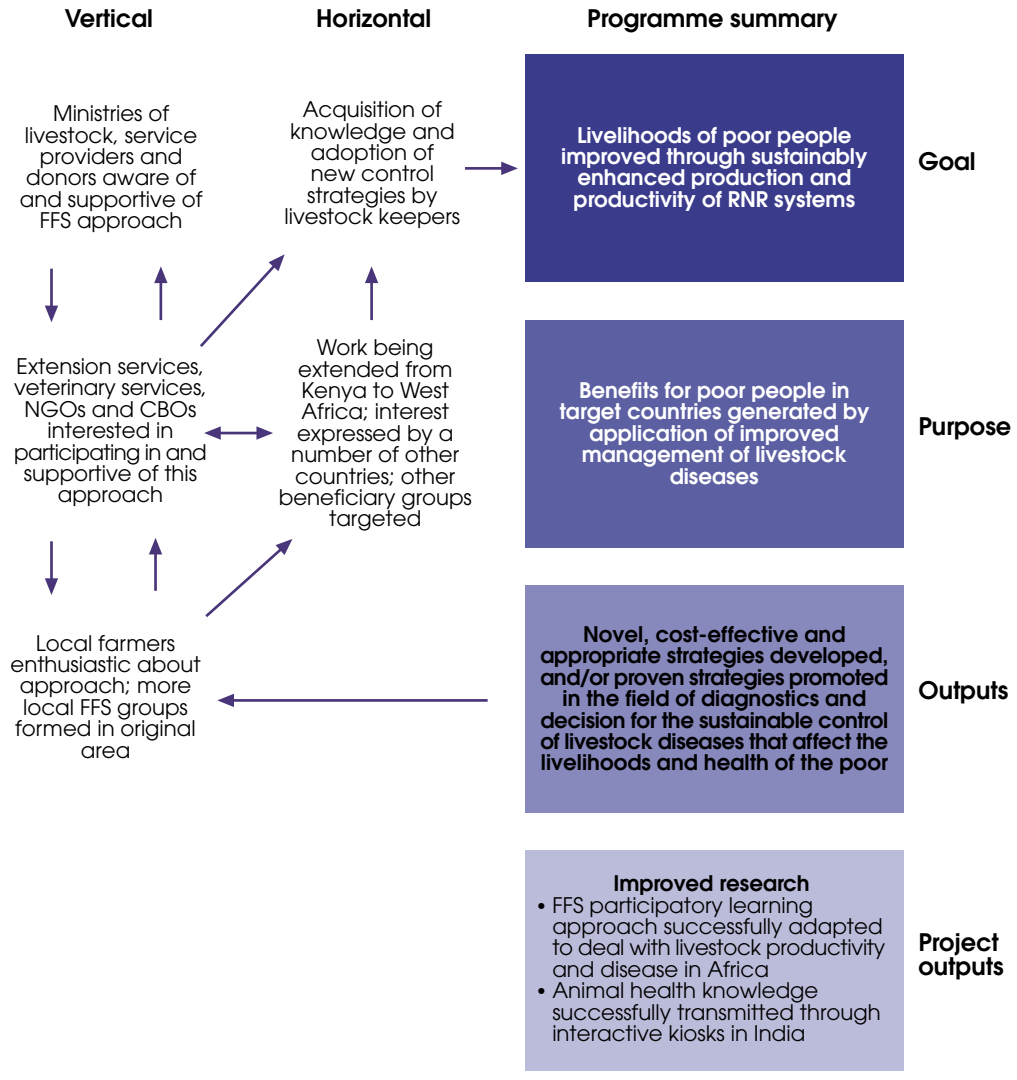
Figure C.2 **Impact pathways for farmer-based control of trypanosomiasis cluster**



C.3 Dissemination and delivery: farmer field schools

The impact pathways for AHP's third cluster, delivery of animal productivity and animal health knowledge using the livestock FFSs, is illustrated below. The most striking aspect of this cluster is its simplicity; it is this simplicity that is the approach's great strength. Once set up in an area, with participatory learning materials suitable to the local livestock production system, farmers join, and neighbouring areas become interested and in turn set up their own FFSs, thus already achieving developmental impact. This has also happened at an international level with other countries hearing about and asking for FFSs to be set up in their countries.

Figure C.3 **Impact pathways for dissemination and delivery cluster**



Acronyms and abbreviations

AHP	Animal Health Programme (DFID)
AHW	animal health worker
AIDS	Aquired Immune Deficiency Syndrome
BSF	Belgian Survival Fund
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza (Central America)
CBO	community-based organisation
CEPA	Cambridge Economic Policy Associates (UK)
CGIAR	Consultative Group on International Agricultural Research
CRD	Central River Division (The Gambia)
CRT	Central Research Team (DFID)
CTVM	Centre for Tropical Veterinary Medicine (University of Edinburgh, UK)
DALY	disability-adjusted life year
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
FMD	foot-and-mouth disease
FTA	Flinders Technologies Australia™
FTR	Final Technical Report (DFID)
G8	Group of Eight industrialised nations
GALV	Global Alliance for Livestock Vaccines
GAVI	Global Alliance for Vaccines and Immunisation
HIV	Human Immunodeficiency Virus
IARC	international agricultural research centre
ICPTV	Integrated Control of Pathogenic Trypanosomiasis and its Vectors
ILRI	International Livestock Research Institute
IRAG	Institut de recherche agronomique de Guinée
ISRA	Institut sénégalais de recherche agricole
ITC	International Trypanotolerance Centre (The Gambia)

ITS	Internal Transcribed Spacer (PCR)
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)
M.Phil	Master of Philosophy
MSc	Master of Science
NARS	national agricultural research system
NGO	non-governmental organisation
NIMR	National Institute for Medical Research (Tanzania)
NRI	Natural Resources Institute (UK)
NRIL	Natural Resources International Ltd (UK)
ODA	Overseas Development Administration (UK)
OVI	Onderstepoort Veterinary Institute (South Africa)
PAC	Programme Advisory Committee (DFID)
PARC	Performance Assessment Resource Centre (UK)
PCR	polymerase chain reaction
PCS	Project Completion Summary (DFID)
PhD	Doctor of Philosophy
PPR	*peste des petits ruminants*
RLD	Rural Livelihoods Department (DFID)
RNR	renewable natural resource
RNRR	renewable natural resources research
RNRRS	renewable natural resources research strategy
SARS	Severe Acute Respiratory Syndrome
SUA	Sokoine University of Agriculture (Tanzania)
TB	tuberculosis
TBD	tick-borne disease
UN	United Nations
VSFB	Vétérinaires sans frontières (Belgium)
WHO	World Health Organization (UN)

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