

Annex 10 – Specialists Reports

Chapter 1 Animal Health Programme (AHP)

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1.1 SUMMARY

Key Issue	Key Findings
<p>Science Quality</p> <p>(a) Quality of experimental design and analysis</p>	<p>In general the research scientists with responsibility for the different AH project have all long-term experience in carrying out research on diseases of relevance in developing countries.</p> <p>The scientific output from the AHP has in general been good and improved over the last 3-4 years to reach high-class international research in the field (east-coast fever vaccine and genome sequencing studies as one example).</p> <p>The selection process has been made more professional and with better defined criteria for selection of projects (more objective criteria and specific score sheets rather than subjective input from members).</p>
<p>(b) Contribution of projects sampled to new knowledge;</p>	<p>There are several examples of significant knowledge contribution from the AHP funded research. Examples of which are</p> <ul style="list-style-type: none"> • Epidemiological evidence of link between bovine tuberculosis and poverty. • Development of a diagnostic kit and a marker vaccine for rinderpest which makes it possible to differentiate between vaccinated and infected animals, a vital distinction in the final stages of an eradication campaign. • A first generation prototype anti-sporozoite neutralising vaccine, p67, has been evaluated under laboratory and field conditions • Improving public health and livestock productivity by controlling trypanosomiasis. This project has produced new vaccines against pleuropneumonia in cattle.

Key Issue	Key Findings
(c) Extent the projects use existing knowledge creatively in new contexts;	<p>The general trend is that the early part of the research program (1994-1998) looks relatively safe in terms of approach or suggested solutions to the problem. The early part of the program focused on defining diseases, typically through the carrying out of disease surveillance programs. In 1994, there were projects that aimed at defining the future basis for immune intervention against diseases like trypanosomiasis and theileriosis.</p> <p>One classical example of existing knowledge in new context is the “feeding-habit” study of tse-tse flies. AHP researchers demonstrated that flies feed mostly on the front legs and mostly on the largest animals in the herd. These findings were followed by studying the effect of ‘restrictive application’ of insecticides to the legs of cows, bulls and draught animals for controlling the fly. The targeted application implies a cost reduction of 80 – 90%.</p>
(d) Awareness of all current knowledge	<p>The general observation is that the scientific approach has been good and in line with and at the front of the scientific field. There are few indications that I have come across that clearly demonstrate that the implementers of the research have not been aware of the current knowledge in the field that s/he is working. The fact that the research activities were organised in “problem areas” or topics as long back as in 1994 (and before) is also a sort of guarantee that the research scientists working in a particular field has long experience, work in an environment with a long tradition in the research field and will thus have a good knowledge of the research front.</p> <p>There is however a tendency of copying research from one project to the other.</p>
(e) Innovativeness and scientific risk-taking with comment on projects that are innovative and projects that are not;	<p>Development of a subunit vaccine against east-coast fever (ECF) is a major goal for the research conducted by ILRI. A major impediment facing researchers has been the difficulty of identifying parasite antigens that could serve as the target(s) of a protective immune response. Because <i>T. parva</i> is an intracellular parasite, conventional approaches to identification of parasite antigens have not been very successful.</p> <p>The innovative elements of the project are many and there are significant risks associated with the research going on.</p>
(f) How risk was managed by programmes and project managers and the lessons from this should be included.	<p>Risk has been managed in several different ways in the different projects assessed. This has included receiving party involvement to ensure sufficient understanding of local conditions. Risk management has also been exercised at the programme level through the design and the selection of projects and research teams to carry out the different projects. Clustering of projects to ensure cross-fertilisation is another example.</p>

Key Issue	Key Findings
Address the issue of measuring science quality for applied projects with non-peer reviewed reports.	Assessing science quality in applied projects without a peer review process is difficult. AHP has had an internal system of reviewing project progress. This evaluator has found these reports of value in assessing the project progress, deviations and outcomes.
<p>Science Capacity Building</p> <p>Science capacity building in the south for both individuals and institutions.</p> <p>Include development of long-term institutional relationships between UK institutions and Southern institutions;</p>	<p>Many UK institutions that have been involved in the AHP have developed long and strong ties with institutions in the “south” and this has contributed to capacity building at institutional level. Over the years of the program there have been a large number of master and PhD students from southern countries that have been trained in specific methodologies, gone through various courses, workshops and seminars at different UK institutions. CTVM has been central in this regard, but also other UK institutions have been involved in this type of training/exchange.</p> <p>For the future, there is need for a long-term strategy with adequate resources both for the exchange itself (travel, accommodation etc) and also at the institutions accepting students. Training should include master and PhD programmes with budgetary support to developing country institutions. The principle that has been adopted over the recent years of AHP where developing country specialists work on and become part of the lead research teams is complemented. Involvement and participation are key elements.</p>
<p>Knowledge Dissemination</p> <p>Adoption, lessons etc. from different approaches to dissemination and uptake promotion.</p>	<p>Dissemination of knowledge in the south was a key element of AHP from 1998 and beyond. This is not saying that dissemination of knowledge had not taken place prior to 1998, but from then on dissemination became a strong focus of the program. Overall, the dissemination has improved from fair over the first period of the programme to good over the most recent years (3-4 years). In the following sections, comments have been included with focus on different aspects of knowledge dissemination to end-users, the scientific community etc.</p>

Key Issue	Key Findings
<p>Management Approach</p> <p>Identify the lesson learning on identification of demand, relevant project design, appropriate dissemination and uptake pathways etc.</p> <p>Identify the lesson learning from different approaches in selecting and designing projects to achieve the purpose.</p> <p>Identify how the programme has evolved and become more demand driven.</p>	<p>The development of the program over the years of the project period has shifted. There is now more focus on</p> <ul style="list-style-type: none"> - more demand-led research through better identification of demand (Voices of the poor) - project design has included receiving party to a greater extent - projects have been clustered into “program-like” activities within AHP - dissemination of knowledge with focus as to how the poor livestock keeper can be best informed (radio for example) <p>Evolvement of program. In 2001, the AHP, in conjunction with RLD (DFID) commissioned a study whose objectives was to describe and quantify the extent of poverty in South-East Asia, southern Asia and sub-Saharan Africa and to determine its association with livestock keeping, which species were of importance to the poor, review the literature and rank the disease constraints to these species and from this, to identify research opportunities that will promote better donor coordination and impact on poverty alleviation.</p>
<p>Conclusions and Lessons for the Future</p> <ul style="list-style-type: none"> • Knowledge dissemination 	<p>Dissemination of knowledge in the south was a key element of AHP from 1998 and beyond. Overall, the dissemination has improved from fair over the first period of the programme to good over the most recent years (3-4 years). This has included dissemination -</p> <ul style="list-style-type: none"> ▪ To developing country end users (farmers, foresters, fisher folk etc.) <ul style="list-style-type: none"> - One of the major challenges that the AHP is faced with, is getting the outputs of the research adopted by farmers. Questions of formats or media are essential and my understanding is that this is well appreciated by the current management of the program. Down-stream focus is key. ▪ To science community (refereed, non-refereed, web-based, other media) <ul style="list-style-type: none"> - The communication to the scientific community has in general been good. The researchers working on the different projects over the years have been very active in communicating in scientific journals, at conferences, at workshops etc. ▪ To developing country policy audiences <ul style="list-style-type: none"> - This part is not so obvious and there is limited documentation in the annual reports

Key Issue	Key Findings
<ul style="list-style-type: none"> • Capacity building 	<p>Several UK institutions have developed long and strong ties with institutions in the “south” through AHP and this has contributed to capacity building at institutional level. Over the years of the program there have been a large number of master and PhD students from southern countries that have been trained in specific methodologies. This part should be strengthened further and pre- and post-graduate training should be pursued. DFID programmes should encourage master and PhD training with exchange of personnel between institutions in the South and UK. Focus should be on disease control and prevention in line with the recommendation of strengthening the focus on disease prevention through vaccination.</p>
<ul style="list-style-type: none"> • Maintaining high science quality 	<p>Quality of research can strictly speaking best be assessed by scientific impact. In general the quality of the science during the period 1994-1998 was fair, with publication in scientific journals of medium or low scientific impact. Over the last years (2000 and onwards), several publications have appeared in journals of high impact scores. There have been publications in <i>The Lancet</i> related to sleeping sickness in human beings and in addition, there will be 2-3 back-to-back publications in the American journal Science related to the sequencing of the <i>Theileria parva</i> genome in 2005.</p> <p>The trend is that the quality of the AHP-funded science has developed gradually from a generic type of research across the board to more innovative research.</p>
<ul style="list-style-type: none"> • Management 	<p>The management of AHP has implemented changes in project portfolio in line with changes of the overall policy of the DFID program. Today there is a stronger focus on the poor livestock keeper and the disease problems that most significantly affect the daily situation of the livestock keepers. It is considered that the AH programme is well-managed with a good presentation of project progress.</p>

Key Issue	Key Findings
<ul style="list-style-type: none"> • Research themes for the future <p>Recommendations on the future research themes should refer to DFID's comparative advantage (or otherwise) in the context of international support to natural resources research.</p>	<p>Vaccine-development and disease control projects. It is recommended that research projects that are built up as clusters with participants from different research groups in the UK and the South are continued in the future. Examples are -</p> <ol style="list-style-type: none"> 1) Future vaccine development projects against diseases like ECF 2) Integrated vector management where the aim is to control malaria and trypanosomiasis using insecticide-treated cattle <p>It is also recommended that these research projects should be of a duration that exceeds the standard 3-year projects of DFID; 5 years is recommended as the minimum, with a mid-term evaluation (after 3 years) and continuation is made dependent on favourable assessment. Clear definition of deliverables must be included and progress should be evaluated against these at mid-term. It is also recommended that DFID adopt a routine of asking the research groups to develop 18 months plans. Between month 12 and 18 of each period, the plan should be updated so that a new plan is ready when the previous expires.</p> <p>Demand-led research with focus on real needs of the poor livestock keepers should be encouraged also in the future. It is my recommendation that more emphasis is put on obtaining objective data as regards the real need of the poor livestock keepers (<i>Voices of the poor</i>) and that this type of research projects are encouraged in the next term. New research efforts should build on what has been obtained in the project <i>Voices of the poor</i>, with focus on well-defined, objective assessment on what demand-led research entails.</p> <p>Co-funding with other funding agencies should be considered – it can keep the best from both sides. Depending of course in what direction the research under DFID is taking, research councils can possible support more basically oriented research while the DFID approach will be more towards demand-led research.</p> <p>Discontinued research activities. Research projects that are not connected with research clusters should not be initiated in the future. There are few examples of these types of projects today, but they were more often initiated in the beginning and mid-90s (rabies vaccines in dogs and jackals, CCP vaccine development). This is not saying that all these individual projects were unsuccessful, but it is considered that research clusters involving scientists from the UK and the South is a better guarantee for capacity building in the south and that good links are created.</p>

1.2 ACHIEVEMENT OF PROGRAMME OUTPUTS (logframe in Annex 4)

The assessment of the log frame has been carried out under the understanding that the logical framework (LogFrame) should set clearly the objectives of any project or a program. The logframe will aid in defining the inputs, processes, outputs, outcomes and impact. It should lead to an identification of performance indicators and anything that might impede the development towards achievement.

The general finding is that with some exceptions, the individual research projects have to a large extent followed what was defined in the logframe, which means that the project leaders had made an effort to stay with what was defined as “inputs”, “objectives” and the “processes” (understood as methods used and applied).

Outputs or outcomes are always uncertain in science, reflected in the fact that many of the projects had a relatively high risk score (see table in section 1.5). I find that the highest risk was associated with the vaccine-related projects with a focus on identification and characterisation of protective antigens of different pathogens. For some, the achievements are very good, like for CBPP vaccine (7196) and identification of protective antigens of *T. evansi* (5572). The question still remains to come up with a cost-efficient and highly efficacious vaccine against ECF, but work is underway. The protective immune responses have to a large extent been characterised, although not fully understood (7358, 7365).

The impact, relative to the log-frame, particularly towards the poor, is less obvious. For more detailed discussion on this topic, reference is made to other parts of this report (paragraph 2 and 3).

The concept of demand-led research, which is mentioned as long back as in 1995, needs further scrutiny. In general, there has been a trend over the recent years in animal health research that have been directed towards the south, to focus more on the need of the poor farmer. Typically, basic research (which was to a large extent the focus of the AHP of the early 90's) has been criticised for not including social, economic and cultural aspects when delivering the products of science. Similarly, applied research lack participation and for both basic and applied research there is a tendency of both being driven by the implementers (supply-driven) and that there is a top-down approach. The result has been low uptake and low adoption rates and new tools and mechanisms are needed to overcome these inadequacies. Simply stated, demand-led research became the mantra of the late 90's, possibly without a precise definition or understanding of what it meant.

In demand-led research the stakeholders are many and diverse and as this is considered a bottom-up approach, it is not clear who represents the “bottom”. The obvious is that it will vary with who defines the demand; at individual level, at community level, at institutional level etc. Knowledge is also important as are needs, wants and desires. This has to be taken into account when defining what the demand under a given setting is really.

1.3 BACKGROUND

Introduction (background information on the programme)

The Animal Health programme has funded many research activities over the years of the assessment period. A marked characteristic has been a shift in the orientation of the research, the most marked changes can be summarised as follows.

- shift from a “supply-driven” or “implementer-driven” research to a stronger emphasis on demand-led (end-user-oriented) research – particularly over the last 2-3 years
- reduced number of projects
- lesser geographic spreading
- stronger focus on poverty impact of the research and dissemination of results over the last 2-3 years

Despite these changes, the project portfolio has, thematically-wise, been kept remarkably focussed over this 10 year period –

- the research areas that the AHP funded in 1994 are still funded by AHP in 2004, and these were/are -
- trypanosomiasis
- tick-borne diseases
- development of diagnostic tools (used in disease surveillance and disease control)

- in addition, there have been several upstream vaccine-development related projects related to:
 - antigen detection and characterisation, with emphasis on East-Coast Fever (*Theileria parva* infection in cattle)
 - characterisation of immune responses towards defined pathogen antigens/epitopes (several pathogens have been studied)
 - small-scale testing of vaccines
- strong focus on the use of modern technology (biotechnology, particularly) in 1994 as well as in 2004

Adjustment with policy

Between 1995 and 1999, there is no doubt that AHP has implemented changes in project portfolio in line with changes of the overall policy of the DFID program. Today there is a stronger focus on the poor livestock keeper and the disease problems that most significantly affect the daily situation of the livestock keepers. These changes have happened gradually, and not solely as a consequence of the change in government in 1998 and later with the adoption of the “White-paper”.

In the 1995 Annual report (p.11) the project manager (Professor Brown) states that “...many projects already have adaptive, downstream and often in-country links within target countries. Few projects are now solely strategic and the need for the research conducted is invariably demand-led”. These changes came according to the project manager, as a result of a new strategy that came into effect by April 1, 1995; “The Renewable Natural Resources Research Strategy (RNRRS), 1995 - 2005”. One cannot question the intention of the project manager to change the direction in line with overall strategy, but looking at the project portfolio over the years 1994-98, very few changes have been made.

There are no changes in thematic orientation as far as I can see, and the only change that can be observed is the number of project within each category. Having said this, it is obvious that it is more or less impossible to change the direction of a relatively large program over a very short time frame (2-3 years).

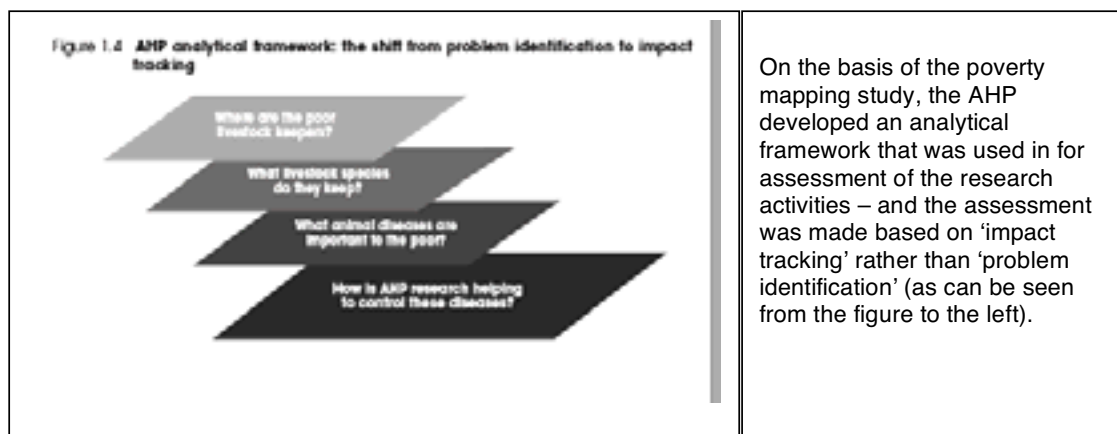
Further, looking at the timeline for the various project under the Trypanosomiasis cluster, several project ended during the 1st quarter of 1996 and 6 new projects were commissioned by the 2nd quarter of 1996 that were related to trypanosomiasis (see Figure 1). These are projects 6553, 6558, 6559, 6560, 6563 and 6564.

Project 6553 “Community Participation in the Management of Tsetse: A Comparative Assessment of Impact and Sustainability” can possibly be a demand-led project, but it is not obvious that project 6560 “Tse-tse flies incapable of transmitting trypanosomiasis” is really a request from the poor livestock farmers”.

Impact focus change

In 2001, the AHP, in conjunction with RLD (DFID) commissioned a study whose objectives was to describe and quantify the extent of poverty in South-East Asia, southern Asia and sub-Saharan Africa and to determine its association with livestock keeping, which species were of importance to the poor, review the literature and rank the disease constraints to these species and from this, to identify research opportunities that will promote better donor coordination and impact on poverty alleviation. According to various guidance notes for poverty assessment I find this study instrumental in its layout. The key elements are assessment of the poverty situation and to analyse the impact of poverty. The right questions were asked; who are the poor, where are they, what do they do and what is the main reasons for their vulnerability?

One might ask why it took some 3+ years to reach an understanding that this assessment/ evaluation was needed? The change in political climate came in 1998 and still it took so long to realise that this study was needed? And another issue, has the research under AHP been carried out over almost 10 years (looking only at the period that we have been asked to assess) without knowing where or how to best focus the research? In the 1995 report it was stated that “Few projects are now solely strategic and the need for the research conducted is invariably demand-led”. Based on the 2001 reports “Mapping poverty and Livestock in the third world” and “Investing in Animal health research to Alleviate poverty” I am tempting once again to ask the question if the research in the early phases was really demand-led.

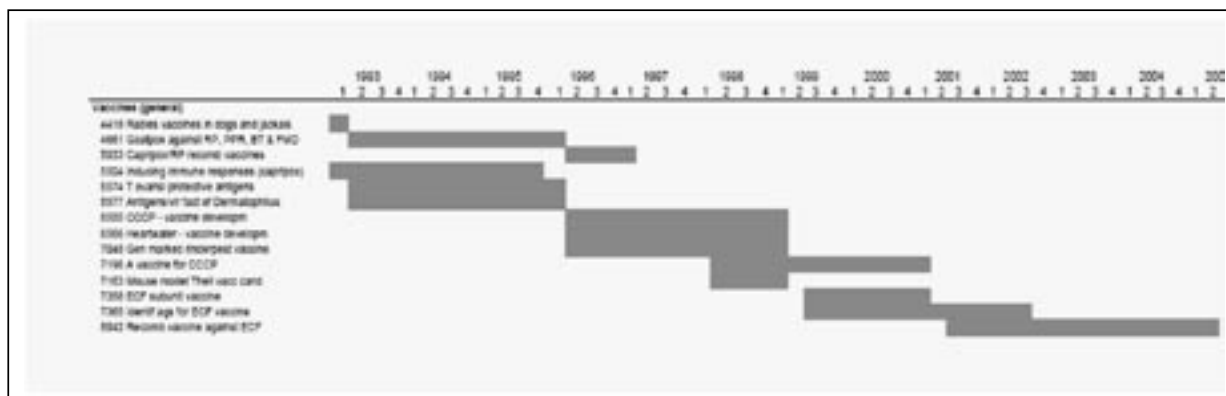


Having said this, the current management of the AHP should be complimented for initiating such a survey and analysis, despite it being initiated somewhat late relative to the policy change. I can understand that it takes time to “change the direction of an oil-tanker”, and resources had to be freed for commissioning such a study. There is however no doubt that with these reports, the AHP became more focused on the poor livestock keepers, and there was now an instrument in place to assist in designing a more optimal research portfolio related to pro-poor research (the outlined is shown in Figure 1.4 above).

Research focus – research portfolio changes

The research focus in 1994 was within 4 thematic research areas, trypanosomiasis, tick-borne diseases, helminths and microbiology (including biotechnology). In 2004, the disease entities studied are still related to trypanosomiasis and tick-borne diseases. In addition to this, under each of these clusters, there are several projects related to vaccine development. More specifically, most of the projects are concerned with characterisation of protective antigens or immunodominant antigens (epitopes) and also characterisation of immune responses to these antigens (both humoral and cell-mediated immunity).

Figure 2. Vaccine project portfolio and timeline (AHP)



Vaccine development was thematically singled out as a separate research area in 1999. In Figure 2 there is an overview of the main research projects and the respective timelines for the vaccine development projects (1993-2005). As can be seen there has been a continuous activity in this field under AHP over these years.

Change in Geographic focus

There has been a gradual narrowing down of the geographic engagement. These changes were initiated already in 1994 with the change in strategy of the RNRRS that resulted in a so-called new country focus. The details are shown in Annex 3. When comparing the “country focus” or geographic focus in 1994 and 2004, the AHP had activities in more or less the same regions and countries. However when looking at the allocation of financial resources to the different geographic regions, the change is more obvious. In 1994, 38% of the total funding was spent on trypanosomiasis (1994, Annual report, p. 8) and most of the research activities were related to *T. evansi* infection in cattle, buffalos, horses etc. in SE Asia, Indonesia particularly (1994, Annual Report p. 9 and onwards). In 2004, only 2% of the resources were allocated to projects in Asia (Annex 3).

The change in focus to the Lake Victoria basin is also in line with the recommendation from the poverty assessment carried out in 2001 (“Mapping poverty and Livestock in the third world” and “Investing in Animal health research to Alleviate poverty”) and represents a change to pro-poor research in the AHP.

Change in Quality of research

Quality of research can strictly speaking best be assessed by scientific impact. Impact assessment is defined by the citation index and updated every year for all scientific journals (given as an impact factor).

In general the quality of the science during the period 1994-1998 was fair, with publication in scientific journals of medium or low scientific impact. This is a typical scientific level for veterinary medical journals. Very few of these journals have an impact factor above 2.5.

Over the last years (2000 and onwards), several publications have appeared in journals of higher impact scores. There have been publications in *The Lancet* related to sleeping sickness in human beings;

Welburn, S.C., Picozzi, K., Fevre, E.M., Coleman, P.G., Odiit, M., Carrington, M and Maudlin, I. (2001). Identification of human infective trypanosomes in animal reservoir of sleeping sickness in Uganda by means of serum-resistance-associated (SRA) gene. *The Lancet* 358: 2017-19

Fevre, E.M., Coleman, P.G., Odiit, M.D., Magona, J., Welburn, S.C. and Woolhouse, M.E.J (2001). The origins of a new sleeping sickness outbreak (caused by *Trypanosoma brucei* infection) in eastern Uganda. *The Lancet* 358: 625-628.

Fevre, E.M., Picozzi, K. Fyfe, J. Waiswa, C. Odiit, M. Coleman, P.G., & Welburn, S.C. (2005). A burgeoning epidemic of sleeping sickness in Uganda. *The Lancet*.

In addition, there will be 2-3 back-to-back publications in the American journal *Science* related to the sequencing of the *Theileria parva* genome (8042) in 2005.

Assessing the quality of science will always be hampered by some degree of inaccuracy, not the least because the impact factor of the different journals will change over time. The trend is however, that the quality of the AHP-funded science has developed gradually from a generic type of research across the board, to more innovative research. Examples of the latter are given above and it is likely that these changes result from the fact that the research program has run over an extended time period. This is not a general rule, but is frequently seen in research good groups that have been allowed to focus on a defined topic over an extended time period.

1.4 SAMPLING AND METHODOLOGY

Sampling of projects for analysis

The projects covered in this report fall under different 4 different categories of research. These are trypanosomiasis, tick-borne diseases, zoonotic diseases and vaccine development. All the projects that have been subject to evaluation are listed in a separate table in section 1.5.

The trypanosomiasis cluster has been active over the duration of the program period. The different projects and their respective timelines are shown in Annex 1. During the early phase of the program, trypanosomiasis research was focused on non-tsetse transmitted *Trypanosoma evansi* infections which included epidemiological (5528), drug resistance studies (5529) and biochemical (5573) and immunological characterisation of protective antigens of the parasite (5572, 5574). The epidemiological studies entailed several in-depth studies of diagnostic methods (5571) used for identification of infected (or non-infected) animals in a given animal population. This was important to assess the relative spread of the disease in susceptible animal species.

The immunological studies were directed towards examining the functional responses of lymphocytes from infected and immune animals in assays using living trypanosomes and soluble trypanosomal antigens. Further to determine the role of cytokines in the response to infection with *T. evansi* and to examine the cellular response in animals vaccinated with purified trypanosomal antigens and recombinant protein. This latter objective was a first step towards vaccine development. This was later followed up in another project (5574) where the aim was to isolate selected antigens of *T. evansi* from crude extracts of the parasite by immunoaffinity chromatography using antibodies raised to each antigen. Thereafter, evaluate the potential of genetically engineered *E. coli* as a source of antigens of *T. evansi* and to develop suitable model systems that could be used to assess the protective properties of particular antigens.

Bovine trypanosomiasis had been studied earlier under the AHP (4344) and became a focus in 4489 and later in several other projects (as can be seen from Figure 1). The tsetse-trypanosome interface became an important area of study (4489, 5683), different approaches to vector control (6553, 6558, 7173), improved and targeted use of trypanocide treatments (7360), development of tsetse flies in the laboratory incapable of transmitting trypanosomiasis (6560), and also through improved knowledge of feeding habits (6559) and preferences of tsetse flies (7364). Drug resistance (5575) in the tsetse flies was also studied (for more details see additional information in Annex I). The cattle-human interaction was also later subject of more detailed studies, with major impact as to how the spread and occurrence of sleeping-sickness in humans can be better controlled (7538, 7596, 8214 and others).

Zoonoses severely affect the poor people. These diseases affect and can kill both animals and their owners. Tuberculosis (5408, 5498, 6104, 7229, 7357) and brucellosis (7985) are two of the major diseases, as are different parasitic diseases (hydatidosis and cysticercosis). Rabies is probably the best known (4418). Different epidemiological studies have identified the major risk factors for bovine tuberculosis and it has been shown that *Mycobacterium bovis* is causing disease in human beings (7229), with cattle as the source. Cattle again can be infected from wild animals and wildebeest populations have a high prevalence of *M. bovis* positives.

Tick and tick-borne disease (TTBD) are another large group of disease that affect livestock and the poor livestock keepers (for more details on TTBD see Annex 2). Over the course of the program, there have been several projects addressing the epidemiology (4893, 5569, 6562), pathogenesis, diagnostics (6562), prevention (7163, 7358), treatment and immunoprophylaxis (7358) of TTBD (, Annex 2). The diseases that have been at the focus of research are *Dermatophilus* infections, and different *Theileria* infections, particularly *T. parva* and *T. annulata*. There have also been several projects related to tick control (5570, 5581) and improved methods of preventing infestation of cattle (6552, 8208, 8214).

Over the more recent years, there has been a shift towards East coast fever, caused by *T. parva* infections. The current method of disease control is an infection-treatment method where cattle are artificially infected and treated with a long-acting tetracycline to control the infection. This method is relatively efficacious but expensive for the poor livestock farmer. It is also dependent on a cold-chain which causes logistical problems in many remote areas. Therefore there is need for new, cheaper and improved methods of immunisation. Based on several studies aimed at characterising the protective immune responses in infected-and-treated cattle (7358), there has been a good progress towards identifying the protective antigens of *T. parva* schizonts. The most recent project is coordinated out of ILRI in Kenya (8042), includes sequencing of the entire genome of the parasite (with 4 chromosomes) and an advanced use of bioinformatics tools to map the potential protective antigens (particularly T cell epitopes) of the schizonts. In this project there is involvement from cattle immunologist, bioinformatics, cancer research scientists and others. It has a high innovative potential and a high risk.

The studies on ECF aiming at identifying the protective antigens of *T. parva* (7163, 7358, 7365, 8042) constitute a core of the vaccine development projects that have been run under the AHP over these years. But there are many others, some of which have already mentioned under the trypanosomiasis research activities (*T. evansi* particularly). In addition there have been projects related to vaccination against rabies in jackal and dogs (4418). The capripox vector (pox virus infecting goats) have been widely used and tested for its ability to induce strong immune responses (4661, 5033, 5504). This methodology is a core competence of one of the industrial partners (Merial) and has thus been used in several projects. It is also used as a delivery and antigen presentation system under the most recent ECF vaccine project (8042).

In addition to this there some vaccine development projects that have been run for a shorter time period. Vaccine development against caprine pleuropneumonia has been carried out as part of two projects (6555, 7196). The same holds for heartwater in ruminants (6566, 7363).

In addition to this there have been several projects that have focused on development of different categories of diagnostic methods and principles. Some laboratory based, others for pen-side diagnosis (5623, 5937, 5955, 7362, 7597).

1.5 SCIENCE QUALITY

Contribution to new knowledge

There are several examples of significant knowledge contribution from the AHP funded research. Examples are –

- Epidemiological evidence of link between bovine tuberculosis and poverty (7357).
- Rinderpest in cattle: Recently AHP has contributed towards this goal by funding the development of a diagnostic kit and a marker vaccine which makes it possible to differentiate between vaccinated and infected animals, a vital distinction in the final stages of an eradication campaign (7362).
- A first generation prototype anti-sporozoite neutralising vaccine, p67, has been evaluated under laboratory and field conditions and shown to reduce the incidence of severe disease by 50% (basis in 7358).
- Improving public health & Livestock productivity by controlling Trypanosomiasis (7596)
- This project has produced new (CBPP¹) vaccines (capsular polysaccharide conjugate and DNA) (7196).

Tuberculosis – cattle – man interaction

This study has established that species other than *M. tuberculosis* caused over 50% of culture-positive cases of human extrapulmonary tuberculosis, which is equivalent to about 10% of the 50,000 new cases of human tuberculosis that occur each year in Tanzania. The causative organisms were identified as *Mycobacterium bovis* (10%) which causes tuberculosis in cattle and atypical *Mycobacteria* species which account for a mere 44% of the cases.

An additional finding from these studies was that *M. bovis* is present and causing disease in a wide range of wildlife species in northern Tanzania, including wildebeest, topi, kudu and buffalo. The Serengeti migratory herds comprise more than 1 million wildebeest and spend several months of the year in areas used by livestock, so the potential for transmission between cattle and wildlife is also very high.

ECF vaccine development program

Vaccine development against East Coast Fever caused by *Theileria parva* has been in the research project portfolio of AHP for 10 years (minimum; cf. Annex 2). It cannot be read directly from the figure, but also for project 4893 activities within the project had elements of vaccine development work.

Vaccination has long been recognised as one of the factors that are important for control of ECF and it is considered to be a viable option that would contribute substantially to a sustainable integrated control programme for ECF (See Annex 2 for details on TTBD control). Currently, a live vaccine based on infecting cattle with a lethal dose of sporozoites and simultaneously treating with long-acting tetracycline is being deployed to control ECF. Cattle immunized by infection and treatment, exhibit long lasting immunity to a homologous parasite re-challenge. Several lines of evidence indicate that cellular immune responses, including CD8+ T cells, directed against the schizont infected lymphocytes are responsible for protection, but the protective antigens have not been identified.

There is an experimental subunit vaccine available based on the major sporozoite surface protein p67, but it reduces the cases of severe ECF by 50% only, but it shows there is a potential for sub-unit vaccines against ECF.

Development of subunit vaccines, potentially the most effective method of ECF control, is a major goal of research conducted by ILRI (project # 8042). A major impediment facing researchers has been the difficulty of identifying parasite antigens that could serve as the target(s) of a protective immune response. Because *T. parva* is an intracellular parasite, conventional approaches to identification of parasite antigens have not been very successful.

¹ Contagious bovine pleuropneumonia (CBPP), a lung infection and inflammation in cattle

The innovative elements of project 8042 are many and there are significant risks associated with the research going on.

- First of all identification of T-cell epitopes is in itself difficult given the research tools in cattle immunology
- One has to go down to the parasite antigens expressed in schizont-infected cells and they have been difficult to identify. The approach is to analysis of the complete genome sequence of T parva, and along with microarray based studies of gene expression throughout the life cycle, antigens for vaccine development has been identified.
- To achieve this, a high throughput antigen identification in vitro assay was applied where individual cDNA cloned from a gene list that was developed using bioinformatic tools. By this method it was possible to predict target genes and T cell epitopes from a fully sequenced T. parva genome. Eight vaccine candidates have been identified.

In addition to this there was need for –

- An In vitro assays for monitoring immune responses in vaccinated cattle
- Selection of cattle of appropriate BoLA types for use in evaluating vaccine candidates
- Laboratory testing for immunogenicity and efficacy

All of which were not fully developed or needed to be improved optimised.

Consequently, the research undertaken in this project was of high risk, and if successful would have substantial scientific impact.

It should also be mentioned that there will be several publications in Science the coming year presenting the data from the sequencing of the genome of T parva. Typically high-impact research.

Existing knowledge in new contexts

The general trend is that the early part of the research program (typically 1994-1998) looks relatively safe in terms of approach or suggested solutions to the problem. The early part of the program focused on defining diseases, typically through the carrying out of disease surveillance programs (occurrence of TB in cattle in Zambia; rabies in the Serengeti etc). However already in 1994, there were projects that aimed at defining the future basis for immune intervention against diseases like trypanosomiasis and theileriosis. Already at this time, part of the research activities was relatively advanced applying state-of-the-art technology; detection of protective antigens for later vaccine development, detection of major antigens for disease diagnosis of theileriosis etc.

One project that possibly falls under this category (existing knowledge in new context) is the “feeding-habit” study of tse-tse flies. This was a phenomenon that was known (understood) among scientists working in the field for many years, but it was not unequivocally proven. Over the years (1996-1999), AHP researchers² demonstrated that flies feed mostly on the front legs and mostly on the largest animals in the herd. These findings were followed by studying the effect of ‘restrictive application’ of insecticides to the legs of cows, bulls and draught animals for controlling the fly. The targeted application implies a cost reduction of 80 – 90%. An economic analysis of the use of these products in Ethiopia showed a financial return (or benefit-cost ratio) of 8 to 1 due to higher productivity and lowered livestock mortality for farmers using pour-ons at traditional application levels. While applying pour-ons still makes demands on farmers’ time, it is the crucial cash component which is dramatically reduced, offering the potential of substantially increasing this benefit-cost ratio.

² Co-funded with the LPP.

Innovativeness and scientific risk-taking

The projects below have been included in the assessment of the research activities undertaken by the AHP over the 10 years period. Not all of them have been examined to the minor details, but they have been included as they form a continuum within a cluster. Those marked with a star have been assessed at a less in-dept level.

Title (and project number)	Innovation	Risk
Immunising Dogs and Jackals against Rabies 4418*	3	3
The Tsetse Trypanosome Interface 4489	7	8
Using sheep and goat pox vaccines to control Rinderpest, PPR, Bluetongue and Foot and Mouth Diseases 4661*	5	8
Diagnosis and Control of Tropical Theileriosis 4893	6	8
Procyclic Proteins of Trypanosoma congolense 4904*	7	6
Field Trials of the Capripox/Rinderpest Recombinant Virus 5033*	3	3
Tuberculosis (TB) in Zambia 5408	3	3
Bovine Tuberculosis in the Tropics 5498	3	3
Inducing Immune Responses 5504	5	8
Diagnosis and Control of Trypanosoma evansi in South East Asia: Field Testing ELISA 5528	5	7
Trypanosoma evansi: Epidemiology of Drug Resistance in Kenya 5529	3	2
The Epidemiology and Control of Bovine Theileriosis 5569	4	2
Improved Control of Ticks 5570	7	8
Diagnosis and Control of Trypanosoma evansi in South East Asia: Validating ELISA 5571	3	3
Immunity to Trypanosoma evansi Infections in Ruminants 5572	5	7
Molecular and Biochemical Studies on Trypanosoma evansi 5573	6	4
The Identification and Characterisation of Protective Antigens of Trypanosoma evansi 5574	5	7
Drug Resistance in Trypanosomes of Domestic Animals 5575	6	5
Improved Control of Ticks (2) - 5581	4	4
Heartwater: Developing Diagnostic Tests 5623*	3	4
The Tsetse Trypanosome Interface: Tsetse Immunity and the Role of Lectins in the Transmission of African Trypanosomiases 5683	7	8
The Interaction of Work and Trypanotolerance in N'Dama Cattle 5797*	4	2
Simple Pen-side Tests for Animal Diseases 5937	3	4
Field testing ELISA to help Control Trypanosomiasis 5955	3	4
Bovine Tuberculosis: Validating TB testing in Tanzania 6104	2	2
Delivering Animal Health Services in Developing Countries 6552	2	4
Community Participation in the Management of Tsetse: A Comparative Assessment of Impact and Sustainability 6553	2	3
Contagious Caprine Pleuropneumonia (CCPP) Vaccine Development 6555	4	7
Field Trialling of the Capripox/Rinderpest Recombinant Virus 6557	3	6
Controlling Tsetse-transmitted Trypanosomiasis 6558	5	3
Using cattle to attract Tsetse Flies 6559	5	3
The Development of Tsetse Flies Incapable of Transmitting Trypanosomiasis 6560	8	9
Development and Evaluation of Diagnostic Techniques for Studies on the Epidemiology of Tropical Theileriosis 6562	5	7
Studies on the Control and Economic Impact of Trypanosomiasis in Livestock in Indonesia 6563	3	2
Heartwater: Developing better vaccines for Ruminants 6566*	4	7
Development of a Genetically Marked Rinderpest Vaccine 7048	6	8
Development of a laboratory mouse model for screening of Theilerial Vaccine Candidates 7163*	4	8
Cattle management practices in tsetse-affected areas 7173	3	3
A Vaccine for CBPP 7196	5	7
Mycobacterium bovis infection of cattle and man in Tanzania 7229	4	4
Quantifying the costs and risks of bovine tuberculosis in Tanzania 7357	3	3
Development of a subunit vaccine against East Coast Fever in cattle using novel prime-boost immunisation Strategy 7358	5	7

Title (and project number)	Innovation	Risk
Controlling Bovine Trypanosomiasis for poor farmers by using better targeting & drug use 7360	3	4
Developing a cheap and effective Pen-side test that differentiated between vaccinated animals and those infected by the Rinderpest virus 7362*	5	7
The Investigation of the immunogenic potential of heartwater (Cowdria ruminantium) grown in tick cell lines 7363*	6	8
Improving the control of tsetse: using DNA profiling to establish feeding responses of tsetse to cattle 7364	6	4
Identifying antigens of Theileria parva that may be used in a vaccine for East Coast Fever 7365	6	8
A Review of environmental change and sustainable poverty-focused strategies for trypanosomiasis control in Africa 7538	2	4
Improving public health & Livestock productivity by controlling Trypanosomiasis 7596	4	6
A Decision Support Tool for Bovine Diseases in Africa 7597	2	3
The Role of Dukas in Animal Health Information & Services 7598	3	6
Alternative Strategies for Foot & Mouth and Tickborne Disease Control Strategies benefiting Poor Farmers 7599	3	3
The Impact of Brucellosis on Public Health & Livestock Reproduction in Tanzania 7985	2	4
Development of a Farm Field School Methodology for Smallholder Dairy Farmers 7986	7	7
Message in a Bottle: disseminating tsetse control technologies 7987*	2	3
Bovine Theileriosis in Semi Arid Pastoral Systems in Tanzania 8022	4	8
Integrated Control of East Coast Fever in cattle of Smallholder Farmers 8042	9	9
Risk management strategies for Tick Borne Diseases in East African pastoral systems 8208	3	6
Including Voices of the Poor 8213	6	4
Integrated Vector Management: controlling malaria & trypanosomiasis with insecticide-treated cattle 8214	5	7

Awareness of current knowledge

The general observation is that the scientific approach has been good and in line with and at the front of the scientific field. There are few indications that I have come across that clearly demonstrate that the implementers of the research have not been aware of the current knowledge in the field that s/he is working. The fact that the research activities were organised in “problem areas” or topics as long back as in 1994 (and before) is also a sort of guarantee that the research scientists working in a particular field has long experience, work in an environment with a long tradition in the research field and will thus have a good knowledge of the research front.

There is however a tendency of copying research from one project to the other. One example from the early years is project 5529 and 5575, both carried out by the same scientist, C.A. Ross, Centre for Tropical Veterinary Medicine, University of Edinburgh and both focusing on drug resistance in trypanosomes (5575 Drug Resistance in Trypanosomes of Domestic Animals and 5529 Trypanosoma evansi: Epidemiology of Drug Resistance in Kenya). There are obvious differences between these two projects, 5575 focusing on “knowledge on the mechanism and acquisition of resistance to trypanocides” while 5529 concerns “the extent and distribution of drug resistance in T. evansi affecting the camel population in the semi-arid regions of Kenya”. One general study on T. evansi drug resistance, the other focusing on a particular problem in a defined species. In terms of scientific innovation they are different and a combination of the two might have been appropriate (they were both initiated the same year). Project 5573 Molecular and Biochemical Studies on Trypanosoma evansi is also a project closely related to 5575 with overlapping objectives.

Having said this, given that the intention is to build a project portfolio of interrelated projects, one has to accept that projects with some degree of overlapping interest/topics are being funded. This opens up for cross-fertilisation between projects and one should also expect to obtain a synergistic effect, given that the projects are well coordinated.

Achievement of science outputs in log frames

The assessment of the log frame has been carried out under the understanding that the logical framework (LogFrame) should set clearly the objectives of any project or a program. The logframe will aid in defining the inputs, processes, outputs, outcomes and impact. It should lead to an identification of performance indicators and anything that might impede the development towards achievement.

The general finding is that with some exceptions, the individual research projects have to a large extent followed what was defined in the logframe, which means that the project leaders had made an effort to stay with what was defined as “inputs”, “objectives” and the “processes” (understood as methods used and applied).

Outputs or outcomes are always uncertain in science, reflected in the fact that many of the projects had a relatively high risk score (see table in section 1.5). I find that the highest risk was associated with the vaccine-related projects with a focus on identification and characterisation of protective antigens of different pathogens. For some, the achievements are very good, like for CBPP vaccine (7196) and identification of protective antigens of *T. evansi* (5572). The question still remains to come up with a cost-efficient and highly efficacious vaccine against ECF, but work is underway. The protective immune responses have to a large extent been characterised, although not fully understood (7358, 7365).

The impact, relative to the log-frame, particularly towards the poor, is less obvious. For more detailed discussion on this topic, reference is made to other parts of this report (paragraph 2 and 3).

The concept of demand-led research, which is mentioned as long back as in 1995, needs further scrutiny. In general, there has been a trend over the recent years in animal health research that have been directed towards the south, to focus more on the need of the poor farmer. Typically, basic research (which was to a large extent the focus of the AHP of the early 90's) has been criticised for not including social, economic and cultural aspects when delivering the products of science. Similarly, applied research lack participation and for both basic and applied research there is a tendency of both being driven by the implementers (supply-driven) and that there is a top-down approach. The result has been low uptake and low adoption rates and new tools and mechanisms are needed to overcome these inadequacies. Simply stated, demand-led research became the mantra of the late 90's, possibly without a precise definition or understanding of what it meant.

In demand-led research the stakeholders are many and diverse and as this is considered a bottom-up approach, it is not clear who represents the “bottom”. The obvious is that it will vary with who defines the demand; at individual level, at community level, at institutional level etc. Knowledge is also important as are needs, wants and desires. This has to be taken into account when defining what the demand under a given setting is really.

1.6 SCIENCE CAPACITY BUILDING

Science capacity building in the South

Many UK institutions that have been involved in the AHP have developed long and strong ties with institutions in the “south” and this has contributed to capacity building at institutional level. Over the years of the program there have been a large number of master and PhD students from southern countries that have been trained in specific methodologies, gone through various courses, workshops and seminars at different UK institutions. CTVM has been central in this regard, but also other UK institutions have been involved in this type of training/exchange.

Development of long-term institutional relationships between UK institutions and Southern institutions

Several post-graduates from southern countries have also come to UK institutions and completed their PhD studies before going back to the mother institution or country of origin. There are several PhD students that have defended their theses under the program over this 10 year period (for example 5 in 1994, 7 in 1997, 1 in 1997/98 and several over the recent years – see below). Some examples are;

Melrose TR (PhD, Napier University, 1994): *Biochemical, Immunological and Genetic Studies of Apicomplexan Parasites with Special Reference to Theileria annulata*.

Miled LB (PhD 1994): *Population Diversity in Theileria annulata in Tunisia*.

Fèvre, E.M. (2002). *The epidemiology of trypanosomiasis, a re-emerging zoonosis in Uganda*. PhD thesis, University of Edinburgh, UK.

Tilley, A. (2002). *Development of PCR-based techniques for the characterisation of Trypanosoma brucei strains from East Africa*. PhD thesis, University of Salford, UK.

Odiit, M. (2003). *Epidemiology of Trypanosoma brucei rhodesiense Sleeping Sickness in Eastern Uganda*. PhD thesis, University of Edinburgh, UK.

Machila, N (2004). *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.

It can only be achieved through a diversified set of arrangements, not only by accepting PhD and master students at UK institutions but through various forms of training programmes and forms of exchange mechanisms, and these activities should be strengthened. In addition to staff exchange, visit by developing countries scientists to UK institutions it can include study tours, research networks, and more sophisticated systems of e-based learning.

For the future, there is need for a long-term strategy with adequate resources both for the exchange itself (travel, accommodation etc) and also at the institutions accepting students. Training should include master and PhD programmes with budgetary support to developing country institutions. The principle that has been adopted over the recent years of AHP where developing country specialists work on and become part of the lead research teams (projects # 7986, 8042, 8152 and many others) is complemented. Involvement and participation are key elements.

It is also reasonable to assume that funding PhDs projects is a cost-effective way of simultaneously conducting research and building capacity.

1.7 KNOWLEDGE AND DISSEMINATION

Rating of the overall result knowledge dissemination from programme

Dissemination of knowledge in the south is a key element of AHP from 1998 and beyond. This is not saying that dissemination of knowledge had not taken place prior to 1998, but from then on dissemination became a strong focus of AHP. Overall, the dissemination has improved from fair over the first period of the programme to good over the most recent years (3-4 years). In the following sections, comments have been included with focus on different aspects of knowledge dissemination to end-users, the scientific community etc.

To developing country end users (farmers, foresters, fisher folk etc)

One of the major challenges that the AHP is faced with, is getting the outputs of the research adopted by farmers. Questions of formats or media are essential and my understanding is that this is well appreciated by the current management of the program.

The problems of effective dissemination are well illustrated by the report summarised in Section 3.1 (Project R5527 - The epidemiology, immunology and control of fasciolosis in dairy cattle in Cajamarca, Peru). The results are that the farmers in this study faced a severe helminth problem (prevalence of fasciolosis was 55%) but despite meetings designed to teach the farmers effective disease control methods, it was found that most of them operated a programme which over-used drug treatments i.e. were not following the recommendations advised in the programme.

A follow-up study was undertaken and revealed the difficulties inherent in the transfer of research findings to farmers, particularly small farmers with little background knowledge. This study and others (7359 and 7360) underline the need for management to ensure that the right media are employed and in the right format to achieve efficient dissemination of knowledge to the end-user.

Down-streams effects became a stronger focus from 1998 and onwards. This goes in hand with a change in the political environment in UK and the formulation of the white paper with a strong focus on the poorest of the poor. The AHP program is no exception in this regard.

To science community (refereed, non-refereed, web-based, other media)

The communication to the scientific community has in general been good. The researchers working on the different projects over the years have been very active in communicating in scientific journals, at conferences, at workshops etc.

To developing country policy audiences

This part is not so obvious and there is limited documentation in the annual reports, although there are several comments on the dissemination of the results (but for the most part with focus on the scientific dissemination, particularly in the early phase of the program).

Some examples:

- Decision Support System for the Control of Trypanosomiasis in South-East Uganda (7596).
There has been presentation in radio, distribution of leaflets, and government intervention following publication in *The Lancet*.
- Investigating the impact of brucellosis on human health and livestock health and reproduction in Tanzania (7985).
 - The report from the project management is that “...some public health measures relating to zoonotic diseases have been disseminated from an early stage of the project (e.g. boiling milk for prevention of zoonotic TB and brucellosis/washing wounds for rabies prevention) through -
 - verbal dissemination at village meetings, to farmers’ and women’s groups, and to community leaders
 - through production of a leaflet in KiSwahili focussing on recognition, treatment and prevention of major zoonotic diseases,
 - development of a mural, which has been placed in district centres throughout Arusha Region,
 - preparation and circulation of a workshop report to officials in the Ministries of Health, Livestock Development and Natural Resources and Tourism, and
 - development of story lines involving rabies, brucellosis and bovine tuberculosis, for a radio soap to be broadcast throughout Tanzania.

And there are other examples like R7164, participatory epidemiology, which produced a methodology that was taken up by the Pan-African Programme for the Control of Epizootics, under the aegis of the African Union. R7229 and R7357 in Tanzania, which brought together the veterinary and medical research organisations and Ministries of Health and Livestock Development, links which the brucellosis project has built upon.

Dissemination and Uptake Promotion – general comment

It is recommended that dissemination should be across diverse audiences, as indicated above also for the future. Dissemination should be included at every level, with the individual projects, at the research programmes level and potentially at DFID centrally. One should consider consolidating outputs of different projects for easier uptake.

One should explore new methods of delivering information. This should include information put into a local context, repackaging for different audiences, including websites. Results from research should be added to existing data-bases that developing countries have access to. One should also consider a more effective use of technologies like internet.

1.8 CONCLUSIONS AND LESSONS LEARNT

Signs of how science had impact on poverty alleviation

Assessment of how science has had an effect on poverty alleviation is a difficult undertaking. First of all, impact assessment is understood as the systematic identification of the effects – positive or negative, intended or not – on different recipient levels (like the individual livestock keeper, the individual households, institutions etc.). Overall, impact evaluation helps us better understand the extent to which activities reach the poor and the magnitude of their effects on people’s welfare. In principle, the impact assessment hinges on asking one key question - what would the situation have been if the intervention had not taken place? As this is not possible under the current setting, the assessment is entirely qualitative and based on the written material provided by DFID, discussions with the program manager and consultants, and scientist working on AHP projects. In addition, the draft PARC report “Impact assessment of DFID’s Renewable Natural Resources Research Strategy” was made available to the experts by 16 November and it gives a good summary of the self-evaluation carried out by the program managers, also related to poverty alleviation (end-user effects etc).

PARC report

The PARC report summarises the AHP poverty focus which has clearly been at the institutional level and not so much directed exclusively at the poor. The reasons for this can be many. The comment from the project management is that “there is first of all a historic reason, up until 1999/2000 (Gov’t white paper on poverty elimination) projects were not exclusively poverty focussed. In addition, individual animal diseases don’t confine themselves to livestock owned by the poor”. Further, the “word ‘institutional’ has acquired a new meaning in recent years, usually described as ‘the rules of the game’ to encompass social relationships and links as well as organisations – so the distinction between this and enabling/policy level is not that clear.” From AHP point of view institutional mostly meant supporting overseas institutions, but the bulk of the scores reflected the fact that the work was inclusive.

The PARC report also summarises the “contribution to purpose”. The purpose statement of the AHP was “Benefits for poor people generated by application of improved management of livestock disease”. The scores given are relatively low, and there is a majority for ‘very little’ or ‘limited’ impact, possibly reflecting a somewhat self-critical assessment. The comment from the project management on this was; “...it seemed more correct and accurate to assign modest scores, especially where impact is still some way down the line. This is especially so in relation to programme (rather than project) purpose, where an honest assessment would be that a modestly financed research programme such as all the RNRR programmes, will make a ‘dent’ in the problem but not have massive impact three or four years after research (not development) has begun”.

The impact matrix in the PARC report is complex and it is difficult to go beneath or behind the meaning of all the various groupings and figures/tables. One example is the possible contradiction for the AHP scoring related to the fact that the focus in the AHP was on the institutional level, while for the “Focused/Poor people level” there is a high score for the “secondary focus”. As an attempt to shed more light on this, I discussed this in more detail with the project management, and my direct question was: How would you explain the low “primary” score compared to the high secondary score (under Focused/poor people level)? The comments from the management of the AHP were as follows.

“It proved difficult, in practice, to make a clear distinction between the three categories. This was partly because the ‘institutional and inclusive’ category combined two components, that of institutional change (in the sense of levelling the playing field which was also the main component of ‘enabling’) and of ‘inclusivity’ – so that projects aimed at the poor which also benefited other livestock keeper groups were all to a greater or lesser extent inclusive. There is [also] a pre-and post 1998 effect (with a lag to 1999/2000 as it takes about 15 months to commission projects) – also an honest assessment of what projects have achieved given that animal diseases affect all livestock keepers, veterinary/extensions services in Africa just don’t reach the poor, so that products have a lesser chance of being delivered to them and the fact that the poor must of necessity be risk averse and this affects their uptake of innovation. AHP has invested a lot in developing methods of accessing poor people and ensuring research is relevant to them”.

Specific comments to some of the thematic activities that have been run over the years have been summarised as follows by the management of AHP:

- all the projects in the vaccine theme were of necessity inclusive, since no disease confines itself to the livestock belonging to the poor, however, as we discussed, AHP has re-oriented its focus in the last five years to be very much on endemic rather than transboundary diseases as these are the diseases which really affect stock belonging to poor livestock keepers;
- in the decision support and diagnostics theme, over the years the focus shifted from broadly ‘inclusive’ to broadly ‘focussed’ on the poor; however some projects which were designed to help the poor will still have broader impact – for example the ‘Magona card’ (started under R7597) and others such as R8213 while specifically targeting the poor, is still primarily ‘enabling’ rather than ‘focussed’;
- in the dissemination and delivery theme, which became increasingly important in recent years, although the focus was very clearly on promoting delivery to poor people and exploring novel ways for them to access animal health knowledge, all the projects, by definition, were also relevant to other groups of livestock keepers, none of the work could be defined as ‘exclusive’ to them. It seems, in retrospect, that one could argue that some of this group of projects could justifiably be classified as being primarily ‘focussed’. It all depends on whether focussed means ‘exclusive’ or not.”

The final comment on this from the project management was ...”but AHP (and the other RNRR projects) would be dealing in illusions if it claimed all work was directly accessible to the poor.”

My view and understanding is that this is a very honest evaluation of the situation and it also reflects again, a very self-critical assessment of the research work carried out (and its impact on poverty and the poor livestock keeper). It should also be noted that the evaluation was based on the overall effect of the whole program (as commented above). The effect from individual projects, is however easier to assess and some examples are given below, which shows that many of the research projects under the AHP have had a (more or less) direct effect on the poor in improving their welfare.

Zoonoses affect the poor

Zoonotic diseases (are diseases that can be transmitted from animals to humans) affect poor more significantly than others. This is linked to poor nutrition, risky work, difficulty in reaching medical services and also lack of money to pay for them. In addition, their animals are likely to be less healthy (few resources to purchase inputs for them, little spare labour to allocate to them and lastly often have to choose between buying medication for their family or their animals). The zoonoses have been little publicised, but they are ubiquitous and can kill both livestock keepers and their livestock. The best known is rabies, and others are bovine tuberculosis, brucellosis, sleeping sickness and various tapeworm infections.

In line with this and as a result of change in focus over the last years, the AHP projects related to the zoonotic theme have primarily been “focussed on poor people, since these diseases above all affect the isolated rural poor, to be effective they rely on policy support and coordination between veterinary and medical groups, hence they all scored ‘enabling’ as second most important” (Maudlin, comment).

Over the years of the program, AHP has undertaken research on all these diseases, studying their incidence, impact and risk factors for both humans and their livestock. Examples are given below and although difficult to assess, it is likely that an increased focus and gained knowledge has had an impact on the welfare of the poor people. It has saved lives and also contributed to increasing the awareness of the international community to these diseases.

Title (and project number)	Impact on poverty	Project period
Quantifying costs and risk factors of bovine tuberculosis in Tanzania (zoonosis) (7357)	Poor families living in remote and isolated households were those particularly at risk from suffering from all forms of extrapulmonary TB. These households had little knowledge of TB and were less aware of the zoonotic risks of disease transmission. Other strategies need to be developed to target more remote households, who may have less access to information circulated at village/district headquarters.	1999 - 2001
Decision Support System for the Control of Trypanosomiasis in South-East Uganda (7596)	this disease (sleeping sickness) is linked to poverty, in particular poor people have especial difficulty obtaining a diagnosis. 90% of people infected with this disease die undiagnosed and it can be assumed that these are the isolated rural poor.	2000 - 2003
Trypanosomiasis projects (examples are 7173, 7360, 7364, 7596, 7597)	One project has studied farmers’ knowledge of the disease and their access to veterinary advice and products and it has developed an information package and studied which routes are the most effective for such messages to reach the farmer, concluding that schools and the radio perform best. Another project has developed a pen-side tool to test livestock for anaemia, a major symptom of trypanosomiasis and accompanied by a diagnostic card it is possible to differentiate this disease from others with some similar symptoms. Lastly, and most importantly, two strands of research, one looking at flies’ feeding habits and the other at the environmental effects of the ‘pour-on’ technology have come together to produce a technology which will dramatically reduce the cost of tsetse control for farmers. For poor livestock keepers, it was cost that was the most prohibitive aspect and AHP researchers have demonstrated that since flies feed mostly on the legs and mostly on the largest animals in the herd, ‘restrictive application’ of these products to the legs of cows, bulls and draught animals is effective in controlling the fly, which implies a cost reduction of 80 – 90%.	1998 - 2003

³ Some of this work was co-funded with DFID’s Livestock Production Programme (LPP) under project R7539

Projects that have stopped/failed/discontinued (Lessons learnt)

Projects that failed (fully or partly)

Project 7598 The Role of Dukas in Animal Health Information & Services aimed at exploring the potential role for dukas (shops) in the delivery of animal health information and services particularly to the resource-poor livestock owners. This involved studying typical dukas, undertaking and evaluating training aimed at improving the flow of quality, research-backed animal health information. So, in brief the project was attempting to influence the Kenyan veterinary establishment to create a more favourable institutional climate for dukas selling veterinary products.

This was a project that was not successful in achieving its goals. There are few comments in the Annual reports (over the year that this project was run) indicating a significant problem in creating a better climate for dukas to sell veterinary products. However, from discussions with the project manager, this project was picked as one that had failed. The main problem was connected to the communication with the Kenyan veterinary association and was also seen as a delicate problem for the AHP and the project manager, which is possibly why so little was brought up in the annual reports. The main problem was that there was strong resistance among the veterinarians to allowing those selling veterinary products at dukas to be receive training in dispensing them and advising livestock keepers on their use. Selling veterinary products is an important source of income for many veterinarians, especially since the move to privatise Africa's veterinary services and changing the routines, the distribution channels or making the veterinary products more available to the public would potentially threaten the small businesses of many of the local veterinarians. This is situation that is well known also from other countries and nothing particular for Kenya. The lessons learnt are clear; carry out a thorough pre-project analysis of potential impact of all stakeholders, that being positive or negative impact.

Project R8022 Bovine Theileriosis in Semi Arid Pastoral Systems in Tanzania was aimed towards carrying out an economic impact assessment of the bovine cerebral theileriosis (BCT - a central nervous disease caused by *Theileria taurotragi*) in pastoralist livestock systems in northern Tanzania. Further to identify possible causal agents of BCT and factors predisposing animals to BCT. BCT is a tick-borne disease.

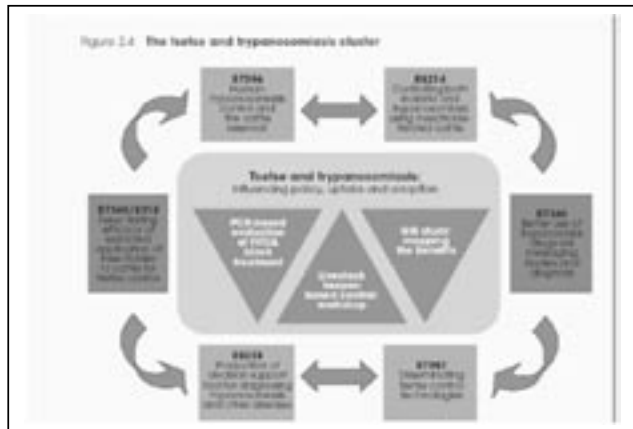
The initial part of the project, to identify the cause of BCT, was successfully carried out. The part related to identifying the predisposing factors was not so successful. This part was reliant on a PCR based method for identification of the causative agent, a part that was carried out by one of the partners in the projects. It turned out that the sensitivity of the method used (which was PCR based⁴) did not obtain a sufficient sensitivity to carry out the testing that was planned. The number of samples that could be collected over a defined time-period was also low, so that the possibility of modifying and optimising the method was not optimal, which is regrettable since it was a good example of a 'demand-led' project, commissioned at the request of local livestock keepers.

Clustered projects

In the 1994 Annual report, the research program was separated into different "problem areas" (as mentioned earlier). Today the same activities are referred to as thematic research areas or clusters. One such example is given below – referred to as Fig. 2.4 (from the 2003/2004 Annual report). Comparing the trypanosomiasis-related research of 1993 (as shown in Figure 1 above), there are similarities, but they are presented differently. It should also be mentioned that the trypanosomiasis-research in the early 90's was focused on non-tse-tse trypanosomiasis, the 2004 research is more or less entirely on the African, tse-tse transmitted form.

There are several arguments for clustering research activities – fertilisation between projects, the critical mass (number of man-months invested) reaches a level that will give synergistic effects, more efficient use of infrastructure etc. However, the pre-requisite is that the scientists work together, that they make use of the same infrastructure, that there are regular meetings and exchanges of views and personnel between the groups etc.

⁴ PCR – polymerase chain reaction – a method that is used to multiply a defined gene segment of any origin (human, animal, from a pathogen etc). In general it is a very sensitive method used in research and diagnostics.



When looking in more detail at the different projects listed in Figure 2.4, they are run at 3 different institutions (University of Edinburgh, University of Glasgow and NRI, UK). They are also not coordinated in time so that they will be run in parallel only for a few years (max 2) where all are active projects. Under such circumstances the combinatory effects obviously get less obvious and the possibility of using common infrastructure is almost absent. The fact that the scientists are located at different campuses will potentially impede exchange of information and ideas.

Another marked change over the years is a more focused approach, with fewer projects that have been clustered into groups of 3-5 projects focusing on one specific topic (like trypanosomiasis, tick-borne diseases, mastitis projects etc). The various research activities have also over the last years (2000 and onwards) been referred to as themes or thematic orientation.

There are also other clusters that have been identified by the program management and examples are;

Zoonosis cluster consisting of -

- Bovine Tuberculosis Projects (R7229 and R7357) as well as previous DFID-funded TB projects: R6104, R5498, R5408
- Brucellosis Project (R7985)
- Sleeping sickness project (R7596)
- Smallholder Dairy Project (R7271)
- Rabies project (R5406, Serengeti, Tanzania)

Trypanosomiasis cluster – in recent years consisting of -

- R7360 Field Methods and Tools to Improve Targeting and Appropriate Use of Drugs used for Control of Bovine Trypanosomiasis
- R7364 Improving the Control of Tsetse: The Use of DNA Profiling to Establish the Feeding Responses of Tsetse to Cattle
- R7539 Environmental risks of insecticide-treated cattle in south African livestock systems
- R7596 Decision Support system for the control of trypanosomiasis in SE Uganda
- R7597 Decision Support Tools for Bovine Disease Diagnosis in Sub-Saharan Africa
- R8214 Integrated Vector Management: Controlling malaria and trypanosomiasis with insecticide-treated cattle

For a full list see Annex 1.

The general comment would be that part of the research under the AHP is somewhat fragmented and that clustering the different projects related to a specific theme or disease entity will not make the research more coherent. This 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.

Research themes for the future

Vaccine-development and disease control projects. It is recommended that research projects that are built up as clusters with participants from different research groups in the UK and the South are continued in the future, examples are

- the ECF vaccine development project (8042)
 - Integrated Vector Management: controlling malaria & trypanosomiasis with insecticide-treated cattle (8214)
- and these research projects should be of a duration that exceeds the standard 3-year projects of DFID; 5 years is recommended as the minimum, with a mid-term evaluation (after 3 years) and continuation is made dependent on favourable assessment. Clear definition of deliverables must be included and progress should be evaluated against these at mid-term.

Demand-led research with focus on real needs of the poor livestock keepers should be encouraged also in the future. It is my recommendation that more emphasis is put on obtaining objective data as regards the real need of the poor livestock keepers (Voices of the poor 8213) and that this type of research projects are encouraged in the next term. New research efforts should build on what has been obtained in project 8213, with focus on well-defined, objective assessment on what demand-led research entails.

Co-funding with other Funding agencies should be considered – it can keep the best from both sides. Depending of course in what direction the research under DFID is taking, research councils can possible support more basically oriented research while the DFID approach will be more towards demand-led research.

Discontinued research activities. Research projects that are not connected with research clusters should not be initiated in the future. There are few examples of these types of projects today, but they were more often initiated in the beginning and mid-90s (rabies vaccines in dogs and jackals 4418, CCCP (contagious caprine pleuro-pneumonia) vaccine development 6555). This is not saying that all these individual projects were unsuccessful, but it is considered that research clusters involving scientists from the UK and the South is a better guarantee for capacity building in the south and that good links are created.

1.9 KEY RESOURCES

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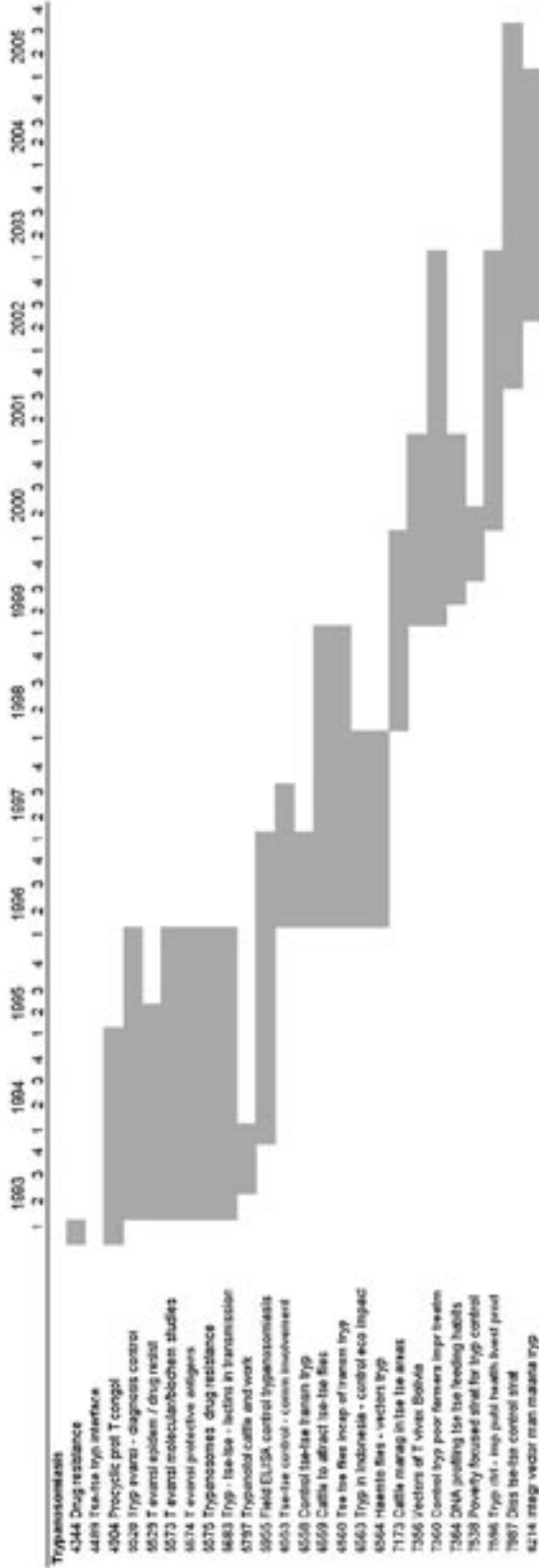
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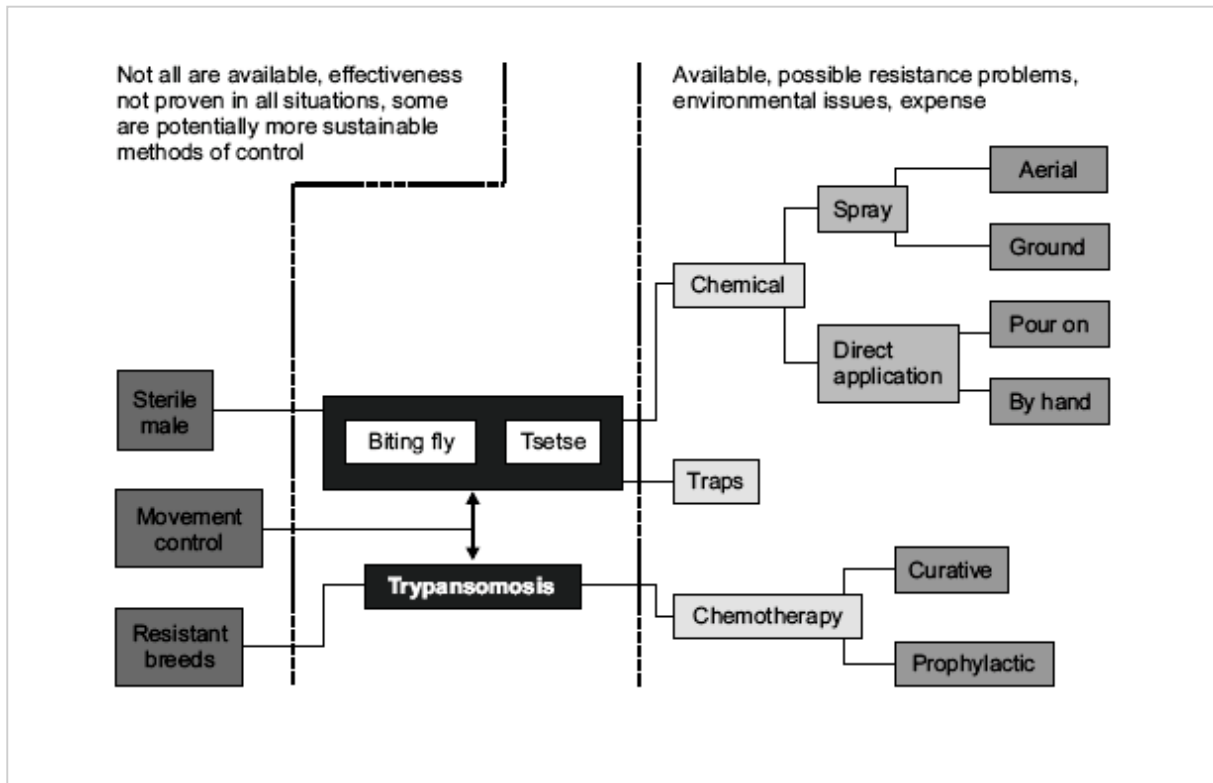
Poverty And Participation: An Analysis Of Bias In Participatory Methods The Livestock Development Group, School of Agriculture, Policy and Development, The University of Reading ISBN 0704914565 January, 2003

Annex 1 – Trypanosomiasis related information



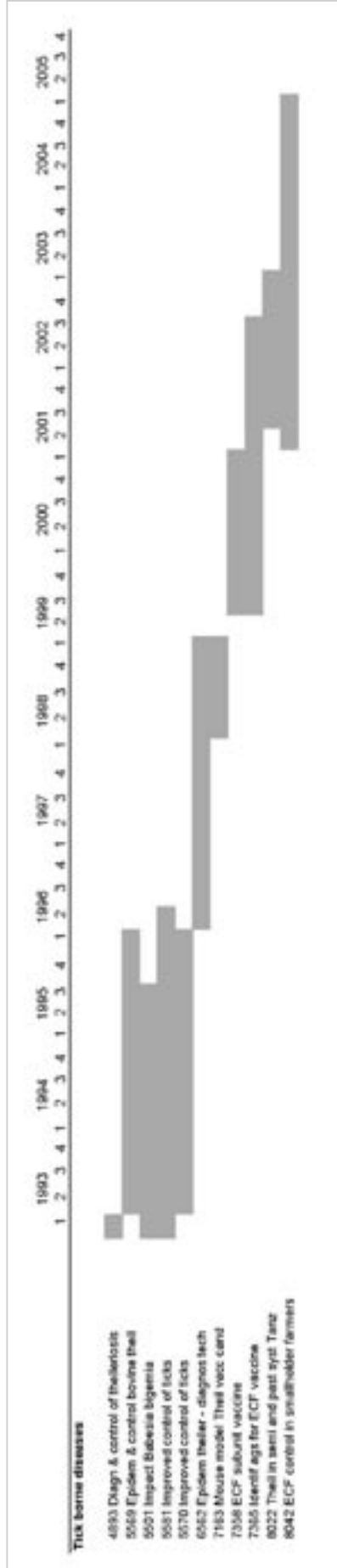
Trypanosomiasis research – 1993-2005 under the AHP.

Methods applied in trypanosomiasis control.



Annex 2 – Tick related information

Tick and tick-borne disease. Research activities 1993-2005 under the AHP



Facts about Ticks and tick-borne diseases (TTBD)

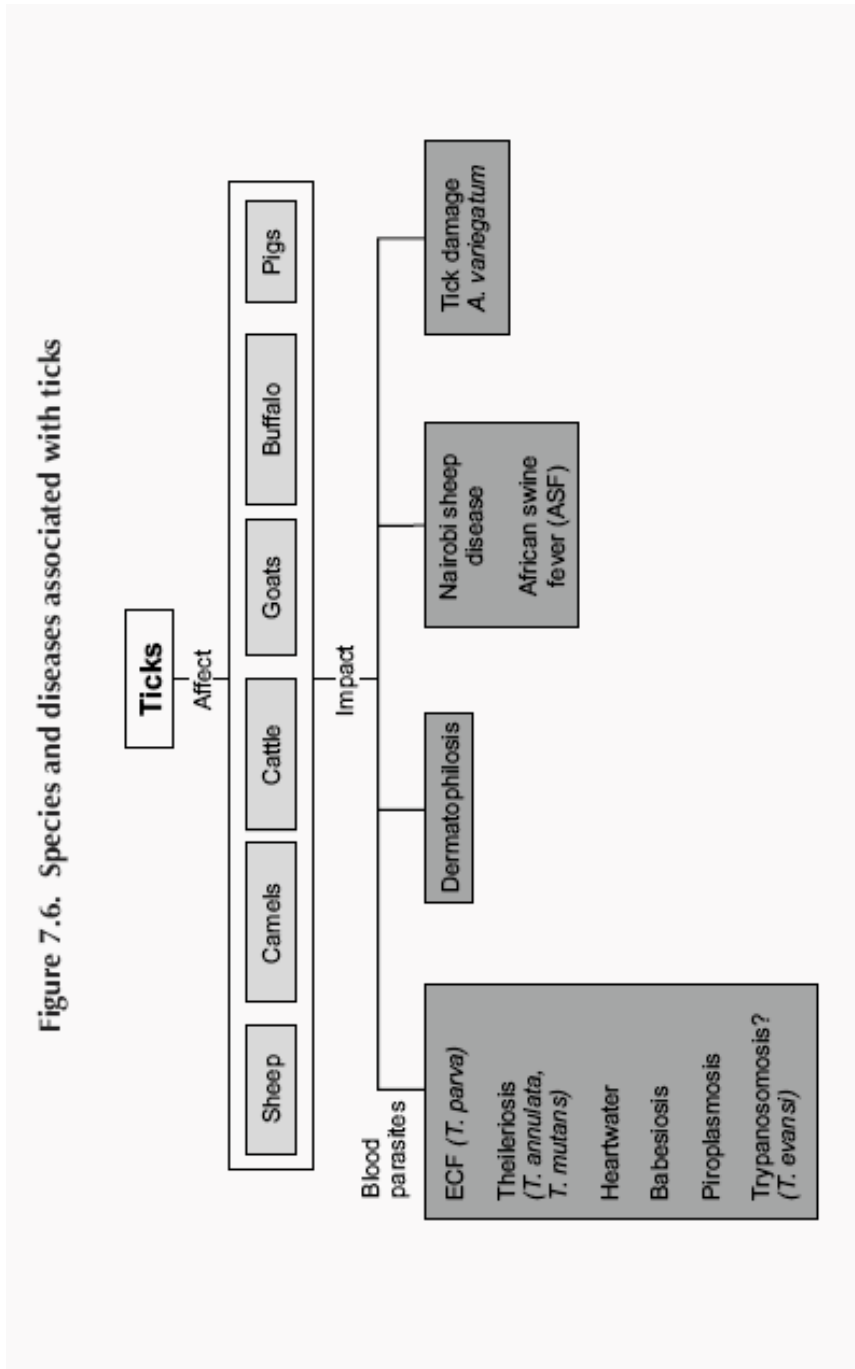
TTBDs are widely distributed throughout the world, particularly in tropical and subtropical countries. It has been estimated that 80% of the world cattle populations are at risk from TTBDs.

The tick species that cause the most serious problems for all livestock producers, rich and poor. They can be divided into 4 groups:

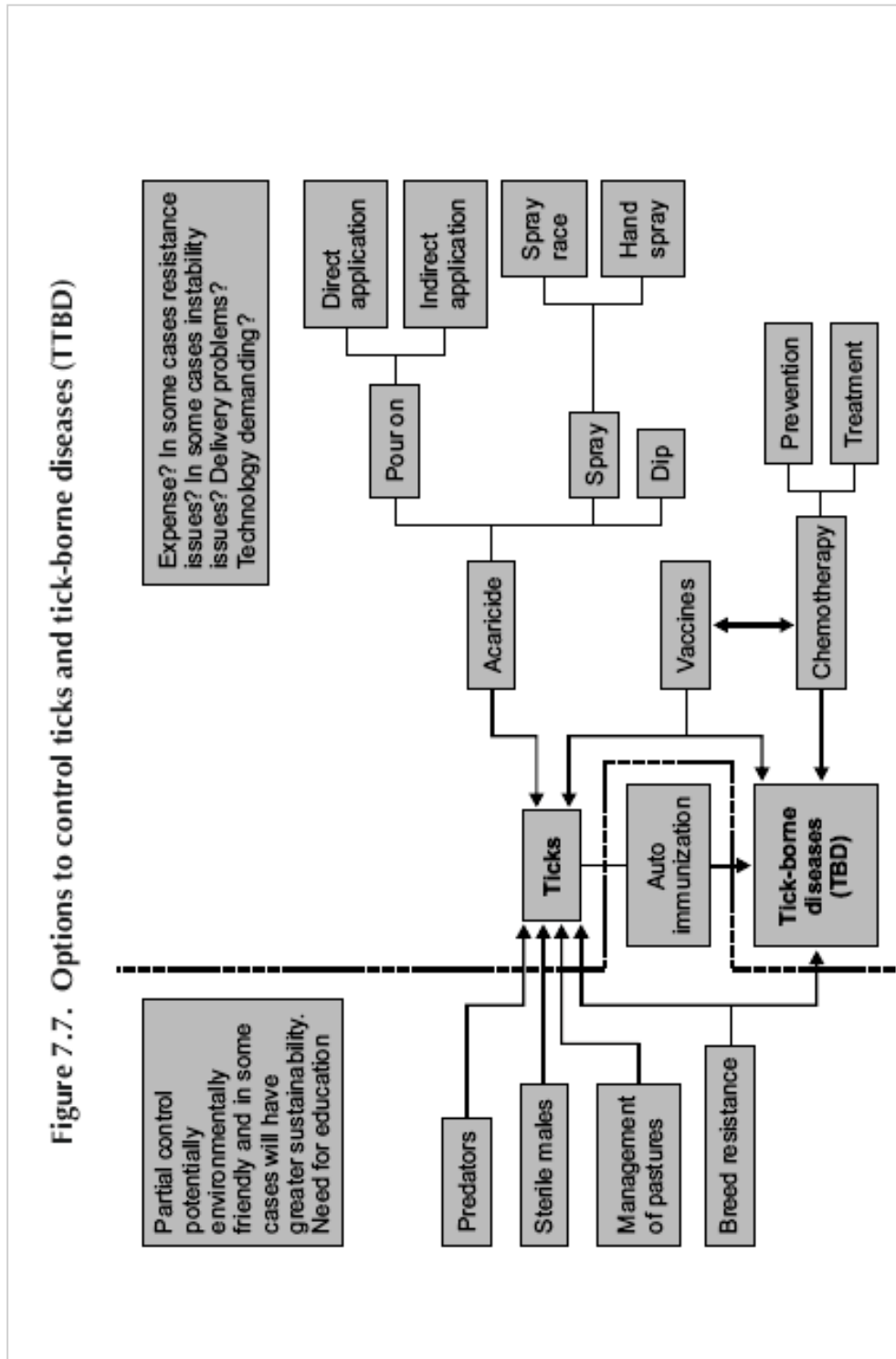
1. ***Boophilus*** spp. that transmit the protozoan *Babesia* spp. and the rickettsia *Anaplasma* spp. The species are widely distributed and their most significant impact is on imported and exotic breeds of cattle.
2. ***Hyalomma*** spp. that transmit the protozoan *Theileria annulata*. Tropical theileriosis, caused by the organism is a particular problem for crossbred dairy cattle in India.
3. ***Amblyomma*** spp., that transmit the rickettsia *Cowdria ruminantium* that causes heartwater, a disease of small ruminants and exotic cattle in sub-Saharan Africa (SSA). *Amblyomma* spp. also transmit the protozoan *Theileria mutans*.
4. ***Rhipicephalus*** spp. that transmit the protozoan *Theileria parva* which causes East Coast fever (ECF), a serious disease responsible for widespread morbidity and mortality among cattle in 11 countries in Eastern, Central and Southern Africa and affects approximately 24 million cattle.

In addition comes infection with *Dermatophilus congolensis* transmitted with ticks.

Below is a figure that lists that species affect and the diseases associated with TTBD.

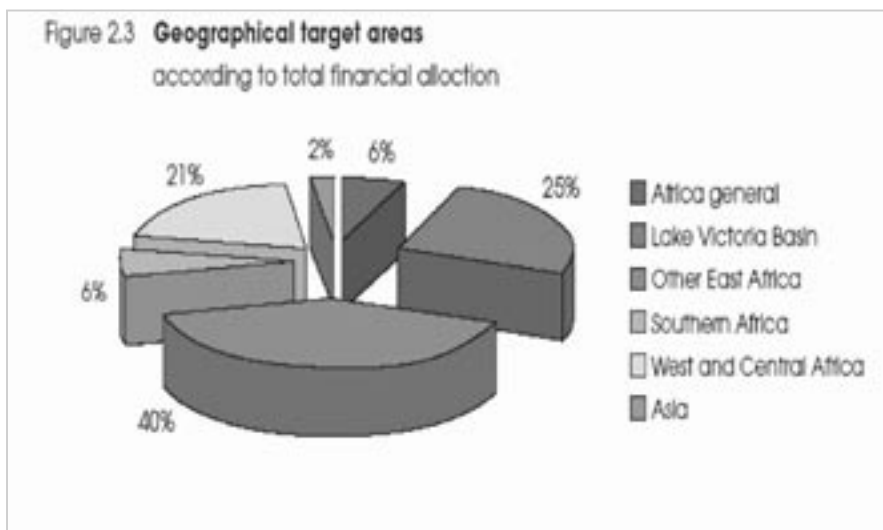


Control of ticks and tick-borne diseases

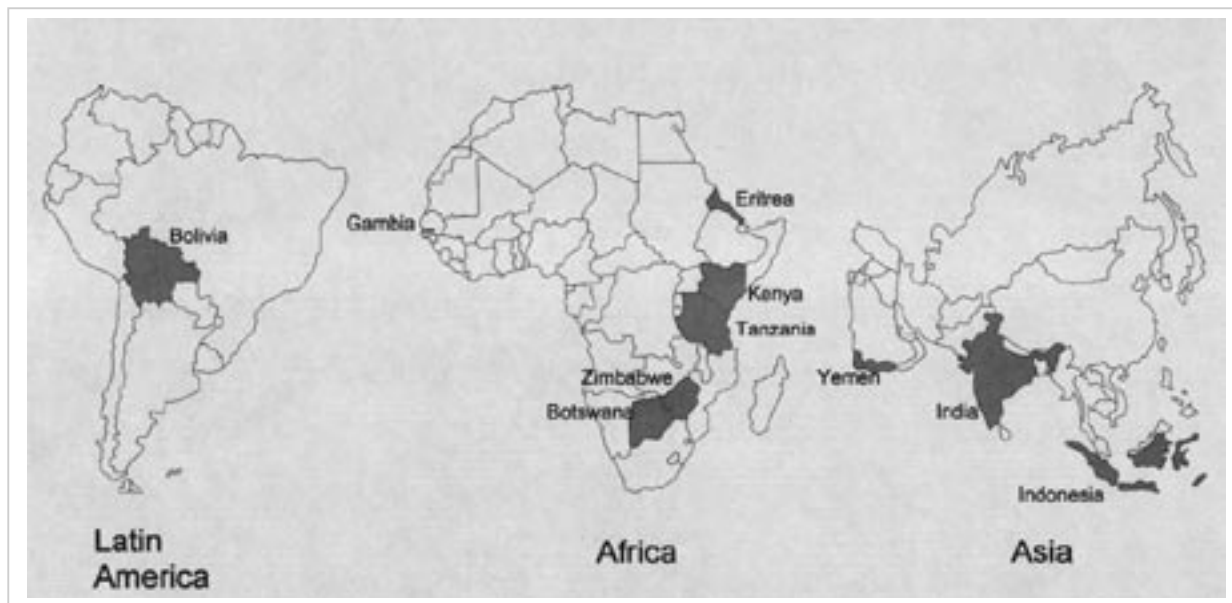


Annex 3 AHP Geographical target areas in 2003-2004

(Annual Report 2003-2004)



1994 – Country focus according to the new RNRRS strategy that was about to be adopted (Annual Report 1994, p. 19).



Annex 4 DFID HEALTH PROGRAMME (AHP) logical framework 2005-2006

NARRATIVE SUMMARY	INDICATORS OF ACHIEVEMENT	MEANS OF VERIFICATION	RISKS AND ASSUMPTIONS
<p>SUPER GOAL Poverty eliminated in poorer countries through sustainable development.</p> <p>GOAL Livelihoods of poor people improved through sustainably enhanced production and productivity of RNR.</p>	<p>Measures of empowerment</p> <p>Measures of change in capabilities, assets and activities.</p>	<p>National and international poverty monitoring.</p> <p>DFID commissioned external reviews of DFID impact.</p> <p>FAO and other agency datasets.</p>	<p>Livelihoods of the poor are not disrupted by political upheaval, economic turmoil, civil unrest or unusual climatic conditions</p>
<p>PURPOSE Benefits for poor people in target countries generated by application of improved management of livestock disease.</p>	<p>By 2006, in Kenya, Uganda, Tanzania, South Africa or India, evidence of:</p> <ol style="list-style-type: none"> 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. 	<p>AHP-commissioned external reviews of programme impact.</p> <p>Reports of in-country institutions.</p> <p>National statistics.</p>	<p>Livestock keepers are able to maintain access to feed and water resources and to markets.</p> <p>Poor people invest benefits to improve livelihoods.</p>
<p>OUTPUTS</p> <p>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.</p> <p>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.</p>	<ol style="list-style-type: none"> 1.1 New methods for the control of trypano-somiasis, tick-borne diseases, helminthiasis and other diseases, particularly zoonoses that are important to poor livestock keepers produced by the AHP validated, locally adopted and accepted by policy makers. 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. 	<p>Animal Health Programme reports.</p> <p>External referee reports.</p> <p>Final technical reports of projects.</p> <p>Annual reports of delivery systems.</p> <p>Systematic evidence-based reviews.</p>	<p>Intermediary organisations able and willing to produce and deliver new technologies to poor livestock keepers.</p>