

ILRAD Program Plans and
Funding Requirements

1988 - 1992



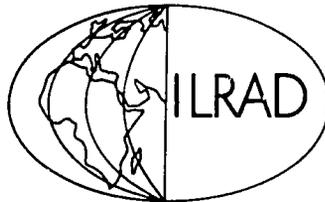
FUNDING REQUIREMENTS
FOR 1990

INTERNATIONAL LABORATORY FOR RESEARCH ON ANIMAL DISEASES

P.O. BOX 30709 NAIROBI KENYA

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POST OFFICE BOX 30709 • NAIROBI • KENYA

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FUNDING REQUIREMENTS FOR 1990

Introduction

The International Laboratory for Research on Animal Diseases (ILRAD) was established in 1973 with a mandate to conduct intensive research leading to improved control of livestock diseases. ILRAD now occupies a modern complex of research laboratories and support facilities at Kabete on the outskirts of Nairobi, Kenya, and has a cattle breeding ranch at Kapiti, about 50 km from Nairobi. Research and training activities concentrate on immunological and related aspects of two diseases that seriously limit livestock production in Africa and other developing regions of the world—African animal trypanosomiasis and East Coast fever (ECF), a virulent form of theileriosis.

Despite intensive research efforts at ILRAD and in other laboratories, measures for the control of ECF and trypanosomiasis are far from satisfactory. Control of ECF is based primarily on control of the tick vector by regular acaricide treatment plus pasture management and exclusion of wildlife. Two drugs have been marketed for the treatment of infected animals, but they are expensive and require early diagnosis if treatment is to be successful.

Control of trypanosomiasis is based on insecticidal control of the tsetse vectors and trypanocidal drugs to prevent infection and to treat infected animals. New techniques using traps and insecticide-treated targets have been developed to control some tsetse species. Overall, however, the area of Africa infested by tsetse has increased rather than diminished. At the same time, no new trypanocidal drug has been introduced for general use for nearly 30 years, and the potential development of drug-resistant trypanosomes remains a serious threat.

During 1988, research program management was strengthened by the activities of the Coordinators for the theileriosis and trypanosomiasis research programs who were appointed in 1987, following the recommendations of the External Program and Management Review Teams in 1986. The Director of Research and the Coordinators of the theileriosis and trypanosomiasis programs comprise a Research Review Committee. This Committee considers program needs and progress and provides input into program formulation and assessment, as well as policy direction by the Program Committee of the Board of Directors. A revised and updated version of ILRAD's strategic plan entitled *Meeting the Challenge of Livestock Diseases: ILRAD in the 1990's* was published in 1988. Also in 1988, ILRAD instituted a policy of regular review of its research programs by panels of experts drawn from the international scientific community. The first review, of the research Project Area Trypanosome Biology and Biochemistry, took place in the latter half of 1988 and the report and recommendations of the Review Panel were considered by the Program Committee of the ILRAD Board of Directors at its meeting in December, 1988.

The research programs at ILRAD on both theileriosis and trypanosomiasis are now structured to encompass research activities that will have potential pay-offs in both the short and long terms.

It should be noted that during 1987 ILRAD prepared proposals for programs of research and training related to the improved control of theileriosis and trypanosomiasis for the five-year period 1988-1992. These medium-term proposals take into account ILRAD's short-term and long-term research strategies and the recommendations of the External Program and Management Reviews. The proposals were approved by the Technical Advisory Committee of the CGIAR in June 1987 and recommended successfully to the donors for funding during International Centers' Week in Washington in October 1987 and again in 1988. The research program for 1990 proposed for financial support in this document follows the research directions given in the medium-term plan. The proposed expenditures are also in line with those set out in the medium-term plan.

Research Highlights for 1988–1989

The results of ILRAD's research program on theileriosis and trypanosomiasis, an account of the work of the training and information services, and the activities of the research support units during 1988 are given in the *Annual Report* and the *Highlights* for 1988. More details of the scientific results can be found in a new publication, the *Annual Scientific Report* for 1988. However, some notable achievements from the programs should be recognized.

In the case of theileriosis, progress has been made in developing new methods for *in vitro* characterization of *Theileria* species and immunologically distinct strains of *T. parva*. DNA probes have been identified that recognize only *T. parva* parasites but do not react with related *Theileria* species. A protein antigen has also been identified in *T. parva* strains that varies in molecular mass in antigenically different clones of *T. parva*. The role of this protein in immunity to the schizont-infected cell must now be elucidated by the use of techniques of gene transfer which have been successfully established at ILRAD. Using these techniques, genes coding for important proteins on the surface of bovine lymphocytes have been transfected into, and expressed in, mouse cells. Bovine immune cells successfully recognize and kill the transfected immune cells, thereby establishing a system for identifying protective schizont antigens for potential use in a vaccine.

The bovine lymphocyte surface antigens themselves have now also been shown to have a significant role in determining the antigenic specificity of such cells to different *Theileria* antigens. This finding will be important when selecting schizont antigens to induce a broad protective response in genetically diverse cattle during the field application of vaccines against theileriosis.

The search for antigens of *Theileria* parasites, which might be used in vaccines, has identified two candidate molecules in the sporozoite and a schizontic protein recognized by monoclonal antibodies previously used to characterize *Theileria* strains. The genes encoding these molecules are under active study. The complete gene sequence has now been obtained for one of the sporozoite antigens and its protein composition determined.

Studies on the bovine immune system are a basic requirement for ILRAD's research programs on both theileriosis and trypanosomiasis and have wider relevance in the context of immunity against other diseases. Recombinant DNA technologies have been used to identify the genes coding for the antigen receptor on bovine T-cells. The products of these genes are fundamental to the induction and expression of protective immune responses. These findings mark the completion of the first stage in the characterization of the elements of the bovine immune system. Functional studies of the interactions of the various elements of the immune system can now be undertaken.

Studies on the resistance of trypanotolerant cattle carried out in the field, in collaboration with the International Livestock Centre for Africa (ILCA) and national organizations, have shown that when cells from resistant and susceptible cattle are analysed for surface molecules associated with immune responses, both positive and negative correlations are observed between certain surface antigen types and resistance or susceptibility to trypanosomiasis, in animals exposed to natural infection. This is evidence of a genetically selectable marker for the trypanotolerant trait and indicates the possible central role of immunity in the manifestation of this trait.

In terms of improved diagnosis of animal and human trypanosomiasis, the trypanosome-species-specific tests, based on monoclonal reagents developed at ILRAD, are now being tested for validity and sensitivity in national laboratories in ten African countries in collaboration with the joint division of the Food and Agriculture Organisation (FAO) and the International Atomic Energy Agency (IAEA), and the World Health Organisation (WHO). It has now been demonstrated, in collaboration with the University of Brussels and national laboratories in Africa, that the diagnostic test for *T. brucei* spp can also be applied to *T. evansi* infections of domestic livestock. This is an economically important pathogen in Africa, Asia and Latin America.

ILRAD's expertise in *in vitro* culture technologies for trypanosomes has been used to develop sensitive assay systems for detection and quantitation of chemotherapeutic and chemoprophylactic agents in the blood of treated livestock. Assays have also been developed to detect the presence of

trypanosomes resistant to these agents and measure their levels of resistance. The pharmacokinetics of these drugs, given by various routes and at different dose levels, are being determined in order to develop better strategies for the treatment of livestock infected with drug-resistant trypanosomes.

In vitro culture techniques have also been applied to determine the mechanisms involved in the development of anemia, which is the major pathological process in trypanosome-infected livestock. This has involved determination of culture conditions which support the growth and differentiation of the precursors of the various bone marrow cell types involved in red cell formation. Success was first achieved in the cultivation of relatively well-differentiated haemopoietic cell precursors, but in 1988, long-term cultures were established of primitive red cell precursors. This is the first time bovine primitive red cell bone marrow precursor cells have been successfully established in culture outside the animal. This now makes possible a detailed study, at the molecular level, of the processes involved in the development of anemia in livestock susceptible to trypanosomiasis.

The development of techniques for cloning *T. vivax* by the use of *in vitro* culture techniques has enabled analysis of the variable antigen repertoires (serodemes) of this parasite. There is extensive cross-reaction between the repertoires of cloned *T. vivax* populations derived from parasite populations isolated from widely different geographical locations across Africa. The cross-reactivity may be the result of shared variable antigen genes between serodemes or shared epitopes on the variable antigen molecules themselves. As the assay used to analyse this cross-reactivity was immune lysis of bloodstream-form parasites, this strengthens the validity of approaches to immunization against this species of salivarian trypanosome.

The epidemiology and socio-economics unit has continued to assess the likely impact of improved control of livestock diseases in economic, social and environmental terms. They are focusing, in the first instance, on aspects of the epidemiology and control of theileriosis. Relevant databases on factors relating to disease distribution and impact are being compiled and an economic assessment has been made of the costs to national programs of implementing a control program for theileriosis based on the *infection and treatment* method of immunization. A collaborative research program has been established with the Kenyan Agricultural Research Institute (KARI) to study the effects of immunisation against theileriosis at three sites in Kenya.

A full program of training activities was continued during 1988 with twenty-four scientists, principally from universities and veterinary research laboratories in Africa, visiting ILRAD for technical experience and collaborative research programs for periods varying from one to six months. Seventeen graduate students from African countries supported by ILRAD fellowships worked for higher degrees, and a further two visiting post-doctoral senior research fellows had research program attachments for periods of a year. A training course, organized in collaboration with the joint division of FAO/IAEA, was held to provide African scientists with the new techniques for diagnosis of trypanosomiasis developed at ILRAD. Other training courses held during 1988 dealt with the preparation and use of reagents for diagnosis of parasitic diseases and the methods of applying the *infection and treatment* vaccine against theileriosis.

Information Services published four issues of *ILRAD Reports*, an *Annual Report*, an *Annual Scientific Report* and edited the proceedings of a workshop held at ILRAD on MHC Class II genes and products and their significance for disease research in livestock species. In 1988 ILRAD scientists published 50 papers in international journals and presented 39 papers at international meetings.

Financial Results for 1988

Total operating costs (Table 1) were slightly lower than expected. Recruitment activities were not as successful as planned, and two senior man-years were not utilized. However, expenditures for replacement equipment (Table 2) exceeded the budget, primarily because of the necessity to replace two large autoclaves in the Central Core facilities. The autoclaves were over ten years old and their performance had deteriorated to a dangerous level. This was balanced by an under-expenditure in salaries. Capital expenditures were as predicted. Details can be found in the ILRAD publication entitled *1988 Accounts and Financial Report*.

Financial Resources for 1989

The 1989 final revised budget follows the program approved by the CGIAR in November 1988. Total approved funding requirements are US\$13.84 million following revision in consultation with the CG Secretariat as a result of the shortfall in total funding forthcoming from the Consultative Group as a whole. ILRAD hopes to attract new donors in 1989 and to receive additional funds from its traditional donors. It should be possible to obtain the funds required to support the proposed research program. There will be no increase in authorized senior positions in 1989 (Table 3).

The costs of disease research will increase by 1.6% in 1989 over 1988 levels. All research will account for 60% of the total essential requirements (see Table 1). The cost of General Operations will increase by 22.5% in 1989, owing to the necessity of replacing part of the transport fleet and purchasing spares for equipment that is now over ten years old.

The planned capital expenditure of US\$610,000 will be slightly higher than 1988. This will be divided between new equipment and small construction and site improvement projects.

PROPOSALS FOR ESSENTIAL ACTIVITIES IN 1990

Financial Resources for 1990

The 1990 proposed budget of US\$14.52 million is essentially the same as projected in the medium-term budget document *Program Plans and Funding Requirements: 1988-1992*. It is US\$680,000 higher than the approved budget for 1989 of US\$13.84 million, a 5% increase. The proposed budget for 1990 makes provision for price increases of US\$667,000.

The proposed 1990 requirement includes the funds required to maintain the current research program at approved staffing levels and to support efforts in outreach and training. After adjustment for inflation, research and research support costs will comprise 63.5% and outreach and training activities 13% of the operations budget. General administration and operation costs will be approximately 23.5% of the operations budget.

Budgets for essential activities and sources of funds for 1988-1990 are given below in US\$000's.

	1988 Actual	1989 Approved	1990 Proposed
Operations Program	12287	13230	13336
Price Increase	—	—	667
Capital	700	610	520
Total Funding Requirement	12987	13840	14523
Source of Funds Received or Expected			
Restricted	2456	2420	2600
Unrestricted	8441	9120	9373
World Bank	2020	2100	2300
Earned Income	365	200	250
Fund balance applied	(295)	0	0
Total	12987	13840	14523

The Kenya shilling depreciated gradually against the US dollar in 1988. The consumer price index in Kenya escalated by an estimated 12%. These trends are expected to continue in 1989. Price inflation in North America and Europe is expected to be below the level for Kenya, and an overall provision of 5% for price increases has been made for 1990.

Capital requirements for 1990 will depend partly upon research progress and decisions concerning programs. General capital equipment requirements have been estimated in line with past experience.

Research Programs for 1990

Research priorities in 1990 will follow the plan set out in the medium-term budget.

In Theileriosis Research, priority will be given to the development of new vaccines against both the sporozoite and schizont stages of the parasite. Special attention will be given to assessing the vaccine potential of isolated sporozoite components. Emphasis will continue to be placed on the improvement and application of the *infection and treatment* method of immunization in collaboration with national organizations in the affected countries of eastern Africa.

In Trypanosomiasis Research, both short- and long-term research strategies will be pursued. Emphasis will be given to the validation and application of new diagnostic tests and the improved use of chemotherapy, while long-term research programs will continue to search for new immunological, chemotherapeutic or genetic means to control this disease.

Development of methodologies and collection of data to assess the economic, social and environmental impact of improved control measures for theileriosis and trypanosomiasis will continue.

The EEC approved funding in 1985 for a special research project on trypanotolerant N'Dama cattle to be conducted jointly by ILRAD and ILCA. This project is the research component of a larger regional project developed by the government of The Gambia and funded by several donors. While the goal is to increase the production and export of N'Dama cattle, this project enables ILRAD to carry out substantial research on the mechanisms of trypanotolerance. The project completed its first 3-year period in 1988 and the EEC will support a further 30-month extension of this research beginning in January 1989.

Desirable Activities

Two senior scientific man-years of desirable activities were completed in 1988. One scientist is working in Theileriosis, funded by France, and another is working in Trypanosomiasis, funded by Japan. The same research is planned for 1989 and 1990.

In 1988 ILRAD secured financing from the Swiss Development Cooperation in the amount of SFr 960,000 (approximately US\$660,000) for constructing and equipping a new laboratory block to house the epidemiological and socio-economics program and related activities. Construction started in early 1989 and the project is to be completed by mid-1990.

Research on the immunology of theileriosis and trypanosomiasis at the cellular level currently results in extensive use of the fluorescence-activated cell-sorter. To facilitate this research and prevent unnecessary delays in conducting experiments and data analysis, it would be desirable, in 1990, to provide additional facilities for analyses of cell populations, in the form of a fluorescence-activated analyser, at a cost of approximately US\$150,000.

TABLE 1. PROGRAM AND ACTIVITY REQUIREMENTS: 1987-1992 (Senior Man Years [SMY] and US\$000's)

Activities	1987 Actual		1988 Actual		1989 Approved	
	SMY	Amount	SMY	Amount	SMY	Amount
ESSENTIAL REQUIREMENTS						
1. OPERATIONS PROGRAM						
Livestock Disease Research						
Trypanosomiasis						
a) Epidemiology	7.4	898	7.4	1014	7.8	951
b) Biology/biochemistry	10.6	1273	11.5	1578	10.8	1319
c) Immunology	4.5	602	3.2	439	5.1	623
d) Resistance mechanisms	3.6	422	4.6	631	4.6	562
<i>Total</i>	26.1	3195	26.7	3664	28.3	3455
Theileria						
a) Epidemiology	3.2	401	4.0	448	4.3	528
b) Sporozoite immunization	3.9	451	3.6	404	4.0	491
c) Schizont immunization	9.3	1087	9.1	1020	9.7	1190
<i>Total</i>	16.4	1939	16.7	1872	18.0	2209
Research Support	3.2	1798	3.2	2216	3.2	2213
<i>Total Disease Research</i>	45.7	6932	46.6	7752	49.5	7877
Economic and Social Analysis						
Research at the Micro Level	1.7	176	3.0	288	3.0	395
Training						
a) Specialized courses		50		125		145
b) Visiting scientists		30		50		70
c) Post-doctoral		530		466		567
d) Degree-related		267		210		238
<i>Total</i>	1.0	877	1.0	851	1.0	1020
Counselling and Advising NARS	0.0	30	0.7	40	1.0	140
Conferences and Seminars		115		89		90
Documentation and Dissemination	1.0	447	0.8	434	1.0	472
General Administration	3.0	1408	3.0	1471	3.0	1567
General Operations	2.0	1355	2.0	1362	2.0	1669
OPERATIONS SUBTOTAL	54.4	11340	57.1	12287	60.5	13230
Price Increase						
TOTAL OPERATIONS		11340		12287		13230
2. CAPITAL						
Construction		354		140		200
Equipment		309		460		410
<i>Total</i>		663		590		610
3. ADDITIONAL WORKING CAPITAL						
		300		100		
TOTAL ESSENTIAL REQUIREMENTS		12303		12987		13840
DESIRABLE REQUIREMENTS						
2. CAPITAL						
Construction		263		242		600
Equipment						

Activities	1990 Proposed		1991 Projected		1992 Projected	
	SMY	Amount	SMY	Amount	SMY	Amount

ESSENTIAL REQUIREMENTS

1. OPERATIONS PROGRAM

Livestock Disease Research

Trypanosomiasis

a) Epidemiology	8.1	1010	8.3	1041	8.6	1100
b) Biology/biochemistry	10.6	1323	10.4	1305	10.0	1279
c) Immunology	5.5	686	5.5	690	5.5	703
d) Resistance mechanisms	4.3	537	4.3	540	4.4	563
Total	28.5	3556	28.5	3576	28.5	3645

Theileria

a) Epidemiology	4.9	628	5.5	690	5.7	721
b) Sporozoite immunization	4.0	512	4.0	502	4.0	506
c) Schizont immunization	9.6	1230	9.5	1192	9.5	1203
Total	18.5	2370	19.0	2384	19.2	2430

Research Support

	3.2	2116	3.2	2198	3.2	2242
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Total Disease Research

	50.2	8042	50.7	8158	50.9	9317
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Economic and Social Analysis

Research at the Micro Level

	3.0	394	3.0	405	3.0	413
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Training

a) Specialized courses		150		154		158
b) Visiting scientists		72		74		75
c) Post-doctoral		550		560		570
d) Degree-related		250		256		262
Total	1.0	1022	1.0	1044	1.0	1065

Counselling and Advising NARS

	1.0	150	1.0	165	1.0	170
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Conferences and Seminars

		90		90		90
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Documentation and Dissemination

	1.0	481	1.0	498	1.0	508
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General Administration

	3.0	1598	3.0	1637	3.0	1670
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General Operations

	2.0	1559	2.0	1625	2.0	1655
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OPERATIONS SUBTOTAL

	61.2	13336	61.7	13622	61.9	13888
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Price Increase

		667		1056		1462
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TOTAL OPERATIONS

		14003		14678		15350
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2. CAPITAL

Construction		150		150		150
Equipment		320		320		320
Total		470		470		470

3. ADDITIONAL WORKING CAPITAL

		50		54		55
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TOTAL ESSENTIAL REQUIREMENTS

		14523		15202		15875
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DESIRABLE REQUIREMENTS

2. CAPITAL

Construction				800		
Equipment		150		150		150

TABLE 2. SUMMARY OF COSTS BY OBJECT OF EXPENDITURE, 1987-1992 (US\$000's)

	1987 Actual	1988 Actual	1989 Approved	1990 Proposed	1991 Projected	1992 Projected
Personnel costs	6547	6933	7610	7842	8084	8246
Supplies	2854	2969	3082	3160	3211	3275
Services	1019	1148	1421	1346	1307	1333
Equipment replacement	364	706	402	335	346	347
Travel	548	531	655	653	674	687
Other/contingency	8	0	60			
Subtotal	11340	12287	13230	13336	13622	13888
Price increase				667	1056	1462
TOTAL OPERATING COSTS	11340	12287	13230	14003	14678	15350

TABLE 3. SUMMARY OF MAN-YEARS, 1987-1992

	1987 Actual	1988 Actual	1989 Approved	1990 Proposed	1991 Projected	1992 Projected
Senior scientific/administrative	54.4	57.1	60.5	61.2	61.7	61.9
Supervisory	36.0	37.0	38.0	38.0	39.0	39.0
Support	324.6	336.0	338.0	338.0	345.0	354.0
TOTAL MAN-YEARS	415.0	430.1	436.5	437.2	445.7	454.9

TABLE 4. BALANCE SHEETS FOR ALL ACTIVITIES, 1988-1990 (US\$000's)

	1988 Actual	1989 Plan	1990 Projected
ASSETS			
Cash & short-term deposits	1930	2129	2037
Accounts receivable	687	687	687
Inventories	565	546	596
Other assets	966	591	591
Property, plant & equipment	22350	22463	23394
TOTAL	26498	26416	27305
LIABILITIES & FUND BALANCES			
Liabilities			
Accounts payable & other liabilities	2291	2078	2078
Payments in advance from donors	91		
Subtotal	2382	2078	2078
Fund Balances			
Capital	22350	22463	23394
Operating	574	1683	1641
Self-sustaining	100	100	100
Capital development	92	92	92
Subtotal	24116	24338	25227
TOTAL	26498	26416	27305

Table 5. FUNDING SOURCES FOR 1988 AND 1989 (US\$ MILLIONS)

	1988 Actual	1989* Pledged/ Received	1989 Estimated	1989 Total
USAID	2.150	2.100		2.100
World Bank	2.020	2.100		2.100
United Kingdom	1.249	1.140		1.140
Canada	0.933	0.881		0.881
Switzerland	0.819	0.720		0.720
West Germany	0.746	0.705		0.705
Japan	0.665		0.650	0.650
Netherlands	0.415	0.390		0.390
Sweden	0.406	0.429		0.429
Finland		0.237		0.237
Norway	0.320	0.294		0.294
Italy	0.716		0.716	0.716
Belgium	0.400		0.400	0.400
ADB	0.200	0.225		0.225
France	0.159	0.154		0.154
Denmark	0.100	0.099		0.099
India	0.026		0.025	0.025
UNDP	0.695	0.736		0.736
IDRC		0.093		0.093
Rockefeller Foundation	0.391	0.475		0.475
EEC (re ITC Gambia)	0.115		0.324	0.324
Netherlands (Wildlife Project)	0.119			
Australia	0.085		0.085	0.085
Earned income	0.365		0.200	0.200
Funds applied	0.055			
Total funds	13.149	10.778	2.400	13.178
Not identified				0.662
Required	12.987			13.840

Note: The unexpended balance brought forward from 1988 was 0.351 (\$351,000).

* 1989 based on information available on 18th July 1989.