

Pillar 1639/02
12/10/79

OVERSEAS DEVELOPMENT ADMINISTRATION

Report on Research and Development 1979

LONDON
HER MAJESTY'S STATIONERY OFFICE

Contents

	<i>Page</i>
Part I The financial picture	1
Part II Institutions receiving long-term support	2
Part III International co-operation	5
Part IV The content of the work	8
Tables I Membership of Boards and Committees	22
2 Comparison of expenditure, 1977/78 and 1978/79	25
3-21 Current R & D projects listed by sector	26

Note: The financial information in this report covers only expenditure actually incurred in the last complete U.K. financial year, ie, to 31 March 1979

I. The financial picture

The cost of Britain's aid programme in the financial year 1978/79 was £775.5 million (gross); the corresponding figure for 1977/78 was £650 million. Expenditure on research and development (R & D) during 1978/79 was £13.4 million; the corresponding figure for 1977/78 was £12.1 million.

The ODA expenditure on R & D has four components:

- i. Work funded from the Research and Development Subhead (D5) of the Overseas Aid Vote. This is the source of grants for research projects carried out on a contract basis by individual researchers or teams, usually based on universities or similar institutions. £4 million was spent under this Subhead in 1978/79 (a similar amount was spent in 1977/78). More detailed information on the comparison between 1978/79 and 1977/78 will be found in Table 2 on page 25.
- ii. Support to British scientific establishments. Some £11.4 million was spent in 1978/79 on contributions towards the recurrent costs of centres in Britain which give scientific and technical help to the developing countries. Of this about 4.7 million was devoted to R & D (the corresponding figures for 1977/78 were £10.1 million and £3.9 million).
- iii. Support to international centres undertaking R & D on the problems of the developing countries. £2.55 million was allocated for this purpose for 1978/79 (£2.25 million in 1977/78).
- iv. R & D carried out as part of Britain's aid to particular countries. £2.31 million approximately was provided for this purpose in 1978/79. (The comparable figure in 1977/78 was £1.97 million.)

Other elements in the ODA expenditure contribute towards R & D: for example, time spent by ODA staff on work relating to R & D; or aid to overseas governments in the field of scientific and technical education and equipment, and hence to these governments' capacities to carry out their own research. Activities of this kind are less easy to quantify and are left out of account here.

This Report also leaves out of account the important scientific and technical aid which Britain provides to developing countries by means other than research (eg through technical surveys, advice and training). It is concerned with R & D only and not with scientific and technical activities of a non-research nature.

II. Institutions receiving long-term support

The ODA has continued to provide long-term financial support to a number of centres specialising in the type of R & D programmes which it would be difficult for researchers in universities and other institutions in Britain to undertake on a contract basis. The names and addresses of these centres are given below. They (or their parent bodies) publish periodical reports on their work, together with reports on particular investigations; their current research projects are listed in the tables at the back of this Report.

Special Units of Overseas Development Administration

The ODA has five Special Units with scientific or technical functions. There is a substantial R & D element in the work of two of these.

i. The *Tropical Products Institute* (56-62 Gray's Inn Road, London WC1X 8LU) is concerned with agricultural, animal, fisheries and forest products at the harvest stage and after. It carries out R & D on the use, handling, processing, quality control, preservation and storage of harvested natural resources and their residues, usually at the request of overseas countries and often in collaboration with overseas institutions. Its R & D budget for 1978/79 was £1,645,000.

ii. The *Centre for Overseas Pest Research* (College House, Wright's Lane, London W8 5SJ) carries out R & D in the control of insect, rodent and bird pests through its five divisions (Biological Sciences I and II; Field; Chemical Control; and Information and Training), often in collaboration with overseas institutions. Its R & D budget for 1978/79 was £838,000.

Units of Other Government Departments

The ODA meets the cost of a number of units in scientific establishments dependent on other Government Departments. There is a substantial R & D element in the work of three of these, all of which come under the Department of The Environment.

i. The *Overseas Unit of the Transport and Road Research Laboratory* (Old Wokingham Road, Crowthorne, Berks RG11 6AU) carries out research into road construction and transport planning in developing countries. Its R & D budget for 1978/79 was £881,000.

ii. The *Overseas Division of the Building Research Establishment* (Building Research Station, Garston, Watford WD2 7JR) carries out research into building materials and methods for use in developing countries, with particular reference to low-cost housing. Its R & D budget for 1978/79 was £348,000.

iii. The *Overseas Unit of the Hydraulics Research Station* Wallingford, Oxon OX10 8BA) carries out research into the engineering aspects of the control and management of surface water resources in developing countries. Its R & D budget for 1978/79 was £400,000.

Mention should also be made of the Overseas Division of the Institute of Geological Sciences (154 Clerkenwell Road, London EC1R 5DU) and an overseas unit at the Institute of Hydrology (Crowmarsh Gifford, Wallingford, Oxon OX10 8BB) which come under the Natural Environment Research Council, and which include a limited amount of research in their work programmes.

Other Institutions

The ODA provides continuing support to certain non-government bodies to enable them to carry out work of direct interest to itself. Those whose work includes an important R & D element are as follows:

i. The *Centre for Tropical Veterinary Medicine* (Easter Bush, Roslin, Midlothian EH25 9RG) carries out research into certain aspects of tropical animal health. The Centre forms part of the University of Edinburgh but is largely financed by ODA. In 1978/79 the core grant was £566,000, of which approximately £376,000 was for research.

ii. *Tsetse Research Laboratory Bristol*. The Langford Laboratory was originally established as a single research project, specifically to determine whether or not it was feasible to establish and maintain productive colonies of tsetse flies in captivity. In recent years activities have been greatly expanded and the laboratory has now become a centre where other research projects are located and supervised and which has achieved recognition as a centre for advice on tsetse problems in general. In 1978/79 its core grant was £101,000. The Laboratory also carried out research financed from ODA's R & D Subhead amounting to £19,300.

iii. The *Overseas Department of the National Institute of Agricultural Engineering* (Wrest Park, Silsoe, Bedford MK45 4HS) is engaged in R & D on a wide range of simple agricultural machinery for use in developing countries and is wholly financed by the ODA. In 1978/79 the core grant was £169,000. Its R & D budget for 1978/79 was £127,000.

iv. The *Commonwealth Forestry Institute* (South Parks Road, Oxford OX1 3RB) has a Unit of Tropical Silviculture supported by contributions from Commonwealth countries, including Britain. This unit has a continuous programme of research into biological, silvicultural and economic problems on tropical forestry and is a permanent source of expert advice on forestry problems in developing countries. Britain's contribution in 1978/79 to maintaining this research centre was £75,000. The CFI also carried out research financed from ODA's Research and Development Subhead amounting to £170,000.

v. The *Centre for Population Studies (Overseas Section)* at the London School of Hygiene and Tropical Medicine is involved in research relating to the analysis of demographic data, the impact of social and economic factors on mortality and the medical problems of family planning. The UK contribution to the Centre in 1978/79 was £68,000.

vi. The *Institute of Development Studies* at the University of Sussex is involved in research and teaching in development studies; as well as specific research grants (see table 15) it receives about two thirds of its annual income from a grant in aid from the ODA. In 1978/79 this core grant was about £1 million. The IDS's research work combines social science disciplines in studying problems of the Third World, in particular those relating to poverty, employment and income distribution.

vii. *Queen Elizabeth House* (2, St Giles, Oxford) promotes development studies by teaching, research and the collection of documents. It has for some time received a grant in aid from the ODA to support its work generally. The ODA makes an annual grant of £50,000 to support four Fellowships, with supporting staff, for research into development problems of particular interest to the ODA.

III. International co-operation

An important element of the research work of the ODA is its contribution to international research and development. Many of the problems facing the developing countries are of such complexity and geographical extent as to necessitate the deployment of research resources on an international scale. Through such co-operation the scientific community may often transcend the national frontiers which can hinder the progress of development.

International Agricultural Research Centres

Support for the work of thirteen international centres is provided through the Consultative Group on International Agricultural Research (CGIAR); this organisation is sponsored by the World Bank, UNDP and FAO and has a membership consisting of national donors, Foundations and Development Banks. Developing countries are represented in the Group by regional nominees. The Consultative Group is assisted by a Technical Advisory Committee (TAC) staffed by eminent scientists and with a membership drawn equally from developed and developing countries. TAC advice to the Group on the research priorities of the international centres takes into account not merely the technical requirements of increased agricultural productivity but also the economic, social and ecological factors which influence the work of small farmers.

Britain contributes through the CGIAR to the work of eleven of the fully-sponsored centres. The research programmes of the centres are briefly indicated below; in the main their research is devoted to the major food crops, but work is also performed on problems of animal production and disease, farming systems and water management. All but three of the centres are located in developing countries and maintain close relations with their hosts; their work, however, is related to problems of regional or global importance. The research undertaken by the centres is taken into account by the ODA in planning its own research programme which also provides support for research in Britain and overseas which is complementary to the work of the centres.

- i. The *International Rice Research Institute (IRRI)*, Philippines, is concerned with breeding high-yielding pest and disease-resistant rice varieties which are tolerant of some environmental factors which limit growth. Britain's contribution to the Institute in 1978/79 was £600,000.
- ii. The *International Maize and Wheat Improvement Centre (CIMMYT)*, Mexico, is responsible for producing new varieties of wheat and maize. Britain's contribution in 1978/79 was £200,000.
- iii. The *International Centre for Tropical Agriculture (CIAT)*, Colombia, is charged with the breeding programme for field beans and cassava. It also conducts research on production of beef cattle and pigs. Britain's contribution in 1978/79 was £175,000.

iv. The *International Institute for Tropical Agriculture (IITA)*, Nigeria, is responsible for research into the system of shifting cultivation in the humid tropics. It has a special interest in cowpeas and yams. Britain's contribution in 1978/79 was £490,000.

v. The *International Potato Centre (CIP)*, Peru, has the main world potato germplasm collection; it does taxonomic and disease-resistance research. Britain's contribution in 1978/79 was £225,000.

vi. The *International Crop Research Institute for the Semi-Arid Tropics (ICRISAT)*, India, is the main centre for research into the techniques of dryland farming and its associated crops such as sorghum, millet, chickpea, pigeon-pea and ground-nut. Britain's contribution in 1978/79 was £375,000.

vii. The *International Laboratory for Research on Animal Diseases (ILRAD)*, Kenya, is mainly concerned with problems associated with trypanosomiasis and East Coast fever, leading to the development of immunological procedures. Britain's contribution in 1978/79 was £200,000.

viii. The *International Livestock Centre for Africa (ILCA)*, Ethiopia, has a mandate to cover the biological and organisational constraints on improved livestock production in tropical countries south of the Sahara. Britain's contribution in 1978/79 was £125,000.

ix. The *International Centre for Agricultural Research in Dry Areas (ICARDA)*, was established in 1976 to examine farming systems in dry (as distinct from semi-dry) areas, along with associated crops and animals such as barley, durum wheat, lentils and sheep. Two research stations are planned in the Middle East. Britain's contribution in 1978/79 was £60,000.

x. The *International Board for Plant Genetic Resources (IBPGR)*, Rome, is concerned with the conservation of germplasm of economic crop plants and the exchange of genetic materials for crop plant improvement internationally. Britain's contribution in 1978/79 was £100,000.

xi. The *International Food Policy Research Institute (IFPRI)*, Washington DC USA. As of 1980, the CGIAR will be sponsoring IFPRI—although the UK has not pledged any contribution. The objectives of IFPRI are to provide an analysis of world food problems and to determine those actions or policies that could be adopted by governments and agencies to effect increase in the quality and quantity of food supplies to the developing world.

xii. *International Service for National Agricultural Research* (location to be determined). The objective of ISNAR is to provide assistance to the developing countries to plan, organise and manage research more effectively. It will begin work in 1980 although it has yet to appoint a Director General and staff.

All these centres have or will have strong training programmes. In addition, the Group sponsors part of the field programmes of the *West African Rice Development Association (WARDA)*, Liberia. Britain's contribution to WARDA is however given bilaterally to support its programme on mangrove rice in Sierra Leone.

FAO have an International Programme for the control of African trypanosomiasis, with which Britain is associated.

International research in tropical medicine

The UNDP/WHO sponsored *Special Programme for research and training in tropical diseases*, with the continuing and active support of a number of institutions and governments, including Britain, embarked in 1979 on the third year of operational activity. Projects continue to develop and are becoming the basis for long-term efforts to solve the most intractable problems associated with the six major tropical diseases—leprosy, malaria, schistosomiasis, filariasis (including onchocerciasis), trypanosomiasis and leishmaniasis (Chagas disease). An internationally funded and organised programme of research (and associated training) into these diseases will attempt to find cheaper and more effective methods of prevention and cure.

The problems ahead remain immense; for example, malaria has continued to increase disturbingly due to the immunity of its parasite and vector to the drugs and chemicals used to control them. British specialists who have worked for many years on these problems under grants provided by the ODA and the Medical Research Council (MRC) are actively involved, along with scientists from other countries, in planning the scientific work of the International Programme.

The administrative work on the Programme has been undertaken by the World Health Organisation as the executing agency, working closely with the UNDP, the World Bank and other bodies such as the International Research Centre of Canada. Britain contributed £766,000 in 1979 towards the costs of the Programme, estimated at some US\$25.5 million in 1979. A Special Fund for the Programme was formally established in early 1978 administered by the World Bank. Britain's contribution is now made through this fund but the Voluntary Fund for Health Promotion remains open for contributions in cases where contributing parties so wish.

A number of national and international donors, including Britain, continue to co-operate with WHO in the implementation of the Onchocerciasis Control Programme. Britain's total contribution up to the end of 1978/79 amounted to £2.4 million. The objective of the programme is to eliminate onchocerciasis (river blindness) from the Volta Basin in West Africa in a twenty year campaign. This is primarily an operational rather than a research programme, but it has a strong scientific content.

International research on population problems

Britain is a major contributor (£3.75 million in 1978/79) to the United Nations Fund for Population Activities (UNFPA). The greater part of UNFPA's expenditure is however on action rather than research work. The UK is an active supporter of the WHO Special Programme of Research and Development in Human Reproduction—the central international research programme in this field.

Other international consultations

It would be impossible to list all the international consultations on research topics with which the ODA and the scientific units associated with it have been concerned. The 1979 UN Conference on Science and Technology for Development provided a focus for general debate on the subject. In this context the OECD and the EEC showed continued interest in the application of science and technology to the needs of the developing countries. The Commonwealth Science Council has continued to work towards its aims of encouraging more active participation by all its members in pursuing the common goals of using science and technology to alleviate poverty and to further development in Commonwealth countries.

IV: The content of the work

Criteria

Within the limit of its resources the Administration is concerned to sponsor and support a programme of research aimed at gathering new knowledge and evolving new techniques directly related to the needs of developing countries. The emphasis is on research likely to be of practical use in a reasonable period of time, and special priority is given to R & D of direct relevance to the poorer sectors of the poorer countries, with particular reference to the development of the rural sector.

R & D projects may be seeking solutions to fundamental problems of concern to wide geographical areas or they may be more specifically directed to problems which are constraints on the development programmes of particular countries. Projects are monitored by ODA Research Advisers assisted by independent assessors, by the small group of ODA Scientific Liaison Officers who are based at institutions in Britain and, when appropriate, by the bodies listed in Table I. Results of the work are made available to the recipient country and are given wide distribution and publicity through the ODA as well as dissemination in the scientific literature as published papers. Eventually the results should filter down to those who really need to know—the farmers in the field, the workers at the bench and the doctors and nurses in the bush.

Continuing the pattern of the 1978 Report the notes which follow describe in some detail the R & D in progress in selected fields. This year the chosen topics are economics and sociology, water resources, construction and forestry. These notes supplement the lists of current research projects given in the Tables at the end of this Report which cover the whole range of the Administration's R & D activities.

Economics and Sociology: Table 15

A vast range of research needs to be, and is being, undertaken under a heading as broad as "Economics and Sociology". It is impossible to classify all projects within a small number of subject headings. Decisions on research projects are taken in the light of specific ideas about priorities, but no attempt is made to concentrate research in specific areas to the exclusion of others. Research—particularly economic and social research—should not merely reflect existing perceptions of the priorities but should also help to refine and sometimes change those perceptions. Industrial development on the Western pattern and the transfer of capital-intensive agricultural techniques were formerly perceived as being more central to development than they are now, and if aid agencies had dragooned research into these "priority areas" it might have taken longer to realize the shortcomings of such an approach. Thus research should, to some extent, be in advance of the administrator's perception of needs, and should not merely follow from it as might be implied by a policy of strict administrative control. Despite these considerations very pronounced areas of concentration emerge in the economic and social research programme.

Rural Technology. One area of concentration is the examination of rural technologies, with particular emphasis on gains and losses occurring in the poorer groups. A major study of agricultural mechanisation in Bangladesh which was carried out in collaboration with the local agricultural development corporation aimed to identify the social implications of various mechanisation policies. The use of draught animals, tractors and the increasingly popular small two wheeled cultivators were compared in terms of their effect upon employment, income distribution and output. A similar exercise is to start soon in Sri Lanka, in close co-operation with the relevant local organization. Identifying the implications of modern technology is also the concern of a study on rice-processing technologies at village level in Bangladesh. Ways of reducing laborious tasks without adversely affecting vulnerable groups are being explored. The effects which could result may be compared with those it is feared micro-processors may cause in industrialised societies. The village communities being studied are, however, without most of the "safety-nets" that advanced societies have constructed to cushion adverse effects of technical change.

A study of grain storage technologies in Andhra Pradesh demonstrated that substantial economic returns were possible by improving traditional storage techniques whilst showing, at least in the area investigated, that there was no basis for the exaggerated estimates of on-farm storage losses which have become widely reported. Losses observed were in the order of five per cent. Two separate studies in Nigeria deal explicitly with the determinants of women's share of output and work, an area of concern that is also implicit in the rice-processing study in Bangladesh mentioned above. From studies in Nigeria it has become evident that there is no justification for assuming that women will automatically benefit from an improvement in output.

Nutrition. The questions of rural technology are closely related to those concerned with nutrition. There is a lack of knowledge on the relationship of work input and its seasonal distribution to calorie availability. In order to rectify the situation a field study in The Gambia sponsored by the International African Institute is attempting to analyze this relationship and develop methods for exploring these problems. Further studies are also needed on the monitoring of food availability in relation to nutritional needs. Such knowledge is essential to the implementation of any successful policy of intervention by national governments or donors, yet at present it is usually non-existent. Statistics giving figures for average calorie availability are not detailed enough to be really useful. A project is being carried out to find means of improving the data available and it is hoped this will provide "backstopping" for technical assistance efforts in this field.

Food aid is the policy instrument which most readily occurs to donors in relation to nutritional problems, and two research projects have recently been completed in this area. The Overseas Development Institute has recently published a study giving a more balanced assessment than was obtained from earlier research. It directs attention to methods of administering food aid rather than producing generalized statements on whether or not food aid is, on balance, a good thing.

Industrial technology. While the emphasis of research is on rural technologies, the problems of industrial technologies continue to be important, if not in relation to the numbers employed in industry, at least in relation to the share of investible surplus absorbed by industry. Work carried out at the David Livingstone Institute, Strathelyde, pioneered the amalgamation

of engineering and economic research. The objective was to identify the "appropriate" technology for a range of industrial sectors at various wage and interest rates. Results showed that the optimum choice of technology is much more sensitive to scale of production than to factor prices. The theory of "technological determinism" that the range of possible production techniques is sharply limited was also dispelled. This work is now being continued at the Institute and aims to compare optimum techniques with those actually chosen by enterprises in developing countries and to identify the reasons for any (apparently) sub-optimal choices that may be observed. Another project in the industrial sector assesses the role of industrial co-operatives in developing countries on the basis of a series of case studies of this institutional framework which is superficially attractive, but frequently disappointing in practice. The aim is to define more precisely the particular determinants of success or failure and thus avoid expensive mistakes.

Manpower and Employment. A concern with manpower and employment issues is related to the interest in appropriate technology. A study of the impact of migration on rural communities in Ecuador confirmed the importance of education as a determinant of migration but also served to modify earlier hypotheses of the severe adverse effects of a rural "brain-drain". International aspects of the "brain-drain" are also being investigated by a study of Guyanese migrants to the UK. The "informal sector", which has been the object of intense and sometimes romantic speculation is of major importance to urban employment and has been intensively studied in Colombia. Hitherto some aspects of the "informal sector" have not been thought suitable candidates for development research. These are its close relationship with the "formal sector", its heterogeneity and its tendency to shade off imperceptibly into areas such as petty crime. Such factors have led to a questioning of the use to which the concept of the informal sector has been put and to a search for more worthwhile categories for investigating marginal employment. The policy implications of the Colombian study have been somewhat negative, delineating areas of Government activity which might exacerbate the problems of marginal groups unnecessarily without suggesting many positive possibilities for improvement.

Macro-economic studies. The bulk of activity in economic and social research has dealt with rather detailed and frequently highly localised field investigations. This kind of research is the only way to generate realistic appreciation of the potential effects of projects and policies and the scope for action which will result in effective improvements in the condition of needy communities. However, research of a more general and macro-economic character has not been totally neglected. In close collaboration with the World Bank, work is under way on the effect of financial management policies on income distribution. Empirical assessment of the differential impact on various groups of direct and indirect taxation, subsidies, and inflation should assist the formulation of financial policies which take account of distributional goals. It is hoped to arrange a seminar in India to discuss and disseminate the findings of the research team headed by Dr Sinha, which recently completed a macro-economic study dealing with a range of distributional measures. Effects of measures ranging from food subsidies or progressive taxation systems to asset (ie land) distribution were simulated using a highly disaggregated model of the Indian economy.

Statistics. Adequate economic and social statistics relevant to the policies of a particular country which do not require disproportionate and over-ambitious efforts for their collection are an essential tool for any policy

intervention. The lack of such statistics in the field of food and nutrition has already been remarked upon: at a more general level there has been a combined research and technical assistance effort over a number of years to improve economic and social statistics. It is hoped that a project to be completed soon will result in the publication of a manual setting out ways of increasing the policy relevance of economic and social statistics in developing countries without undue cost. Much of the information for this work has evolved in the course of technical assistance assignments in numerous developing countries. Additionally, research at the University of Warwick is being carried out on the development and application of social accounting matrices (SAMS). This is a technique which is being used increasingly in several developing countries as a simple means of displaying and analyzing the interdependence of different economic sectors. The work is integrated with Technical Co-operation assignments which have prepared SAMS for Botswana and Kenya and will shortly do so for Fiji.

Pastoralism and Irrigation Management. A brief survey cannot do justice to all the areas covered by the economic and social research programme. Perhaps the two most significant projects not already mentioned are one on pastoralism and the potential for policy interventions to improve the condition of pastoralists and one on irrigation management in Bangladesh. Both projects are attempts to fill two of the most obvious gaps in recent policy orientated research; the former is being carried out in collaboration with a West African institute.

Research on trade. The absence from the programme of any research on trade may possibly seem a notable exclusion and may appear to be a defect, given the flurry of recent international activity relating to UNCTAD's Integrated Programme for Commodities. Ample research has, however, been carried out under other auspices and has tended to confirm the very limited direct contribution made by trade measures at an international level to the reduction of poverty.

The current research programme is largely directed at carrying out detailed micro-investigations in developing countries. Emphasis on this kind of research seems justified as it is the only way of gaining an understanding of the social and economic environment of the most vulnerable groups in developing countries who would be affected by national or international policy measures. A possible direction for further future research would be renewed interest in such international measures of a kind which made use of the data obtained in the micro-investigations of the current research programme; one or two projects of this kind are currently under consideration.

Water Resources: Table 4

Lack of readily available water supplies places constraints on agricultural development in many developing countries. Changes in land use may cause soil erosion, which in turn creates problems such as reservoir sedimentation. In countries where irrigation is widely used, increased soil salinity and sedimentation in irrigation canals present problems. Countries or regions situated around large multi-branch deltas are found mainly in South Asia. The high population density and intensive agricultural activity associated with these areas create problems peculiar to them, the most troublesome being flooding, salt intrusion and channel migration. All these problems serve to illustrate that proper use, management and conservation of the water resources available in developing countries are essential to maximise efficiency.

In order to help overcome problems such as those described above the ODA finances three units within Government Laboratories, devoted to investigating water problems in relation to development: namely the Hydraulics Research Station of the Department of the Environment, the Institute of Hydrology of the Natural Environment Research Council (NERC) and the Institute of Geological Sciences also part of NERC.

The Hydraulics Research Station (HRS). The main purpose of the Hydraulics Research Station, established in 1949, is the study of civil engineering work in open waters—rivers, estuaries, on coasts or off shore—to assess their performance and predict their effects on the environment. Most of the work undertaken is of a contractual nature and research studies on specific engineering projects are carried out, usually at the planning or design stage. In 1973 the Overseas Development Unit (ODU) was established at the HRS to provide advice and research assistance for the study of water related problems in developing countries. Attention is focussed mainly on the problems of irrigation, agriculture and water resources development. Research projects usually investigate problems which occur widely in the developing world where the results will be applicable to several countries whereas problems which are highly localised are normally investigated under special contract. All long term research at the Unit is financed wholly by the ODA and several contractual studies are also financed by ODA each year under Technical Co-operation arrangements.

Recently commissioned contractual investigations include scale models of aspects of the proposed Victoria dam on the Mahaweli River in Sri Lanka; a scale model of water flows and levels in the Irrawaddy Delta, Burma, to help the Burmese Irrigation Department foresee the effects of draining and flood protection works; a series of studies of aspects of the development of Port Qasim in Pakistan and the provision of equipment, technical advice and support to the Hydraulics and Sediment Research Institute, Egypt.

The current research programme of the Overseas Development Unit is varied and the results should be applicable to several developing countries. Projects include studies on water management, reservoir sedimentation and soil erosion, sediment control in irrigation systems, soil salinity and the hydraulics of multi-branch deltas.

Water Management Studies. In providing new sources of supply, water may have to be conveyed for long distances, energy may be needed for pumping, or the incidence of new sources may be less reliable. As sources become more inaccessible and difficult to exploit, costs tend to increase progressively. Awareness is thus heightening in developing countries of the need to make the best use of existing water resources rather than to continue searching for new sources of supply. The problem is particularly acute in South and South East Asia where small-farmer irrigation systems are principally used and the very small size of the land units make detailed control of the individual water consumption impracticable, at least for the present. In an attempt to gain an understanding of the problems, measurements are being taken of the water distribution in typical existing schemes and then the implications of water saving strategies, such as the lining of channels, are examined. Detailed research investigations of this kind were first made at Kandulla in Sri Lanka.

Reservoir sedimentation and soil erosion. Sedimentation problems caused by soil erosion are increasing rapidly in many developing countries. The

main causes are usually changes in land use arising from the combined effects of population expansion and economic changes. Principal agencies of soil erosion include forest clearance, over grazing, shifting cultivation and inappropriate agricultural practices. The major consequences, apart from the immediate soil loss, include rapid reduction in the economic life of reservoirs by sedimentation, exacerbation of flooding by the raised level of river beds and silting of canal systems, ports and access channels in estuaries. Additionally, there is more rapid run off of rainfall from denuded slopes; greater variability in river flow may result in higher floods or longer dry seasons and wider variations in ground water and soil moisture levels are observed. These problems, massive in scale, are still insufficiently recognised. By taking field measurements of various parameters the Unit attempts to help gain an understanding of the balance between the causes in different climatic and social systems. At present soil studies are in progress in Nigeria and Indonesia and other sites are being considered.

Sediment Control in irrigation systems. When an irrigation canal is supplied with water by diversion of a river rather than from a reservoir there is a tendency for sediment to be deposited in the canal. This is caused by the difference in flow rate between the parent river and canal, the latter is frequently slower flowing than the river. The often abrupt change in gradient and water velocity reduces the sediment carrying capacity of the canal. Consequently if the river carries a high load of sediment, particularly coarse sediment, it is highly likely that it will be carried into and deposited in the canal. To solve this problem engineers must either exclude the sediment from the canal, by some arrangement of the intake works, or extract it after it has entered. In practice both solutions are applied and a wide variety of designs for works which achieve the aims illustrate that generally applicable solutions are not available. The sedimentation problem is particularly severe in the commonly occurring situation of a fast flowing river emerging from a steep mountainous tract onto an alluvial plain. In such a case there is a strong argument for putting a canal intake a short distance upstream of the plain—that is, at the very place where sediment problems are likely to be most difficult. In order to find means of alleviating the problems caused by sedimentation, studies on the behaviour of different types of sediment have been initiated and improved ways of predicting the performance of sediment-extracting devices are being sought.

Soil Salinity. Irrigated lands in arid and semi arid climates suffer a problem peculiar to them: the accumulation of salts in the upper soil layers resulting in reduced crop yields. The region in the Middle East between the rivers Indus and Nile portrays the classic example of this major problem. In this region annual potential evaporation vastly exceeds annual rainfall, the net effect being that salts carried to the surface by evaporation are not all washed downwards by rainfall, and become concentrated in the surface soil layers. Irrigation tends to aggravate the problem by raising the water table, thus maintaining high levels of soil moisture throughout the dry season, and enabling actual evaporation to reach its maximum potential level. By ensuring that drainage provides sufficient downward flow of irrigation water, salts are carried downwards too and the problem is usually solved using this technique. However if the problem is not foreseen and drainage or irrigation systems are inadequate soils may be damaged beyond restoration. A project to investigate the problem of soil salinity is being carried out in the Northern Nile delta where it has occurred in recent reclamation works.

Hydraulics of multi-branch deltas. The regions on and around multi-branch deltas experience a variety of hydraulic problems of which the most troublesome are flooding from the sea or parent river, salt intrusion and channel migration. The heavy loss of life caused by cyclonic flooding in areas such as the Ganges-Brahmaputra delta in Bangladesh shows a need to build protective structures, such as flood embankments. Predicting the effects of specific civil engineering works on the complex multi-branch delta systems is difficult and controversial, but the severe effects outlined above illustrate the need for the design of such works. In order to obtain data to help establish the best design for control structures, the Overseas Unit at HRS devised a mathematical model. This numerical model was applied, for the first time to the Irrawaddy delta in Burma. The first phase of the project has concentrated on reproducing water movements, both flows and water levels. In the next phases factors such as salinity and sedimentation will be introduced into the model.

The Institute of Hydrology. The Institute of Hydrology has carried out research overseas since its foundation in 1968, and the increase in this work, funded by the ODA, led to the establishment of an ODA Unit at the Institute in 1977.

A study of the low flow characteristics of British rivers enabled the development of empirical methods for predicting aspects of flow behaviour from a knowledge of the relationship of flow and climatic and topographic characteristics of the river basin. These methods are now being applied to river flow data in Malawi, where extensive records are available in order to develop similar relationships. The results of this work should be applicable to other countries in Central Africa of similar climate, topography and vegetation.

Modern time series analysis techniques have been used to study the flow into Lake Nasser, on the Nile, and results of this research will be used to formulate methods to regulate the supply of water from the Lake.

Thus, in addition to providing answers to the problems of developing countries, the work abroad provides a rigorous test bed for techniques developed at the Institute and ensures their more general applicability.

Until recently, hydrological studies in Kenya have tended to concentrate on the well-watered, highly productive volcanic soil regions. The growth in population has resulted in increased agricultural development in the drier medium potential areas which have not previously undergone hydrological investigation. A project which has commenced in the Machakas-Kitui area of Kenya is concerned with the establishment of four representative basins which will monitor water and sediment yields and show how the agricultural practices used will affect them.

Crop Water Studies. In order to determine the water requirement, in terms of rainfall and irrigation, of crops and forests, it is essential to estimate the rate of evaporation of water from the different types of vegetation. Techniques available for determination of evaporation rate range from simple methods to highly sophisticated instruments using the physics of the process. The latter, although more costly, are more widely applicable than the former which can only be crudely and empirically related to water use of different crops. Desk studies are being undertaken at the Institute using climatic data from The Gambia and Malaysia. Several field studies are being carried out in Sri Lanka including collaboration with the HRS on the Kaudulla project.

Groundwater Studies. The Institute is collaborating with the Institute of Geological Sciences and the Indian Central Groundwater Board in a study of the Deccan Trapps aquifers by measuring the recharge to the aquifer in the Betwa catchment from Monsoon rainfall. The Betwa catchment is an area of about 18,000 square kilometres situated between Jhansi and Bhopal in Madhya Pradesh. Field measurements are being taken to determine the variation of soil moisture over the catchment, and pilot studies are used to estimate the deep percolation through the soil to the underlying aquifer. These measurements are complemented by a water balance study of the catchment to determine the total quantities of water which may be available for recharge.

Instrumentation. Conditions in developing countries such as extremes of climate, shortage of qualified observers and of technicians create problems in using instruments. The Institute of Hydrology has long been interested in the development of instrumentation for hydrology and the IH automatic Weather Stations which have been used world-wide for several years have been steadily improved to withstand a wider range of climates. However these weather stations are expensive complex instruments and there is a need for simpler cheaper instruments capable of working unattended for long periods in remote situations or where suitably qualified observers are unavailable. Work has commenced on developing a series of simple cheap instruments using modern micro-electronic techniques to record various measurements. The first instrument produced has been a long term daily recording rain gauge capable of recording daily rainfalls for over two months without attention; it can thus be used in extremely remote sites. Preliminary results from the prototypes which have been constructed and set up in Indonesia, Kenya, Libya and Brazil have been most encouraging.

Computer Techniques in Groundwater Resource Study. During studies of groundwater reservoirs large quantities of data from pump tests, borehole logs and chemical analysis are accumulated. This gives rise to a need for simpler instruments for the reasons given in the preceding paragraph. The work on developing simple instruments includes instruments for groundwater resource study and the rain gauge described is giving encouraging results. All this information has to be brought together and the Institute is developing a series of computer programs for this purpose. The programs include a simple data management system for storage, retrieval and display of the data, methods for analysing water levels, water quality, lithological logs and pump test data. A particular feature of the system is an ability to apply digital models to the data and it has already been used in the UK in a number of studies for developing countries.

The Institute of Geological Sciences' Hydrogeological Unit. The ODA maintains a source of expertise at the Hydrogeological Unit of the Institute of Geological Sciences by funding about sixteen special posts at the Unit. These posts, termed home based posts, provide scientists with suitable qualifications and experience for working in developing countries. Additional specialist support is available within the Unit for subjects such as mathematical modelling, hydrochemistry and borehole geophysics, and from other Units in subjects such as surface geophysics and microearthquake analysis. The Hydrogeological Unit is currently involved in projects in seventeen countries, mainly on groundwater but including some geothermal projects. The projects described below include a high research and development content.

Hydrogeology. The Unit is involved in the Indo-British Deccan Trapps in which the Institute of Hydrology are also collaborating. The Deccan Trapps, an extensive volcanic sequence covering about 40 per cent of the surface of India, is an important economic unit which has not previously been studied in detail.

Groundwater can be found in an upper continuous weathered zone, deeper in the inter Trappean deposits or at the weathered surface of older flows. Water might also have been expected at the lava bed rock interface. Deep drilling of the aquifers has shown that the surface weathered layer is the only significant aquifer available for exploitation but that small supplies of clean water can be obtained from depth almost anywhere in the Trapps. In areas where irrigation water is required the best means of exploiting the upper aquifer is by the use of large diameter hand dug wells.

The team used the most modern methods available for hydrogeological investigation and during the study some important results were observed. A means of identifying individual lava flows over great distances, by measuring radiation given off by certain lava flows, was devised. The estimates of river flow, rainfall and soil moisture changes made by the Institute of Hydrology are being used to refine the estimates of available small reserves of groundwater in the Betwa Valley.

Well design. At least 10,000 public high-yielding tubewells have been constructed in Pakistan to date and many more are planned. Any improvement in well design and performance would be useful. The Overseas Unit are helping in two ways:

Firstly, a mathematical model is being developed which will, for the first time, incorporate all the complexities of groundwater flow. It is hoped to simulate turbulent flow caused by high velocities at the well face and to screen entry and friction head losses, all factors which are usually ignored. By using this model it is thought improvements will be made in well design.

Secondly, attempts are being made to prolong well life by improving well designs. Wells in Pakistan have a relatively short life of about eight years. Site investigations are proposed to attempt to determine the exact cause of well failure as it is thought if this could be established, longer well life could be obtained by improved well design.

Recharge of Semi Arid Zones. The greatest uncertainty in many water resource investigations is an estimation of aquifer recharge. A project in Cyprus, now entering its third and final year, had as its objective the investigation of different methods for determining quantitative recharge to aquifers in semi arid areas. Preliminary results for recharge, using large lysimeters and geochemical techniques, have proved encouraging. Joint studies are being carried out in the south eastern Mesaoria area (average annual rainfall 370 mm), where there has already been a quantitative water resources investigation and further studies are being undertaken in the Akrotiri peninsula (average annual rainfall 465 mm). Excavation and piling techniques have been used to install the lysimeters which are up to 100 m² in area by 4 metres deep. The lysimeters have been made as large as possible to minimise edge effects whilst maintaining the soil and aquifer material within them in an "undisturbed" state.

A dry drilling method has been developed to obtain uncontaminated samples from the unsaturated zone together with a method for processing the core material to obtain data on dissolved solutes. Solute profiles of the

unsaturated zone have been interpreted to provide estimates of the direct recharge component using a steady-state, mass-balance approach; results from the chloride profiles compare well with recharge estimates using tritium. In addition, it is found that some solute peaks give a reasonably accurate indication of the rainfall history during the period 1950 to 1975. The solute profile method is relatively unsophisticated and could be more widely applied to recharge estimation in other semi-arid areas of the world.

Palaeohydrology. The Hydrogeological unit has recently had approval from NERC to set up a palaeohydrology project, initially in North Africa and also in other countries as appropriate. The project will study the recharge chronology of the Holocene and historic past and will have applications not only in groundwater resource evaluation but also in other related aspects such as drought prediction.

Construction: Table 19

The provision of adequate housing, particularly for low-income families, represents a major problem in developing countries. Naturally occurring disasters such as hurricanes and earthquakes frequently have severe effects on the housing of low-income groups. The Overseas Division of the Building Research Establishment (BRE), which is sponsored by the Overseas Development Administration, is carrying out research projects on low cost housing in co-operation with government bodies and building research organizations overseas.

Low cost housing. At the request of the Government of St Vincent, a special study is being undertaken on the effects of the special adverse environments, described above, on the housing of the poorer sectors of society. The forces exerted on housing by hurricanes and earthquakes in the Caribbean have been studied for a year by an officer stationed in Barbados. The information obtained has been used to devise structural techniques to resist these forces. The techniques have been demonstrated at Camden Park, St Vincent, where prototype low-cost dwellings have been constructed. All the houses on this site have been designed to withstand earthquakes and hurricanes which might occur during a fifty year period. The dwellings vary in size and method of construction but all are within the financial reach of families with a monthly income of fifty USA dollars. The results of the project will be applicable in other areas, particularly, South East Asia and the Pacific Islands.

Housing Kits. The Government of Indonesia is particularly interested in the concept of using housing kits to provide dwellings for low income groups. This approach has been actively pursued in co-operation with the Director of Building Research, Bandung. A maximum cost per unit area of building low cost housing is set by the Indonesian Government. Consideration of infrastructure costs led to the initial selection of a two-storey terraced house and a kit comprising four basic thin-walled concrete units was developed to meet the requirements. A prototype was successfully constructed and erected at the BRE, Garston. Following this, two dwellings were erected at the research station, Bandung, supervised by two officers from the Overseas Division, BRE, who obtained accurate cost information under Indonesian conditions. A further six prototype dwellings are now being built at Bandung.

Environmental Data for Planning. In order to enable architects and building designers to predict the environmental conditions in low cost dwellings in Egypt, a co-operative project is being undertaken in collabor-

ation with the General Organisation for Housing, Building and Planning Research, Cairo. Construction of test rooms has already started and there will be about twelve in all. The first phase of the project will investigate effects of using seven different wall constructions including solid brickwork, cavity brickwork, mud brickwork and limestone blocks. The second phase will include a study of different roofing materials such as solid concrete, insulated concrete and single layer roofing sheets. Each room will be equipped with instruments to measure internal and external surface temperature and also the internal room temperature.

Forestry: Table 10

Tropical forests are of increasing international importance as a major renewable source of industrial materials, and of energy, both rural and industrial. Locally, forests play a vital role in the protection of soil and water resources, and in helping to meet basic needs of rural populations, including food. Increasing deforestation is leading to a wood deficit in many areas causing loss of agricultural production with environmental damage resulting.

The natural tropical forests are highly complex ecosystems to manage and as yet little studied. Very few of their species have so far been brought into cultivation. The scope of needed research is very wide and the time and resources very limited. In view of the urgency to increase wood production where it is most needed greatest emphasis is placed on research into fast growing species, capable of growing on degraded sites too poor for sustained agricultural production. In these conditions the study of variation within species, and the selection of the best adapted provenances (seed sources) are vitally necessary as the basis for the needed plantation programmes.

Tropical Pines. Like the temperate coniferous species which dominate commercial wood production the tropical pines produce a long fibred general purpose timber, capable of a wide variety of end use, including pulp and paper. However, there are few tropical species and their natural range is limited to parts of Central America, the Caribbean and South East Asia. Some are adapted to infertile soil, drought and occasional fire and the most promising for the lowland tropics is *Pinus caribaea*, especially the mainland variety *hondurensis* from Central America. ODA Research Schemes centred at the Commonwealth Forestry Institute (CFI) have undertaken intensive exploration and seed collection of this species together with the lesser known *P. oocarpa*, which now looks equally promising for somewhat higher and more severely dry sites. This work is the basis for research in 50 countries, comprising over 350 field trials, each containing up to 16 provenances of each species. Data on all seed sources, and on their performance in trials in the collaborating countries, are recorded on computer at CFI, to aid interpretation and analysis of performance. This work has already revealed major differences in growth and form between seed sources of both *P. caribaea* and *P. oocarpa*.

In addition to growth data, comparative wood quality must be examined, and related both to seed origin and to site conditions in the exotic plantation. The research schemes at CFI have developed the capability to examine very large numbers of small wood samples from individual trees and work in progress is attempting to relate the observed wood properties to end-use characteristics, for example in paper production. This study is being done in collaboration with the Tropical Products Institute (TPI) and has links with their more extensive research programme on pulp and paper in

which *P. caribaea* features prominently (Table 12). TPI are also collaborating with CFI in research on tropical pine resins.

An important attribute of the tropical pines which assists them in colonising and utilising infertile soils is the association of mycorrhizal fungi with their root systems. Such fungi are widespread in tropical soils but some species or strains are likely to be a more efficient aid to the tree than others, particularly under more extreme conditions of heat, drought, soil alkalinity, etc. Some earlier attempts to introduce tropical pines outside their natural range failed for lack of suitable mycorrhizal associates. Under an ongoing research scheme mycorrhizal fungi were collected from a variety of sites in natural forests of *P. caribaea* and *P. oocarpa* and are in culture at CFI, prior to testing in tropical countries.

Seed supplies from the most suitable provenances are the key to plantation establishment. A Seed Centre has been established under an ongoing project, in collaboration with the Honduran Government, close to the centre of the natural range of *P. caribaea* and *P. oocarpa* in Central America. The main activities are seed collection, storage, testing, certification and distribution and studies are in progress to improve techniques in various aspects of seed handling. The natural forests are under increasing pressure and the future of some valuable seed sources is in doubt. Other activities associated with the Centre are location and regulation of seed stands, forest fire management and development of nurseries for seedling production. The Centre is also collaborating in a research scheme to study native pathogens of the Central American pines, based at the Commonwealth Mycological Institute (CMI), and at the Forestry Commission Research Station which stores, tests and despatches seed on behalf of the CFI overseas research programme.

Although tropical pines were given priority the exploration and collection in Central America, and subsequent testing in other countries, have been extended to valuable hardwood species of the region, such as *Cedrela odorata* and *Cordia alliodora*. This work is part of an international programme co-ordinated through the FAO Panel of Experts on Forest Gene Resources. The ODA activities in this programme are centred on Central America but exploration and limited seed collections have also been made throughout the natural range of *Agathis*, in S E Asia. This valuable conifer is adapted to the wetter tropics and in common with many other species from wet tropical forests its seed has very brief viability under normal conditions. Research on seed handling and storage to extend its viability is being done in collaboration between CFI and the Royal Botanic Gardens, Kew.

Genetics and tree improvement. Following selection of the best adapted provenances from the wild populations in natural forests further large gains in productivity are possible through selection of the best individuals in the exotic environment, and their use in multiplication and breeding programmes. Ideally this should be done in advance of major plantation schemes, using information and material from the trials, and from further introductions based on their early results. The research scheme on the genetics of fast growing plantation species, based at CFI, aims to help individual countries to develop propagation and breeding programmes, by drawing on the data from the international network of field trials, supplemented by selective visits to gather more detailed information. It is important to examine not only the evident qualities of growth rate, stem

form, branch habit, etc but also wood quality. The studies of *P. caribaea* in collaboration with TPI have identified individual trees of the same origin and on the same site with above-average values for pulp yield and most strength characteristics. Particular assistance is being given by the assignment of a senior forest geneticist to the Tropical Agricultural Research and Training Centre (CATIE), Costa Rica, whose regional responsibilities extend to the main countries of origin of the most important tropical pines.

Research on the improvement of some tropical hardwoods has been carried out in collaboration between the Forest Research Institute of Nigeria, and the Institute of Terrestrial Ecology, Edinburgh. A major obstacle to the propagation and use in plantations of the valuable West African species *Triplochiton scleroxylon* was the inability to ensure adequate seed supplies. The development of a system for large scale vegetative propagation under the joint research programme has opened the way to plantation establishment and further selection and breeding programmes for this species. For all species of potential value the conservation of their genetic resources is a matter for increasing concern as natural forests diminish and this aspect receives attention in several research projects.

Management and Yield Studies. The very high rates of growth possible in tropical plantations, coupled with availability of land and labour, are natural advantages in meeting not only domestic needs but world demand, particularly from the richer countries already seriously deficient in wood. Efficient management is essential for this. Accurate prediction of future yields must be linked to prediction of the effects of various treatments which might be applied to the forest, the possibility of change in the time of harvesting and of the end product, the effects of developments in other sectors of a developing economy, and the resolution of multiple conflicting objectives. Research into the simulation of tropical forest plantation management is in progress at CFI, in co-operation with some developing countries, to develop integrated plantation management information systems, incorporating yield models, data base management systems and plantation inventory procedures, adapted for use on computers in developing countries. The application of these techniques in future plantation management is dependent on improved training and availability of staff, for which parallel provision is required. The research is now well advanced and the results promise to be of value not only to developing countries but to others, including the United Kingdom, where plantation management is already very highly developed.

Compared with plantations of a single species the natural tropical high forest is extremely complex with its variety of species, age classes, site conditions and past history. For this very reason research into the use of computers in the management of these forests is needed, and has been in progress at CFI in recent years. Computer programs for the forward projection of growth rates and for the prediction of future volumes and size frequency tables have been developed and are being improved. Developing countries are being assisted to run the existing programs on local computers.

For planning and management not only growth rates but the quality of the end product must be considered and for this the work of TPI on wood for construction (Table 12) and of the Princes Risborough Laboratory of BRE continues to play an important role.

As the area of tropical forest plantations expands the dangers of serious pest and disease problems, and the possible need for identification and control measures, are likely to increase. The COPR and CMI are important centres of expertise in these fields of research.

Community Forestry. In developing countries many people are still dependent on the forests for some of their basic needs. In the rural sector of these countries wood, where it is still available, is the principal source of energy and upwards of 1,500 million people depend on it for cooking and for warmth. Research into this aspect has been neglected in the past, in the expectation of readily available cheap substitutes for wood, but now it is clear that research must be intensified, to improve both production and utilisation in the face of an increasing wood deficit. Research schemes in individual countries have helped with local problems, for example in the coastal severely dry areas in Ecuador, to provide wood for charcoal and other uses, in Nicaragua, to select species for a variety of uses, including shelterbelts in farmland, and in Nepal, where a Silvicultural Trials Unit is now being established. In the Himalayan foothills, where intensive occupation of the land is threatening not only the living standards and environment of local communities but a much wider area below, research into stable systems of integrated land use, combining food, fodder and wood production (agro-forestry) is urgently needed.

Although increased wood production and tree planting in rural areas are the most urgent needs, the TPI research on renewable fuels and small scale processing, to achieve optimum production of charcoal, for example (Table 12) could have a major effect if their research and extension activities could be intensified.

For increased research into the production of wood for energy and other uses the existing studies of fast growing species, based largely at CFI, could be extended, given the necessary extra resources to do so, and this might become an important feature of the future research programme.

Tables

Table 1: Membership of Boards and Committees

Tropical Medicine Research Board

Chairman

Sir Arnold Burgen MD, FRCP, FRS Director, National Institute of Medical Research

Deputy Chairman

Dr S G Owen CBE, MD, FRCP Medical Research Council

Members

Prof G Webbe DSC Department of Medical Helminthology, London School of Hygiene and Tropical Medicine

Prof J V G A Durnin MB, DSC Institute of Physiology Glasgow

Prof Chevalier H M Gilles FRCP Department of Tropical Medicine, Liverpool School of Tropical Medicine

Prof R G Hendrickse MD, FRCP, FMCP Department of Tropical Paediatrics, Liverpool School of Tropical Medicine

Prof W W MacDonald PHD, DSC, FIBIOL Department of Entomology London School of Hygiene and Tropical Medicine

Dr C C Draper DM, DPH, DTM&H Ross Institute of Tropical Hygiene

Dr A D M Bryceson MD, FRCP Hospital for Tropical Diseases, London

Prof C A Mims BSC, MD, FRCPATH Department of Microbiology, Guy's Hospital Medical School, London

Prof R J Terry PHD, DSC, FIBIOL Department of Applied Biology, Brunel University

Dr D I H Simpson MD, MRC(PATH) London School of Hygiene and Tropical Medicine

Assessors

Dr I T Field MB, BS, MRCS, LRCP, MFRCM Chief Medical Adviser, Overseas Development Administration

Mr J E Whitelegg Head of Health and Natural Resources Department, Overseas Development Administration

Secretary

Mr K I. Tucker MA Medical Research Council

Trypanosomiasis Panel

Chairman

Dr R K Cunningham PHD, FRIC
Chief Natural Resources Adviser,
Overseas Development Administration

Members

Dr D G Godfrey OBE, BSC, PHD
Department of Medical Protozoology,
London School of Hygiene and
Tropical Medicine

Dr A R Gray MA, PHD, VETMB,
MRCVS
Centre for Tropical Veterinary
Medicine, University of Edinburgh

Prof D Molyneux MA, PHD
Department of Biology, University
Salford

Mr K MacLennan
Balchruggan, Craigrory, Kessock,
Inverness

Dr B A Newton PHD, MRCPATH,
FIBIOL, FRIC
MRC Biochemical Parasitology Unit,

Prof K Vickerman BSC, PHD,
FRSE
Department of Zoology, University of
Glasgow

Ex-officio members

Dr A M Baker MA, MRCS, LRCP,
DPH, DTM&H
Medical Adviser, Overseas Develop-
ment Administration

Dr G D Gwyer
Natural Resources, Economics and
Management Adviser, Overseas
Development Administration

Mr A L C Thorne CBE, MRCVS
Principal Animal Health Adviser,
Overseas Development Adminis-
tration

Mr J E Whitelegg
Head of Health and Natural Resources
Department, Overseas Development
Administration

Secretary

Mr C Gerard
Health and Natural Resources Depart-
ment, Overseas Development
Administration

Committee on Overseas Economic and Social Research

Chairman

Mr R S Porter CB, OBE
Director General of Economic Planning, Overseas Development Administration

Members

Lord Balogh
British National Oil Corporation, London

Mr C Cooper BSC, BA
Institute of Development Studies, University of Sussex

Dr R A Chambers PHD, MA
Institute of Development Studies, University of Sussex

Prof R P Dore BA
Institute of Development Studies, University of Sussex

Prof W Elkan PHD, BSC
Department of Economics, Brunel University

Prof S J Gould MA
Department of Sociology, University of Nottingham

Mr A D Hazelwood BSC, BPHIL, MA
Pembroke College, Oxford

Dr P P Hewell CMG, OBE, MA, DPHIL
Director, Cambridge Course on Development, University of Cambridge

Mr I Livingston MA
School of Development Studies, University of East Anglia

Prof D G Seers MA
Institute of Development Studies, University of Sussex

Dr D S Thornton PHD, BSC
Department of Agricultural Economics, University of Reading

Prof D Walker MA
Department of Economics, University of Exeter

Dr J M Healey PHD(ECON), BSC(ECON)
Director of International Economics Division, Economic Planning Staff, Overseas Development Administration

Mr K V Henderson BSC(ECON), FSS
Director of Statistics Division, Economic Planning Staff, Overseas Development Administration

Mr A R G Prosser CMG, MBE
Adviser on Social Development, Overseas Development Administration

Dr M T Spens PHD
Consultant on Social Development, Overseas Development Administration

Mr P W Stutley OBE, MSC
Principal Natural Resources Economics and Management Adviser, Overseas Development Administration

Secretary

Mr C E Young BA, MSC
International Economics Division, Overseas Development Administration

Table 2: Comparison of Expenditure, 1977/78 and 1978/79

The four sources of funds for R & D work are summarised on page 1. The table below is concerned with the first of them only. It shows the distribution by sector of expenditure under the Research and Development Sub-head (D5) of the ODA's Vote. This is the source of finance for "research projects carried out under contract", as the term is used in Tables 3-21.

	1977/78 <i>(financial year)</i> <i>(£ thousands)</i>	1978/79 <i>(financial year)</i> <i>(£ thousands)</i>
Agriculture	996	879
Medicine and Health	903	1,022
Livestock production and health	422	391
Trypanosomiasis	412	296
Economic and Social	246	342
Fisheries	217	204
Forestry	208	204
Pest Control	197	180
Engineering	121	114
Energy	—	118
Geology	82	95
Population	62	66
Education	48	62
Environment	33	28
Miscellaneous	56	31
	<hr/>	<hr/>
	4,003	4,032
	<hr/> <hr/>	<hr/> <hr/>

Tables 3–21: Current R & D Projects Listed by Sector

Tables 3–21 list current or recent R & D projects referred to in Part II of the Report. They are arranged as follows:

<i>Page</i>	<i>Table</i>	
27	3	Geology
28	4	Water Resources
29	5	Environment
31	6	Agriculture
38	7	Livestock production and Health
42	8	Trypanosomiasis
43	9	Pest Control
50	10	Forestry
52	11	Fisheries
54	12	Post-harvest Technology
67	13	Nutrition
68	14	Medicine and Health
74	15	Economic and Social
79	16	Population
80	17	Education
81	18	Engineering
82	19	Construction
83	20	Transport
84	21	Energy

R & D projects are financed in one of four ways:

- i. Projects financed by research grants and carried out under contract.
- ii. Projects carried out by the ODA's Special Units or by British institutions receiving long-term support from the ODA.
- iii. Projects financed from allocations of aid to specific countries.
- iv. Projects financed jointly by the ODA and other donors or institutions.

Some investigations may in practice have started several years before the starting date quoted. This is because long-term investigations are treated for administrative purposes as a series of projects of set duration.

Similarly one investigation may lead on to another in the same general field. The "project description" is in many cases a short version of the title of the project, indicating the topic or field of interest rather than the precise terms of reference.

The status of each "project leader" varies according to the project. In some instances the project leader will be the person chiefly or solely concerned with carrying out the investigation; in others he may be, for example, a professor responsible for the general supervision of a number of research projects. For reasons of space the tables do not show the full postal addresses of project leaders; the ODA will however provide these on request; enquiries may be addressed in the first instance to the Head of Health and Natural Resources Department, Overseas Development Administration, Eland House, Stag Place, London SW1E 5DH. The ODA would also be glad to receive corrections of any errors in the tables or elsewhere and to provide information about its past programme of research support.

TABLE 3: GEOLOGY

†Projects undertaken by institutions receiving ODA support grants.

‡Projects financed from allocations of aid to specific countries.

All other projects are financed by ODA research grants and carried out under contract.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Geochemical studies in the Nigerian younger granite province	UK/Nigeria	Dr P Bowden Department of Geology, University of St Andrews	62,600 (4,600)	Mar 1973 7 years
Investigation of evolution and economic potential of the basement complex in parts of N W Nigeria	UK/Nigeria	J B Wright Department of Earth Sciences, The Open University	13,100 (2,500)	Apr 1973 6 years
Field and laboratory mineral studies of the granitic coastal batholith of Peru	UK/Peru	Prof W S Pitcher Department of Geology, University of Liverpool	93,600 (16,000)	Jan 1974 7 years
Field and laboratory studies of the granitic coastal batholith of Peru. (Complementary to above project)	UK/Peru	Overseas Division, Institute of Geological Sciences	196,000 (26,100)	Apr 1975 6 years
Editing and printing of geological maps of northern part of Kenya Rift Valley	UK/Kenya	Dr P H Truckle Department of Geology, Bedford College, University of London	42,800 (17,100)	Apr 1975 5 years
Investigation of geology and mineral resources of Igneous Ring Complexes of the Sudan	UK/Sudan	Dr J R Vail Department of Geology, Portsmouth Polytechnic	21,100 (1,700)	Apr 1975 4 years
Investigation of the geology and mineral resources of the Igneous Ring Complexes of the Sudanese Red Sea Hills area (detailed study of part of area of preceding project)	Sudan	Dr J R Vail/Dr D C Almond Department of Geology, Portsmouth Polytechnic	33,500 (15,400)	Sep 1978 3 years
Geological exploration with economic potential	Kenya	Prof D J Blundell Department of Geology, Chelsea College, University of London	22,800 (7,200)	Dec 1976 3 years
Study of semi-arid zone aquifer recharge	UK/Cyprus	Overseas Division, Institute of Geological Sciences	112,600 (63,100)	Sep 1977 3 years
Mineral exploration methodology in mountainous arid zones: Oman ophiolite	Oman	Prof I G Glass The Open University	95,800 (22,500)	Oct 1977 3 years
Coal Research Project	Peru	J Philpott	47,000 (3,000)	1977 3 years
Oxford Geological expedition to Peru	Peru	A G Robinson University College Oxford	700 (700)	Jun 1978 4 months
Micro earthquake survey in southern Ghana	Ghana	Prof D J Blundell Department of Geology, Chelsea College, University of London	7,900 (6,600)	Sep 1978 1 year
Regional investigation of the SE Asia orogenic arc using satellite imagery	UK/SE Asia	Overseas Division, Institute of Geological Sciences	123,800 (800)	Feb 1979 1 year

TABLE 4: WATER RESOURCES

†Projects undertaken by institutions receiving ODA support grants.

‡Projects financed from allocations of British aid to specific countries.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Salinity intrusion in estuaries	The Gambia Ecuador Guyana	Dr K Sanmuganathan Overseas Development Unit, Hydraulics Research Station	†175,000 (37,000)	Apr 1973 7 years
Performance of selected well screens without gravel pack	Sudan	Dr H O Anwar ditto	†122,000 (22,000)	Apr 1973 9 years
Inflatable dam performance and application	Botswana Sudan St Lucia Liberia	R Wooldridge ditto	†114,000 (22,000)	Apr 1974 6 years
Sedimentation of reservoirs	Indonesia Nigeria	T E Brabben ditto	†230,000 (36,000)	Apr 1974 9 years
Minor irrigation design procedures	India	D W Holmes ditto	†71,000 (4,000)	Apr 1974 8 years
Statistics of tropical river flows	The Gambia Tanzania	T E Brabben ditto	†82,000 (8,000)	Apr 1974 9 years
Prevention of air entrainment through vortices at reservoir intakes	India	Dr H O Anwar ditto	†68,000 (16,000)	Apr 1974 6 years
Soil salinisation	Egypt Sri Lanka	Dr K Sanmuganathan ditto	†293,000 (97,000)	Apr 1975 8 years
Improvement of water quality by means of improving oxygen content and reducing evaporation in reservoirs	Sudan	Dr H O Anwar ditto	†55,000 (1,000)	Apr 1975 5 years
Evaluation of benefits of improved water management practices	Sri Lanka	D W Holmes ditto	†268,000 (29,000)	Apr 1976 7 years
Sub-surface membranes	Caribbean	Dr H O Anwar ditto	†110,000 (30,000)	Apr 1976 7 years
Hydraulics of large deltas	Burma Bangladesh	N V M Odd ditto	†157,000 (20,000)	Apr 1976 7 years
Experimental basin programme related to water resources planning	Kenya	Dr K A Edwards Ministry of Water Development	†140,000 (30,000)	Apr 1976 4 years
Canal linings and seepage	Egypt Sudan	J M A Pontin Overseas Development Unit, Hydraulics Research Station	†232,000 (29,000)	Apr 1977 7 years
Computer groundwater study	UK	Institute of Hydrology	†126,100 (23,200)	Apr 1977 4 years
Low temperature automatic weather station	UK	ditto	†25,700 (8,200)	Apr 1977 3 years
Crop water use	UK	ditto	†104,900 (15,600)	Apr 1977 4 years

Table 4 (continued): Water Resources

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Reservoir operation	UK	Institute of Hydrology	†38,200 (9,600)	Apr 1977 4 years
Sediment control	Yemen Arab Republic	P Lawrence Overseas Development Unit, Hydraulics Research Station	†182,000 (52,000)	Dec 1977 6 years
Collaborative Programme between HRS and Hydraulics and Sediment Research Institute (HSRI), Cairo	Egypt	J A Perkins ditto	‡73,000 (25,000)	Mar 1978 3 years
Salinity in coastal lagoons	Mexico	P J Waite ditto	†109,000 (7,000)	Apr 1978 5 years
Wastewater treatment	Colombia	Dr C Banks Universidad del Valle, Cali	‡60,000 (15,000)	Nov 1978 2 years
To set up a Mathematical Model capable of predicting the effects of engineering works on tidal flows and saline intrusion of the Irrawaddy Delta	UK/Burma	Hydraulics Research Station	‡110,000 (25,000)	Dec 1978 3 years

TABLE 5: ENVIRONMENT (See also Tables 9, 11 and 21 for Pest Control, Fisheries and Energy projects)

†Projects undertaken by a Special Unit of the ODA.

‡Projects financed from allocations of British aid to specific countries.

*Projects financed jointly by ODA and other donors or institutions.

All other projects are financed by ODA research grants and carried out under contract.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
The impact of sheep and goats on vegetation in arid lands	Kenya	Mrs Alison Field c/o UNESCO Arid Lands Project, P O Box 30592, Nairobi	14,300 (500)	May 1976 1 year 11 months
<i>Feeding ecology of Cormorants on Lake Malawi</i> (also Table 11)	Malawi	I J Linn University of Exeter	41,600 (13,400)	Oct 1977 3 years
Extraction of pesticide residues from water under tropical field conditions	UK	Tropical Products Institute, London	‡	Apr 1977 continuing
Ecological study of side-effects on fisheries of Endosulfan spraying against tsetse fly in Okavango Delta (see also TPI project below)	Botswana	Dr P J Fox and COPR	‡163,000 (68,000)	Jun 1975 4 years
Pesticide residues in fish in Botswana arising from tsetse spraying programme	UK	Tropical Products Institute, London	‡†	May 1975 continuing

‡See note about TPI projects on page 54 (Table 12)

Table 5 (continued): Environment

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Analysis of pyrethrum residues in dried fish	UK	Tropical Products Institute, London	£†	May 1977 continuing
Molluscicide residues in plant products	UK	ditto	£†	Continuing
Terminal pesticide residues in tropical beverage crops	UK	ditto	£†	Apr 1972 continuing
DDT pollution studies in Lower Shire area of Malawi	UK	ditto	£†	Jun 1973 continuing
Residue problems of agricultural produce in Mauritius (initially tomatoes)	UK	ditto	£†	Mar 1972 continuing
The Cusichaca Project, environmental research pilot study	Peru	Dr Ann Kendall Institute of Archaeology, University of London	18,300 (12,400)	May 1978 support reviewed annually
The effect of forest destruction on birdlife in certain Tanzanian mountain ranges	Tanzania	S Stuart University of Cambridge	*1,000 (1,000)	Jun 1978 3 months
Ecology of fruit bats and of amphibia on Mount Nimba	Liberia	R Wolton University of Oxford	*1,800 (1,800)	Jun 1978 3 months
Quantitative ecological field-work on selected species of cacti in Mexico	Mexico	P Daniels University of Cambridge	*1,000 (1,000)	Jun 1978 3 months
Ecological studies in Mole National Park	Ghana	A Anderson University of Aberdeen	*1,000 (1,000)	Jun 1978 2 months
Ecology of species of heron, deer, prawns and plants in Yala Game Sanctuary	Sri Lanka	Prof G M Dunnet ditto	*1,340 (1,340)	Jul 1978 2 months
A study of the locomotory activity of Zooplankton in Lake Naivasha, and of drought tolerance in dominant trees of the Kenyan Rift Valley	Kenya	P Kerslake University of Cambridge	*400 (400)	Aug 1978 2 months
Residues of the newer types of pesticides on tea	UK	Tropical Products Institute, London	£†	Sep 1978 continuing
Dry spells, drought risk and Agricultural production in Maharashtra State, India	UK/India	Miss L. Vincent School of Development Studies, University of East Anglia	11,400 (6,500)	Oct 1978 1 year
The environmental impact of selected bilateral aid programmes	UK	International Institute for Environment and Development	*49,000 (18,000)	Dec 1978 11 months
An ecological survey of the Massif du Termit	Niger	D M Jones Zoological Society of London	7,000 (6,000)	Feb 1979 2 months

†See note about TPI projects on page 54 (Table 12)

TABLE 6: AGRICULTURE

‡Projects financed from allocations of British aid to specific countries.
 *Projects financed jointly by the ODA and other donors or institutions.
 All other projects are financed by ODA research grants and carried out under contract.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
<i>Plant breeding and propagation:</i>				
<i>i. plant breeding</i>				
Multidisciplinary research to breed cocoa varieties resistant to swollen shoot virus	Ghana	Dr J T Legg Cocoa Research Institute, Tafo	280,000 (35,000)	Apr 1975 5 years
Screening rice varieties imported from the International Rice Research Institute for use in mangrove swamp conditions, comparison with local varieties and study of associated problems of salinity, acidity and iron toxicity	Sierra Leone	E Jones WARDA, Rice Research Station, Rokupr, Sierra Leone	‡425,500 (59,000)	Feb 1976 6 years
The breeding of <i>Phaseolus vulgaris</i> (bean) for increased yield and resistance to rust; evaluation of "protein quality"	UK	Dr A M Evans Department of Applied Biology, University of Cambridge	75,900 (17,500)	Apr 1976 3 years 8 months
Cotton Research Project. Cotton Breeding Agronomy programme	Tanzania	Dr G B Jones Agricultural Research Institute, Ukurigura, Mwanza	350,000 (64,000)	Mid 1976 6 years
Cotton breeding Pest Control	Swaziland	R O S Clarke Ministry of Agriculture, Lowveldt Research Station	80,000 (20,000)	Sep 1976 3 years
Cotton breeding Cotton Agronomy	Ecuador	J M Munro Instituto Nacional de Investigaciones Agropecuarias Boliche	‡52,000 (18,000)	Jan 1976 3½ years
Establishment of an oil palm breeding programme for improved planting material with high yield per acre	Ghana	R M Langham Oil Palm Research Centre, Kusi, Kade	‡46,000 (10,000)	Jul 1976 2 years
Storage of seed	Indonesia	Dr Jean Hanson National Biological Research Institute, Bogor	‡100,000 (50,000)	Aug 1978 3 years
The introduction into groundnut, by way of wild species, of resistance to <i>Cercospora</i> leaf spot, one of the major groundnut pathogens	UK ICRISAT	Dr J K Jones Department of Agriculture and Food, University of Reading	26,300 (9,000)	Sep 1976 3 years
Oilseeds Research Project. Breeding/Agronomy Programme	Tanzania	A Bolton Agriculture Research Station, Naliendule Mtwara	‡550,000 (107,000)	Jan 1978 4 years
Long Term Storage of cocoa seeds <i>Theobroma Cacao</i> for genetic resources conservation.	UK	Prof J G Hawkes University of Birmingham	10,050 (6,400)	Oct 1978 1 year

Table 6 (continued): Agriculture

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
To improve and increase coconut production	Thailand	K G Windsor Department of Agriculture, Bangkok	£100,000 (22,000)	Jun 1978 3 years
Endosperm development and grain quality in cereals	UK	Dr M D Bennett Plant Breeding Institute, Cambridge	48,700 (14,900)	Jan 1979 3 years
Improving quality of tobacco plant through breeding and selection, increasing yield and resistance to disease	Malawi	J B Abington Chitedze Agricultural Research Station, Lilongwe	£62,000 (1,300)	Mar 1977 4 years
<i>ii. propagation</i>				
Coconut tissue culture	UK	Dr R M Fulford East Malling Research Station	80,450 (20,100)	Jan 1976 4½ years
Coconut tissue culture	UK	Prof W Schwabe Wye College, Ashford	77,000 (19,150)	Jan 1976 4½ years
Preparation for propagation of coconut tissue culture plantlets using excised germinated embryos to simulate plantlets (in association with Wye College and East Malling Research Station)	Jamaica	D H Romney Coconut Industry Board, Kingston	15,700 (6,500)	Apr 1976 3 years
Tissue culture techniques and genetic conservation with potato	UK	Dr G G Henshaw University of Birmingham	65,500 (21,600)	Oct 1977 3 years
Cassava tissue culture research	UK/CIAT	ditto	26,500 (10,300)	Apr 1978 3 years
<i>Crop physiology and biochemistry</i>				
Physiology of cocoa	Ecuador	W Hadfield Instituto Nacional de Investigaciones Agro- pecuarias, Pichilingue	£235,000 (16,500)	Nov 1972 7 years
Plant physiology and soil science research associated with maize to improve performance of high-yielding varieties	Kenya	Dr P Cooper National Agricultural Research Station, Kitale	110,200 (8,350)	Oct 1974 4¼ years
Effect of temperature on the early growth of maize	UK/Kenya	Prof J L Monteith School of Agriculture, University of Nottingham	24,500 (5,500)	Nov 1975 3 years 7 months
Response of maize to temperature stress	UK	Dr J Stoddart University College of North Wales	41,200 (12,000)	Jan 1978 3 years
Collaborative research in plant biochemistry	Mexico	Dr K Varty National Autonomous, University of Mexico	£66,000 (20,000)	Jan 1974 7 years

Table 6 (continued): Agriculture

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
The chemical basis of resistance shown by certain coffee varieties to coffee berry disease and resistance of grain legumes to pathogens	UK/IITA Nigeria	Prof R L Wain Wye College, Ashford	31,800 (4,600)	Apr 1975 3½ years
Role of abscisic acid in determining responses of cereal crops to drought	UK	R B Austin Plant Breeding Institute, Trumpington, Cambridge	51,000 (15,000)	Oct 1977 3 years
Development of analytical techniques and spray equipment for control of premature fruit drop of citrus	UK/Belize	Dr N G Morgan Long Ashton Research Station, Bristol	28,500 (4,900)	Apr 1975 4 years
Establishment of the translocation patterns of photosynthates from the mature foliage and young shoots of tea plants; and study of endogenous levels of growth substances in tea plants	Malawi	Dr T W Tanton Tea Research Foundation of Central Africa, Mulanje	£28,000 (7,500)	Sep 1976 2 years
Salt tolerance in rice	UK	Dr T J Flowers Department of Biological Sciences, University of Sussex	75,000 (17,000)	Oct 1976 4 years
Investigation into protein content and overall yield in rice	UK	Professor D Boulter Department of Botany, University of Durham	41,100 (7,300)	Oct 1978 3 years
Grain legume quality research	UK	ditto	37,800 (12,000)	Oct 1976 4 years
Research on environmental physiology of grain legumes	UK/ICRISAT	Prof E H Roberts University of Reading	335,400 (110,700)	Apr 1977 3 years
Research into environmental physiology of pigeon peas	Trinidad	Prof Spence/Dr Keatinge University of the West Indies	56,700 (29,900)	Apr 1978 2 years
<i>Crop agronomy and farming systems research support for Institut de Recherches pour les Huiles et Oleagineux</i>	New Hebrides	IRHO Coconut Research Station, Santo	* £(111,000)	July 1977 continuing subject to annual review
Oil palm pollination—research into problems of inadequate natural pollination of oil palm	Papua New Guinea	Dr D M Lawton Dami Oil Palm Research Station, Kimbe, West New Britain	£60,000 (5,000)	Dec 1978 2 years
Production and selection of better varieties of: sorghum, groundnut, millet, cassava, sesame, coffee	Sudan	A Bennett Crop Production Division, Regional Ministry of Agri- culture, Juba	£200,000 (55,000)	1976 3 years

Table 6 (continued): Agriculture

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Crop research and development to increase and improve production of coconuts, breadfruits, pandanus, bananas and vegetables	Kiribati	Ministry of Local Government and Rural Development	£114,000 (14,000)	Jan 1977 5 years
Banana and oil palm research	Ecuador	T Menendez Instituto Nacional de Investigaciones Agropecuarias, Boliche	£90,000 (20,000)	Mar 1975 5½ years
Agronomy development trials with new produce, and development of better varieties of existing local crops.	Tuvalu	T J Moss Ministry of Commerce and Natural Resources	£24,880 (11,950)	Nov 1977 3 years
Curing, cultivation and quality studies connected with the production of Western and Burley tobacco varieties having field resistance to one or both of the pathogens <i>Colletotrichum tabacum</i> and <i>Alternaria longipes</i>	Malawi	J Abington Chitedze Agricultural Research Station, Lilongwe	£42,500 (9,750)	Apr 1975 3¼ years
Agronomy trials of tobacco. Improvement of production methods, introduction of new varieties	Paraguay	J Moss Ministry of Agriculture, Research Station, Chacupe	£98,000 (21,300)	Sep 1977 4½ years
Agronomy trials of sugar-cane. Improvement of cultivation methods, and introduction of new varieties	Paraguay	B Walker Ministry of Agriculture, Asuncion	£50,000 (17,000)	Nov 1977 2½ years
Study of factors limiting arable crop production in a semi-arid environment. Investigations into soil / crop / water relationships and appropriate tillage systems	Botswana	T J Willcocks Agricultural Research Station, Gaborone	£226,300 (37,900)	Jun 1975 4 years
Evaluation of farming systems and agricultural implements project	Botswana	D Salmon c/o Agricultural Research Station, Content Farm, Ministry of Agriculture, Gaborone	£126,000 (33,000)	Dec 1975 6 years
Integrated farming pilot project	Botswana	G Garrud Dept of Agricultural Research, Gaborone	£319,200 (47,000)	Nov 1975 6 years
Dryland cultivation trials for rice crop in Mahaweli II and 5 tanks project areas	Sri Lanka	W McKinlay Mahaweli Development Board, Anuradhapura in collaboration with P D Russell 5 tanks project	£20,000 (nil)	Feb 1979 1 year

Table 6 (continued): Agriculture

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
<i>Crop protection</i>				
<i>i. Plant pathology</i>				
Investigation of Moniliasis and Witches Broom diseases of cocoa	Brazil	Dr H C Evans Cocoa Research Centre, Belem, Para	£48,000 (16,500)	Mar 1977 3 years
Screening of cocoa varieties for resistance to black pod disease	Brazil	Dr J Lawrence Cocoa Research Centre, Itabuna, Para	£30,000 (16,500)	Dec 1977 2 years
Identification of pathogen causing lethal yellowing disease in coconut palms and of its natural vector	Jamaica	Coconut Industry Board, Kingston	183,000 (76,000)	Apr 1975 6 years
Biochemistry and Physiology of lethal yellowing diseased palms research	UK	Professor D Hopwood John Innes Institute	53,850 (3,100)	Nov 1978 3 years
Clove disease research in Sumatra	Indonesia	Dr P Hunt Solok, Sumatra	£200,000 (50,000)	Aug 1975 5 years
Field studies on virus diseases of yams	Barbados	S H Mantell Caribbean Agricultural Research and Development Institute, Bridgetown, Barbados	57,000 (21,800)	Oct 1976 3 years
Laboratory/glasshouse studies of the transmission of virus diseases in yams	Trinidad	Dr S Q Haque Caribbean Agricultural Research and Development Institute, Trinidad	17,700 (9,700)	Oct 1976 3 years
Advisory visits to the Coffee Research Foundation in connection with coffee berry and related disease	Kenya	Dr J E Crosse East Malling Research Station, Maidstone, Kent	£5,000 (2,000)	1976 2 years (intermittent)
Plant Pathologist—to investigate and advise on pathological problems of bananas and other fruit crops in the region	Windward Islands	Dr D K Cronshaw Windward Islands Banana Growers' Association, PO Box 115, Castries, St Lucia	£33,000 (14,000)	Jan 1978 2 years
The field resistance to virus diseases of maize, ground-nut, grain legumes and cassava in East Africa	East Africa	Dr K R Bock Kenya Agricultural and Forestry Research Organisa- tion, Nairobi	161,000 (45,200)	Jul 1976 3 years
Molecular basis of resistance to rice blast disease	UK	Dr J A Callow University of Leeds	27,300 (6,500)	Jan 1979 3 years
Investigations into the pathogenic variation of downy mildew on pearl millet	UK	Dr N Hague University of Reading	27,600 (1,600)	Feb 1979 2 years
<i>ii. Weed Science</i>				
Assistance to research on weed control in conjunction with optimal agronomic practices, especially in cultivation of maize and rice	Ghana	D Laycock Crops Research Institute, Kwadaso	£115,000 (25,000)	Aug 1976 4½ years

Table 6 (continued): Agriculture

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Striga research	UK	Dr C Parker Weed Research Organisation, Yarnton, Oxford	36,000 (23,000)	Oct 1977 2½ years
<i>iii. Nematodes</i>				
Provision of a nematologist to evaluate nematocidal properties of banana insecticides and identify and control banana nematodes	Windward Islands	D J Hunt (COPR) Banana Growers' Association, Castries, St Lucia	£36,000 (15,000)	Jul 1975 3¼ years
Research nematologist	Ecuador	Dr S Gowen Instituto Nacional de Investigaciones Agropecuarias, Bolíche	£70,000 (20,000)	Jan 1976 4 years
<i>Soil Science and Microbiology</i>				
<i>i. Soil Science</i>				
The sulphur status of East African soils and responses of cereal and legume crops to applied sulphur	East Africa	A R Bromfield Kenya Agricultural and Forestry Research Organisation, Nairobi		Dec 1974 5 years
Sorption and release of phosphate in soils of the humid tropics	UK/IITA Nigeria	Dr P H Le Mare Department of Soil Science, University of Reading	63,000 (20,400)	Apr 1976 3½ years
Hydrous oxides in tropical soils	UK	Dr A Wild University of Reading	27,600 (7,800)	Nov 1977 3 years
Research into improving acid sulphate soils	Thailand	J Osborne Land Development Department, Bangkok	£39,000 (4,000)	Jan 1979 2 years
Development of research and related practical projects in soil science by post-graduate students	Mexico	Dr S McConaghy National Autonomous, University of Mexico	£208,000 (52,500)	Jan 1976 4 years
Soil identification techniques	UK	Dr W I Kelso University College of North Wales, Bangor	12,500 (6,400)	Oct 1977 2 years
<i>Microbiology</i>				
Soil microbiology research at Rothamsted to assist with work on pigeon peas in Trinidad, cerrado soils in Brazil and investigations at IITA (Nigeria)	UK	Dr Roughley Rothamsted Experimental Station, Harpenden, Herts	63,500 (18,400)	Apr 1976 3½ years
Research into rhizobial nitrogen fixation by pigeon peas	Trinidad	Prof J A Spence University of the W Indies, Trinidad	80,000 (27,400)	Apr 1976 3 years
Determination of the requirements for efficient rhizobium inoculation in the establishment of pasture legumes	Malawi	Dr P E Davis Agricultural Research Station, Chitedze, Lilongwe	£27,000 (15,500)	Jan 1976 4 years

Table 6 (continued): Agriculture

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Genetic marking of rhizobia strains for chickpea	UK/ICRISAT	Dr J E Beringer John Innes Institute, Norwich	30,500 (12,500)	Sep 1977 2 years
A study of the physiology of VA endophytes and the possibility of their culture in artificial media	UK	Dr L Fowden Rothamsted Experimental Station	53,550 (9,500)	Oct 1978 3 years
<i>Agrometeorology</i>				
Microclimatology research—effect of temperature, water stress and light on crops of the humid and semi-arid areas	UK	Prof J L Monteith School of Agriculture, University of Nottingham	312,800 (61,300)	Oct 1976 5 years
Tropical agricultural meteorology	UK	Prof A H Bunting University of Reading and Dr J Elston University of Leeds	61,000 (20,000)	Apr 1977 3 years
<i>Biometrics</i>				
Evolution of economic methods of field experimentation suitable for use in tropical developing countries where skilled supervisory manpower is in short supply, where conditions under which field experiments are done are extremely heterogeneous, and where there is a lack of suitable land for experimentation	UK	Prof S C Pearce University of Kent	45,700 (7,000)	Apr 1975 3½ years
Biometrics research to elucidate more efficient design of agricultural experiments in Caribbean area	Barbados	F B Lauckner/A Brewer Caribbean Agricultural Research and Development Institute, Barbados	74,550 (26,600)	Aug 1976 2 years 10 months
Biometrical techniques to aid intercropping research	UK	Prof S Pearce University of Kent	41,850 (7,500)	Oct 1978 3 years
<i>Agricultural mechanisation</i>				
Development of an animal powered unit	UK	Overseas Department, National Institute of Agricultural Engineering	12,000 (500)	1975 continuing
Development of an animal drawn cotton stalk puller	UK/Swaziland	ditto	30,000 (6,300)	1976 5 years
Development of a tractor-mounted cotton stalk puller	UK/Sudan	ditto	£85,000 (53,000)	1977 3 years
<i>Miscellaneous</i>				
Assistance with production of a flora of the Mascarene Islands by financing that part of the work undertaken at Kew	UK/Mauritius	H M Burkill Royal Botanic Gardens Kew	24,000 (1,500)	Apr 1975 3½ years

Table 6 (continued): Agriculture

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Agricultural research	Solomon Islands		123,800 (20,900)	Aug 1975 6 years
Scientific Evaluation of ODM Agricultural aid during 1974-1978 and publication of 1968-73 Evaluation	UK	Mr Kasasian	15,850 (7,700)	Apr 1978 1 year 1 month (intermittent)

TABLE 7: LIVESTOCK PRODUCTION AND HEALTH

†Projects undertaken by a Special Unit of ODA or by institutions receiving ODA support grants.

‡Projects financed from allocations of aid to specific countries.

*Projects financed jointly by the ODA and other donors or institutions.

All other projects are financed by ODA research grants and carried out under contract.

NOTE: To obtain maximum economy in their utilisation, CTVM staff and equipment are not allocated in predetermined proportions among the projects carried out at the Centre but are shared or transferred between projects as expedient. It is therefore not possible to quote precise costs for projects financed from CTVM's regular budget, but an estimated £249,200 from that budget was spent on R & D in 1978/79.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
<i>Animal health: virus diseases</i>				
Foot and mouth disease Embakasi, Kenya	Kenya	Dr E C Anderson Wellcome Institute for Research on Foot and Mouth Disease, Nairobi	343,300 (65,000)	Nov 1970 9½ years
Pathogenesis and immunology of malignant catarrhal fever in cattle	UK/Kenya	Dr N Edington The Royal Veterinary College, London	98,200 (15,800)	Apr 1974 4¼ years
Comparative studies of the epidemiology and control of Newcastle disease	UK	Dr Hsiau-pin Chu Department of Clinical Veterinary Medicine, University of Cambridge	66,300 (6,900)	June 1975 6 years 7 months
Laboratory diagnosis of mucosal disease in animals in tropical countries	UK	Centre for Tropical Veterinary Medicine, Edinburgh	†	Apr 1976 3 years
Malignant catarrhal fever	Kenya	Veterinary Research Department, Muguga	116,800 (59,100)	Jan 1977 3 years
Assessment of the role of vaccination and revaccination in perpetuating sheep and goat pox	UK	Centre for Tropical Veterinary Medicine, Edinburgh	†	Apr 1976 3 years
<i>Animal health: protozoal diseases</i>				
Theileriosis	UK	Centre for Tropical Veterinary Medicine, Edinburgh	†	Apr 1977 4 years

Table 7 (continued): Livestock production and health

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Immunisation of cattle against infection with <i>Babesia</i> species	UK	Dr R E Purnell Institute for Research on Animal Diseases, Newbury, Berks	33,800 (10,700)	Apr 1977 3 years
East Coast fever: therapy of <i>Theileria</i> infections	Kenya	Dr T Dolan Veterinary Research Department, Muguga	98,700 (42,400)	Jan 1977 3 years
Epizootiology of economically important theileriosis of cattle	Kenya	Dr A S Young Veterinary Research Department, Muguga	77,200 (29,000)	Jan 1977 3 years
Research into Babesiosis in Nigerian cattle at Vom. C'TVM collaborative project	Nigeria	Prof D W Brocklesby C'TVM/Vom Collaborative Project, National Veterinary Research Institute, vom	54,000 (9,600)	Sep 1978 3 years
<i>Animal health: bacterial diseases</i>				
Post-parturient diseases associated with lactational failure in the sow	UK	Dr J E T Jones The Royal Veterinary College, Potters Bar	39,000 (3,700)	Apr 1971 8 years
Rickettsial immunity in sheep	UK	Centre for Tropical Veterinary Medicine, Edinburgh	†	Apr 1975 6 years
A field and experimental study of reproductive disorders in sows with special reference to ovarian and uterine pathology	UK	Dr J E T Jones The Royal Veterinary College, Potters Bar	51,800 (13,000)	Oct 1975 4 years
Control of streptothricosis	UK/Developing countries	Centre for Tropical Veterinary Medicine, Edinburgh	†	Apr 1976 5 years
Laboratory and field investigations of mixed mycoplasma infections	UK	Dr Janet Bradbury University of Liverpool	15,700 (5,200)	Oct 1976 3 years
Studies on some untyped avian mycoplasmas	UK	ditto	17,000 (1,800)	Oct 1978 3 years
<i>Animal health: helminth diseases</i>				
Bovine cysticercosis	UK	Centre for Tropical Veterinary Medicine, Edinburgh	†	Oct 1968 12½ years
Immunology of fascioliasis	UK	ditto	†	Apr 1973 8 years
Evaluation and aetiology of breed and strain resistance to <i>Haemonchus contortus</i>	UK/Kenya	Prof W Mulligan Department of Veterinary Physiology, University of Glasgow	38,600 (9,600)	Oct 1974 5½ years
Aspects of the pathogenesis and immunology of bovine schistosomiasis	UK	Dr J D Dargie University of Glasgow	10,100 (5,200)	Aug 1977 2 years 8 months

Table 7 (continued): Livestock production and health

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Parasitic gastritis of ruminants	UK	Centre for Tropical Veterinary Medicine, Edinburgh	†	Apr 1978 3 years
Research on bovine cysticercosis	Kenya	Dr P G W Stevenson Kenya Veterinary Research Institute	88,000 (18,400)	Aug 1978 3 years
<i>Animal health: vector studies</i>				
Research into Tickicides Tick pheromones and immunisation against ticks	UK	Dr M G R Varma London School of Hygiene and Tropical Medicine	77,600 (8,900)	Oct 1976 6 years
Age grading of ticks in relation to theileriosis	UK	Centre for Tropical Veterinary Medicine, Edinburgh	†	Apr 1977 4 years
Tick research	UK	ditto	†	Apr 1977 4 years
<i>Animal production: breeding</i>				
Support for research on beef and sheep breeding and artificial insemination	Sudan	G Pollott c/o British Embassy, Khartoum	£184,000 (40,000)	1976 3 years
Pregnancy diagnosis in beef cattle	UK	Prof J A Laing The Royal Veterinary College, Potters Bar	79,800 (12,000)	Jul 1975 6 years
Infertility of British sheep in tropical countries	UK	Dr H LI Williams The Royal Veterinary College, Potters Bar	41,600 (11,700)	Apr 1977 3 years
Analysis, evaluation and interpretation of data on the growth, breeding and slaughter potential of cattle in Zambia	UK	Dr J H D Prescott Edinburgh School of Agriculture	(Nil)	Feb 1978 1 year 2 months
An investigation of anoestrus in Dorset Horn sheep to assess suitability for low altitudes	UK	Dr H LI Williams The Royal Veterinary College, Potters Bar	41,200 (400)	Jan 1979 3 years
<i>Animal production: nutrition</i>				
The effects of feeding methods on the productivity of dairy cattle kept under simulated tropical conditions	UK	Centre for Tropical Veterinary Medicine, Edinburgh	†	Apr 1973 8 years
Support for research on animal nutrition and forage agronomy	Sudan	Dr N Ellis c/o British Embassy, Khartoum	£203,500 (38,000)	1976 3 years
Research into alternative feeding programmes etc for cattle in tropical lowlands	Mexico	Dr Wylie University of Yucatan Merida, Yucatan	£600,000 (52,000)	Nov 1975 6 years

Table 7 (continued): Livestock production and health

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978-79) £</i>	<i>Starting date and duration</i>
Nutritional requirements for early weaning of calves in tropical areas	UK	Centre for Tropical Veterinary Medicine, Edinburgh	†	Apr 1976 5 years
The effect of plane of nutrition and environmental temperature on the work output of draught cattle	UK	ditto	†	Nov 1976 5 years
Nutritional requirements of Anglo-Nubian goats	UK	ditto	†	Apr 1978 3 years
Assistance to poultry research at Khartoum University	Sudan	P Francis University of Khartoum	£60,500 (15,000)	Mid 1975 4 years
<i>Animal production: management</i>				
Development of methods of data collection for the economic evaluation of animal disease control schemes and animal production projects in Africa	UK Nigeria	P R Ellis Department of Agriculture and Horticulture, University of Reading	*234,400 (71,000)	Oct 1974 5½ years
Support for dairy husbandry research	Sudan	Mr White c/o British Embassy, Khartoum	£55,000 (25,000)	1976 3 years
Study to obtain data on the economic benefits of disease control in the tropics	UK	Centre for Tropical Veterinary Medicine, Edinburgh	†	Sep 1976 4½ years
Factors limiting cattle production in highland areas of Nigeria at Vom. C.I.V.M. collaborative project	Nigeria	Prof D W Brocklesby C.I.V.M. Vom Collaborative Project, National Veterinary Research Institute, Vom	66,400 (21,500)	Oct 1977 3 years
To devise a rational and practical system for the clinical management of multiple infections in animals	UK	Centre for Tropical Veterinary Medicine, Edinburgh	†	Apr 1978 3 years
Animal Disease Survey	Kiribati	Ministry of Natural Resource Development	£16,100 (4,000)	Jun 1978 2 years
<i>Animal production: pasture and forage</i>				
Investigation of vegetation and livestock to establish data for improvement of farming	Falkland islands	Dr J A Ferguson C D Kerr The Secretary, Stanley	£184,000 (89,000)	Jul 1979 3 years

TABLE 8: TRYPANOSOMIASIS

†Projects undertaken by a Special Unit of ODA or by institutions receiving ODA support grants.

‡Projects financed from allocations of aid to specific countries.

*Projects financed jointly by the ODA and other donors or institutions.

All other projects are financed by ODA research grants and carried out under contract.

Note 1: To obtain maximum economy in their utilisation, C IVM staff and equipment are not allocated in predetermined proportions among the projects carried out at the Centre but are shared or transferred between projects as expedient. It is therefore not possible to quote precise costs for projects financed from C IVM's regular budget, but an estimated £249,200 from that budget was spent on R & D in 1978-79.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978-79) £</i>	<i>Starting date and duration</i>
<i>Entomology</i>				
Sex recognition in tsetse flies	UK	Dr P A Langley Tsetse Research Laboratory, Langford, Bristol	19,000 (5,000)	Aug 1975 3 years 5 months
Background research on tsetse behaviour	UK	Dr J Brady Imperial College Field Station, Silwood Park	31,400 (6,000)	Feb 1976 6 years
Study of tsetse biology and distribution	Botswana	R Allsopp c/o British Commission	†107,000 (40,000)	Oct 1977 3 years
Tsetse control equipment and insecticide trials	Botswana	Centre for Overseas Pest Research, London	§ †	Sep 1975 continuing
Tsetse control research and co-ordination	UK	ditto	§ †	continuing
Arthropod tissue culture	UK	Centre for Tropical Veterinary Medicine, Edinburgh	§	Apr 1977 4 years
Research into the sub-lethal effects of insecticides on the behaviour of tsetse flies	UK	Dr A Gatehouse Department of Applied Biology, University College of North Wales, Bangor	27,800 (9,600)	Oct 1976 3 years
Development of automated tsetse fly traps	UK	Prof D Molyneux University of Salford	24,700 (3,600)	Aug 1978 3 years
Application of sex recognition pheromones in population sampling and control measures for <i>Glossina</i>	UK	Dr P A Langley Tsetse Research Laboratory, Langford, Bristol	28,200 (4,000)	Jan 1979 3 years
A study of the feeding and feeding site selection of triatomid bugs	UK	Prof F J Popham Department of Biology, University of Salford	14,200 (4,400)	Oct 1975 3 years
Parameters of flight by triatomine bugs (provision of equipment and travel costs)	UK	Dr C J Schotfield London School of Hygiene and Tropical Medicine	*3,500 (2,000)	Nov 1977 2 years
Sensory and behavioural factors involved in host and resting site selection by triatomine bugs	UK	Prof H Enlayson University of Birmingham	28,400 (2,100)	Oct 1978 3 years
<i>Protozoology</i>				
Cytogenetical research on the problem of tsetse and trypanosome control	UK	Dr D I Southern Department of Zoology, University of Manchester	70,800 (9,400)	Oct 1970 9 years

§See above note about C IVM and note about COPR projects on page 45 (Table 9).

Table 8 (continued): Trypanosomiasis

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Study of refractory trypanosome pathogens	UK	Prof W H R Lumsden London School of Hygiene and Tropical Medicine	37,400 (5,200)	Apr 1975 4½ years
Epizootiology, immunology and diagnosis of infection with <i>T. evansi</i>	UK/Sudan	Centre for Tropical Veterinary Medicine,	§	Apr 1975 6 years
Infection of tsetse with <i>T. brucei</i>	UK	Dr D A Evans Dr D S Ellis Dr W E Ormerod London School of Hygiene and Tropical Medicine	67,200 (9,400)	Jul 1976 6 years
Uptake and digestion of macromolecules by <i>T. brucei</i>	UK	Dr I B R Bowman Department of Biochemistry, University of Edinburgh Medical School	22,100 (7,000)	Apr 1977 3 years
Continuous in vitro cultivation of <i>T. cruzi</i>	UK	Dr I Hudson St George's Hospital Medical School	44,100 (15,100)	Oct 1978 3 years
Biology of the African pathogenic trypanosomes	UK	Dr R W F Le Page University of Cambridge	38,000 (14,300)	Oct 1978 3 years
<i>Biochemistry</i>				
Biochemical parasitology of <i>T. cruzi</i>	UK	Dr W E Gutteridge Department of Biology, University of Kent	72,500 (12,900)	Apr 1971 8 years
Carbohydrate metabolism of <i>T. brucei</i> under anaerobic conditions and the sub-cellular organization of glycolytic enzymes	UK	Dr I B R Bowman Department of Biochemistry, University of Edinburgh Medical School	6,500 (2,600)	Jun 1976 3 years
Serological and biochemical typing of strains of <i>T. vivax</i>	UK	Prof M J Clarkson Department of Veterinary Parasitology, Liverpool School of Tropical Medicine	29,400 (7,800)	Oct 1975 3¼ years
Enzyme variation in trypanosomes	UK	Dr D G Godfrey London School of Hygiene and Tropical Medicine	210,800 (53,300)	Apr 1975 3¼ years
The use of liposomes as carriers for anti-parasitic drugs	UK	C D V Black Nuffield Institute of Comparative Medicine, Zoological Society of London	44,900 (14,200)	Nov 1976 3 years
A search for isoenzymes useful in characterising trypanosomes	UK	Dr D G Godfrey London School of Hygiene and Tropical Medicine	131,100 (9,100)	Jan 1979 3 years
Evaluation of the isoenzymic characterisation of trypanosomes	UK	ditto	104,600 (6,200)	Jan 1979 3 years

§See above note about CTVM and note about COPR projects on page 45 (Table 9).

Table 8 (continued): Trypanosomiasis

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Assessment of the potential of the miniature anion-exchange/centrifugation technique for the field diagnosis of sleeping sickness	Ivory Coast	Prof W H Lumsden London School of Hygiene and Tropical Medicine	6,400 (6,400)	March 1979 1 month
<i>Immunology</i>				
Chemotherapy and the development of immunity in animals infected with trypanosomes	UK	Centre for Tropical Veterinary Medicine, Edinburgh	§	Apr 1975 6 years
The immunopharmacology of African trypanosomiasis	UK	Dr P F L Boreham Imperial College of Science and Technology	28,200 (4,300)	Oct 1976 3 years
Cellular dynamics of the immune response of mice infected with <i>T. brucei</i>	UK	Prof R J Terry Department of Biology, Brunel University	20,500 (5,700)	Jul 1975 3½ years
Cellular responses to trypanosome infections in relation to changes in the immune status of the host	UK	Dr G A Targett London School of Hygiene and Tropical Medicine	17,100 (3,400)	Oct 1975 3 years
Cellular changes in immunosuppression by <i>T. brucei</i>	UK	Dr D Franks Department of Pathology, University of Cambridge	22,700 (7,300)	Dec 1976 3 years
Immunological studies on <i>T. brucei gambiense</i>	UK	Centre for Tropical Veterinary Medicine, Edinburgh	§	Oct 1974 6½ years
Structural studies of trypanosome surface antigens	UK	Dr M Turner Medical Research Council, Biochemical Parasitology Unit, The Moltano Institute, University of Cambridge	32,300 (11,600)	Aug 1976 3 years
Immunochemical and endotoxic studies on <i>T. cruzi</i>	UK	Dr D S Ketteridge London School of Hygiene and Tropical Medicine	20,500 (7,400)	Apr 1977 3 years
Antigenic variability, infectivity and ultrastructure cyclically transmitted trypanosomes	UK	Prof K Vickerman Department of Zoology, University of Glasgow	37,500 (10,000)	Oct 1977 3 years
Identification of blood-meals of vectors of African and American trypanosomes	UK	Dr P F L Boreham Imperial College of Science and Technology	28,200 (9,200)	Oct 1976 3 years
Heterogeneity of <i>T. brucei</i>	UK	Prof R J Terry Brunel University	25,200 (2,600)	Jan 1979 3 years

§See above note about CTVM and note about COPR projects on page 45 (Table 9).

Table 8 (continued): Trypanosomiasis

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
<i>Pathology</i> Studies of anaemias of trypanosomiasis	UK	Prof G Jenkins Department of Haematology, The London Hospital Medical College	94,100 (13,500)	Apr 1972 9 years
Studies on the pathogenesis of bovine trypanosomiasis	UK	Prof G M Urquhart Department of Veterinary Pathology, University of Glasgow	42,300 (5,000)	Oct 1975 3 years
An immunological and pharmacological investigation of the cardiomyopathy in Chagas' disease	UK	Dr J Morley Cardiothoracic Institute, Brompton Hospital, London SW3	21,900 (10,700)	May 1976 3 years
Survey of human trypanosomiasis in certain localities in the Gambia	The Gambia	Prof W H R Lumsden London School of Hygiene and Tropical Medicine	7,000 (7,000)	Jan 1978 3 months
Nutritional requirements of <i>Glossina</i>	UK	Dr A M Jordan University of Bristol	27,300 (6,300)	Sep 78 3 years
Behaviour of pregnant Tsetse flies	UK	Prof L H Finlayson University of Birmingham	44,800 (3,800)	Oct 78 3 years

TABLE 9: PEST CONTROL

†Projects undertaken by a Special Unit of the OLA or by institutions receiving ODA support grants.

‡Projects financed from allocations of British aid to specific countries.

*Projects financed jointly by the ODA and other donors or institutions.

All other projects are financed by ODA research grants and carried out under contract.

NOTE: To obtain maximum economy in their utilisation, COPR staff and equipment are not allocated to specific projects in predetermined proportions but are employed as necessary overseas or in Britain. It is therefore not possible to quote precise costs for projects financed from COPR's regular budget, but an estimated £838,000 from that budget was spent on R & D in 1978/79. Some COPR projects are closely associated with projects carried out by other researchers and listed elsewhere in these tables.

See also note on TPI, Table 12, page 54.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
<i>Locusts and grasshoppers</i> Production, for publication, of an inventory of the economically important species of grasshopper	UK	J A Whellan Centre for Overseas Pest Research, London	20,900 (7,200)	Oct 1976 3 years
Annotated catalogue of economically important <i>Acridoidea</i> (locusts and grasshoppers)	UK	ditto	†	Continuing
Preparation of desert locust forecasting manual	UK	ditto	†	1976 3 years
Locust surveys	Various	ditto	†	Continuing

Table 9 (continued): Pest Control

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to OD.A (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Locust and grasshopper taxonomy	UK	J A Whellan Centre for Overseas Pest Research, London	†	Continuing
Investigation into the locust moulting hormone	UK	Dr E D Morgan Department of Chemistry, University of Keele	13,000 (3,300)	Oct 1975 3 years
Hormonal control of insect reproduction in relation to pest management	UK	A R McCaffery Centre for Overseas Pest Research, London	†	Jan 1979 continuing
<i>Plant-hoppers</i>				
Biotaxonomic studies of leaf-hopper pests of rice	UK	Dr Claridge University College of Wales, Cardiff (in consultation with Dr Chapman COP)	134,900 (55,200)	Apr 1977 3 years
Ecology and migration of <i>Nilaparvata</i>	UK	Centre for Overseas Pest Research, London	†	1978 5 years
<i>Termite studies</i>				
Termite studies, biology, identification and materials testing	UK	ditto	†	Continuing
Assessment of the importance of sub-terranean termites in Northern Nigeria as crop pests, including their utilisation and disposal of food materials, rate of increase and influence on soil structure	Nigeria	Dr R A Johnson Agricultural Research Station, Mokwa via Jebba	140,000 (26,000)	Jun 1973 6½ years
Termites in Sarawak rain forests	Sarawak	Centre for Overseas Pest Research, London	†	1977 2 years
Biological and behavioural studies of leaf-cutting ants with a view to the production of effective and economical toxic baits	UK	Dr J M Cherrett Department of Applied Zoology, University College of North Wales, Bangor	45,300 (9,400)	Sep 1975 4 years
<i>Lepidoptera</i>				
Moth pheromones: their role in behaviour and potential for pest control	Crete/Egypt	Centre for Overseas Pest Research, London	†	Continuing
Structure of scent plumes from female moths and associated insect behaviour	UK	ditto	†	Continuing
The field application of the synthetic sex pheromones of the red bollworm moth	UK/Malawi	Tropical Products Institute, London	†	Apr 1973 continuing
The field application of the synthetic sex pheromones of <i>Spodoptera littoralis</i>	UK/Crete	ditto	†	Dec 1973 continuing

Table 9 (continued): Pest Control

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
The sex attractant of <i>Heliothis armigera</i>	UK/Malawi	Tropical Products Institute, London	†	May 1974 continuing
The sex pheromones of <i>Chilo sacchariphagus</i>	UK	ditto	†	Jun 1975 continuing
The sex pheromones of the citrus flower moth <i>Prays citri</i>	UK	ditto	†	Nov 1975 2 years 3 months
Applications of synthetic sex pheromones of <i>Chilo suppressalis</i>	Philippines-UK	ditto	†	Jun 1976 continuing
Use of synthetic sex pheromones of <i>Spodoptera exempta</i>	UK	ditto	†	Oct 1977 continuing
Sex pheromones of the rice moth, <i>Corcyra cephalonica</i>	UK	ditto	†	Jul 1978 continuing
Investigation of the use of pheromone traps to time spraying against <i>Diparopsis castanea</i> and <i>Heliothis armigera</i> on cotton in Malawi	UK/Malawi	ditto	†	Jul 1978 continuing
Trials in use of pheromones in controlling cotton pests	Egypt	Dr D G Campion Centre for Overseas Pest Research, London	£140,000 (45,000)	Nov 1978 2 years
Identification and characterisation of the armyworm virus to devise a virus control system	UK	Dr T W Tinsley Unit of Invertebrate Virology, Natural Environment Research Council, Oxford (in collaboration with COPR)	110,300 (12,000)	Jan 1974 4½ years
<i>Meteorological and radar studies</i>				
The use of radar to monitor insect aerial activity	UK	Dr J R Riley Centre for Overseas Pest Research, Radar Entomology Unit, Great Malvern	†	Oct 1974 continuing
Structure and behaviour of tropical weather systems	UK	Centre for Overseas Pest Research, London	†	Continuing
<i>Crop protection</i>				
Methods of forecasting by biogeographical analysis of armyworm distribution	UK	ditto	†	Continuing
Chemical control of locusts and African armyworm	UK	ditto	†	Continuing
The ecology, behaviour and physiology of the African armyworm (<i>Spodoptera exempta</i>) in relation to the forecasting and control of outbreaks	Kenya	Prof J W S Pringle University of Oxford/ ICIPE Kenya (in collaboration with COPR)	115,800 (38,300)	Jul 1977 3½ years

Table 9 (continued): Pest Control

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Armyworm research: control of armyworm outbreaks	Tanzania	Agricultural Research Station, Ilonga	£200,000 (10,000)	Jan 1979 4 years
COPR/OCLALAV Grass-hopper control project	Niger	G Popov (Centre for Overseas Pest Research), PO Box 2501, Niger	*£122,000 (42,000)	Sep 1976 2 years 3 months
Deep water rice pest management research project	Bangladesh	Dr H D Catling Bangladesh Rice Research Institute, Dacca	£(60,000)	1977 continuing
Investigation of causal agent(s) of premature fruit drop and kernel damage in Macadamia nuts and identification of pest cycle and life cycle of causal agents and recommendation of control measures	Malawi	E A La Croix Bvumbew Research Station, Limbe	£1,000 (15,500)	Jan 1978 4 years
To investigate the most cost-effective means of control of rats in rice fields	Malaysia	Dr A P Buckle Crop Protection Services, Bumbong Lima	£70,000 (18,000)	Jan 1977 3 years
Studies of the relationship between pest insects and their host plants	UK	Centre for Overseas Pest Research, London	†	Continuing
Nature of insect resistance in sorghum	UK	ditto	†	Continuing
Provision of banana entomologist to investigate and control pests of banana crops	Windward Islands	Dr G A Mitchell (COPR) Windward islands Banana Growers Association Castries, St Lucia	£23,600 (6,000)	Nov 1974 3 years 8 months
Provision of cotton entomologist as Regional Entomological Adviser to investigate and control cotton pests in the region	Barbados and Caribbean Region	W R Ingram (COPR) c/o British Development Division in the Caribbean	£43,100 (13,000)	Oct 1974 4 years
Pesticide application techniques for cotton and fruit trees	Thailand	Dr H C Rendell Department of Agriculture, Bangkok	£116,000 (22,000)	Jun 1974 4½ years
Advice to developing countries on tree-crop entomology	Developing Countries	Centre for Overseas Pest Research, London	†	Continuing
Coconut Pest Control: research on <i>Melittomma insulare</i> and <i>Oryctes monoceros</i> (successor to earlier investigations)	Seychelles	I A D Robertson Ministry of Agriculture, Mahe	157,000 (3,000)	Oct 1978 3 years

Table 9 (continued): Pest Control

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Photographic and freight charges for research on biological control of the coconut mite in West Africa and the Caribbean	UK	Dr N W Hussey Glasshouse Crops Research Institute, Sussex	1,100 (800)	Oct 1977 2 years
Research on main pests affecting multi-cropping of beans, maize, rice, cassava and sweet potato in Central America	Central America	Dr A B S King (COPR) Tropical Agricultural Research and Training Centre, Turrialba	£110,000 (21,000)	May 1975 6 years
Development of pest management control system for cotton	Thailand	Dr T H Mabbett Department of Agriculture, Bangkok	£35,000 (18,000)	Aug 1977 2 years
<i>Public health</i>				
Molluscides: effectiveness, mode of action and possible effects on fish	UK	Centre for Overseas Pest Research, London	†	Continuing
Onchocerciasis (river blindness) control: studies of the effects of weather on distribution of the carrier blackfly	W Africa	ditto	†	1975 5 years
Studies of blackfly complex, Ivory Coast	UK	Dr H Townson Liverpool School of Tropical Medicine	4,500 (1,500)	Feb 1978 6 months
"River Blindness" Biological control of <i>Simulium damnosum</i>	Developing Countries	Dr M W Service Department of Medical Entomology, Liverpool School of Tropical Medicine	(3,360)	Jun 1978 5 months
<i>Pest control chemicals and application methods</i>				
Chemical and physical properties of insecticides	UK	Centre for Overseas Pest Research, London	†	Continuing
Evaluation of candidate insecticides for vector control	UK	ditto	†	Continuing
Evaluation of candidate insecticides and formulations for agriculture	UK	ditto	†	Continuing
The penetration of insecticides	UK	Dr C T Lewis Royal Holloway College	4,300 (2,500)	Oct 1978 11 months
Assay of candidate chemicals for bioactivity	UK	Centre for Overseas Pest Research, London	†	1978 2 years
Agricultural use of remotely piloted vehicles	UK	ditto	†	1977 2 years
Feasibility study of hovercraft for pest control	Ghana	ditto	†	Continuing
Development and assessment of spray application machinery and methods	UK	ditto	†	Continuing

Table 9 (continued): Pest Control

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
<i>Environmental studies of pesticides</i>				
Fish toxicology of pesticides	U.K.	Centre for Overseas Pest Research, London	†	1978 4 years
Biological control of water hyacinth by introducing pests; use of hovercraft for operations against water hyacinth	Sudan	S Irving (COPR) Department of Crop Protection, University of Khartoum	£210,000 (30,000)	Jul 1977 4 years
An assessment of the occurrence and potential of natural enemies of <i>Mikania</i> spp in the Neotropics	Developing Countries	Commonwealth Institute of Biological Control, Curepe, Trinidad	51,600 (13,500)	Apr 1978 3 years

TABLE 10: FORESTRY

‡Projects financed from allocations of British aid to specific countries.

*Projects financed jointly by the ODA and other donors or institutions.

All other projects are financed by ODA research grants and carried out under contract.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
<i>Tree improvement and genetic conservation</i>				
Reproduction, conservation and improvement of some tropical hardwoods	UK/Nigeria	Dr K A Longman Institute of Terrestrial Ecology, Edinburgh	88,600 (42,700)	Jan 1978 2¼ years
Study of the genus <i>Agathis</i> in Australasia and the Far East in order to define species and provenances of high silvicultural potential for plantations in different climates and soils throughout the tropics	UK/Developing countries	Dr R Bowen Commonwealth Forestry Institute, Oxford	69,600 (17,000)	Apr 1974 6 years
Collection, analysis and treatment of forestry seeds; investigation of genetic variation of pines; demarcation of seedstands	Honduras	A M J Robbins and G Buszewicz Escuela de Capacitacion Forestal, Siguatepeque Depto-Comayagua	£126,000 (60,500)	Nov 1975 5 years
Tropical provenance exploration and seed collection with particular reference to Central America	UK/Developing countries	A Greaves Commonwealth Forestry Institute, Oxford	278,200 (54,000)	Apr 1976 5 years
Examination of forest genetics of fast-growing tropical plantation species and development of breeding strategies principally for <i>Pinus caribaea</i> and <i>Pinus oocarpa</i>	UK/Developing countries	Dr R D Barnes ditto	72,000 (30,800)	Oct 1977 2½ years

Table 10 (continued): Forestry

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Research on provenance trials, production of clonal material, establishment of seed orchards etc.	Central America	Dr W G Dyson Tropical Agricultural Research and Training Centre, Turrialba, Costa Rica	£90,000 (18,000)	Nov 1977 4 years
<i>Forest management and silviculture</i>				
Species trials on country-wide basis to provide basic information for economic reforestation programme; windbreak trials	Nicaragua	H B L Evans Ministry of Agriculture and Livestock, Matagalpa	£180,000 (30,000)	Jul 1972 7 years
Assessment of most suitable species and cultivation methods for planting in coastal dry areas with a view to improvement of land use	Ecuador	D Webb c/o Commonwealth Forestry Institute, Oxford	£105,000 (19,000)	Apr 1974 5 years
Forest Fire management	Central America	J Hudson Central American Tropical Agricultural Research & Training Centre (CATIE), Costa Rica	£85,000 (16,500)	Sep 1975 6 years
Advice on forestry research	Sierra Leone	A J Vincent Ministry of Agriculture and Natural Resources, Freetown	£22,000	Sep 1975 3 years
Simulation of tropical plantation management using systems techniques to allow more flexible and efficient plantation management, by means of existing computer facilities and staff in developing countries	UK/Developing countries	D Alder Commonwealth Forestry Institute, Oxford	64,900 (28,000)	Apr 1976 3 years
<i>Utilisation</i>				
Key wood properties and use characteristics of plantation-grown <i>Pinus caribaea</i>	UK/Developing countries	R A Plumptre and C I Goodwin-Bailey ditto	76,000 (20,900)	Apr 1976 4 years
Improvement of design of kiln and of operating techniques used in solar drying of timber	UK/Dominica Tanzania	R A Plumptre ditto	*7,000 (2,000)	Jan 1978 2 years
<i>Mycology and Pathology</i>				
Collection, isolation, culture and trial of mycorrhizal fungi of Central American pines; preparation of a handbook on mycorrhizal techniques for tropical pines	UK/Developing countries	Dr M H Ivory ditto	54,100 (16,800)	Apr 1978 3 years

Table 10 (continued): Forestry

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Central American pine pathogens: identification and control in exotic plantations	UK/Central America	Commonwealth Mycological Institute, Kew & Forestry Commission Research Station, Alice Holt, Farnham, Surrey	49,000 (3,100)	Aug 1978 4½ years

TABLE 11: FISHERIES

‡Projects financed from allocations of British aid to specific countries.

*Projects financed jointly by the ODA and other donors or institutions.

All other projects are financed by ODA research grants and carried out under contract.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Collaborative research and training study of the coastal lagoons of West Mexico by the University of Liverpool and the National University of Mexico	Mexico	Prof E Naylor Department of Marine Biology, University of Liverpool	212,600 (38,600)	Jan 1973 6¼ years
Fish Preservation and Processing in Malawi (also Table 12)	Malawi	P J Meynell c/o British High Commission, Lilongwe	34,300 (4,000)	Jul 1975 3 years
Skipjack tagging	Solomon Islands	Principal Fisheries Officer, Honiara	‡4,300 (—)	Oct 1976 3 years
South Pacific Commission: Skipjack survey and assessment programme	South Pacific	SPC Noumea, New Calendonia	210,000 (70,000)	Oct 1977 3 years
Catfish: fishing trials of an offshore catamaran fishing boat at Elmina and Kromantse	Ghana	R K Stride c/o E W H Gifford & Partners, Southampton	‡93,000 (37,000)	May 1977 ?½ years
"Catfish" project in Ghana	Ghana	ditto	5,800 (3,200)	Dec 1978 10 months
"Sandskipper" Development of fishing boats	Ghana	E W H Gifford and Partners	14,200 (13,200)	Nov 1978 1 year 4 months
Influence of disease and husbandry factors on productivity of cultured tilapia and carp	UK	Dr R J Roberts University of Stirling	69,400 (24,000)	Jun 1977 2¼ years
Collection of fisheries statistics	UK	E L Hamblyn c/o The ODA, London	6,300 (1,300)	Aug 1977 1 year
Freshwater aquaculture	Brazil	Dr D R Swift Superintendency for the Development of Fisheries, Brasilia	‡35,000 (10,500)	Sep 1977 2 years

Table 11 (continued): Fisheries

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Feeding ecology of cormorants on Lake Malawi (also Table 5)	Malawi	I J Linn University of Exeter	41,600 (13,400)	Oct 1977 3 years
Identification and abundance of larval fishes in Jamaica	Jamaica	Prof I M Goodbody Department of Zoology, University of the West Indies, Jamaica	8,900 (2,800)	Oct 1977 1 year 7 months
Biology and management of nearshore stocks of pelagic fishes in the Caribbean	Jamaica	Prof I M Goodbody ditto	261,600 (35,000)	Jan 1978 3 years
Report on the fisheries research project at Lake Turkana	UK	Dr A J Hopson	3,500 (1,800)	Apr 1978 2 years
Fisheries Development including purchase of vessel and trial baitfish programme	Kiribati	Ministry of Natural Resources	£974,600 (549,900)	Jun 1978 3 years
Fish protein electro-phoresis--Tilapia	UK	Dr I M Mackie Torry Research Station, Aberdeen	1,000 (1,000)	Oct 1978 4 months
Report on Fisheries Research Project Bahrain	UK	D Herdson Marine Biology Association of the United Kingdom	8,800 (650)	Dec 1978 11 months
Investigation into the feasibility of the intensive cultivation of grass carp as a source of protein	UK	Dr D P Knight King Alfred's College, Winchester	2,600 (1,900)	Dec 1978 3 years
A preliminary assessment of potential for improvements of sailing fishing craft in development countries	UK	J Flewitt University of Southampton	10,600 (Nil)	Jan 1979 6 months
Research into the development of Tilapia Hatchery techniques	UK	Dr R K Roberts University of Stirling	128,700 (27,100)	Jan 1979 3 years

TABLE 12: POST-HARVEST TECHNOLOGY

†Projects undertaken by a Special Unit of ODA or by institutions receiving ODA support grants.

*Projects financed from allocations of British aid to specific countries.

All other projects are financed by ODA research grants and carried out under contract.

NOTE: To obtain maximum economy in their utilisation, the staff and equipment of the Tropical Products Institute (TPI) are not allocated to specific projects in predetermined proportions, but are employed as necessary in Britain or overseas. On many individual projects work is intermittent. It is therefore not possible to quote precise costs or duration for individual projects financed from TPI funds and carried out by the Institute itself. In the following table the TPI-funded projects for which cost and duration are shown are contracted out by TPI to the institutions named.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
<i>Animal feeds</i>				
Nutritive evaluation of <i>Avena sp</i> from Ethiopia	UK	Tropical Products Institute, London	†	Aug 1975 continuing
Evaluation of <i>Cassia tora</i> seed as an animal feedstuff	UK	ditto	†	Jan 1976 continuing
Use of tropical root crops as animal feed	UK	ditto	†	Oct 1976 continuing
Recycling of hides and skins	UK	ditto	†	Nov 1976 continuing
Determination of digestibility of roughages	UK	ditto	†	Jan 1977 continuing
Investigation of cattle diets in the Yemen Arab Republic	UK	ditto	†	Feb 1977 continuing
Ensilage of tropical waste products	UK	ditto	†	Feb 1977 continuing
Analysis of poultry feeds from Nyala University, Sudan	UK	ditto	†	May 1978 continuing
Effectiveness of anti-oxidants on the stability of stored leucaena	UK	ditto	†	Nov 1978 continuing
Use of Leucaena meals in poultry diets	UK	University of Edinburgh	†20,900 (10,800)	Mar 1978 3 years
Evaluation of tropical plant materials as ingredients of diets for fish	UK	University of Aston	†14,200 (300)	Oct 1978 2 years
Poultry feeding trials with materials processed by TPI	UK	University of Reading	†3,000 (1,000)	Jan 1979 2 years
<i>Fruit, vegetables and root crops</i>				
The causes and prevention of deterioration in fresh cassava roots	UK	Tropical Products Institute, London	†	Feb 1975 continuing
Storage losses in cassava	UK	Imperial College, University of London	†7,900 (2,600)	Oct 1975 3 years
The flavour characteristics of traditional cassava-based foods	UK	Tropical Products Institute, London	†	Nov 1975 continuing
Vascular discolouration of cassava roots after harvest	Colombia	Wye College, University of London	†14,600 (4,100)	Mar 1978 3 years
Storage and ripening of plantains	UK	Tropical Products Institute, London	†	Jul 1973 continuing

Table 12 (continued): Post-Harvest Technology

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Ripening, storage and handling of plantains	Ghana	University of Ghana and TPI	124,000 (9,300)	Apr 1977 3 years
Investigation of the flavour of plantains and its development during ripening and storage	UK	Tropical Products Institute, London	†	Oct 1975 continuing
Screening of sample beans to determine suitability for use as baked beans in tomato sauce	UK	ditto	†	Nov 1973 continuing
The biology of the potato tuber moth (<i>Phthorimaea operculella</i>)	UK	ditto	†	May 1977 continuing
Development of off-flavours in mangoes during storage and ripening	UK	ditto	†	Aug 1970 continuing
Development of mango-based foods	UK	ditto	†	Nov 1974 continuing
Quality evaluation of tetraploid banana fruit	UK	ditto	†	Mar 1971 continuing
Investigations on retarding the degreening of fresh limes	UK	ditto	†	Jan 1972 continuing
The effects of pre-harvest factors on the quality of citrus fruit	UK	ditto	†	Nov 1975 continuing
Post-harvest handling and storage of South American melons exported to Europe	UK	ditto	†	Jun 1974 continuing
Post-harvest pathology of fruits	Mexico	Dr R Noon (TPI) National Commission for Fruit Culture (CONAFRUT)	440,000 (15,000)	Mar 1977 2½ years
Fruit quality, storage and ripening	Trinidad	University of the West Indies, Trinidad, and TPI	19,900 (1,000)	Jan 1978 2 years
Problems associated with insolation of horticultural produce under tropical conditions	UK	Tropical Products Institute, London	†	Aug 1973 continuing
Export containers for the transportation of fruits and vegetables by air and sea	UK	ditto	†	Jul 1975 continuing
Post-harvest losses in horticultural produce after importation into the UK	UK	ditto	†	Oct 1977 continuing

Table 12 (continued): Post-Harvest Technology

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79): £</i>	<i>Starting date and duration</i>
Investigation of methods of improving the storage of perishable commodities	Zambia	O J Burden (TPI) Mount Makulu Research Station, Chilanga	£32,000 (12,400)	Feb 1976 3 years
The recovery of enzymes with polyacrylic acid	UK	Tropical Products Institute, London	†	Jan 1979 continuing
Post-harvest diseases of sweet potatoes	UK	University of Manchester	£20,200 (4,500)	Nov 1978 2 years
Effect of processing and storage on cyanide concentration in cassava	Costa Rica	CITA, Costa Rica	£16,000 (2,000)	Jan 1979 3 years
Investigations into the regulation of dormancy in yam tubers by plant hormones	UK	Wye College, University of London	£15,700 (nil)	Mar 1979 2 years
Effect of processing on the nutritional value of cowpea protein	UK	University of Reading	£2,900 (nil)	Oct 1979 2 years
<i>Fish</i>				
Acid hydrolysis of fish under tropical conditions	UK	Tropical Products Institute, London	†	Feb 1971 continuing
The development of methods of fish smoking in the tropics	UK	ditto	†	Nov 1972 continuing
<i>Fish preservation and processing in Malawi (also in Table 11)</i>	<i>Malawi</i>	<i>P J Meynell c/o British High Commission, Lilongwe</i>	<i>£34,300 (4,000)</i>	<i>Jul 1975 3 years</i>
Preparation of minced fish products	UK	Tropical Products Institute, London	†	Mar 1976 continuing
Ice storage of tropical fish	UK	ditto	†	Mar 1976 continuing
Development of new fish products and utilisation of fish waste	Seychelles	A Hoffman (of TPI) Ministry of Agriculture, Mahé	£88,000 (16,000)	Mid 1976 5 years
Provision of a Fish Processing Technology Adviser for investigation, and development of techniques to reduce waste; plus supporting equipment	Sri Lanka	Dr G Poulter Fish Technology Institute, Colombo	£48,000 (10,000)	Oct 1978 2 years
Improved quality and yields in tropical fish	UK	Tropical Products Institute, London	†	Jun 1977 continuing
Fish products for export: development of new locally produced fish products	Tuvalu	K Machell Ministry of Commerce and Natural Resources	£45,600 (20,200)	Aug 1977 2 years
Support for the preceding Project in Tuvalu	UK	Tropical Products Institute, London	†	Sep 1978 continuing

Table 12 (continued): Post-Harvest Technology

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Research into uses of shrimp by-catch, particularly for human consumption	Mexico	Dr R Young ITESM Guaymas	£150,000 (67,000)	May 1977 4 years
Support for the preceding project in Mexico	UK	Tropical Products Institute, London	†	Sep 1978
Preparation of lecture notes on fish processing	UK	Grimsby College of Technology	†400 (400)	Dec 1978 1 year
Processing of blue crab and shrimp by-catch products	Mexico	Institute of Technology, and Higher Education, (ITESM), Guaymas, Sonora	†8,200 (nil)	Jan 1979 1 year
Feeding fish silage to fish	UK	Tropical Products Institute, London	†	Dec 1977 continuing
<i>Oilseeds and edible nuts</i>				
Estimation of cashew nut shell liquid (CNSL) in processed cashew nuts	UK	ditto	†	Oct 1971 continuing
Improvements to coconut processing and the production of new coconut food products	UK	ditto	†	Mar 1972 continuing
Production of desiccated coconut from hybrid nuts	UK	ditto	†	Sep 1974 continuing
Evaluation of methods of determining the oil content of oil palm mesocarp	UK	ditto	†	Jan 1973 continuing
Jajoba—a technical and economic appraisal	UK	ditto	†	Apr 1978 continuing
Study of the residual pigments in commercial bleached palm oil	UK	ditto	†	Feb 1976 continuing
Isolation of carotenes from palm oil	UK	ditto	†	Jan 1978 continuing
Cottonseed decortication (Chad)	UK/Chad	ditto	†	Mar 1977 continuing
Decortication and detoxification of rapeseed and mustard seed	UK	ditto	†	Jan 1978 continuing
The chemical examination of salseed	UK	ditto	†	Jun 1978 continuing
Oxidation studies on sesame seed oil	UK	Polytechnic of the South Bank	†4,150 (3,350)	Oct 1978 2 years
<i>Meat</i>				
Utilisation of meat and meat offal in developing countries	UK	Tropical Products Institute, London	†	Feb 1972 continuing

Table 12 (continued): Post-Harvest Technology

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Carcass evaluation and meat quality studies on tropical goat breeds	Malawi Ghana Botswana	Tropical Products Institute, London	†	May 1974 continuing
Meat quality investigations	UK	ditto	†	Oct 1974 continuing
Pork processing operations	UK	ditto	†	Apr 1976 continuing
Studies on rabbit meat production in developing countries	UK	ditto	†	Jul 1977 continuing
Rabbit meat production in developing countries	UK	University of Reading and TPI	†18,200 (8,000)	Oct 1977 3 years
<i>Storage and packaging</i>				
Development and evaluation of ferro-cement grain stores	UK	Tropical Products Institute, London	†	Feb 1976 continuing
Preparation of scanning electron micrographs of the diagnostic features of stored products insect pests	UK	ditto	†	Mar 1979 continuing
Design and construction of grain storage warehouses	UK	Brunel University	†1,750 (900)	Jul 1977 1 year
Evaluation of sheet material used in flexible storage structures	UK	Tropical Products Institute, London	†	Jan 1972 continuing
Effectiveness of materials traditionally used to protect produce against insect attack	UK	ditto	†	Feb 1977 continuing
The handling behaviour of woven plastic sacks	UK	ditto	†	Mar 1975 continuing
Problems of deterioration of WFP donated foodstuffs	UK	ditto	†	Jan 1979 continuing
Insecticide resistance in <i>Trogoderma granarium</i>	UK	ditto	†	May 1978
Quality assessment of pesticide formulations in Malawi	UK	ditto	†	Aug 1978
Role of trypsin inhibitors in conferring resistance to <i>Callosobruchus maculatus</i> in cowpeas	UK	University of Durham	†13,700 (1,100)	Oct 1978 2 years
Crop storage research and development	Malawi	Bvumbwe Research Station and TPI	‡272,000 (73,000)	1974 4 years
Investigation of methods of improving the storage of durable commodities	Zambia	P H Giles (TPI) Mount Makulu Research Station, Chilanga	‡33,500 (15,000)	Mar 1978 2 years

Table 12 (continued): Post-Harvest Technology

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Evaluation of methods of assessing losses in stored grains and pulses and collection of reliable data	UK	Tropical Products Institute, London	†	Jan 1976 continuing
Investigation of the use and accuracy of a formula method for assessment of weight loss due to insect infestation in small grained cereals	UK	ditto	†	Jan 1976 continuing
The effect of dust admixture and moisture content on the bushel weight of stored grain and pulses	UK	ditto	†	Jan 1976 continuing
Survey, calibration and assessment of moisture meters	UK	ditto	†	1967 continuing
The relation between the moisture content and relative humidity of stored products	UK	ditto	†	1967 continuing
Mathematical model of heat and moisture transfer in stored grain	UK	University of Newcastle-upon-Tyne	†17,600 (500)	Nov 1977 3 years
A study to optimise the drying rate in maize storage and drying cribs	UK	Tropical Products Institute, London	†	Jun 1975 continuing
Moisture characteristics of macadamia nuts and other commodities from Malawi	UK	ditto	†	Apr 1977 continuing
Effect of changes in relative humidity on diapause in <i>Sitotroga cerealella</i>	UK	ditto	†	Dec 1975 continuing
The inherent susceptibility of maize varieties to post-harvest infestation by <i>Sitotroga cerealella</i>	UK	ditto	†	Mar 1973 continuing
Inherent susceptibility of maize varieties to <i>Sitophilus zeamais</i>	UK	ditto	†	1967 continuing
The susceptibility of triticale to <i>Sitophilus spp</i> and <i>Sitotroga cerealella</i>	UK	ditto	†	Jun 1976 continuing
Infestation of maize storage cribs	Nigeria	Imperial College University of London	†14,500 (3,700)	Oct 1977 3 years
Laboratory studies of natural factors limiting populations of <i>Ephesia cautella</i>	UK	Tropical Products Institute, London	†	Dec 1971 continuing

Table 12 (continued): Post-Harvest Technology

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Population, biology and importance of <i>Prostephanus truncatus</i> (Horn), the Greater Grain Borer	UK	Tropical Products Institute, London	†	Oct 1977 continuing
Inherent susceptibility of of cowpea varieties to post-harvest infestation by <i>Callosobruchus maculatus</i> and <i>C. chinensis</i>	UK	ditto	†	Jan 1975 continuing
Resistance of cowpeas to infestation by <i>Callosobruchus</i> species	UK	ditto	†	Mar 1978 continuing
Susceptibility of beans to post-harvest infestation by <i>Acanthoscelides obtectus</i>	UK	ditto	†	Mar 1978 continuing
Insecticide resistance in pulse beetles	UK	ditto	†	Jun 1975 continuing
Evaluation of insecticide sprayer	UK	ditto	†	Jul 1976 continuing
<i>Miscellaneous food activities</i>				
Analysis and preparation of plant proteases	UK	ditto	†	Mar 1970 continuing
Nucleic acid in food yeast and other types of single-cell protein	UK	ditto	†	Aug 1973 continuing
Extraction of bromelain from pineapple fruit waste	UK	ditto	†	Dec 1975 continuing
Production of sweeteners from starch by enzyme hydrolysis	UK	ditto	†	Mar 1976 continuing
Evaluation of methods for the saccharification of cassava and other starchy materials relevant to alcohol production and other fermentation industries	UK	ditto	†	Mar 1976 continuing
Wheat testing—CENTO countries	UK	ditto	†	Dec 1975 continuing
CENTO Food Composition Project	UK	ditto	†	Jan 1976 continuing
Laboratory evaluation of sorghum and millet varieties	UK	ditto	†	Jan 1976 continuing
Survey of processing methods and utilisation of starch in less developed countries	UK	ditto	†	Mar 1976 continuing

Table 12 (continued): Post-Harvest Technology

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Use of cassava products in the manufacture of bread and baked goods	UK	Tropical Products Institute, London	†	Sep 1976 continuing
Manufacture and uses of a composite flour prepared by the milling of wheat and millet grains	UK	ditto	†	Sep 1976 continuing
Biochemistry of tea fermentation	Malawi	University of Cambridge and Tea Research Foundation of Central Africa	†26,000 (2,500)	Oct 1976 3 years
Development of improved methods of processing fresh coconuts at rural or domestic level	UK	Tropical Products Institute, London	†	Aug 1977 continuing
Development of a stirrup-operated grater for starchy root crops	UK	ditto	†	Aug 1977 continuing
Research into processing nutritious food crops using low cost technologies	Central America	B Axtell Central American Nutrition Institute (INCAP), Guatemala	‡100,000 (23,000)	Mar 1978 4 years
Rural food processing	Costa Rica	Dr R Cooke (TPI) Centre for Food Technology, San Jose	‡90,000 (24,500)	Mar 1978 2 years 3 months
Development of analytical procedures for the analysis of mycotoxins in foods and feedingstuffs	UK	Tropical Products Institute, London	†	Aug 1975 continuing
The incidence and significance of mycotoxin in tropical foods and feedingstuffs	UK	ditto	†	Aug 1975 continuing
Investigation into the detoxification of aflatoxin-contaminated ground-nut products	UK	ditto	†	Oct 1975 continuing
Aflatoxin and ochratoxin contamination of certain food products	UK	ditto	†	Feb 1977 continuing
Enzymic assay for cyanide content of cassava and its products	UK	ditto	†	Sep 1976 continuing
The effects of insect infestation on the nutritive value of stored products	UK	ditto	†	Apr 1977 continuing

Table 12 (continued): Post-Harvest Technology

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
<i>Essential oils and spices</i>				
Standards for oils and spices	UK	Tropical Products Institute, London	†	Feb 1972 continuing
Essential oils from Thailand with special reference to basil and phlai oils	UK	ditto	†	May 1970 continuing
Development of essential oils in Sarawak, particularly from aromatic grasses, vetiver and patchouli	UK	ditto	†	Jan 1972 continuing
Improvement of the quality of petitgrain oil	UK	ditto	†	Apr 1974 continuing
Improvement of means of distilling essential oils	Paraguay	D Baker Tropical Products Institute, London	£95,000 (16,500)	Nov 1974 4½ years
Gum turpentine analyses of tropical pine provenances	UK	Tropical Products Institute, London	†	Apr 1977 continuing
Establishment of processing qualities of essential oils	Indonesia	A E Dann Chemical Research Institute, Bogor	£50,000 (30,000)	Jun 1977 2 years
Development of essential oil production in Swaziland	UK	Tropical Products Institute, London	†	Jan 1978 continuing
Development of research programmes for spice crops; co-ordination of field extension work; improvement of processing and marketing	Papua New Guinea	R T Town Department of Primary Industry, Lowlands Agricultural Experimental Station, East New Britain (in collaboration with TPI)	£35,000 (16,000)	Feb 1978 2 years
Improvement of Central American pimento, especially from Belize	UK	Tropical Products Institute, London	†	Jan 1972 continuing
Microbiological examination of spices (pimento, nutmeg, ginger, etc)	UK	ditto	†	Dec 1972 continuing
Improvement of Zambian chillies and capsicums	UK	ditto	†	Jan 1978 continuing
Spice industries development in Papua New Guinea	UK	ditto	†	Aug 1978 continuing
<i>Hides, skins and leather</i>				
Development of tanning methods to give products suitable for export by developing countries	UK	ditto	†	Dec 1975 continuing
Reduction of chemical and water consumption during the processing of hides and skins into leather	UK	ditto	†	Dec 1975 continuing

Table 12 (continued): Post-Harvest Technology

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
<i>Pest control in storage</i> (see table 9 for other pest control)				
Sex pheromones for the control of the tropical warehouse moth <i>Ephesia cautella</i>	UK	Tropical Products Institute, London	†	Jan 1973 continuing
Measurement under tropical field conditions of Concentration X Time (CT) products for methyl bromide and phosphine fumigations	UK	ditto	†	Jun 1974 continuing
Comparative study of the characteristics of insecticide spray deposits on woven polypropylene and B-twill fabrics	UK	ditto	†	Sep 1974 continuing
Evaluation of organic and mineral fillers from Malawi for dilute insecticide dust formulation	UK	ditto	†	Jun 1976 continuing
Technical evaluation of candidate materials for small-scale fumigation	UK	ditto	†	Jan 1978 continuing
<i>Pulp and paper</i>				
Use of hard fibre in the manufacture of speciality papers	UK	ditto	†	Nov 1969 continuing
Determination of pulp characteristics of potential seed trees	UK	ditto	†	Oct 1973 continuing
Pulping trials on plantation-grown hardwoods from Fiji	UK	ditto	†	Apr 1976 continuing
Evaluation of hardwoods from Guyana for use as paper pulp	UK	ditto	†	Apr 1976 continuing
Evaluation of <i>Dicymbe altsoni</i> from Guyana as a source of paper pulp	UK	ditto	†	Apr 1976 continuing
Evaluation of <i>Eucalyptus grandis</i> as raw material for paper pulp	UK	ditto	†	Apr 1976 continuing
Evaluation of <i>Eucalyptus regnans</i> , <i>E. camaldulensis</i> and <i>Acacia meurnsii</i> from Kenya	UK	ditto	†	Apr 1976 continuing
Evaluation of <i>Pinus patula</i> , <i>Eucalyptus saligna</i> and <i>E. fastigata</i>	UK	ditto	†	Apr 1976 continuing

Table 12 (continued): Post-Harvest Technology

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Evaluation of <i>Pinus patula</i> and <i>P. elliottii</i> from Tanzania for use as paper pulp	UK	Tropical Products Institute, London	†	Apr 1976 continuing
Pulping of <i>Pinus patula</i> from the Turbo pulpwood project in Kenya	UK	ditto	†	Sep 1976 continuing
Pulping characteristics of <i>Pinus caribaea</i> growing in Fiji	UK	ditto	†	Apr 1976 continuing
Evaluation of <i>Pinus caribaea</i> from Tanzania for use as paper pulp	UK	ditto	†	Apr 1976 continuing
Determination of pulp characteristics of potential seed trees of <i>P. caribaea</i> from Uganda	UK	ditto	†	Sep 1976 continuing
Pulping characteristics of <i>P. caribaea</i> from Sri Lanka	UK	ditto	†	Feb 1977 continuing
<i>Vegetable fibres</i>				
Alternative black dyes for coconut fibre	UK	ditto	†	Jul 1973 continuing
Improved water fastness from reactive dyes in sisal	UK	ditto	†	Jan 1978 continuing
Experimental spinning and weaving of Sea Island Cotton in Montserrat	UK/Montserrat	ditto	†	Mar 1976 continuing
Evaluation of flame-retarded rubberised coir pads	UK	ditto	†	Jan 1978 continuing
Flame-retardant treatment for coir used in rubberised car seatings (Phase III)	UK	Shirley Institute, Manchester	†8,600 (3,200)	Feb 1978 1 year
Treatment of coir and sisal with permanganate to prevent yellowing	UK	ditto	†7,000 (nil)	Mar 1979 continuing
Treatment of dyed sisal with resins to fix unreacted dye	UK	ditto	†2,700 (nil)	Feb 1979 continuing
Development of more efficient minimum application techniques and catalysts for the chemical finishing of cotton textiles	UK	International Institute for Cotton/TPI	†135,000 (22,300)	Nov 1978 3 years
Investigation of the yarn count/stitch length interactions for single cotton fabrics	UK	ditto	†179,300 (34,500)	Nov 1978 4 years

Table 12 (continued): Post-Harvest Technology

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Investigation of the effect of variations in dyeing and mercerising processes upon the properties of knitted cotton outer-wear fabrics	UK	International Institute for Cotton/TPI	†112,800 (26,000)	Nov 1978 3 years
Assessment of yarn produced by experimental cotton spinning plant in Montserrat	UK	Shirley Institute, Manchester	†1,600 (nil)	Oct 1978 1 year
<i>Construction materials</i>				
Evaluation of the dry hard-board process for small scale production	UK	Tropical Products Institute, London	†	Sep 1975 continuing
Potential uses of coconut timber	UK	ditto	†	Feb 1976 continuing
Woodwool/cement slab production plant	UK	ditto	†	Mar 1979 continuing
<i>Miscellaneous non-food activities</i>				
Examination of Malayan plants for biological activity	UK	ditto	†	Dec 1966 continuing
Isolation of diosgenin from fenugreek seed	UK	ditto	†	Apr 1972 continuing
Structure/property relationship of cardanol	UK	Brunel University	†21,500 (6,300)	Oct 1975 3 years
Potential anti-ulcer drugs related to B-glycyrrhetic acid from <i>Diplodisia</i> and <i>Phytolacca spp</i>	UK	Tropical Products Institute, London	†	May 1976 continuing
Cardioactive compounds from plant sources	UK	ditto	†	May 1976 continuing
Anti-fouling agents derived from plant-sources	UK	ditto	†	Apr 1977 continuing
<i>Industrial processing</i>				
Macadamia nut processing	UK	ditto	†	Nov 1968 continuing
Coconut dehusking, decorticating and peeling plant	UK	ditto	†	Feb 1972 continuing
Thick bed driers; design, manufacture and testing	UK	ditto	†	Nov 1972 continuing
Leaf-fired essential oil still for experimental work	UK	ditto	†	Mar 1973 continuing
Establishment of a leaf-fired distillery in Dominica for bay oil production	UK	ditto	†	Jul 1973 continuing

Table 12 (continued): Post-Harvest Technology

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Portable essential oil still Mark II	UK	Tropical Products Institute, London	†	Sep 1973 continuing
Design and development of manually operated oil extraction equipment	UK	ditto	†	Feb 1976 continuing
Automated bleaching equipment for pulp and paper	UK	ditto	†	Sep 1973 continuing
Cocoa drying in Brazil (design assistance)	UK	ditto	†	Dec 1975 continuing
Improvement of means of drying cocoa	Brazil	Dr C R McDonald Cocoa Research Centre, Itabuna	£58,000 (20,000)	Jul 1977 3 years
Cassava chipping and drying project	UK	Tropical Products Institute, London	†	1976 continuing
<i>Small-scale processing</i>				
Exploratory project to determine the optimum conditions for the production of charcoal (and associated products of pyrolysis) from tropical cellulosic materials	UK	ditto	†	Apr 1974 continuing
Small-scale production of vinegar from bananas	UK	ditto	†	Oct 1976 continuing
Development of an improved domestic tool for macerating coconut meat	UK	ditto	†	Oct 1976 continuing
Design of small abattoirs and butchers shops	UK	ditto	†	Mar 1977 continuing
Development of a small mill for polishing and grinding sorghum grain	UK	ditto	†	Dec 1978 continuing
<i>Post-harvest use of renewable fuels</i>				
<i>Drying of agricultural crops using solar energy, supplemented by combustion of methane derived from waste products (also in table 21)</i>	UK	ditto	†	Sep 1975 continuing
<i>Natural draught hull-fired burner for various uses including drying and parboiling paddy (also in table 21)</i>	UK	ditto	†	Aug 1976 continuing
<i>Force draught hull-fired paddy dryers (also in table 21)</i>	UK	ditto	†	Nov 1976 continuing

TABLE 13: NUTRITION

*Projects financed jointly by the ODA and other donors or institutions.
Other projects are financed by ODA research grants and carried out under contract.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Assistance to Dunn Nutrition Unit, Fajara, The Gambia	The Gambia	Dr R G Whitehead Dunn Nutrition Unit, Cambridge	*£(45,400)	1973 support reviewed annually
Assistance to Tropical Metabolism Research Unit University of the West Indies (mainly concerned with aspects of malnutrition)	Jamaica	Professor D Picou Tropical Metabolism Research Unit University of the West Indies, Mona, Kingston	*397,400 (99,300)	Aug 1975 3 years 5 months
Characterisation of factors involved in glutamine utilisation by kidney and intestine in Jamaica	Jamaica	Prof G A O Alleyne University of the West Indies, Kingston	*5,400 (2,100)	Jul 1976 3 years
<i>The methodology of food and nutrition surveillance (also in table 15)</i>	Ethiopia	Dr R W Hay Queen Elizabeth House, St Giles, Oxford	20,900 (16,700)	Jan 1978 1¼ years
A study to determine the effects of dietary interventions on worker productivity in Kenya	Kenya	Dr M C Latham Cornell University, New York	39,300 (19,800)	Jan 1978 2 years
<i>Village food systems in West Africa: an exploration of the impact of an agricultural development project on work patterns, food consumption, health & nutrition status (also in table 15)</i>	The Gambia	Mrs A M Coles & L D Phillips International African Institute	45,600 (19,900)	Sep 1978 1 year 5 months
Studies of the secretion of dietary antigens in milk	UK	Dr W A Hemmings University College of North Wales	700 (700)	Oct 1978 3 months
Evaluation of the effects of DSM in the Sudan	Sudan	Professor J C Waterlow/ Dr P Vaughan, London School of Hygiene and Tropical Medicine	16,500 (6,400)	Nov 1978 1 year
Child development (Behavioural intervention) Programme	Jamaica	Dr S M McGregor Tropical Metabolism Research Unit, Jamaica	140,000 (13,700)	Jan 1979 3 years
Zinc supplementation and weight gain, cost of growth and body composition in child protein energy malnutrition	Jamaica	Dr B E Golden ditto	7,100 (1,800)	Jan 1979 1 year

TABLE 14: MEDICINE AND HEALTH

†Projects financed from allocations of British aid to specific countries.
 *Projects financed jointly by the ODM and other donors or institutions.
 All other projects are financed by ODM research grants and carried out under contract.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
<i>Tropical Communicable diseases: bacterial & viral</i>				
Leprosy studies using metabolites with radioactive labels	India	Prof E J Ambrose Leprosy Research Unit, Bombay	7,400 (3,300)	Apr 1978 2 years
MRC leprosy project in Addis Ababa	Ethiopia	Dr J M H Pearson Leprosy Control Hospital, Addis Ababa	*43,500 (13,200)	Dec 1975 3 years 4 months
Experimental chemotherapy of leprosy and the development of the nude (athymic) mouse as a model for leprosy	UK	Prof G R F Hilson St George's Hospital Medical School, London	*10,900 (1,000)	Jan 1977 3 years
Comparative study of different forms of short-course treatment of spinal tuberculosis	India Hong Kong Korea	D Lloyd-Griffiths MRC Tuberculosis and Chest Diseases Unit, Brompton Hospital, London	(28,300)	1966 support reviewed annually
Assistance to East African Tuberculosis Investigation Centre: staff provided for chemotherapy trials	Kenya Tanzania Uganda	Dr J A Aluoch East African Tuberculosis Investigation Centre, Nairobi	(76,200)	1971 support reviewed annually
Immunological study of measles and malnutrition, and continuation of immunological studies of meningococcal infection	Nigeria	Dr H C Whittle Department of Medicine, Ahmadu Bello University, Zaria	82,500 (36,700)	Oct 1975 3 years
Immunological studies in meningococcal and pneumococcal infections	Nigeria	Dr B M Greenwood ditto	110,200 (35,900)	Oct 1976 3 years
Comparison of white pox viruses with variola and monkey pox	UK	Prof K Dumbell St Mary's Hospital Medical School, London	*15,800 (7,500)	Nov 1976 3 years
Search for antigens and antibodies specific to variola virus	UK	Prof K Dumbell ditto	*15,800 (4,900)	Nov 1976 3 years
Poxvirus identification by polyacrylamide gel electrophoresis of virus induced polypeptides	UK	Department of Microbiology Birmingham University	*5,900 (3,300)	Jan 1978 2 years
Laboratory and clinical studies of streptococcal infections and their sequelae	Trinidad	Streptococcal Disease Unit, San Fernando	*8,600 (600)	Jan 1978 3 years

Table 14 (continued): Medicine and Health

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978-79) £</i>	<i>Starting date and duration</i>
Epidemiology of leptospirosis in Trinidad and Grenada, and epidemiology of rabies	Trinidad	Dr C O R Everard Caribbean Epidemiology Centre, Port of Spain	*54,000 (27,500)	Apr 1976 Jun 1979
Cholera and tetanus toxins structure interactions with ganglioside and mechanism of action	UK	Dr S Van Heynigen Edinburgh University	4,600 (1,500)	Dec 1977 3 years
Bacterial colonisation of the small intestine in tropical sprue	UK	Dr B S Drasar London School of Hygiene and Tropical Medicine	*4,000 (2,200)	Jan 1977 2 years
Virological, serological & epidemiological studies of Ebola Virus	UK	E T Bowen Microbiological Research Establishment, Porton Down	*33,300 (14,400)	Apr 1978 2 years
Pathology & prevention of arena-virus infection	UK	Dr D I H Simpson Dr C R Howard London School of Hygiene and Tropical Medicine	*54,800 (9,000)	May 1978 3 years
<i>Tropical communicable diseases: helminthic</i>				
Research into schistosomiasis—identification of schistosomiasis transmission areas and potential areas of infection by the study of villages, latent rock pools and rice fields in the Bansang region	The Gambia	P Goll Medical Research Laboratories, Fajara	*62,000 (18,000)	Jun 1975 4½ years
Ultrastructure of the Schistosomulum of <i>Schistosoma mansoni</i> in relation to host structure resistance	UK	Dr R A Wilson University of York	*8,300 (1,000)	Oct 1978 3 years
Study of control of schistosomiasis by chemotherapy and snail eradication, and of effect of improved domestic water supplies	St Lucia	Dr P Jordan Ministry of Education and Health, Castries	75,900 (38,400)	Apr 1977 2 years (supported since Nov 1968)
The immunity, pathology and chemotherapy of <i>Schistosoma haematobium</i> in laboratory animals	UK	Dr G Webbe London School of Hygiene and Tropical Medicine	72,000 (25,300)	Apr 1977 3 years

Table 14 (continued): Medicine and Health

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978-'79) £</i>	<i>Starting date and duration</i>
Study of the host-parasite relationship of filarial worms in their mosquito and mammalian hosts	UK	Dr B R Laurence London School of Hygiene and Tropical Medicine	17,700 (1,600)	Jul 1975 3 years
A study of the human filariasis and their vectors in Trinidad	Trinidad	Dr N B Nathan Epidemiology Centre, Port of Spain	*55,000 (17,400)	Apr 1976 3 years
The chemotherapy of filariasis	UK	Dr R E Howells Liverpool School of Tropical Medicine	14,600 (4,600)	Jan 1976 3½ years
Host-parasite relationships in filariasis	UK	Prof G S Nelson London School of Hygiene & Tropical Medicine	*21,100 (5,600)	Apr 1977 1¼ years
Studies in filarial infections in the E African coast area	Tanzania	N Kolstrup Helminthiasis Research Unit, Tanga	29,300 (29,300)	Jul 1977 1½ years
Host-parasite relationships in filarial infections	UK	Dr D A Denham London School of Hygiene and Tropical Medicine	*80,500 (18,800)	Jul 1978 3 years
Studies on the epidemiology and treatment of hydatid disease in the Turkana district of Kenya	Kenya	Dr A M Wood African Medical Research Foundation, Nairobi	74,000 (21,500)	May 1977 3 years
Intestinal immunity to adult tapeworms	UK	Prof C A Hopkins Glasgow University	*5,100 (1,600)	Aug 1977 3 years
Strain differences in the hydatid organism <i>Echinococcus granulosus</i>	UK	Prof J D Smyth Imperial College of Science & Technology	*20,300 (7,100)	Nov 1977 3 years
Sero-epidemiology of hydatid disease in Wales	UK	Prof M J Clarkson Liverpool University	*4,800 (1,800)	Jan 1978 3 years
Immunological aspects of infection with <i>Nematospiroules dubius</i>	UK	Dr J M Behnke Department of Zoology, Nottingham University	9,200 (3,100)	Jul 1977 3 years
Analysis of immune responses to the adult and larval stages of the parasitic nematode <i>Trichinella spiralis</i>	UK	Dr D Wakelin Glasgow University	*6,700 (2,400)	Oct 1977 3 years

Table 14 (continued): Medicine and Health

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
<i>Tropical communicable diseases; protozoa</i>				
Assistance to Medical Research Council Laboratories Fajara, The Gambia (work includes malaria studies, investigation of levels of immunoglobins, child health, epidemiology and immunology of schistosomiasis, epidemiology and serology of influenza)	The Gambia	Dr R S Bray MRC Laboratories Fajara, Banjul	*180,000	1967 support reviewed annually
Enzyme-immunoassays for parasitic diseases	UK	Dr A Voller & Dr D Bidwell Nuffield Institute of Comparative Medicine, Zoology Society of London	*18,900 (8,900)	Apr 1976 3 years
Genetic control of mammalian resistance to infection with special reference to leishmaniasis	UK	Prof D J Bradley London School of Hygiene & Tropical Medicine	*15,300 (4,600)	Apr 1977 3 years
Culture of malaria parasites	UK	Prof S Cohen & Dr A G Butcher Guy's Hospital Medical School, London	*27,100 (11,300)	Oct 1976 3 years
Experimental mouse malaria: immunisation and immunological characterisations of chronic infections	UK	Dr H S Micklem University of Edinburgh	*21,100 (6,000)	Dec 1976 3 years
Genetics of malaria parasites	UK	Prof G Beale ditto	*40,000 (15,000)	Oct 1977 3 years
Survival of malaria parasites in the semi-immune host	UK	Dr R S Phillips Glasgow University	*12,500 (3,400)	Oct 1977 3 years
Analysis of immune responses in mice vaccinated against malaria	UK	Dr J H I. Playfair Middlesex Hospital Medical School, London	*21,000 (7,900)	Jan 1978 3 years
Sexual development of malaria parasites, <i>in vitro</i> and <i>in vivo</i>	UK	Dr R F Sinden Imperial College of Science and Technology, London	*21,317 (2,447)	Aug 1978 3 years

Table 14 (continued): Medicine and Health

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
<i>Tropical communicable diseases: vectors</i>				
Investigation into mosquito behaviour	UK	Dr M T Gillies Department of Biological Sciences, University of Sussex	*27,900	1966 support reviewed annually
Circadian flight behaviour in the mosquito <i>Culex pipiens fatigans</i>	UK	Dr B C Goodwin Sussex University	*5,900 (2,900)	Feb 1978 2 years
Behaviour & physiology of mosquitoes with particular reference to males	UK	Prof J D Gillett	*7,100 (900)	Oct 1978 3 years
Serological identification of the sibling species of the <i>Anopheles gambiae</i> complex	UK	Dr G Davidson London School of Hygiene and Tropical Medicine	27,900 (2,500)	Jul 1975 3 years
Biology and genetics of anopheline mosquitoes	UK	Dr G Davidson ditto	*15,500 (4,300)	Jun 1977 3 years
Monolayer and bilayer studies and their application to mosquito control	UK	Dr A J McMullen University of Southampton	*34,100 (11,800)	Sep 1975 3 years
Blood feeding of <i>Anopheles gambiae</i> within huts	UK	Dr P F I. Boreham Imperial College of Science and Technology, London.	*10,000 (4,500)	Oct 1977 3 years
Study of factors affecting methods of delaying or reversing the evolution of insecticide resistance in anophelines	UK	Dr G Davidson and Dr C F Curtis London School of Hygiene and Tropical Medicine	*25,200 (8,400)	Jan 1978 3 years
The taxonomy, ecology and vector potential of the man-biting <i>simuliidae</i> in Guyana	Guyana	Dr P A Munroe Caribbean Epidemiology Centre, Port of Spain Trinidad	*7,400 (4,100)	Jan 1976 3 years
Arboviruses and other micro-organisms in arthropod and lower vertebrate cell cultures and characteristics of such cell systems	UK	Dr M G R Varma London School of Hygiene and Tropical Medicine	*9,600 (4,300)	Oct 1976 3 years
Identification of arthropod (other than tsetse) blood meals of medical importance	UK	Dr P F I. Boreham Imperial College of Science and Technology, London	*10,700 (3,300)	Oct 1976 3 years

Table 14 (continued): Medicine and Health

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Taxonomy and distribution of phlebotomine sand flies in the old world	UK	Dr D J Lewis British Natural History Museum	*4,300 (1,400)	Oct 1977 3 years
Investigation into the rhythmic biology of helminthologically important freshwater snails	UK	Dr E Morgan Birmingham University	*3,000 (1,000)	Oct 1977 3 years
Applications of genetics to the control of the vectors of malaria & filariasis	UK	Dr C F Curtis London School of Hygiene & Tropical Medicine	*32,900 (10,700)	Jun 1977 5 years
<i>Epidemiology</i>				
Assistance to MRC Laboratories in Jamaica	Jamaica	Dr G R Sergeant MRC Laboratories University of the West Indies Mona, Kingston	*(56,100)	1968 support reviewed annually
Epidemiological study of myocardial ischaemia, high-density lipoprotein and other coronary risk-factors in Trinidad	Trinidad	Dr G J Millar Caribbean Epidemiology Centre, Port of Spain	*50,600 (16,500)	Oct 1975 3½ years
The development of statistical services and methods in tropical epidemiology	UK	Dr J P Vaughan London School of Hygiene and Tropical Medicine	20,900 (4,800)	Nov 1978 5 years
Intensive study of the dynamics of transmission of schistosomiasis (in collaboration with Sudan Medical Research Council, University of Khartoum and other research institutions)	Sudan	Dr A Fenwick (COPR) Ministry of Health, Khartoum	137,000 +*(22,000)	1976 5 years
The changing pattern of endemic diseases in Northern Nigeria	Nigeria	Prof H M Gilles Liverpool School of Tropical Medicine	*41,300 (20,300)	Oct 1978 2 years
Biological inter-relationships in the Tristan da Cunha population	UK	Dr D F Roberts Department of Human Genetics, University of Newcastle-upon-Tyne	*15,600 (6,200)	Nov 1976 3 years
Genetic polymorphism and its association with health and diseases in a village community in The Gambia	UK	Dr S G Welch London Hospital Medical School	*7,000 (2,800)	Jul 1977 3 years
Mechanism of production of immunoglobulin E and its biological role	UK	Dr E E Jarrett Glasgow University	*5,800 (3,400)	Jan 1978 1¼ years

Table 14 (continued): Medicine and Health

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79)</i> £	<i>Starting date and duration</i>
Significance of silica & silicates in the Aetiology of endemic (non-filarial) elephantiasis of the lower legs	UK	Dr E W Price London School of Hygiene and Tropical Medicine	*3,300 (—)	Jan 1979 6 months
<i>Epidemiological</i>				
Aspects of Kala-Azar investigation	India	Liverpool School of Tropical Medicine	†3,000 (3,000)	Mar 1979 2 months
<i>Miscellaneous</i>				
Development of diagnostic and management techniques for use by medical auxiliaries in developing countries	UK	Dr B Essex BIAT Centre for Health and Medical Education, London	44,000 (23,000)	Apr 1977 2 years
Production of slide teaching material in parasitology	UK	Prof W Peters Liverpool School of Tropical Medicine	8,100 (5,500)	Apr 1977 2 years
Viper venoms, haemorrhage and thrombosis	UK	Dr H A Reid Liverpool School of Tropical Medicine	*5,300 (5,300)	Sep 1977 1 year
Analysis of haemoglobin variants	UK	Prof H Lehman Cambridge University	*5,600 (3,300)	Oct 1977 3 years
Support to the Experimental Taxonomy Unit of the British Museum	UK	Dr D S Brown	*15,600 (4,800)	Apr 1978 3 years

TABLE 15: ECONOMIC AND SOCIAL

*Projects financed jointly by the ODA and other donors or institutions.
All other projects are financed by ODA research grants and carried out under contract.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79)</i> £	<i>Starting date and duration</i>
<i>Rural technology</i>				
Study of farm management systems	Zambia	Dr J F Bessell Dept of Agriculture and Horticulture, University of Nottingham	121,800 (750)	Oct 1974 3½ years
Productive labour absorption in small farm sector, Sri Lanka	Sri Lanka	M P Moore Institute of Development Studies University of Sussex	29,000 (6,000)	Apr 1976 2¼ years

Table 2.2 (continued): Economic and Social

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
The mechanisation of agriculture in South Asia: output and distribution of work	Bangladesh	H Metrick Dept of Agricultural Economics and Management, University of Reading	160,000 (51,200)	Apr 1977 2 years 6 months
Economics of water storage and supplemental irrigation in tropical bimodal rainfall areas	UK	M Upton and Mrs A Ansell Dept of Agricultural Economics and Management, University of Reading	6,000 (6,000)	Mar 1978 1 year 3 months
Small scale irrigation in Bangladesh: a socio-economic evaluation of alternative techniques	Bangladesh	M Howes Institute of Development Studies University of Sussex	41,100 (17,500)	May 1978 2 years 10 months
Rice in Bangladesh: research on appropriate technology for the intra village post harvest system	Bangladesh	M Greeley ditto	105,000 (41,200)	Jun 1978 3 years
The use of water & power in Sri Lanka: proposed joint research project by the University of Reading & Agrarian Research & Training Institute, Colombo—preliminary visit by Mr H Metrick	Sri Lanka	H Metrick Dept of Agricultural Economics and Management, University of Reading	350 (350)	Oct 1978
An analysis of multi product food processing for developing countries	Sierra Leone	Dr P Preece and C Squire Dept of Chemical Engineering, University of Leeds	5,800 (1,000)	Oct 1978 2 years
<i>Nutrition and food aid</i>				
Impact of food aid in recipient countries	Africa	K N Wood and Dr C Stevens Overseas Development Institute, London	22,500 (1,500)	Jan 1976 3½ years
Food aid since Hot Springs (1946—76)	UK	Dr D S Miller Dept of Nutrition Queen Elizabeth College University of London	15,500 (8,500)	Sep 1976 1 year 8 months
The methodology of food and nutrition surveillance (also in table 13)	Ethiopia	Dr R W Hay Queen Elizabeth House, St Giles, Oxford	20,900 (16,700)	Jan 1978 1¼ years

Table 15 (continued): Economic and Social

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Village food systems in West Africa: an exploration of the impact of an agricultural development project on work patterns, food consumption, health and nutrition status (also in table 13)	The Gambia	Mrs A M Coles and L D Phillips International African Institute, London	45,600 (19,900)	Sep 1978 1 year 5 months
<i>Role of women in development</i>				
Inter-relationships of family farm size, cropping patterns, women's work, nutrition and childcare	Nigeria	R Longhurst Institute for Development Studies, University of Sussex	6,200 (700)	Apr 1976 3 years 1 month
Women's role in agricultural development	The Gambia	Mrs J M Dey The Agricultural Extension and Rural Development Centre University of Reading	*14,500 (2,000)	Mar 1977 1 year 10 months
The effect of change on the role of Hausa women in the economic and social structure	Nigeria	Mrs C Jackson School of Rural Economics and Related Studies, Wye College University of London	7,300 (3,200)	Apr 1977 2 years 4 months
Resources and strategies of Ashanti Market women in central Kumasi, Ghana	Ghana	Mrs G C Clark Dept of Social Anthropology, University of Cambridge	21,000 (7,900)	Aug 1978 2 years 1 month
<i>Other Rural development studies</i>				
Group farming in NW Nigeria: an institutional stage in economic development	Nigeria	Mrs A Dickie Dept of Agricultural Economics and Management, University of Reading	18,300 (8,700)	Dec 1976 2 years 7 months
Marketed surplus of rainfed staple foodgrains from small farmers	India	Dr B Harriss Overses Development Institute, London	19,300 (8,500)	Oct 1977 2 years
Poverty and rural development in India: pre-feasibility study	India	Dr J Heyer Somerville College, Oxford	1,500 (1,500)	Jul 1978 3 months
A socio-economic survey of the Kano river project area	Nigeria	J C Jackson c/o MCR Wye College University of London Nr Ashford, Kent	2,900 (2,600)	Aug 1978 9 months
Rural factor markets in Pakistan	Pakistan	Ijaz Nabi Dept of Economics University of Warwick Coventry	4,500 (3,600)	Oct 1978 8 months

Table 15 (continued): Economic and Social

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
West African pastoral economies & market development	Mali	J Swift Institute of Development Studies University of Sussex	42,800 (2,900)	Dec 1978 3 years 7 months
<i>Urban problems</i>				
Policies towards urban informal service employment: a case study of Cali	Colombia/UK	Dr R J Bromley Department of Social Administration, University College of Swansea	24,300 (1,500)	Jun 1976 2 years
Public intervention, housing and land use in Latin American cities	Latin America	Dr A Gilbert and Dr P Ward Dept of Geography University College, London	107,800 (55,800)	Apr 1978 2½ years
Petty crime in Cali, Colombia: The implications for policy	Colombia	C H Birkbeck Centre for Development Studies University College, Swansea	3,900 (3,900)	Aug 1978 4 months
Evolution of national urban policy, planning and development action: the Eastern Central African experience 1963-78	Eastern Central Africa	M Safier Development Planning Unit, University College, London	4,300 (4,300)	Aug 1978 5 months
<i>Industrial development</i>				
OECD study on future development of advanced industrial societies in harmony with those of developing countries	Developed and developing countries	OECD Steering Committee Paris, France	*30,000 (20,000)	Jan 1976 3 years
The economic and social potential of industrial co-operatives in developing countries	India Indonesia Mali Peru	Prof P M Abell International Co-operative Alliance, London	37,700 (20,600)	Apr 1977 2 years
The Lomé Convention and sugar production problems of the African, Caribbean and Pacific states	Fiji	I Smith Dept of Economics University of Newcastle-upon-Tyne	2,600 (50)	May 1977 1 year
World demand and supply projections for agricultural production: an input—output analysis	UK	Dr J Dunworth University of Bradford	8,000 (1,600)	Apr 1977 1 year 2 months
Study of costs of producing ammonia in South Asia and long run supply prices of converted nitrogen products in international markets, especially in the West Asia area	UK	Prof G R Allen Allen Associates Ltd Barnstaple	1,100 (800)	Nov 1977 6 months

Table 15 (continued): Economic and Social

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Business behaviour: the choice and use of industrial technology in developing countries	Africa and Asia	J Pickett and Dr E Rahim David Livingstone Institute of Overseas Development Studies, University of Strathclyde	111,000 (45,500)	Jul 1978 2 years
<i>International problems</i>				
Impact of the brain drain on development: a case study of Guyana	Guyana	Dr M S Boodhoo Department of Administrative Studies, University of Manchester	16,500 (5,500)	Jan 1977 3 years
The world tin industry—policy options for producing countries	Malaysia Thailand Indonesia Nigeria	Dr J T Thoburn School of Economic and Social Studies University of East Anglia	12,000 (7,800)	Apr 1978 17 months
Southern Africa development analysis project	USA	B D Giles British member of USAID	5,300 (5,300)	Aug 1978 2 months
<i>Evaluation Studies</i>				
The role of feeder roads in promoting agricultural change in Southern and Eastern Province of Sierra Leone	Sierra Leone	A Airey Geography Dept Lanchester Polytechnic, Coventry	5,300 (1,700)	Apr 1977 1 year 9 months
<i>Macro-economic issues</i>				
Data needs for developing countries	UK/Europe	Prof M Ward Institute of Development Studies University of Sussex	36,800 (11,500)	Nov 1975 3 years 10 months
Research Associate at the University of Warwick – Miss C G Hayden to work on the development and application of social accounting matrices in developing countries	UK	Dept of Economics University of Warwick jointly with the ODA	*15,200 (5,600)	Jul 1977 3 years
Financial management and its effects on income distribution	Malaysia	Prof W T Newlyn Institute of Development Studies, University of Sussex	36,300 (30,000)	Dec 1977 2 years
Participation in an OECD study of decision-making in the context of basic needs programmes	India	Prof T S Epstein OECD Paris, France	*8,000 (8,000)	Jul 1978 4 months
<i>Miscellaneous</i>				
Supply of 10 copies of Mr S R Simpson's book "Land Law & Registration" follow up to research contract	UK	S R Simpson	220 (220)	Apr 1978

Table 15 (continued): Economic and Social

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
University of Oxford expedition to the Gilbert Islands	Kiribati	J Hughes University of Oxford	2,000 (2,000)	July 1978 4 months
Grant to research material for a book on the economy of Kenya	Kenya	A Hazlewood Institute of Economic Studies, University of Oxford	1,000 (1,000)	Sep 1978 6 months
<i>Key Factor Booklets</i>				
Sector Planning Handbook on Electricity Supply	UK	M D Webb Institute of Social and Economic Research University of York	850 (250)	Jan 1975 3½ years
Investment planning manual for beef production	UK	Mrs M C Simpson School of Economic Studies, University of Leeds	800 (800)	Mar 1978 1 year
"Ports Planning in Developing Countries"	UK	A Harding Port Operations Consultants Blackheath, London	1,000 (700)	Jul 1978 1 year
Sector planning manual on water supplies	Developing countries	Dr I Carruthers Agrarian Development Unit Wye College, University of London	800 (800)	Nov 1978 5 months

TABLE 16: POPULATION

†Projects financed from allocations of British aid to specific countries.
 *Projects financed jointly by the ODA and other donors or institutions.
 All other projects are financed by ODA research grants and carried out under contract.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Computer processing and analysis of data from notifications of live and still births in Solomon Islands	Solomon Islands	Solomon Islands Medical Department	2,300 (428)	Nov 1972 5 years 5 months
Study of relationship between oral contraceptives and blood clotting in women of different ethnic groups	Singapore	Prof S S Ratnam Kandang Kerbau Hospital for Women Singapore	68,700 (22,200)	Jan 1974 5¼ years
Investigation of metabolic effects of oral contraceptives in women of various ethnic origins	UK	Prof V Wynn St Mary's Hospital Medical School, London	63,900 (21,000)	Jul 1977 3 years

Table 16 (continued): Population

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Identification of social and economic determinants of fertility (Kenya element of World Fertility Survey)	Kenya	J Cleland International Statistical Institute London	£*60,000 (30,000)	1977 3 years
Determination of causative factors in the rapid fertility decline in the Chiang Mai region of Thailand	Thailand	Dr T Pardthaisong Chiang Mai University	37,200 (17,100)	Mar 1977 2¼ years
Research into aspects of population and human reproduction in Eastern Venezuela	Venezuela	I S McDonald Chelsea College University of London	3,500 (700)	Jul 1977 11 months
Fertility decline in Sri Lanka since World War II; its extent nature and causes	Sri Lanka	C M Langford Population Investigation Committee, London School of Economics	2,000 (200)	Dec 1977 1 year
Fertility Survey (Sudan element of World Fertility Survey)	Sudan	O El Tay Dept of Statistics Ministry of Planning	£*176,000 (81,000)	1977 2 years
Construction, validation and application of a new pictorial method for assessing and reporting attitudes to children & family size in developing countries	Sri Lanka	J Liggett University College, Cardiff	6,600 (4,900)	Aug 1978 2 years
POPTRAN—Computer assisted population dynamics training programme	UK	C Brook David Owen Centre for Population Growth Studies, University College, Cardiff	*39,000 (14,000)	Oct 1978 3 years

TABLE 17: EDUCATION

*Projects financed from allocations of aid to specific countries.
Other projects are financed by ODA research grants and carried out under contract.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Research into technical English language requirements for university science, engineering etc students	Mexico	Dr J Alderson Centre for foreign languages (CELE) National Autonomous University of Mexico	£95,000 (8,000)	Jan 1975 4 years

TABLE 17 (continued): Education

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Tracer project to investigate movements of school leavers and determine how their school curricula have fitted them for their work	Zambia	C P Shaw University of Zambia Lusaka	£45,000 (15,000)	Dec 1976 3 years
Research Study on "Education Administration in Rural Areas in the Sudan"	Sudan	R F Lyons International Institute for Educational Planning	12,500 (12,500)	Sep 1978 7 months
Applications of micro-teaching to the teaching of English as a second or foreign language in teacher training situations	UK	M J Wallace Scottish Centre for Education Overseas, Moray House, College of Education, Edinburgh	30,000 (5,200)	Oct 1978 3 years
School leaver tracer project	Swaziland	G Sullivan Swaziland Institute for Educational Research	£10,000 (—)	Mar 1979 6-12 months
Regional training course on educational evaluation—The Asian Region	Thailand	R F Lyons International Institute for Educational Planning Paris, France	*33,000	Oct 1978 1 month
Regional training course on educational administration in remote rural areas	Nepal	R F Lyons ditto	*10,000	Mar 1979 3 days

TABLE 18: ENGINEERING

All projects are financed by ODA research grants and carried out under contract.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Investigation into the production of "Low Cost Steel" in developing countries	UK	Prof A R E Singer Department of Metallurgy and Materials Science University College, Swansea	146,000 (26,900)	Dec 1976 4 years
Portable ice making devices for developing countries	UK	Dr W H Gleghorn University of Strathclyde, Glasgow	55,800 (33,300)	Sep 1977 2 years
Foot/hand operated pumps for use in developing countries	UK	Dr J Cuthbert Harpenden Rise Laboratories, Harpenden, Herts.	99,000 (31,100)	Sep 1977 2½ years

TABLE 18 (continued): Engineering

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978-79) £</i>	<i>Starting date and duration</i>
Development of a portable refrigerated vaccine container	UK	Dr C J Hearsey AERE, Harwell	30,900 (13,000)	Jan 1978 1 1/2 years
Cambridge Fijian transport study	Fiji	N Chisholm Downing College, Cambridge	700 (700)	Jun 1978 3 months
Pure water conditions in road cutting slopes	St. Lucia	Dr Anderson University of Bristol	9,300 (1,100)	Oct 1978 3 1/2 years
The River Rover Hovercraft Expedition	Nepal	Sqn Ldr M E Cole RAF Adastral House London	7,000 (7,000)	Nov 1978 5 months
The matching of water pumps to windmills for use in developing countries	UK	Prof P Dunn Dr J D Burton Reading University	6,700 (3,700)	Jan 1979 6 months

TABLE 19: CONSTRUCTION

†Projects undertaken by receiving ODA support grants.

‡Projects financed from allocations of British aid to specific countries.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978-79) £</i>	<i>Starting date and duration</i>
Use of indigenous materials in building	UK Ghana	Overseas Division BRE	46,000 (0,000)	Apr 1974 6 years
Low cost construction techniques	UK Sudan Botswana	ditto	1102,000 (27,000)	Oct 1976 4 years
Low income housing	Caribbean Indonesia UK	ditto	1259,000 (53,000)	Dec 1976 4 years
Collaborative building research project with Egyptian General Organisation for Housing, Building and Planning Research	Egypt	ditto	184,000 (30,000)	Nov 1977 3 years
Research into low cost urban rural housing, settlement planning & quarter settlement management. Auto-construction in urban & rural environments	Mexico	Dr P Ward Federal Secretariat for Human Settlements & Public Works	122,000 (12,000)	Jul 1978 1 year 2 months

TABLE 20: TRANSPORT

The TRRL is an institution receiving an ODA support grant.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
<i>Planning</i>				
Urban public transport	India Malaysia	Overseas Unit Transport and Road Research Laboratory, Crowthorne	338,000 (88,000)	1975 6 years
Urban traffic planning	Thailand	ditto	187,000 (38,000)	1975 6 years
Rural transport planning	Ghana Lesotho Thailand Sri Lanka	ditto	354,000 (102,000)	1976 6 years
National transport policies and planning	Sri Lanka Malaysia Lesotho	ditto	316,000 (55,000)	1977 5 years
<i>Safety</i>				
Road safety	Pakistan Thailand India	ditto	248,000 (85,000)	1976 5 years
<i>Economics</i>				
Road user costs	Caribbean India	ditto	214,000 (59,000)	1976 4 years
Road transport investment modelling	UK	ditto	40,000 (18,000)	1977 4 years
Economics of road maintenance	UK	ditto	86,000 (28,000)	1978 4 years
<i>Techniques</i>				
Road design	Kenya and others	ditto	257,000 (70,000)	1975 7 years
Terrain surveys and remote sensing	Various	ditto	186,000 (58,000)	1975 6 years
Effective use of bitumen	Various	ditto	96,000 (13,000)	1975 6 years
Stabilised road bases	UK and Kenya	ditto	39,000 (8,000)	1975 6 years
Naturally-occurring road-building materials	Botswana Belize	ditto	320,000 (75,000)	1977 5 years
Arid area construction techniques	Sudan Kenya	ditto	131,000 (20,000)	1977 6 years
Erosion and reinforced earth studies	Nepal	ditto	122,000 (28,000)	1977 6 years
Low-cost bridges	UK, Kenya India	ditto	119,000 (35,000)	1977 6 years

TABLE 21: ENERGY

†Projects undertaken by institutions receiving ODA support grants (See Note on page 54 relating to the Tropical Products Institute).

‡Projects financed from allocations of aid to specific countries.

* Projects financed jointly by the ODA and other donors or institution.

All other projects are financed by ODA research grants and carried out under contract.

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978/79) £</i>	<i>Starting date and duration</i>
Drying of agricultural crops using solar energy, supplemented by combustion of methane derived from waste products (also in table 12)	UK	Tropical Products Institute, London	†	Sep 1975 continuing
The application of a producer gas generator as a motive power source in developing countries	UK	ditto	†	Sep 1975 continuing
Bacteriophages of methanogenic bacteria	UK	Brunel University	†11,500 (3,300)	Aug 1976 2 years
Natural draught hull-fired burner for various uses including drying and par-boiling paddy (also in table 12)	UK	Tropical Products Institute, London	†	Aug 1976 continuing
Force draught hull-fired paddy dryers (also in table 12)	UK	ditto	†	Nov 1976 continuing
Methane Production—Research leading to the design of a digester capable of serving a typical Korean village and operating during winter months.	Korea	A C Hollingdale Office of Rural Development, Suwon	‡35,000 (15,000)	Jul 1977 2 years
Coal: research into new processes	Peru	J Philpott	‡7,000 (3,000)	1977 3 years
<i>Improvement of design of kiln and of operating techniques used in solar drying of timber (also in table 10)</i>	UK/Dominica Tanzania	R A Plumtre Commonwealth Forestry Institute, Oxford	*7,000 (2,000)	Jan 1978 2 years
The design and development of a solar powered refrigerator	Thailand	Dr R H B Exell Asian Institute of Technology, Bangkok	17,700 (8,700)	Mar 1978 3 years
Wind turbine generators	Falkland Is. & St Helena/UK	Electrical Research Association, Cleeve Road Leatherhead, Surrey	97,900 (97,000)	June 1978 9 months
Low cost wind turbines	UK	R E Peacock Cranfield Institute of Technology, Cranfield, Beds	11,300 (4,600)	Jul 1978 1 year
Research into low pressure steam engine	UK	Prof M W Thring Queen Mary College, London	62,500 (5,600)	Sep 1978 3 years
Use of bagasse for electricity generation	Barbados	Commonwealth Science Council, London	1,000 (5,000)	Oct 1978 6 months

Table 21 (continued): Energy

<i>Project description</i>	<i>Country of primary research</i>	<i>Project leader or institution</i>	<i>Total cost to ODA (and cost in 1978-79) £</i>	<i>Starting date and duration</i>
Single-stage continuous fermentation	UK	Tropical Products Institute, London	†	Jan 1979 continuing
Appraisal of microbiological methods of coffee pulp utilisation	UK	ditto	†	Jan 1979 continuing
Sea wave energy research	Mauritius	Dr S Jugessur University, Mauritius	£45,000 (—)	Jan 1979 1-2 years
Survey—Repair of wind & solar radiation equipment	Caribbean Region	Commonwealth Science Council, London	6,500 (1,600)	Jan 1979 3 months

85