

WOSSAC:25694

711.2

(911.14)



HUNTING TECHNICAL SERVICES LIMITED

A DIVISION OF HUNTING SURVEYS AND CONSULTANTS LIMITED
ELSTREE WAY - BOREHAM WOOD - HERTS - ENGLAND
Cables: HUNTECO BOREHAMWOOD Telephone: 01-953 6161 Telex: 23517

LAND USE AND AGRICULTURAL CONSULTANTS

Directors
T. D. WEATHERHEAD, O.B.E., M.A., Managing
V. C. ROBERTSON, M.A., B.Sc. (Agric), Dip Agric Cantab General Manager
G. S. HIGHCOCK Secretary
Consultants
H. GILLMAN, B.Sc. (Agric), M.Sc., A.I.C.T.A.
T. JEWITT, B.A. (Chem), Ph.D.
Associate Directors
D. V. CHAMBERS, B.Sc. (Agric), A.M.I. Agric. E.
D. A. FRANCIS, B.Sc. (Forestry)
H. PIPER, B.Sc. (Geology), D.I.C. (Hydrology), M.Sc., F.G.S.
D. T. SINKER, B.A. (Econ), A.C.A.
R. J. SPOONER, B.Sc. (Agric), D.I.P. Agric.

21st October, 1971.

Our Ref. : 49110/100/VCR/MR

The Chief Secretary to the Government
Prime Ministers Department
Jalan Dato 'Onn
Kuala Lumpur.

Dear Sir,

We have pleasure in submitting our proposal for undertaking a feasibility study in the Miri-Bintulu Proposed Development Region of the Fourth Division, Sarawak.

In order to carry out this task we propose to offer a consortium comprising Hunting Technical Services Ltd., Binnie and Partners (London), Shankland Cox Overseas and special consultants.

The proposal is in two sections. The first discusses the general requirements of the study, the broad capability of the consortium, sets out how we would satisfy the Scope of Work and the organisation necessary for this. The second section indicates the range of projects previously undertaken by the members of the consortium relevant to the feasibility study, personal records of participating personnel and requirements for laboratory analyses. The Terms of Reference of the study are also included as an Annexure.

We have given a great deal of thought to project management and administration, and at the same time to providing the maximum input from previous work.

The leadership we have proposed, with Mr. Harbord (who was Deputy Project Manager on Johor Tenggara) as Project Manager and Mr. Read as Deputy Project Manager (covering administration of the project as well as providing a substantial "technical" input to organisation and management aspects of the project) is we believe, sound. Mr. Harbord's agricultural experience is extremely wide, and the posting of Mr. Read in an administrative/co-ordinative capacity as DPM leaves Mr. Harbord free to devote himself to the technical aspects of the study. By himself providing the main agricultural input, a saving in staff input is achieved.

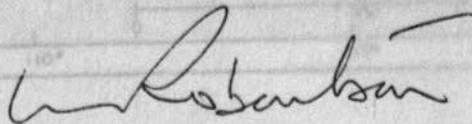
We fully appreciate, bearing in mind the difficulties we and others have experienced in the past, how important to you the whole question of project management is. We have therefore felt that you should be given the opportunity to consider an alternative project study organisation, while emphasising our view that the one we have proposed is our own recommendation. The alternative would be to entrust the post of Project Manager to Mr. I. L. A. Ysselmuiden, and appoint as Deputy Project Manager Mr. F. A. Sole. Mr. Harbord and Mr. Read could then be available for shorter-term 'consultant' assignments covering agricultural planning and organisation and management respectively.

Mr. Ysselmuiden and Mr. Sole have worked in both West Malaysia and Brunei. Mr. Ysselmuiden, whose primary experience is in land resource appraisal, would be responsible for project administration: we should wish to recruit or have seconded to us a suitable administrator to work directly to the Project Manager. Mr. Sole would be responsible for the main input in agricultural planning. Mr. Rancorn would, as already proposed, be available to plan project administration and to pay supervisory visits as necessary.

We have not proposed this alternative staffing for two reasons: partly because the original one is in fact our first choice, as indicated above, and also because both Mr. Ysselmuiden and Mr. Sole are tentatively committed to other projects. We regard the Miri-Bintulu project as one of such importance, however, that we should endeavour to transfer them if this alternative staffing was preferred.

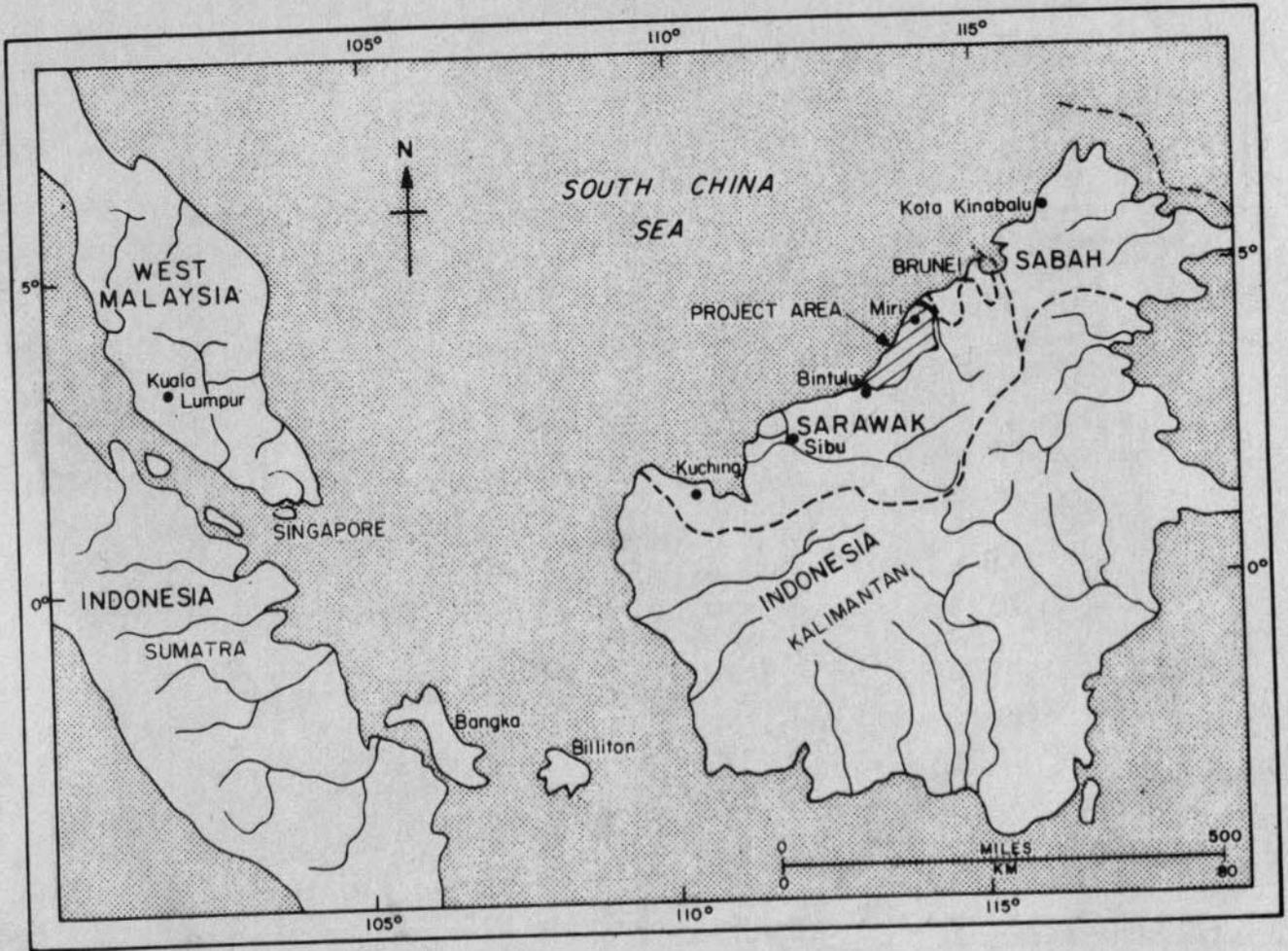
The alternative might involve some additional man-months, perhaps 6-8, in total staffing.

Yours faithfully,
for: HUNTING TECHNICAL SERVICES LTD.

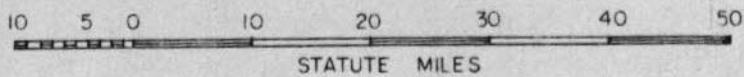
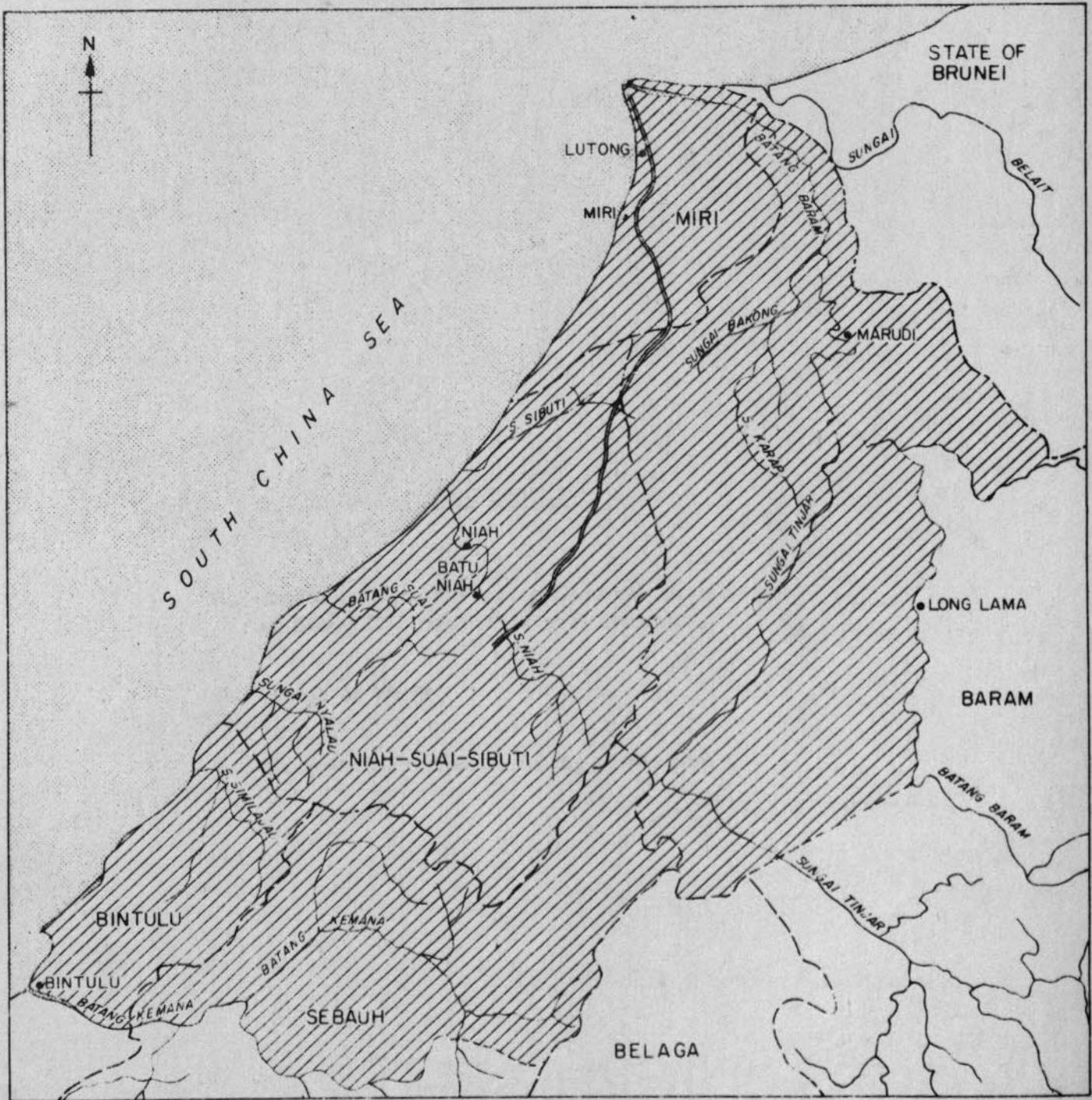


V. C. Robertson
Director and General Manager.

LOCATION OF PROJECT AREA



THE PROJECT AREA



-  Project Area
-  International Boundary
- BINTULA Sub-District Names

SECTION 1

- A. Introduction: Covering General Discussion of Study Requirements and Timing
- B. Scope of Work
- C. Proposed Plan and Timing of Studies

1.A INTRODUCTION : COVERING GENERAL
DISCUSSION

1. A INTRODUCTION: COVERING GENERAL DISCUSSION OF STUDY REQUIREMENTS AND TIMING

(a) General Considerations

The Invitation declares that it is the intention of both the Federal and State Governments that the Miri-Bintulu Region of the Fourth Division be developed primarily to permanent agricultural settlement and large scale forest management, exploitation and processing, and also to such other economic activities as may be viable. Both public and private investment are envisaged with special emphasis on improving the economic position and living standards of the rural population.

The economic and social progress of Malaysia as a whole under the stimulus of the series of official development plans is a clear indication of the potential and the dynamic movement towards it.

Sarawak has, of course, a substantial and expanding oil industry, and it will be important to consider the impact of this on development in the State (and perhaps particularly in Fourth Division, off-shore of which the main oil and gas fields lie). Other mineral resources do not appear to be of major economic consequence, certainly not in the project area: but there are major water resources and hydro-electric power potential deriving from them. The possible future connection between such power potential and developments stemming from the oil industry cannot be ignored. One of the two major hydro-power sites so far identified in Sarawak is on the Batang Baram, close to the project area.

Nevertheless the emphasis for some time to come must be on development stemming from efficient use of Sarawak's land resources, in agriculture and forestry. Hitherto the comparative poverty of many of the country's soils, the problems and hazards of its broken terrain and the difficulties of communication and access have impeded progress. And with a rapidly rising population increasingly threatening the country's resources in an unsatisfying and unsatisfactory system of shifting cultivation, the emphasis on planned permanent settlement while there is still space and time for it is a development in which we would welcome participation.

We fully endorse the concept that settlement should be an integral part of a broad zonal plan of rural development prepared as the Consultants' first objective. Such a concept was the foundation of both the Jengka and South-East Johor Project Master Plans.

In a country as conscious as Malaysia of the need for the conservation of natural resources, it is evident that sound land use must be the basic consideration of any plan. Indeed this is particularly important in the Fourth Division with its high rainfall, erosive soils and the

dissected topography of much of the terrain. Moreover, it is important to minimise the risk of harmful floods on the riparian alluvial flats used for wet padi production and to preserve the flow of river water for industrial use, communications and transport.

As with rural development schemes elsewhere in Malaysia it is clearly right that planning should aim at as much diversity in agriculture as sound land use and socio-economic factors allow. We recognise that the soils, terrain and comparative inaccessibility of much of the Fourth Division may impose serious constraints on agricultural diversification and it will be all the more important therefore to search for other income-earning opportunities. The fullest possible vertical development of the forest industry, both from land cleared for settlement and on a sustained yield basis, would seem to us imperative, and we are pleased to note that UNDP is making a comprehensive study in this field. Private enterprise could make a valuable contribution to development.

We would like to express our agreement with the considerable emphasis given in the Terms of Reference to the sociological aspects of settlement and rural development. They are of even greater significance in Sarawak than in parts of West Malaysia, where a pattern and practice of large scale settlement has become established and the settlers are drawn mainly from one ethnic group. The selection of settlers who have an interest (albeit latent) and a potential for farming, and the provision of an environment and facilities in which a prosperous and contented community can evolve are the essence of any settlement scheme. It is moreover of great political importance.

In this connection the organisation and management of settlement and participation by the settlers themselves are vital ingredients of success. We believe that our experience in examining different patterns and systems for Johor will be useful, though it has certainly not covered all situations which may occur in the Sarawak context.

We also wish to express our appreciation of the timing of the Invitation to submit a proposal for planning the development of the Fourth Division and the phased approach adopted. We particularly like the method of "bracketing down" progressively from a broad regional investigation to more detailed plans of priority areas identified as information is acquired and analysed. By early 1972 all the data necessary for working out a broad Zonation Plan and Perspective Plan should be ready. We have seen samples of the excellent maps and aerial photographs available and we are familiar with the work of the Soil Survey Division of the Department of Agriculture. We understand that an inventory of forest resources and proposals for management and utilisation will be available and that the road from Bintulu to Miri will be finished. The assembly and analysis of ready information should enable Phase I to get off to a good start, and the liaison procedures

and facilities for assistance from Government departments envisaged in the invitation would make for satisfactory progress.

As will be shown in more detail later in this Proposal, it would be our intention to undertake Phase I with a small high powered team supplemented by other specialists only to the very limited extent that photo-interpretation and some additional field checks may be needed. At this stage we think it possible - and a desirable aim - that the Zonation and Perspective Plans should be completed well before the end of the first year. This would enable the Government to review them earlier in the progress of the study and give more time for the more detailed work of Phase II. Recent experience in the South-East Johor Project has emphasised to us the importance and value of decisive discussions with Federal and State Governments at an intermediate stage to ensure that the detailed planning is fitted into a sound and agreed perspective. It may be that we would consider it wise to present certain alternative strategies for development in a draft Perspective Plan on which reasoned judgment could be made by all concerned.

(b) The Consortium

The Scope of Work to be undertaken in the Fourth Division covers a fairly wide field of specialised activity; land development planning, including agriculture and forestry; sociology, embracing all aspects of settlement that affect the well-being of settlers and advisory personnel; physical planning; various branches of engineering such as transportation, ports, power and essential services, and the economics of the total plan and its component parts and projects. An association of three firms has been arranged to cover all these activities.

The principal partners in this association are Hunting Technical Services, in whom overall co-ordination of the work would be vested, Messrs. Binnie & Partners, the London firm of consulting engineers and Messrs. Shankland Cox Overseas, specialists in physical regional planning and transportation, its sociological and economic aspects. These three firms worked together in the team which has recently completed a master plan for the development of two regions in South-East Johor. As in this project and the Jengka Triangle, the Commonwealth Forestry Institute in Oxford is available and willing to give professional advice on forestry matters if needed. It may be necessary to undertake limited work on port studies, which can either be handled within proposed consortium or by bringing in Wallace Evans and Partners, who undertook the preliminary study of Johor Baharu port in 1970.

Details of the relevant experience of the three associated firms are given in Section 2 of this Proposal. In this introductory section we outline the overall competence of the consortium.

The task described in the Terms of Reference is essentially one of land use planning for human betterment with emphasis laid upon the opportunities for agricultural development. These are activities in which Hunting Technical Services have specialised during the last 18 years. Their participation in the master planning of the Jengka Triangle and more recently the Johor Tenggara region has generated a strong interest and understanding of the problems associated with human and land development in the wet tropics. Huntings have also taken an active part in a range of studies in neighbouring countries, features of which would strengthen the company's contribution to this task.

Hunting Technical Services maintain some 65 professional staff supported by a further 25 technical and executive personnel. It also has arrangements for the periodic assignment of some 35 special consultants as required.

Apart from its ability to provide the services related to the planning of land and water resources in regional development the company carries out specialist tasks in monitoring and assistance in implementation, irrigation and drainage, watershed management, hydrology and hydrogeology. It also maintains an environmental chemistry division with modern laboratory facilities.

Binnie and Partners are consulting engineers specialising in water supply, hydroelectric power, flood control, irrigation, main drainage and pollution control. The firm undertakes, for schemes anywhere in the world, the investigation of water resources, economic studies, the preparation of master plans, feasibility reports, designs and contract documents, supervision of construction and commissioning on site.

The firm is a partnership of ten chartered engineers supported by permanent consultants and associates and a staff of over 400, three-quarters of whom are chartered engineers or hold degrees in engineering at a British University.

The partners are members of the British Association of Consulting Engineers and practise in accordance with its rules. The senior partner is Mr. G. M. Binnie, grandson of Sir Alexander Binnie who founded the firm in 1902. Most of the partners are on Panel 1 under the Reservoirs (Safety Provisions) Act 1930.

Specialists are employed on all aspects of the firm's work, including contract procedure, electrical and mechanical engineering, engineering geology, hydraulics, hydrology, instrumentation, systems analysis and computer programming, economics, soil mechanics, structural design and water treatment. The firm has its own water testing laboratory supervised by a qualified chemist.

Shankland, Cox provide a comprehensive service for the planning of land use and the development of human settlements in the context of the

total physical, social and economic environment. The firm has a wide experience of the whole field of planning from national and regional strategies to detailed designs for the development of sections of a town. During the last five years we have worked in sixteen countries, both developed and developing, the latter mainly in the humid tropics.

The firm has a total staff of about 70, with offices in London and Liverpool, Kingston (Jamaica), Split and Rijeka (Yugoslavia) and St. Germain-en-Laye, Paris. The permanent staff includes experts qualified in a broad range of disciplines:-

- architecture and urban design
- regional and urban planning
- municipal engineering
- transport planning
- economics, statistics, sociology and geography
- valuation and property development
- planning administration, control and implementation.

The presence of this inter-professional team means that the firm either offers a complete planning service from its own resources, or, for the larger and more complex projects, is able to collaborate effectively with firms specialising in such aspects as resource development, economics, engineering, transportation and management.

Shankland, Cox is accustomed to advising public agencies on the orderly implementation of development and to presenting plans in a form suitable for realisation by private sector investors.

(c) Phasing of the Work

The Invitation calls for the planning work to be done in two distinct phases suggesting that these occupy about one year each. Phase I comprises the preparation of a broad Zonation Plan, and a Perspective Development Plan covering a 20-year period based upon it. It also prepares the way for more detailed work in Phase II, which consists of a semi-detailed master plan to meet projected settlement requirements for 20 years on about a quarter of a million acres and detailed project plans in the form of "investible packages" aggregating about 50,000 acres for inclusion in the current and Third Malaysia Plans.

The Invitation further requires that the results of the Phase I studies shall be compiled in two substantive reports; the Zonation Plan within about 6 months and the Perspective Plan at the end of the phase.

We readily accept this sequence of the work programme, noting with agreement the further requirement that the work shall be scheduled to allow time for review and discussion of drafts of the various reports with the Governments before final editions are prepared and before progression from Phase I into Phase II.

There is, we observe, a desirable degree of flexibility in the Scope of Work as between the two phases, envisaging the possibility of anticipating project areas in which more detailed soil survey work for Phase II could be begun during Phase I. As indicated in our General Considerations above, we would see every advantage in making a special effort to complete both the Zonation Plan and the Perspective Plan ahead of schedule because all other stages of planning depend upon it. As we now see it, this aim should be possible. We believe that it would be an advantage to base Phase I work in Kuching where there would be easy access to the information, policies and senior officials on which preliminary planning largely depends. Phase II work would certainly have to be based on Miri.

The Invitation makes it clear that basic physical planning data are (or will be) available by the time the study starts. The only item of information in which the Terms of Reference and our own knowledge of Sarawak cause us to have some doubts concerns local land gradients. We are aware that the extensive broadly level lowland areas have a dissected micro-relief in which the gradients of comparatively short slopes are frequently excessively steep. Because the lowland area has the greatest prima facie potential for agriculture the breakdown of this broad landform into classes related to steepness is vitally important. As the Invitation points out, local differences of this kind may be masked in aerial photographs by the blanket of forest; but our experience and a brief study of a sample of the excellent photographs available lead us to believe that specialist stereoscopic examination can clarify the situation considerably, though landform analysis would require some ground checks and perhaps also low level aerial reconnaissance. Provision is made for such checks in our work and staffing schedules.

We propose a preliminary period of about $2\frac{1}{2}$ months in which air photographs are studied in close collaboration with field workers in Government departments and UNDP on soils, agriculture and forestry to identify and delineate the major land types in the Division and to determine in particular their terrain characteristics.

During the period of preparation of the Zonal Plan, studies would be undertaken and detailed discussions held with Government departments and others to ascertain policies and to assemble ideas, facts and figures necessary - as the Scope of Work puts it - to "project the structure of a balanced economy and society" in the Perspective Plan. The several fields of investigation which must be covered are of course specified in the Scope of Work. We are conversant with all of them in the Malaysian context, and only wish to comment here on the great importance we attach to what might be grouped as the "human factors" - itemised in the Scope of Work under the headings Social Aspects, Settlement Patterns and Manpower. Several aspects of Administration and Organisation also have a vital influence on human reactions and responses, determining the success or failure of settlement schemes.

Whereas the work prescribed for Phase I is definable with some precision, that for Phase II is less clear to the extent that it depends in detail upon the outcome of the Phase I studies, the amount and nature of consequential surveys involved and the directives given by the Governments (para. 37 of the Scope of Work). Our staff and work schedules shown in later sections of this Proposal are based on the premise in the Terms of Reference that the Master Plan will cover about a quarter of a million acres and that a detailed projects plan will cover some 50,000 acres in one or more blocks developed over six years to internationally accepted standards. Here again the work specified for Phase II is closely similar to that undertaken in the Jengka and Johor studies, and we do not envisage any great difficulty, within the above assumptions, in completing them within the prescribed period, especially if some time can be gained in Phase I. This saving of time would be doubly important if later field work were interrupted by an unusually wet "Landas" season.

The smooth and timely progress of the work will depend upon close continuous liaison with the Government bodies and UNDP supplying basic data and information. Discussion on policies, planning priorities and staged decision making should be a continual process from about the third month onwards. We note with satisfaction that the Government will provide procedures for this purpose. We have one comment only to make in this connection; that the Steering Committee should be kept as small as possible, limited to really vital agencies, in view of the difficulty of assembling large numbers of people so far from Federal headquarters. We have indicated in the Plan of Operations and Timetable the critical points beyond which delays in decision making would have a serious impact on the work programme.

1. B SCOPE OF WORK

1. B THE SCOPE OF WORK

The Scope of Work in the Invitation sets out clearly and comprehensively the principal studies and tasks to be done. We accept this document and include it as an Annexure to this Proposal for easy reference. In this section we take the main stages and items of the Scope of Work and indicate how, in our view, each should be carried out. We outline methods and standards which at this stage seem desirable, but which could need some modification at closer quarters to the task and upon consultation with those Government departments concerned with it.

The subjects discussed under the following headings are not of course entirely separate and the way each component task is integrated into an overall plan of operations is described in a later section.

In addition to the maps and contact prints of aerial photographs which would be put at Consultants' disposal, we would require uncontrolled mosaics at both contact scale and 1:50,000. We were gratified by a ready assurance in Kuching that prints, enlargements and mosaics would be quickly available.

PHASE I

We repeat that we would tackle this phase from the outset with a small high level team capable of assimilating and appraising all the information made available to it without delay and processing it into draft Zonation and Perspective Plans for the earliest possible consideration by the Governments.

The Zonation Plan

As we see it, this is essentially a regional statement of physical resources based on an analysis of available data and broad recommendations as to their land use potential.

Excellent aerial photographs are available of the project area and we would propose a small 'sub-unit' (2 men) attached to the initial study team who would concentrate on a rapid analysis of the air-photo cover. They would begin by using mosaics, to exclude areas of very steep topography or areas where there are other critical limitations on diversified use (such as major peat swamps); and would then go on to give more detailed stereoscopic analysis to the remaining higher potential areas.

This work would have the following objectives:-

- (i) Initially to delineate (as indicated above) land restricted by topographic or other factors from land with the apparent potential for more diversified use. To some extent this had already been done (viz. map in Invitation), but some refinement is necessary at this stage.
- (ii) To analyse, within the "higher potential" areas, those areas where slopes and changes of slope are more or less critical. This aspect of the work will require detailed stereoscopic analysis of the aerial photos (from which, in spite of the forest cover over most of the area, it is in our opinion possible to prepare a preliminary classification of sub-units of the dominant landform), but field checks and also low-level direct aerial reconnaissance will certainly be necessary.
- (iii) To analyse where settlement (fixed and shifting cultivation) is currently taking place.

This information, together with data derived from forest inventory work now being completed, and information from the forests department on timber license areas, would be put together in the form of an overall "recommended use" map.

We would expect to find that the areas showing some promise for agricultural development and settlement would begin to emerge quite early in the analysis and mapping of physical resource data and that pointers towards the areas to be developed in the first five or six years of the master plan period would also soon begin to stand out. The new Miri-Bintulu road is bound to be an influential factor here. We would aim as far as possible to avoid zoning good commercial forest for agricultural purposes, preferring to use logged land for the latter as far as possible. Early studies for the Perspective Plan, particularly those concerned with accessibility, communications, transport, marketing and administration (which would be going on concurrently with the analysis of physical resources) would all influence the final selection. Areas already heavily cultivated (as revealed on air photographs) would be avoided for planned development.

The total area it is hoped to find for a 20 year settlement programme is large - a quarter of a million acres. No matter how carefully conservation measures are carried out on it and surface run-off of water controlled, the consumptive use of water (particularly during early crop growth) will be appreciably lower than that of natural forest. There will therefore inevitably be an increased river flood hazard with serious consequences for river traffic, stream banks and to cultivated alluvial land. There will be a further hazard from the areas zoned for "traditional agriculture" in accordance with para. 15 of the Scope of Work.

We would therefore aim to provide a reasonable geographical mix of agricultural and forest land in the Zonation Plan. And in this general connection we note with interest that Government policy includes national parks. It may well be that the best use of certain of the higher steeper land would be as a natural reserve for scientific interest and for the conservation of wild life as well as soil and water. Provision for such an area was made in our plans for South-East Johor after taking into account both the flora and fauna of the area and the likelihood of a developing public interest. An important concept of land utilisation planning is that all land finally zoned as forest for productive purposes should be recognised and accepted as inviolate.

The Zonation Plan would be presented as a map in colour at a scale of 1/250,000, supported by a brief supplementary report giving a synopsis of the data on which it was based, the criteria used in land classification and the reasons behind the choices and recommendations made.

The Perspective Plan

We conceive this plan as giving life to the Zonation Plan. It is, in broad outline, the socio-economic proposals which would provide "the structure of a balanced economy and society" for the region over a 20-year period. The main emphasis is to be on the agricultural development of the suitable land identified in the Zonation Plan and the optimum use of the forest resources of the area including the development of industries associated with these and other activities.

Before giving thought to the more specific uses to which various categories of land (particularly agricultural) should be put, we would wish to be informed authoritatively of the extent to which the land in the development region was "unencumbered" and precisely what this meant. We understand that there is a tendency for unexpected claims to rights over supposedly unencumbered land to be made when the intention to develop it is announced. We would need to ascertain from the Government whether there were any parts of the region in which plans for controlled use could not be made with confidence. We would also need clarification on the status of Lambir Subis in regard to the regional plan.

The essence of the Perspective stage of planning is, as we see it, to understand the interests, characteristics and aspirations of the human resources available for developing the region and to devise a satisfying pattern of life for them in the sustained economic use of its natural resources.

We discuss our proposals for the various aspects of work in connection with the Perspective Plan broadly under the headings used in the Scope of Work. Additional headings have been used to allow further

important issues to be discussed. We should expect that a final decision on the selected area for Master Planning would be made after consideration of both Zonation and Perspective Plans.

Water Resources

The water resources work of Phase I is mainly seen as that of data collection and preliminary analysis of data for the derivation of relationships for use in Phase II engineering studies. However, the Perspective Plan will include indications of the probable requirements for water supplies and sewerage systems in the development of the region as set out in the Plan. In addition the Perspective Plan will include proposals for the water resources studies required to carry out the work of Phase II of the project. These proposals will take into account, as far as they can be defined at that stage, the conclusions of other related aspects of the Plan. The proposals will indicate the extent, methods and depth the studies should take including studies for water supplies, sewerage facilities, reservoirs, irrigation and drainage systems and flood control as well as the effects of project developments on run-off and river regimes, both as concerns flows, sediment flow and water quality.

Regarding data collection, it is clear from the Terms of Reference that no hydrological survey is provided for in the project comparable with that carried out in the Johor Tenggara study. The main basis of the water resources studies must therefore be existing available data from inside and outside the project area. Without a much greater hydrological survey input the accuracy of conclusions will depend greatly on the validity of the existing data. The effect of this on the optimisation of engineering schemes is hard to predict at this stage but it is clear the existing data collection networks are deficient in their coverage of the project area. To a certain extent the deficiency can be made good by transposition of conclusions from the Johor region. However, this would have to be done with considerable caution, paying careful attention to the differences in climate, geology and geomorphology between the two regions.

Following the comprehensive appraisal of all existing available data, we propose that a limited amount of hydrological data collection field work should be included. This would be aimed specifically at providing:

- (a) information on the effects of changes in catchment cover;
- (b) information on catchment area to yield relationships;
- (c) substantiation of existing data;
- (d) historic flood levels;
- (e) monitoring of exceptional hydrological phenomena occurring within the period of the surveys.

It would not be possible to include within the hydrological work the establishment of permanent network stations.

There is clearly a need for extension of the existing permanent hydrological network for providing data for proper appraisal of future projects. It is understood that this need is fully appreciated, and that the DID office hoped for assistance from the project in their hydrological surveys. The Terms of Reference for the study do not include any mention of, or make allowance for, the kind of hydrological survey input that would be appropriate in the region, and it can be considered that, since the data from new survey work would not be available for use until late in the studies or until further studies are commenced, a major hydrological survey contribution would be something of a separate project and should be separately and specifically described. It may, however, be considered convenient to include such work as an extra activity under the general cover of the Miri-Bintulu project. If this is the case we propose that discussions should be held to draw up Terms of Reference for the work and specifications for the equipment required. By way of a guide it could be considered that the input required should include for approximately an additional fourteen man-months of expatriate hydrologist's time, some twelve months time of a technician from the Malaysian or Brunei office of Binnie & Partners and about six locally recruited hydrological assistants for an average of twenty months each.

The pattern of the water resources studies in the Phase I work is therefore one of:

- (a) collection of all available relevant data from inside and outside the region;
- (b) the analysis of the data to draw conclusions on hydrological relationships;
- (c) the formulation of water supply schemes and sewerage schemes in relation to other study conclusions at appropriate levels of detail for the Perspective Plan;
- (d) review of existing proposals for water use including river transport and port facilities;
- (e) the definition of the direction of the studies for Phase II.

Forestry

In view of the potential significance of standing timber in the project area we make specific reference to its place in our proposed studies.

We understand that UNDP and the Forest Department will have completed inventories at reconnaissance level of all forest reserves and protected forests of likely commercial value by the time Consultants start work. It is believed that no quantitative information will be available for logged forests, although some useful timber may remain which could be exploited with advantage when land is cleared for agricultural use.

We conceive the task of Consultants, as far as forestry matters are concerned in Phase I, to be the interpretation of available inventory data and the adjustment and adaption of UNDP proposals and their integration into the total development plan. In this we would be guided, as we now see the task, by certain criteria established in consultation with the Government and UNDP. The area for economically productive forest in Sarawak is limited; one should therefore reserve the best of it for forest purposes if possible. There are formidable and complex problems associated with forest development, particularly access and extraction; the reservation of forest land should take this into account. And it follows from both of these that the fullest possible utilisation of forest and the development of vertical wood based processing industries are necessary.

Our staff proposals provide for forest data interpretation and appraisal (including Forest Department block closing reports on logged areas) and for the adjustment of existing recommendations to the overall plan. We would also regard it as necessary to consider (in conjunction with UNDP and the Forest Department) whether further inventory work is desirable and feasible in Phase II or at a later stage (and, if so, what areas) in the light of alterations to UNDP's forestry plans. It is understood that UNDP envisage more detailed inventory before the full feasibility of investment can be examined for working commercial blocks of forest. It is, of course, possible that provision for further inventory has already been made.

Assuming that the inventory reveals an adequate commercial stock of timber UNDP will also have completed recommendations for forest management and industrial processing. We would not expect the requirements of the integrated Perspective Plan to necessitate much change here, except perhaps to give added urgency to making provision to deal with timber from land cleared for agriculture. In this, as indeed throughout the timber industry in Sarawak, market prospects for traditional and new products is a matter of great concern, to which we are confident UNDP

will have paid close attention of relevance to the development region.

In the light of this study and of market opportunities and prospects (referred to earlier), UNDP's recommendations for the type, scale, and siting of new plant could be adapted and an approximate economic appraisal undertaken by them, or in conjunction with them. We would expect that particular attention would be paid to carrying processing through to the production of high value articles and to exploring the market for chips from residual timber in clear felling operations. Investigations into this latter possibility in connection with Johor timber may be relevant and useful if UNDP have not explored it. The agencies for operating these wood-based industries would be considered with UNDP.

Agriculture

The mainstay of the Perspective Plan will be agricultural development. Using the information on land use potential derived from the Zonation Plan we would draw up a programme in outline for the progressive development of a series of agricultural enterprises for the region as a whole. Each would be selected to satisfy the characteristics of the resources, as broadly defined in the Zonation Plan. Provision would be made for the introduction at appropriate points in time of a wider range of enterprises but this would depend upon an assessment of present and future technical knowledge upon which new activities can be incorporated with confidence in such a programme. The selection of all the enterprises would also depend upon the assessments of economic performance within the Perspective Plan period. Application of the results of our detailed examination of possible enterprises elsewhere in Malaysia would accelerate this selection.

The broad zonation and approximate phasing of agricultural development would provide the basis for further programming of infrastructural and settlement development, manpower and approximate training needs.

Manpower and Social Aspects

From the beginning of Phase I we would give high priority to studying the people from whom settlers would be selected both in and adjoining the development region and in the more densely populated parts of the First, Second and Third Divisions. At the same time we would ascertain the supply and suitability of all categories of personnel likely to be required to staff a development programme of the kind and scale envisaged. On an understanding of the people depends the foundation of appropriate settlement patterns and training facilities and programmes for those required to implement it.

Close consideration of human resources will be needed at every stage of the study to ensure that there is no failure to achieve the desired objectives because of a lack of settlers or because social and administrative institutions are inadequate for the planned developments or are insufficiently adapted to the felt needs of settlers from different backgrounds.

The main sources of settlers would seem to be:

- (a) The rural population of the First Division.
- (b) The upriver Iban of the Second Division.
- (c) The rural population of the Mid and Lower Rejang.
- (d) The Malay and Melanau population of the Rejang Delta and Coastal District.

A considerable body of information on these populations already exists, but a careful evaluation of this material is needed to ascertain what degrees of under-employment and population pressure in relation to resources actually do exist in the different sections of these populations. The existing information on each section would need to be supplemented by surveys to elicit systematic data on population densities, land usage, and employment opportunities. These surveys would subsequently need to be developed into studies of institutions and values (varying in depth with the different populations) in order to estimate what incentives might attract settlers to the area of development, and what types of settlement and social institutions would best maintain them in their new environment and ensure their remaining there. At an early stage, too, studies of the population already living in the area of development would be required to estimate how their interests could best be accommodated and assimilated to the planned development.

The sociological aspects of the feasibility study would need to be divided into three stages:

- (i) the collation and evaluation of existing material;
- (ii) the carrying out of fixed surveys designed to fill in the gaps in this material and bring it up to date; and
- (iii) the extension of these surveys, where necessary, into fuller studies of the social structures and value systems of the various communities. We anticipate that these last would be mainly undertaken in Phase II.

The proposals for sociological investigations fall into three categories:-

- (a) Surveys and studies of the numbers and the background of possible settlers who might come into the Fourth Division from outside.
- (b) Surveys and studies of communities at present living in the region to be developed.

- (c) Studies designed to guide the establishment of new communities in the development area.

The variety of socio-economic patterns among the possible settlers is such that it would be wise to divide the sociological investigations into three sections: an Iban section; a section for the Malay, Land Dayak and Melanau; a section for Chinese, and other peoples (including the existing populations of the development area). In each section an experienced sociologist would be responsible for collating and evaluating existing data (stage 1), and organising and supervising field surveys (stage 2), and studies (stage 3). All three would work in close consultation with one another and under the direction of the senior sociologist, who could himself direct one section.

We are familiar from experience in Malaysia and elsewhere with the sometimes conflicting factors affecting the choice of settlers. On the one hand there is the need to relieve congestion in urban and peri-urban areas and to give the landless and those with large families a fresh opportunity in new surroundings. On the other hand it is necessary that settlers shall be adaptable to a different life and have the willingness and capacity to learn and work hard at it. There are difficulties in distinguishing between a genuine interest in farming, for example, which often only comes with a successful farming background, and a natural desire for the security and independence associated with land. Again, it is important that settler families shall be capable of fitting well into a community and that there shall be among them those who are respected and with a potential for leadership.

Our studies in Phase I would be in sufficient breadth and depth to ascertain whether enough of the right kind of settler was likely to be forthcoming for a 20 year programme on the area suitable for development and to determine what sort of community environment and social structure would evoke the best from them. There will be differences between ethnic groups in this and other respects.

Settlement Pattern and Infrastructural Requirements

The planning of a network of new and expanded settlements at the regional level, and the setting up of guidelines for the design of towns and villages at the local level, must together serve two fundamental purposes:-

- (i) To provide in the short term a physical and social environment that will attract different groups of people to the project areas and enable them to contribute fully to the initial economic developments.
- (ii) To establish in the longer term a framework that will stimulate the growth of additional economic activities (including manufacturing industry and modern services) and ensure the availability of a progressively higher level of social and urban services to the whole population of the region.

Experience in a number of developing regions, and especially in South-East Johor, suggests that the following will be among the important factors affecting the planning of a satisfactory network of settlements:-

- (a) The number of people required to support different levels of facility in the health and education and other social and commercial services, assuming a progressive increase in the standard of provision.
- (b) The density of employment on different agricultural projects. This determines the size of settlement from which agricultural workers can have a work journey of reasonable length.
- (c) The prospects for the establishment of new forms of economic activity, e. g. manufacturing industry, tourism.
- (d) Present and future levels of bicycle, motor bicycle and car ownership, and levels of usage of public transport.
- (e) Maximum use of existing infrastructure, especially the main road network, and of economical additions to the infrastructure.

Some of these factors may point in different directions. The objective of physical planning will be to strike a balance that best satisfies the objectives of the New Economic Policy and the Third Malaysia Plan.

There are three special problems of settlement planning in the project region:-

- (a) The new settlers may be of several ethnic groups with different cultural backgrounds and varying requirements. For this reason, the physical planners and sociologists should work closely together throughout the studies. The physical planners should assist in designing and carrying out social surveys among the communities from which new settlers might be drawn; the sociologists should assist in planning the settlement network and especially in establishing guidelines for the design of new villages and towns and the expansion of existing settlements.
- (b) The only existing settlements of any consequence - Miri and Bintulu - are on the extreme edges of the study region. It will be necessary to consider the future growth of these two towns as part of an adequate hierarchy of service centres for the whole of the Fourth Division. The Master Plan should include outline structure maps for the expansion of Miri and Bintulu.
- (c) Over a large part of the study region the complex pattern of micro-relief will make it difficult to find satisfactory sites

for new settlements and might significantly increase costs of construction. The range of appropriate sizes for new settlements cannot be decided until the sociological, economic and resource studies are well advanced. During Phase I of the study as many options as possible should be kept open. This might mean that the location of the 250,000 acres required for settlement during the next 20 years would be determined in part by the physical potential of different parts of the region.

In the light of the problems outlined above and the factors affecting settlement patterns sub-regional and major service centres would be planned in outline in Phase I in conformity with the indications of the Zonation Plan and a skeleton communications network.

We believe that a settlement pattern that encourages a wide range of employment and income-earning opportunities and provides accessible education, recreation and entertainment usually associated with urban life helps towards prosperity, the prevention of boredom and the generation of a community spirit. Moreover, there is better prospect of absorbing the next generation in satisfactory employment than is the case where livelihood is too closely dependent on agriculture and limited land.

Communications and Transport

The main task for the Zonation Plan would be to assess the relative merits of alternative development areas in respect of general accessibility, both by public and private transport. Each land use component will have specific transport requirements, e. g. an urban settlement will make quite different demands on a transport system from those of a port.

The transportation input would form one element in a broad sieve analysis and in the context of the more general physical analysis, would probably therefore be more useful at the latter part of this first stage.

In relation to the potential demand for each land use element defined at this stage, the transportation analysis for the Perspective Plan would primarily be an optimisation process. It would attempt to assess in terms of transportation the optimum juxtaposition of strategic land uses within the region once the potential land use demands and employment prospects had been quantified.

The above information together with a consideration of terrain and soil characteristics would enable us to prepare a skeleton road network to serve the region as a whole.

We note with interest the requirement to investigate the possibilities of port construction to take the produce from the development region.

There seems to be a basic need for any plan for large scale exports, both in the short and long term. We are aware that of the sites so far considered for port facilities, that at the mouth of the Batang Banam has been studied at the Hydraulics Research Station at Wallingford (further reference is made to this later in this Proposal). If the model study indicates finally that this site is fully technically feasible we would make only a brief reconnaissance of alternative sites. Assuming that other criteria, e. g. geographical location in relation to production, are met by the Batang Banam site we would use the information available to us from the Wallingford study and from discussions with authorities on site to prepare outline engineering proposals. These would relate to facilities necessary to meet the magnitude of production projected for the Perspective Plan. Outline costs would also be prepared for use in the Perspective Plan. If, however, the Batang Banam site finally proved unsatisfactory we would consider alternative sites making recommendations for further studies as necessary, at the same time providing outline engineering proposals and costs for port facility development.

Administration and Organisation

The sociological studies to which we have referred earlier and the patterns of development to which they give rise would have an important bearing on the most desirable forms of organisation and administration.

We envisage that consideration of the organisational requirements for implementation of the final plans would fall into two parts. First the conceptual phase in which it would be necessary to review the institutions already available for the task of implementation, their objective, functions, structure and interrelationships. This appraisal would be augmented by discussions designed to establish the nature and degree of future participation in project development by both the Federal and State authorities, the apportionment of their respective responsibilities and the legal framework within which an implementing organisation would operate. We attach great importance to the need for frequent and conclusive discussions with all concerned on these particular issues.

It would, on the one hand, be necessary to determine the relative merits and desirability of reinforcing or reorganising existing institutions and authorities to accommodate the needs of project implementation. We would also expect to examine thoroughly the merits and desirability of creating a new organisation or organisations for this purpose, taking account particularly of the availability of trained and experienced manpower. Furthermore, it would be necessary to establish whether an implementing organisation would be expected to extend its functions and responsibilities to other development areas in the longer term. We would hope to complete this phase of the organisational studies when the Perspective Plan proposals are being debated.

An aspect of settlement organisation on which we would particularly seek Government policy guidance would be small-holdings, their socio-economic parameters and tenure objectives. In this connection we have already indicated our concern for flexibility of development pattern to

provide more mobility of employment. We would wish to examine this philosophy in relation to the characteristics of the peoples whom it is hoped to attract as settlers in the Fourth Division.

In the field of forestry we would examine the organisational requirements of UNDP's proposals in relation to the total plan under two main heads, logging and processing. (Silviculture and forest management are important and have important research and staff requirements, but do not involve such heavy inputs of finance, organisation and management.) We have commented earlier on the vital economic importance of efficient and expeditious logging closely coordinated with clearing for settlement. There is a prima facie case here for Government participation (if not control) possibly in conjunction with local interests and an experienced expatriate firm. These possibilities would be considered in the light of Government policies and existing agencies.

In the area of processing we would study UNDP's information and recommendations on the location, capability, capacity and efficiency of existing sawmills in relation to expected output from the Zonation Plan and the phased rate of land clearance recommended for agriculture.

Among the subsidiary agencies and institutions which we would also consider in outline would be for the provision of credit and for advisory services of all kinds (technical and social) that the participating community would need. These services in turn necessitate a range of trained staff at various levels. We should study existing Government institutions and their future plans in relation to our estimate of the phased needs for regional development.

Financing

This section and that following are closely linked with the necessary economic studies for Phase I and have therefore been located closely to the economics section.

Estimates of the overall financing requirements of the Plan form an important part of the economic studies and analysis. These would be set out and related to the overall demand and supply of funds in Sarawak and Malaysia over the Plan period. Requirements for funds would be under the normal budget heads in total and for each State and Federal Ministry involved to a significant extent in the Plan. Estimates would be made at a level of detail similar to that set out in the Second Malaysian Plan.

Exports and Imports

Estimates of the direct and indirect increases in exports and imports arising from the Plan will be made as part of the economic studies. A very high proportion of agricultural output is likely to be for export. This would include palm oil, peppers and timber and no doubt some rubber. Diversification could lead to export also of such products as tapioca and beef products. The scope for import substitutes however, which is most likely to be in the form of increased domestic padi production, is less certain since it is understood that areas suitable for wet padi production are limited in the Fourth Division. In addition to assessing the direct effects in foreign exchange terms from increased exports of agricultural and timber products and increased imports of agricultural materials and equipment and services for development, we propose to

assess in broad terms the indirect effects arising from increased consumption. Its importance will depend very much on the type of goods that will be purchased by settlers with their increased incomes, and whether these goods are imported.

Economic Studies

In selection of staff and the organisation of the work particular emphasis is given to ensuring continuity throughout the study. We also believe that a small, closely integrated team is the most effective way of undertaking Phase I economic studies. This would ensure good liaison between the economic and other studies and would facilitate close and continued discussion with Governments. It is to the latter that we attach particular importance particularly during the early part of Phase I.

The Development Economic Studies would cover the following areas:-

- (a) Identification at an early stage from existing information, the Second Malaysian Plan and discussions with State and Federal Government of an economic framework for Sarawak, against which the role of the Project Area can be identified over the Perspective Plan period. This would include a review in broad outline and at national level of the potential for future development in terms of market, natural and human resources, and financial and institutional resources.
- (b) The position of the Project Area in relation to this framework would be analysed and in close liaison with both Governments, objectives for the development of the Fourth Division would be formulated. The broad impact on the national economy and the Project Area of alternate development programmes, which seek to meet these objectives would be assessed. In this, particular emphasis would be given to the demand and use of those resources, which would be identified as being in short supply at both divisional and national level. In this respect it is expected that special emphasis would need to be given to the consequences of labour movement into the division as well as the demands and availability for skilled and trained manpower, the need for institutions, finance and the capacities of industries and services involved in implementation (e. g. clearing contractors and construction industries).
- (c) Collection of information in Sarawak and where appropriate West Malaysia, which would allow a future assessment of the needs for supporting and servicing industries to the leading sectors, and the likely need for industries, or for imports, to provide consumption goods arising from increased incomes.

If sufficient information could be obtained a regional input-output model showing the approximate demands and resource requirements by sectors would be used to assess the broad impact of alternative development assumptions on a balanced and growing divisional economy.

- (d) The main resource requirements and outcome of the Perspective Plan in both physical, financial foreign exchange and national and state economic terms would be assessed by sectors and in total. This assessment would include demands over the Plan period for finance from both public and private sectors, manpower indicating particularly the demand for skilled manpower and training requirements, and the demands in cash and physical terms to be made upon the industries and services supporting the leading sectors of agriculture, timber and, if appropriate, other industry.
- (e) In the process of formulating the Perspective Plan, in conjunction with other team members a number of agricultural and other leading sector projects will be identified. Infra-structural developments necessary to support these projects e.g. roads, ports, credit and transport would also be identified and described in outline form. These projects would be on a scale sufficient to ensure development for at least the first six years of the Perspective Plan up to the end of the Third Malaysian Plan period.

The Agricultural Economic Studies would include:-

- (f) An assessment of the market prospects and profitability of the major crops. It is anticipated that in the main, development will be confined to tree crops notably oil palm and to a lesser extent rubber. Pepper is an important crop at present however, and special emphasis would need to be given to the prospects for an expansion in the market. We would also expect that some diversification crops, including tapioca, and beef cattle may be particularly promising on a less significant scale. In the initial stages the emphasis would, however, be on the major crops and since climatic conditions are similar to the southern part of West Malaysia extensive use will be made of performance data in similar environments and would include use of the data on the wide range of crops analysed on the South-East Johor Project. Other crops, however, outside these may also show promise and would be investigated from local information.
- (g) In close consultation with the sociologists, alternative forms and sizes of agricultural enterprise would be formulated and analysed in the light of criteria and objectives identified during the studies on development economics and criteria identified in the course of the social studies.

- (h) The foregoing would result in the formulation of priorities for cropping which would be used to formulate in conjunction with the development economist and other team members, the agricultural sector activities of the Zonation and Perspective Plan, but also would identify priority projects in the agricultural sector for detailed feasibility analysis during Phase II.

The Industrial Economic Studies would cover the following matters:-

The major emphasis in Phase I would be to assess the prospects for industry and its possible location in the light of the framework and objectives outlined for the Fourth Division. The emphasis would be on consideration of those industries which are not associated with the agricultural sector and would be part of an autonomous industrial sector. It is not known at this stage whether the UNDP forestry investigation is considering further processing of timber products, which might enhance the local value-added of timber products for export. Detailed assessment of the capacity of certain local key industries to implement or support agricultural development might be necessary as a result of the general review undertaken at national and divisional level. The studies would include the detailed assessment of these industries with the particular view of identifying the national and divisional implementation capacity for agricultural development.

We conclude this outline of Phase I tasks, many of which would be expanded and tackled in more detail in Phase II, by referring to the desirability of beginning field surveys and possibly other studies just as soon as project areas and sectoral activities are identified. We discuss these surveys and studies more fully in Phase II; but we should mention here that the period during which a start to field work may become technically possible might coincide with the start of the 'Landas' season. Although we do not expect that field work would be seriously impeded, it might be difficult to make good progress if the north-east monsoon was severe, but there is little doubt that much useful preparatory work could be done to ensure accelerated field surveys as soon as conditions improved.

PHASE II

The task in Phase II is to prepare (i) a "semi-detailed Master Plan" of a large area (about $\frac{1}{4}$ million acres) selected for "settled agriculture", and (ii) a detailed project plan for about 50,000 nucleus acres for "agricultural development" during the first 5 or 6 years of the Master Plan.

Before proposing the steps we would take to fulfil these tasks, we present a point on which further clarification would be sought concerning the delimitation of the Master Plan and project areas. The Scope of Work specifies agricultural development as the prime purpose of the Plan in both cases, related however to the overall development of the region.

The area envisaged for the 20 year Master Plan is about a quarter to one sixth of the total area presently estimated as suitable for agriculture and approximately one twelfth of the development region as a whole. The more detailed treatment of the agricultural areas that master planning and project planning will involve, will in turn require more detailed attention to the adjoining forest areas if an integrated local land use plan and balanced economic development are to be achieved. We presume Government would aid Consultants to plan on such an integrated basis, making further and more detailed modification to overall forest development plans accordingly in consultation with the Forest Department and UNDP.

Much of the work in Phase II will consist of pursuing in more detail studies and projections used broadly in Phase I and applying them more specifically to policies and objectives agreed with the Governments during Phase I discussions. Our proposals for Phase II are therefore to a great extent a progression from those of Phase I. To avoid repetition of general observations and arguments we shall limit our proposals in Phase II to detail and method specifically applicable to that phase, doing so under the sub-headings used in the Scope of Work.

Soils and Topography

Using standards and units agreed with the Soil Survey Division we would combine the surveys of soil and terrain in two stages. The first would entail a further photo-interpretation of the semi-detailed (250,000 acres) agricultural area with three objectives:-

- (i) to achieve as precise a degree of terrain classification as possible;
- (ii) to delineate vegetational differences and drainage effects to the extent that they might indicate soil boundaries;
- (iii) to devise a pattern of ground surveys of soil and slope.

The last would take into account not only the general 'strike' of the country, but also the need for surveyed base lines from which to tie in rentises, and to cope with problems of access. In this connection the mode of access (helicopter, road, river) would be an important factor in determining accessibility.

The second stage in the joint soil/terrain survey would be the work on the ground. Based on our experience in soil surveys under tropical forest conditions we feel that an average rentis density of not more than 1 mile is required. It would be our intention to vary the rentis interval, so that areas with complex soils and/or terrain patterns, or areas which have a more promising agricultural potential, have a closer rentis interval.

The area(s) required for the semi-detailed Master Plan is in the Terms of Reference estimated at about 250,000 acres. The exact location of such land however will no doubt be determined in part by socio-economic considerations studied during Phase I.

Based on the aerial photo-interpretation map and the available relevant resource data we would select a number of sample areas in varying size to aid soil familiarisation, standardisation and correlation by the members of the soils team. These sample areas would also provide the opportunity to study the relationships between soils and topography at an early stage of Phase II.

As the development plan may include a variety of crops or livestock enterprises, special attention would be given by the soils team to the topographic characteristics of the study areas so as to facilitate plans for the development of semi-perennial and annual crops. To obtain sufficient information for the terrain classification "Rentis Logs" would be kept which also would include physical slope measurements along the survey lines. These slope measurements would be carried out continuously along the traverse lines and would thus not only give terrain characteristics at soil observation sites but also between points.

We are not at this stage convinced of the need for more detailed soil surveys in these priority project areas. Within the complex land-form which comprises the bulk of the potential agricultural land in the Miri-Bintulu area, soil variations may be considerable due to rapid changes in slope and the variable nature of the underlying sedimentary rocks. Detailed soil survey, even at a rentis density of 1/3 mile or less (the density used in the Jengka Triangle), may not allow the detailed soil pattern to be mapped. We have experienced this problem in Brunei, where similar land-forms and soils occur. We should therefore only recommend more detailed soil surveys in case of particular enterprises (such as irrigation schemes) or if we find, in the semi-detailed work, that there are factors of critical agricultural significance that must be further investigated. Detailed surveys, if required, might well be on a sample basis, covering not more than 10,000 acres out of the 50,000 acres to be selected for priority projects.

We would require a range of laboratory analyses to be carried out. These are listed in Section 2. C.

The final publishing scale of the semi-detailed master plan will be 1:50,000 as required by the Terms of Reference. We would also produce soil and terrain class maps at the same scale for this area.

Our suggested publishing scale of similar maps for the 50,000 acres would be 1:25,000 or larger, depending on the scale of the field maps (or aerial photographs).

Considering the generally difficult terrain conditions we would propose to study the erodibility of the main soil units. The intention is to set up field trials in connection with the Project Hydrologist and to work out erosion factors based on laboratory determinations. It must however be pointed out that the determinations of erodibility and erosion factors in different environment situations have yet to be finally resolved.

Throughout these surveys we would maintain the closest liaison with the Soil Survey Division. We may add that we have already examined some of the survey reports and map of the area compiled by Mr. J.R.D. Wall and are familiar with the Division's soil and land classification and the standards adopted for Malaysia.

Soil Suitability Classification

The Invitation calls for a soil suitability classification, presumably interpreted in map form. In Phase I the Zonation Plan will have been based on an overall land capability map translated into a broad "recommended use" map.

More specific use classification maps are likely to be needed for the Master Plan and particularly for the individual projects. These will be synthesised from the soil and terrain data, using agreed criteria and standards and in the light of the requirements of appropriate agricultural systems and crops. Different forms of classification would be required for rain-fed crops and systems and for irrigated wet padi land.

Agriculture

Under this heading we would examine in detail the agronomic prospects of all crops and agricultural systems likely to be suitable for the Master Plan and project areas (economic aspects are dealt with in a subsequent section). This study would cover estate, individual smallholder and settler enterprises. Emphasis would be given to the opportunities for diversification, both short and long term, and extensive use of the information which we have gathered in West Malaysia would be used.

We should at this stage of the study already have proceeded some way towards reviewing, in the light of Sarawak's climatic and physical conditions, the many agricultural and livestock enterprises studied in the S. E. Johor project. Conditions, in this sense, are similar enough to the northern part of Sarawak (which has a substantially lower rainfall than elsewhere in the State) to assess fairly rapidly which crops are likely to be successful from the purely agronomic point of view. Data from research stations in Sarawak would of course be valuable in making this review: we have, for example, been much impressed by the results of oil palm trials at Kabylah, near Miri, and the growth of both oil palm and rubber trees in this area is impressive.

In addition to research information we would also wish to obtain and

analyse all relevant practical experience and costs of land clearance, planting methods, cover-cropping, fertilising, pruning and harvesting. This would include family-farm labour inputs and estate practice. CDC and SDFC experience in Lambir Subis would be particularly appropriate. Costs are at present substantially higher than in W. Malaysia - mainly due to lack of contractors and their relative inexperience.

The great local importance of pepper and Sarawak's predominant position in the world market would warrant careful study of market and price prospects in a national context.

In the belief that the main agricultural activities will be long term and comparatively slow to come into profitable bearing, emphasis would be given to studying the possibilities of interim and perhaps inter-planted crops and livestock enterprises that could improve income and labour patterns during the immature years of tree crops. The prospects do not appear to be very good, but cassava, pineapple and small livestock may be worth investigation, bearing in mind the need to restrict short term crops to gently sloping land (probably not exceeding four degrees). The wisdom of giving some preference to pepper in the early years (because it attains full production more quickly) should be considered in relation to its limited market potential.

We considered, in S.E. Johor, that cocoa, certain new types of hybrid coconut and special cultivars of bananas could be developed for export markets. This is likely to be the case also in the Miri-Bintulu area, but planting trials would be necessary before these crops could contribute in a major way to a diversification programme.

We have little information at present concerning the suitability of cattle to Fourth Division conditions and the market prospects for meat and milk within reach of the area. We would wish to examine these things. It is reasonable to suppose that, as prosperity improves both inside and outside the Master Plan area, the demand for animal products will increase. There should be no insuperable technical difficulty in producing poultry and eggs, and our study of comparable environmental conditions in South-East Johor led us to believe cattle could be kept for beef both on estate and smallholder bases, but there may be difficulties in grassland management in the extensive areas of broken and dissected terrain. Many of these livestock enterprises can be highly profitable and some are as labour-intensive as rubber and oil palms. We have in mind the possibilities of beef for export. Generally we would expect that the large land areas available and low population would be a stimulus to beef enterprises. But we would expect to find that local experience and management expertise are at present lacking in cattle projects. Again, there would be no substantial diversification in this direction during the early stages of development, although pilot schemes in this and other fields might well be justified.

We note with interest that the Scope of Work enjoins the study of freshwater fish prospects on both commercial and smallholder scales. There is no doubt of the local need for animal protein in human diet, and we are aware that the techniques of fish production are well understood and the skills are available to

exploit them. Competitive supplies from the sea must be taken into account, but we would hope to make full provision for the development of fish-farming in any plans - preferably from an early stage. (A member of Huntings' staff was trained at the Tropical Freshwater Fish Research Station at Malacca).

Our study of the place of fish farming in the Master Plan region (and particularly in the early project areas) would involve close consideration of the landform and local hydrology (considered in a later section).

Likewise closely related to the soils, landform and hydrology would be the opportunities for expanding wet padi production. Here, too, the need is apparent, though the opportunities may be limited. We are fully conversant with the conditions and estimation of water requirements for double cropping.

Forestry

The main task of Consultants would be to adjust and adapt the UNDP recommendations regarding forest management and wood-based industries to the agreed Perspective Plan. We have mentioned the desirability of clarifying the extent to which the modified forest development plans should be integrated by Consultants into the Master Plan, observing here that this principle is recommended in the draft UNDP Preliminary Technical Report.

In the meantime and until these preliminary data are available and analysed, comment on what Consultants should and could do must be limited. We understand that UNDP's recommendations on management, logging and industry will be comprehensive and fairly detailed, but that the limits and the low intensity of their inventory studies may make a detailed appraisal of forest utilisation in connection with the smaller scale Master Plan more difficult.

For example, it is understood that there is little or no inventory information about forest land that has been logged, although there may be worthwhile timber left - particularly hard and semi-hard woods and much smaller residual timber of potential use for block-board, chipping, etc. Forest Department logging block-closing reports might furnish some useful data on these timber classes. Again, the reconnaissance status of the UNDP methods may preclude the accurate application of their general inventory findings to smaller areas of forest such as parts of large forests zoned for agricultural use. The UNDP team themselves acknowledge that financing institutions will require more detailed feasibility studies than it was their purpose to carry out at this stage.

The needs for further inventory will emerge from our study of UNDP data in Phase I in relation to comprehensive zonation. Assuming that more will be required as part of integrated regional development, consideration will have to be given to method and a phased programme. There may be some technical reservations about the adaption for smaller areas of the method employed by UNDP. On the other hand if other methods

are used (such as that advocated by the CFI and used by us in Jengka and Johor), inventory teams would have to be trained afresh. In all these circumstances it may not be practicable to make an accurate assessment within the Phase II period of the forestry component in the different phases of the Master Plan development programme. We would, however, expect to recommend at the outset of Phase II more detailed inventory work if the lack of it delays an early start to the large scale logging and milling enterprise that UNDP and we would envisage.

In all events we would regard it as an important responsibility to integrate agricultural and forestry considerations in a phased development programme. As far as possible full forest exploitation should precede settlement on land destined for agriculture, but without holding it up; and conversely land clearance should not run ahead of settlement capacity if this results in waste of the forest resource.

Another area in which integrated planning involving forestry is necessary is the road system. Produce extraction roads must take into account the vital importance of providing access and extraction routes for the forests; even though the latter may be well outside the settlement area of the Master Plan. In this connection we also have in mind the importance attached by UNDP to the management and planned exploitation of the mixed Dipterocarp forests at higher elevations as a "renewable resource base".

Mining

We make no proposals or provision for mineral studies in view of the comments in the Scope of Work. Observations concerning road-making materials and hydrogeology are made in a later section.

Water Resources and Hydrology

The bulk of the engineering studies will take place in the Phase II period after specific projects and potentials have been adequately located. Two stages of investigations may be identified, preliminary investigations for establishing feasibility and investigations leading to specific project proposals. In the case of water supplies, work on project proposals may be able to commence as soon as demand locations have been identified. In the case of irrigation or drainage developments, it will be necessary to wait for conclusions of soil and topographic surveys before project designs can be carried forward to any useful extent. Flood studies and investigation of projects for flood control and flood mitigation can be expected to be important and attention will be given to these although the available data may be limited. The location of certain demands for flood control may be identifiable early in the Phase II work but certain demands may not be known until after other aspects of projects have been investigated

and proved feasible at a fairly advanced level. There will be inevitably, therefore, a large but presently indefinable amount of detailed project design work concentrated into the end of the project period. The approach to the Phase II studies will take account of this and endeavour to complete as much as possible of the general studies and appraisal of Phase I conclusions early in the Phase II work so that there will be adequate manpower resources for the more detailed project studies which depend on other disciplines for their data.

The general scope of the Phase II work will include the following:-

- (a) review of Phase I conclusions and the refining of run-of-river and storage yield relationships;
- (b) the formulation and design of water supply schemes and sewerage schemes at appropriate levels of detail:
 - (i) for the Master Plan and
 - (ii) for the immediate developments;
- (c) preliminary evaluation of flooding;
- (d) the prediction of demands for water from different users and their rates of growth;
- (e) the examination of conservation projects including surface storage;
- (f) the evaluation of specific flood control projects;
- (g) the prediction of water quality developments and necessary controls;
- (h) the prediction of the effects of developments on other water users;
- (i) the review of hydro-electric potential;
- (j) the formulation of engineering proposals for any drainage and irrigation schemes that may arise from other study conclusions;
- (k) the preparation of Terms of Reference for future water resources studies that are recommended.

Projects designs will specify the capacity of all hydraulic structures and will include outline drawings of proposals in sufficient detail for use by Government agencies to prepare working drawings of small structures. Site investigations will not be carried out in the project but Terms of Reference for site investigations will be included with the final report.

Water supplies for agricultural use as distinct from that needed in the industrial processing of agricultural crops is likely to be limited to paddy irrigation and crop nurseries. The requirements in both cases can be easily assessed and related to stream-flow data. As the latter are unlikely in many places to be available for significant periods of time, considerable safety margins would be necessary.

The conversion of land cover from forest to permanent agricultural crops (including tree crops) have been found elsewhere to increase stream flow and peak floods even with optimum conservation methods.

This change in river regime affects the design of dams and spillways and must be taken into account in planning the use and protection of valley bottom and delta areas.

We would aim to minimise these difficulties and dangers by our general land use planning, conservation and management recommendations. But we would also consider the early establishment of some simple catchment studies in typical local conditions to give valid information on the changes in river regimes that can be expected.

In the event of surface water being inadequate for domestic and industrial purposes in any area or location it might be necessary to call on the Geological Survey Department to undertake further groundwater investigations, despite the poor general prospects mentioned in the Scope of Work.

Industry and Commerce

We note that detailed projections for the first six years are called for both in the public and private sectors. We would have ascertained Government policy in Phase I and discussed possible amendments to it. We would also have made a preliminary review of existing and projected industrial enterprises both inside the development region and adjoining it. Again an outline of new industrial opportunities would have been part of the Perspective Plan.

In Phase II more detailed studies would be made and their implications analysed for the early years of development. Domestic and export markets would be investigated, the labour, material and capital needs and the marketing and distribution facilities involved would be examined. This would be part of a screening process; preliminary feasibility studies would be done on the more promising survivors.

The main areas of industry will of course be crop processing and saw-milling and the processing of forest produce. UNDP will have made detailed recommendations for the wood-based industry, and the Consultants' task would be to adapt their proposals to the early stages of the modified development plan. We would expect

to start adaptation from a basis of agreement with them. A point (already mentioned in another context) to which we would also expect to give attention is the utilisation of residual timber on logged-over land that would be scheduled for clearance for settlement. UNDP's inventory studies will have excluded such land and its produce may likewise have been outside their consideration. Chipping and such ancillary activities as wood packaging for crumb rubber etc., are possibilities. And again - at the risk of repetition - we might have to give added emphasis to the early establishment of industrial logging and processing plant to cope with the accelerated output of timber from agricultural land.

We would examine the optimum type, size and siting of factories for dealing with products requiring processing scheduled for the early years of planting. Similar studies would be undertaken for any other crop products that physical and market investigations showed to be promising. Cassava for stock feed and starch is one possibility.

Whilst there do not appear to be any other major opportunities for industrial development, except in connection with oil industry, or particular advantages in the development region to encourage industry, minor industries will grow as general development takes place and may require specific measures for their encouragement. Such measures would include making sites, materials, equipment and credit available and technical training.

Commercial activities will play an important part in development and ample provision would be planned for them in the local and major service centres. We would recommend measures to attract people of entrepreneurial ability to the project areas to staff shops, markets, handicrafts and other commercial activities.

In considering all these industrial and commercial opportunities close co-ordination would be given to subjects discussed under later headings - the attitude of people towards them and the need and supply prospects for physical and social services.

Settlement Pattern and Infrastructural Facilities

We stressed under Phase I that the key to preparing a successful settlement pattern is to understand the human material that will comprise the settlers and industrial labour in the development area. And it is, of course, particularly important that the pioneer projects of the Master Plan should be seen and accepted as successful by other potential settlers.

The following basic questions would need to be considered in relation to master planning:-

- (a) New types of settlement.
- (b) New types of social and economic organisation (e.g. co-operatives).

- (c) Greater participation in a cash economy.
- (d) The acquisition of new skills.
- (e) The development of new administrative structures.
- (f) The relationship between public and private sector development.
- (g) Relations between settlers of different social and geographical backgrounds.
- (h) Relations between settlers and the present occupants of the region.

The general approach would be from the premise that settlement programmes create new social conditions including new organisations, procedures, regulations, opportunities and incentive systems in which settlers must decide and act. We should therefore expect to carry out a study of the present administration of development and of existing development schemes. This should include the Lambir/Subis area and projects such as Youth Settlement Schemes to be started during the period of the Second Malaysia Plan.

Cooperatives may play an important part in the proposed development region. It would seem advisable to pay particular attention to existing attempts to introduce cooperatives as these organisations carry expectations which are not always consistent with traditional social structures.

A study of the social aspects of existing methods of timber extraction would be important. Particular attention should be given to the organisation of labour and the relations of the migrant labour force to the home community.

A study would also be desirable of the problems facing the development of entrepreneurial activity among the indigenous peoples.

Finally, a short study of school leavers would be helpful, as Government has suggested that Youth Settlement Schemes be started in the Fourth Division to provide employment for these school leavers and to give them an opportunity to farm in the absence of some of the constraints imposed by traditional social structures and farming methods.

During the course of these studies we would aim to have frequent discussions with Mr. Grypstra whose work is relevant.

Armed with the kind of human information discussed above and with our experience of designing community settlements elsewhere in Malaysia, we would prepare type layouts of villages, local centres and townships as appropriate. The pattern would depend to some extent upon the size and disposition of settlers' agricultural holdings in relation to the village and

the area of the house-lot recommended.

An aim of design would be to combine some security of housing with flexibility of employment choice. It should be possible to locate each village within reasonable travelling time of agricultural and other enterprises.

Infrastructural Facilities

It is important that every community should have (or have easy access to, according to its size) ample facilities for recreation for all ages both indoors and out. Their proper provision involves planning on the ground, and the institutional arrangements to encourage full community participations.

Similarly, for contented settlement, good services of health and education are essential. We believe that accessible schools of good standard will be a potent inducement to migration to new settlement areas; and this is likely to become increasingly important with the general advancement of the community. We would plan accordingly.

As part of the pattern of development we would also make recommendations for the type and standard of housing to be encouraged, and the water, sewerage and power services that should be made available. There are high standards of rural housing in many parts of Malaysia in which the owners take great pride and interest - attitudes worth fostering. Project areas should, we believe, have the quality of housing and environment which the people have shown they can create quickly and at low cost. Traditional methods and styles of housing lend themselves to industrialised methods of construction by local timber processing plants. Variation in design and provision for extension should be encouraged to cater for different family sizes and tastes. The terms on which houses can be built or acquired, and the provision of grants, loans and mortgages would need definition.

In the reported absence of groundwater supplies village water systems will have to rely upon run-of-river intakes, villages being sited and grouped with such systems in mind. For the sake of reasonable economy domestic supply would probably have to be stand-pipes distributed through the village. Individual connections might come later for those who could afford them.

In considering sewerage requirements we would expect that houses in villages, and initially in local centres would use standard pit latrines, with septic tanks for grouped higher density purposes. Town plans could allow for the provision of sewerage pipes and treatment works.

The prime importance of power supply will, initially at any rate, be for industrial and processing purposes; and would be sited accordingly. The optimum location of such industrial plants will have to take account

of distance from the supply of new material and the comparative supply of raw materials and the comparative geographical and cost advantages of gas and possible hydro-electric projects. These developments have to be studied in a wider context than the immediate regional Master Plan. For domestic purposes we would wish to examine the feasibility of providing electric light for village communities as soon as possible in view of its importance in encouraging social and educational activities after dark.

The framework of communities, roads, amenities and services proposed would be designed for the phased development of the early project areas.

Communications and Transport

The communications facilities devised for the first six years of Master Plan development would involve a more detailed treatment of part of the long term network and system outlined in Phase I. And, though designed with the immediate objective of serving the first stages of settlement and agricultural production, it would have to take account of forest exploitation plans in the vicinity, whether part of the Master Plan area or a separate project having access through it. Logging routes should, as far as possible, coincide with alignments along which permanent roads will eventually run. They help to consolidate them, avoid damage to land needed for other purposes and significant economies of road length may be achieved.

There will be a need for a well thought out network of minor roads to facilitate crop harvest and transport, and to encourage mobility of labour and commerce. These roads should (again as far as possible) follow contours and conform with the conservation pattern of land use.

An estimate would be made of the load carrying requirement of these and the major roads, having due regard to Government policy and regulations for the axle loads of vehicles - particularly timber lorries. Outline designs and specifications would be developed for each class of road, taking into account the soil mechanics of the country traversed and the characteristics of the road-making materials available and appropriate for each class. Consideration would be given to the comparative merits of making roads to full design width at the outset, or adding to them at a later stage to cope with full traffic densities.

Having determined road standards and designs, we would consider how best they could be built; the extent to which full mechanisation was desirable or alternatively partial mechanisation and increased opportunities for manual employment. We would also enumerate the technical staff required for the programme envisaged.

The programme itself would be phased to correspond with the broader pattern of development, preferably going somewhat ahead of it

to facilitate access, supervision of project work and the removal of timber.

The study of all these aspects of the road system and the quantification of the equipment and human requirements for building it would enable us to estimate costs for unit lengths of each class of road and for each year of the six year development period. It would also be feasible to estimate the value of produce carried by the system.

We note the instruction in the Scope of Work for Consultants to prepare projects for public transport requirements. Much would depend upon Government policy in this field; decisions concerning the status of the logging organisation established, and the agency responsibility for the different stages of movement of agricultural produce. Again, the provision of public transport (bus services could be a Government or private enterprise). We would, however, estimate the traffic expectation in these various categories and make recommendations as to the kind and quantity of transport equipment needed to cope with it. The capital and recurrent costs of Government participation would also be estimated.

Assuming that the Perspective Plan showed promising prospects for development and that the preliminary studies of possible port sites were favourable, it might well be advisable to take port studies a stage further. At the same time an appraisal of the merits of newer transport as an element of the Master Plan would be made.

Port Studies

It is difficult at this stage to forecast exactly what specific port studies might be needed. Of the two sites, on the project area coastline, which appear most favourable (Kuala Baram and the bay below Tanjong Kidurong) the former has been the subject of a model study at the Hydraulics Research Station, Wallingford. The latter has not been studied.

Kuala Baram could provide a reasonably deep-water coastal port by the provision of training banks at the river mouth, which would also permit sizeable cargo boats to operate a long way up the Baram. The model studies so far completed have shown the scheme to be technically feasible, subject to two further problems requiring investigation. These are the extent of salt-water intrusion up-stream following construction of the training walls (with consequent effect on siltation), and the possibility of erosion of the coast south of the river-mouth. An extension of the present model study can determine the former question: the latter, connected with movement of sand along the northern coast, requires fieldwork. We have recently visited Wallingford, in company with Mr. Stephen K. T. Yong, Deputy Chief Minister and Minister for Communications and Works, Sarawak. The

additional studies could be completed in time to coincide with the work of the Miri-Bintulu regional study but the present model cannot long be retained at Wallingford. Once it is destroyed, it would be enormously expensive to carry out the additional studies. It does seem to us important that the opportunity should not be missed to complete technical feasibility studies while the present model still exists.

Clearly the justification for a new port, wherever it may be best situated, must depend on economic considerations also. These the regional study must clearly indicate, and it is not possible at this stage to suggest whether or not they would prove favourable to construction of port installations. If they did, however, and if they further indicated that the Kuala Baram site best suited development needs, failure to complete technical studies using the present Wallingford model could lead both to delay and greatly increased costs. Completion of port development in all its aspects could well occupy several years, during which interim facilities may be necessary. We would therefore examine the extent to which short term installations prior to more permanent development could be utilised.

Manpower

We discussed manpower in terms of the selection, adaption and training of settlers in an early section because we believe settler suitability to be basic to the choice of patterns of settlement. Under this heading we comment on manpower as related to personnel requirements (excluding management) for the first six years in the public and private sectors of agencies and organisations operating development. Manpower studies in this context would of course be closely dove-tailed with the evolution of our thinking on patterns of settlement and the kind of administration and organisation set up to implement development. Indeed manpower requirements will be largely dependent on them. In a much smaller degree certain categories of personnel will depend upon policy decisions as to what preparatory work should be done by settlers themselves or for them in advance of their arrival by others.

Our studies, as the Scope of Work requires, would be "detailed projections" of manpower needs, taking into account the capacity of existing Government departments and relevant organisations, and their plans for expansion. We would expect from our experience that the requirements for technical, advisory and supervisory personnel at most levels would be relatively heavy in the early years of a new large and complex enterprise. There would be a decline later, probably beyond the six year planning period.

We propose here to do no more than list some of the more important fields of activity which we think at this stage may present particular personnel demands.

Public Sector

1. Detailed project planning; supervision and monitoring of implementation.

2. Supervision of contractor clearing, soil conservation and drainage.
3. Survey, layout and demarcation of land and holdings.
4. Establishment and maintenance of plant nurseries.
5. Agricultural advisory and supervisory services, including irrigation and fish farming.
6. Village and township layout and plot demarcation; land title registration.
7. Supervision of housing construction (built by settlers or contractors).
8. Settler selection, reception, guidance and social services generally.
9. Public services, construction and operation; health, education, police, etc.; water supply, power, etc.
10. Road layout and construction.
11. Marketing organisations, cooperatives and credit facilities.
12. Forest management.
13. Participation in logging and wood processing industries.
14. Public transport.
15. Supervision of port construction.

Private Sector

1. Contractor capacity for land clearing, building, road construction, etc.
2. Processing industries, in particular crops, logging, saw-milling and wood based manufactures.
3. Transport services.
4. Port construction.
5. General commerce.

A review of manpower requirements in these fields will almost certainly reveal a need for professional and technical personnel beyond existing supply. We would examine the output - quantity and quality - of

all relevant training institutions and their plans and capacity for expansion to meet the needs of Fourth Division development. We would make recommendations for filling the gap between projected supply and demand including temporary expatriate assistance.

Financing

In Phase II of the study the financing of the semi-detailed and detailed plans for development becomes closely linked to the economic studies which would be an essential part of our studies. This aspect of the task therefore is considered under a later section "Economic Studies".

Administration and Organisation

In Phase I we would have hoped to achieve a considerable measure of agreement on the philosophy or concept of the administrative and organisational requirements of the final Master Plan.

The second phase of activity in this field therefore would consist essentially of defining in detail the objectives, functions and responsibilities of the selected form of organisation and preparing detailed proposals for its structuring, staffing and training requirements. A desirable rate of growth for the organisation would be determined, compatible with the speed of project development, availability of trained personnel and the magnitude of training facilities for staff appointed.

Definition of function for individual personnel would be important whether the organisation was based upon existing institutions or was a new creation. Bearing in mind that shortage of personnel may well impose constraints upon effectiveness of administration we would also examine, and make recommendations where desirable for the introduction of recording and control systems and the use of mechanical aids to maintain them.

Although no mention is specifically made in the Terms of Reference to prerequisites for implementation we should expect to draw up a programme of important activities necessary to the setting up of the organisation or organisations concerned and suggest modification which may be necessary to the law or laws under which the implementation machinery would be established.

The organisational needs for implementation of overall development particularly in the first six years of the programme would be urgent. However, as the pattern particularly of agricultural enterprises within the programme emerges, the servicing of these activities will also become of importance. We would, therefore, examine the facilities which may exist which, at present, cater for such requirements as marketing and credit and the present arrangements for stimulating cooperative activity, as well as the institutions which promote and supervise the settlement of newly opened up lands. In the light of our findings we would

make proposals either for their reinforcement or redistribution of activity or for the establishment of further organisations to undertake the enhanced responsibilities resulting from perhaps more rapid and larger scale settlement of the project area.

Economics

In the early part of Phase II it might be necessary to revise the Perspective Plan and reformulate some of the priority projects in outline form arising from the comments by the Steering Committee in its review of the Perspective Plan. Apart from this, special emphasis would be placed on bringing the priority projects up to a sufficient level of detailed analysis for submission as loan application. This might involve some further detailed work and gathering of information on costs. It is difficult, at this stage, to predict the number of such projects and therefore the work load, and it might be necessary for the development economist to assist in some of the agricultural project evaluation. It is for this reason that we attach particular importance to the assigning of a development economist who has considerable background knowledge of agricultural sector problems and experience of agricultural sector feasibility studies. During the detailed formulation of the priority projects their phasing would be continually reappraised to ensure that the combined outcome conforms to the Perspective Plan and is feasible within the overall limitations imposed at both national and divisional level.

The economic appraisal of the individual priority projects would cover the normal range of analysis requirement for international lending and would include:-

- (i) Analysis of the production unit (farm level) showing the profitability to the farmer or the entrepreneur which would show the increase in his income arising from the project and his capacity to repay project charges. In the case of the provision of credit for on farm development his capacity to repay this credit would also be an outcome of the analysis. In view of the need to attract settlers into the area special emphasis would have to be given to ensuring that the levels of personal income from agricultural development would be sufficiently attractive to encourage mobility. This would be over and above the satisfaction of other social needs in terms of settlement form and type of enterprise.
- (ii) Financial analysis at implementing agency level. This would show the need for funds and assess the agency's ability to cover its operating expenses and capital costs from revenues.

- (iii) Economic analysis at state and national level. Assessing benefits and costs from these two standpoints would specifically take account of the opportunity cost of resources and take into account the distorting influence of Government taxes and subsidies.

In all these analyses discounted cash flow techniques would be used to give internal-rate of return and net present value criteria. While these analyses would be a specific part of Phase II work, similar analyses on a model crop and activity basis would be done during Phase I in order to assist crop and activity selection.

The Development Economics Studies would cover the following:

- (a) Review and analysis of alternative proposals made by the Steering Committee arising from the Perspective Plan.
- (b) Analysis from a national and agency stand-point of alternative systems of domestic water supply, of lower supply, highway phasing and where appropriate highway standards.
- (c) Continual review of the phasing and integration of the project packages in the light of more detailed appraisal and planning during this phase.
- (d) Detailed analysis of priority projects other than the agricultural and industrial sectors. This, for example, would include highways and possibly forestry project.
- (e) Assessment of the detailed implementation requirements, over time for all the projects occurring in the early stages of the semi-detailed Master Plan indicating where phasing and resource bottlenecks are likely to occur, and in conjunction with the specialists responsible for organisation, identifying the appropriate measures to overcome these.
- (f) Detailed analysis of the financial, economic and physical aspects of the semi-detailed Master Plan indicating the significance of the component project packages to the whole. The financing requirements of this Plan will be broken down between public and private sector funds. In respect of public sector funds these will be divided under normal budget heads between the major State and Federal Ministries involved. For the first six year period of the Plan, which would cover the Second and Third Malaysian Plan periods, the financial requirements and development estimates would be in the necessary detail for submission as part of these Plans. The level of detail for the remaining period of the Plan would be more of an indicative nature but where individual projects run into the Fourth Malaysian Plan period the appropriate level of detail would be shown.

The Agricultural Economic Studies would cover the following:-

- (g) Analysis in further detail of additional diversification crops if required by the Steering Committee and analysis of any further alternative forms of agricultural enterprise, which may arise as a result either of the Steering Committee's review of the Perspective Plan or from the detailed results of the human resource studies.
- (h) Further detailed analysis of the priority projects including full project evaluation.

The Industry Economic Studies would cover the following areas:-

- (i) Further detailed assessment of the requirements for the supporting industries and services necessary for inclusion in the semi-detailed Master Plan. This would include general recommendations on the role of the private sector in providing these and the necessary Government measures to encourage this and where appropriate public sector involvement. In the latter case outline requirements in financial and organisational terms would be assessed and indicated.

It would not be possible until completion of Phase I and receipt of the Steering Committee's comments to assess the need for a detailed Feasibility Study of major industrial projects such as, for example, fertiliser production based on petro-chemical industry. Should a study of this sort be required additional staff time both in economics and technical disciplines would also be required.

- (j) Studies would also include planning for the development of supporting industries and services. In particular the sizing and location of agricultural processing plants, (especially for oil palm and rubber) and the transport mode and form for delivering oil palm fruit and latex from the farm to the mill and in process form to the port. Additional processing may also have to be considered in the light of the development of crops other than oil palm or rubber. Consideration will also be given to the role of the private sector especially in processing and transport.

1. C PLAN OF OPERATIONS

1. C THE PROPOSED PLAN AND TIMING OF STUDIES

In the preceding sections of this Proposal we have indicated how we envisage the Scope of Work being carried out. This section is to show briefly how we would co-ordinate the work into a coherent sequence of operations and how the staff input and timing would be geared to implement it.

These aspects of the work are depicted in three diagrams in the following pages:-

- (i) a bar chart to illustrate the timing and duration of the various work activities;
- (ii) a chart to show the Consortium's organisation and management structure;
- (iii) a table setting out the functions and timing of each member of the resident staff on the project.

The whole operation is geared to the production of the Zonation Plan by month 6 and the Perspective Plan by month 8 so that full consideration can be given to the multiple tasks of Phase II. We would emphasise the critical significance in this regard of the two weeks provided for Client approval of the Zonation Plan and the four weeks provided for discussion and approval of the Perspective Plan.

The first chart divides the plan of operations into the two Phases, sub-divides these into the principal plan objectives (Zonation, Perspective, etc.) and the major work activities required for each. Their starting and finishing points are shown and important stages in them are indicated.

There is a steady progression of work in which the assembly and analysis of information is timed to permit its processing and integration into each of the plans required by the Government. Points of time are marked on the chart in respect of each plan at which Government decision and approval would be sought to enable the Consultants to proceed with the next stage of the work and maintain the overall schedule. Throughout there would be close co-ordination with Government departments and liaison bodies to facilitate and expedite decision.

The key to the fulfilment of the total time schedule is the expeditious production of a sound Zonation Plan: all else stems from it. And the most important and time-consuming factor in its preparation will be the air photo-interpretation of land units in the potential agricultural land.

We have provided a month for Mobilisation before the arrival of the team in which the Project Manager would ensure that everything was

ready for a flying start. Facilities for photo-interpretation would be of special importance. It is because we believe that these facilities and close co-operation with Government departments generally would be most effective in Kuching that we have recommended that our team should be based there for Phase I.

The air photo-interpretation mapping unit would be attached to the small high level team for the first part of the phase. We plan that the interpretation work would be finished in 6-8 weeks when the unit would start map compilation, taking into account the conclusions drawn from the concurrent studies of forest and agricultural information.

It will be seen that we envisage a decision being made by the Government on the draft Zonation Plan not later than the end of month 6. Approval would be sought for the Master Plan Study Area and for the first stage projects within it at the end of month 9.

The start of soils field work (recruitment of rentis teams) is shown in the Phase II chart at the beginning of month 9.

Our concern would be that the physical and human field studies should be completed to enable the processing of information through to the Recommended Land Use stage in time to allow all the agro-economic and socio-economic planning and evaluation to be brought to a state of readiness for overall regional planning not later than the end of month 17.

Reverting to Phase I, it will be seen from the chart that the basic studies in the fields of sociology, physical planning, agriculture and economics necessary to translate the Zonation Plan into the Perspective Plan would begin in month 1 and would run concurrently, and connected with, the Zonation Plan Studies. When the two plans had acquired sufficient substance the team would be temporarily increased by specialists in - for example - Administration and Organisation and Communications.

Perspective Plan formulation would start as soon as the Zonation Plan was approved. Our aim would be to complete the task by the end of month 8 and, after a month for discussion with the Government, to finalise the Report.

Immediately the draft had been approved the principal team members formerly engaged in Phase I would begin to concentrate their attention on the more detailed work for the Master Plan area - and later on the needs of the first stage project areas. They would have laid the foundation for this work in Phase I, and their activities are shown in the chart as continuous from start to finish.

Again, a number of subordinate but important tasks are fitted into the schedule as soon as the processing of information on which they depend has gone far enough. An example is the more detailed study of

forms of organisation and management structure and functions, which should begin as soon as the patterns of land use they are to serve and administer have begun to emerge.

It will be noted that we have, at the same stage, made provision for the adjustment of the UNDP and Forest Department utilisation plans on the Master Plan agricultural area. We have not provided for further and more intensive inventory work in Phase II. Should this emerge during Phase I as desirable and feasible, separate arrangements could be made for the work.

It will be seen from the chart that we would expect to begin to identify essential components of the Master Plan within four months of the approval of the draft Perspective Plan. They could then be examined in detail and their suitability in the broader context assessed. Indeed, the whole process of planning from about month 12 onwards would be an evolutionary sequence of evaluating and testing propositions, relating them to the total concept of the plan as it emerged and integrating the acceptable components in it.

Finally, the Master Plan and the first project plans would themselves be evaluated as entities and an estimate made of their financial requirements.

Our intention is that the plans should be brought to this stage of readiness in a final draft report for submission to the Government not later than the end of month 24.

Comment on the final draft by the Government would follow and arrangements made for discussion as required. Requirements for printing of the Report would be decided at about month 21.

Project Staff Chart

The Project Staff Chart sets out the members of the team offered for the execution of the study and their associated time inputs. Many have experience of Malaysian conditions, those who worked on the South-East Johor to meet the proposed Plan of Operations Project are asterisked on the chart.

A small team of long term resident staff has been assembled who would be reinforced by a larger number of shorter term specialists. The responsibilities of the former require them to participate in the preparation of the Zonation Plan, Perspective Plan and the development programmes for both the semi-detailed and detailed areas. We venture again at this point to draw attention to the desirability of the Zonation Plan (described appropriately in the Terms of Reference as primarily a desk study) being prepared in Kuching. We would hope to discuss this arrangement if required, as we foresee the constant requirement for discussions and consultations in Kuching at that time. We would, however, anticipate that the Land Classifiers would move to Miri before the submission of the Zonation Plan.

Mr. Harbord's name is proposed for the key post of Project Manager coupled with the task of Senior Agriculturist. These are both positions which he has held with success on projects elsewhere. He would be supported by Mr. M. Reed as Deputy Project Manager. Mr. Reed's extensive knowledge of conditions in Sarawak would be valuable in the dual role proposed for him. First, he would coordinate, under the Project Manager, the office and field arrangements necessary to maintain the team on site. He would also undertake studies, have frequent consultations with interested authorities, and make proposals for the detailed organisation or organisations necessary to carry out the development programmes chosen. The latter would be coordinated by Mr. D. Searle of Shankland Cox Overseas who would also undertake the studies and consultations with interested authorities necessary to determine concepts of organisational structure and responsibility.

The production of maps, reports and illustrative material is a continuing and important task throughout this project associated with its various stages. We would assign Mr. Tucker to this task coupling it with air photo-interpretation, connected with the Zonation Plan and field soil surveys. He has experience in all these fields. We have also provided for brief advisory visits by Mr. I. L. A. Ysselmuiden whose extensive knowledge of soils and land classification in the wet tropics would add to that already available from his colleagues in the team.

As the emphasis laid upon human resources in the study is so great we have set out to achieve the widest possible spread of time on site by the sociological team. However, if it is found desirable that some additional field time is required, particularly for the supervision

of field survey data collection, we would put in some additional time at this modest level of responsibility. In these circumstances we have in mind to assign Mr. Nicholas Turner who has spent extended periods in Malaysia in the last three years during his pre-University phase. It should also be mentioned here that Miss Barbara Ward is in private life Mrs. H. Morris, wife of Dr. Morris. However, she maintains a separate academic career from Dr. Morris.

The estimated total input of man-months is 283 for all disciplines and including headquarters' supervision. The nature of the study, however, is such that the full scope of the Phase II tasks may not become apparent until well on into, or at the end of, Phase I. Reference has been made elsewhere in our Proposal to this possibility. It is, however, desirable to draw together at this point the fields of activity in which this may occur. First, it may be necessary to carry out further forest inventory work. While the preparation of such a programme would require no more than one month of the time of the Forest Inventory specialist, several months of field supervision time would be necessary, plus the assignment of field examination teams.

Second, it cannot yet be firmly established that Phase II studies of port feasibility are required. If they were, we estimate that one month of a Hydraulics Consultant and four months of a Port Engineer would be required.

Third, the desirability and opportunities for the construction of dams and development of hydro-electric power is not certain at this time. Decision to develop such opportunities as may exist would require additional manpower inputs.

Fourth, the importance of introduced industry, separate from agro-based activities, has to be established. If policy decisions require the introduction of such industries further time, perhaps four months or more, may be required.

Finally, it is not expected that the areas selected for Master Planning within the study as a whole will have substantial potential for major irrigation development. It would, however, be desirable to discuss with the authorities in Sarawak the need for further engineering and soils studies should this not be the case.

Curricula vitae for the team form part of this Proposal - Section 2. B. In addition a supplementary list is enclosed in respect of certain posts.

Counterpart Staff and Services

The provision of counterpart staff provides substantial benefits both to Client and Consultant. We place a high value upon the assignment of such staff for the purposes of this study. At the same time we acknowledge that such arrangements may place a burden upon existing establishments. While we would hope to arrange for one participant particularly in each of the fields of land classification, agriculture, sociology, physical planning and economics, it seems practical to us that this should be considered in detail should we be invited to negotiate.

We would also wish to ensure provision of suitably equipped office and house accommodation in adequate numbers, complemented by a range of transport and equipment to meet the needs of the study. Details of such needs would be presented in a full statement of local cost requirements.

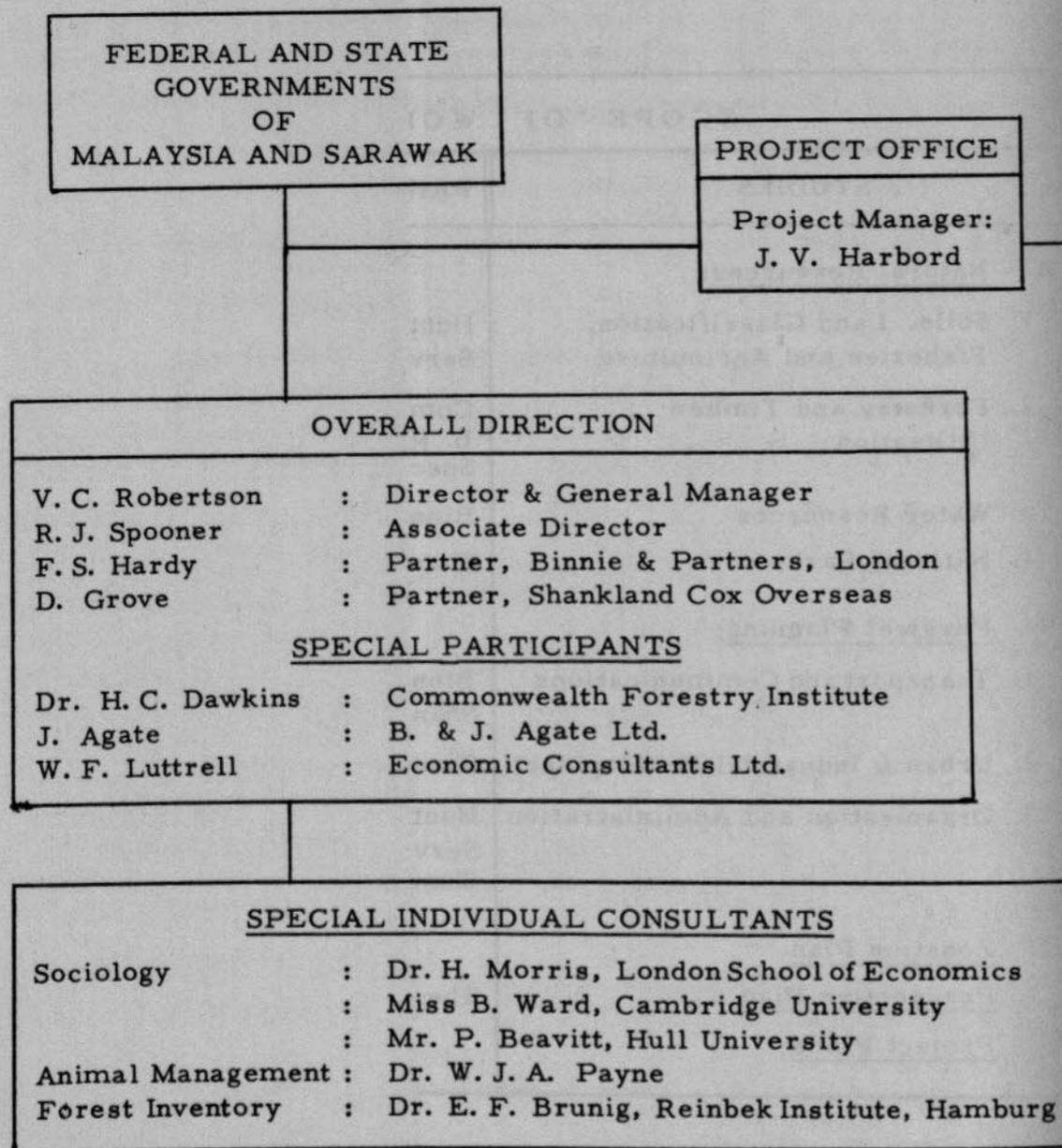
PROPOSED PROGRAMME AND TIMING OF STUDIES

PHASE I
ZONATION PLAN
PHASE II
PERSPECTIVE PLAN

OPERATION	PHASE I ZONATION PLAN										PHASE II PERSPECTIVE PLAN																
	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
	Data Collection			Zonation * Plan			Perspective * Plan		Field Data Collection					Project Selection					Master Planning				Project Evaluation Report Draft				
Mobilisation																											
Airphoto Interpretation																											
Mapping and Reports																											
Soil Surveys																											
Forestry																											
Hydrology																											
Sociology																											
Agronomy																											
Agricultural Planning																											
Physical Planning																											
Communications																											
Water Supplies & Control																											
Ports																											
Agricultural Economics																											
Industrial Economics																											
Development Economics																											
Client Consultation																											
Organisation and Administration																											

* Client Decision.

STUDY ORGANISATION



SCOPE OF WORK	
STUDIES	PRINCIPAL PARTICIPANTS
A. <u>Natural Resources:</u> 1. Soils, Land Classification, Fisheries and Agriculture 2. Forestry and Timber Utilisation 3. Water Resources 4. National Parks	Hunting Technical Services Ltd. Commonwealth Forestry Inst. B. & J. Agate Ltd. Special Consultant. Binnie & Partners. Shankland Cox Overseas.
B. <u>Physical Planning:</u> 1. Transport and Communications 2. Urban & Industrial Development 3. Organisation and Administration	Binnie & Partners and Shankland Cox Overseas. Shankland Cox Overseas. Hunting Technical Services Ltd. and Shankland Cox Overseas.
C. <u>Zonation Plan</u> <u>Perspective Plan</u> <u>Project Plans</u>	The Consortium.

PROJECT STAFF CHART

		-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Time	
																										Field	U. K.	
PROJECT STAFF																												
P 1	Project Manager / Senior Agriculturist	J. V. Harbord *																								25	-	
P 2	Senior Sociologist	Dr. H. S. Morris																								12	-	
P 3	Sociologist	P. Beavitt																								10	-	
P 4	Water Resources Engineer	T. J. Reardon *																								21	-	
P 5	Physical Planner	B. Evans																								24	-	
P 6	Agricultural Economist	Dr. J. English *																								21	-	
P 7	Development Economist	D. I. W. Berkoff																								24	-	
P 8	Deputy Project Manager / Organisation & Admin.	M. R. Read																								25	-	
P 9	Land Classifier	R. D. Law *																								19	-	
P10	Land Classifier	D. A. Holmes *																								10½	-	
P11	Airphoto Interpreter / Map & Report Control	R. B. Tucker																								24	-	
P12	Airphoto Interpreter / Fisheries	R. A. J. Harrison *																								9	-	
P13	Civil Engineer	A. T. Fairley *																								8	1	
P14	Roads Engineer	P. R. W. Morris																								4	-	
P15	Transport Planner	L. Findlay																								4	-	
P16	Sociologist	Miss B. Ward																								6	-	
VISITING SPECIALISTS																												
C 1	Forest Inventory	Dr. E. F. Brunig																								2	-	
C 2	Forest Utilisation	R. Hedley-Miller																								6	-	
C 3	Land Classification	I. L. A. Ysselmuiden *																								1	-	
C 4	Livestock	Dr. W. J. A. Payne *																								2	½	
C 5	Hydraulics	A. R. Thomas																								½	1	
C 6	Ports Engineer	J. R. Gwyther																										
C 7	Engineering Geologist,	M. Watkins																								2	-	
C 8	Senior Planner	D. Walton *																								3	-	
C 9	Organisation & Admin.	D. Searle																								1	-	
C10	Credit	D. N. Evans																								2	-	
C11	Industrial Economist	J. Fullbrook																										
HEADQUARTERS SUPERVISION																												
Hunting Technical Services																												
1	R. J. Spooner *																									3	1	
2	D. T. Sinker *																									3	1½	
3	H. A. R. Rancom *																									1½	-	
Binnie and Partners																												
4	J. Holt *																									1½	2	
Shankland Cox Overseas																												
5	D. Grove *																									2	-	

— Field Time - - - - U. K. Time
* Worked on South-East Johor Project

SECTION 2

- A. Qualifications and Experience of Consortium
- B. Personal Histories of Staff Proposed
- C. Soil Analyses Requirements

2.A QUALIFICATIONS AND EXPERIENCE OF
CONSORTIUM

2. A1. HUNTING TECHNICAL SERVICES LIMITED

Hunting Technical Services have provided consultancy services in the field of land and water resource development during the past two decades in many countries of Africa, Central and South America, the Middle East, and South-east Asia. They have also operated in the sub-continent of India and Pakistan and Australia. Brief details of studies which have a close relevance to the Miri-Bintulu Regional Study are appended below.

MALAYSIA

Jengka Project

Client: Federal Land Development Authority. Study in association with Tippetts, Abbett, McCarthy and Stratton, Consulting Engineers and Architects, New York.

Preparation of a Master Plan for settlement and development of a gross area of about 500,000 acres in what is now largely primary rain forest. Field studies included detailed soil survey, forest inventory and agricultural surveys. A land capability survey was carried out and specific crops proposed for each type of land.

The Master Plan required a complete layout for the Jengka Triangle, from basic land-use through settlements (villages with groups of small-holders) to individual projects capable of separate implementation and economically viable in their own right. A phased series of development operations were planned and costed starting with logging and clearing of the forest, development of a major new timber industry, planting the main crops (oil palm and rubber), developing villages, harvest and access roads and a new primary road system, siting and phased construction of processing plants for palm oil and rubber, locating new towns to serve a projected new rural population of over 100,000 people, and providing all other infrastructure needed by a developing community.

A full financial and economic analysis of the planned development was undertaken, showing the viability of the Plan as a whole at both international and social prices for capital, demonstrating the viability of individual projects, and analysing the effects of changes in the order of development, of price changes in the major commodities produced and of including a further area of good land to the north. The management requirements of the whole Plan were worked out and a suitable organisation and staffing proposed.

MALAYSIA

Tanjong Pengerang and Johore Tengah Regional Master Plan Project.

Client: Government of Malaysia and Ministry of Overseas Development, London. Study in association with Binnie & Partners (London), and the Overseas Development Group of the University of East Anglia and, specialist consultants, Shankland Cox.

Preparation of a comprehensive Master Plan for the economic and social development of some 700,000 acres or 1,080 square miles in the State of Johore over the development period 1971-1990. Study commenced August 1969 and will occupy two years.

BRUNEI

Land Capability Survey

Client: Commissioner for Development, Government of Brunei.

A land capability survey of the whole of the State of Brunei, as a basis for the planned development of infrastructure - roads and other services. The study took approximately 16 months, making extensive use of air photographs and using mobile field teams and helicopter transport in difficult densely forested terrain. Besides providing a basis for infrastructure planning, the survey aims at identifying land development projects.

THAILAND

Oil Palm Development

Client: Ministry of Agriculture, Bangkok.

A preliminary appraisal of the potentialities for developing commercial oil palm production in southern Thailand, prior to identification and formulation of a specific project for development.

INDONESIA

NORTH SUMATRA

Smallholder Rubber Survey

Client: Government of Indonesia, Study in association with Commonwealth Development Corporation.

A survey of smallholder rubber production and processing facilities to select areas for detailed examination with the aim of improving rubber production in the area

THAILAND

Yom Basin Study

Client: Ministry of Overseas Development, London, and Government of Thailand.

A feasibility study, in association with Howard Humphreys & Sons, London, Consulting Engineers, for the full development of the water resources of the Mae Yom Basin and its complementary land resources.

THAILAND

Chiengmai University Farm

Client: Ministry of Overseas Development, London, and Faculty of Agriculture, Chiengmai University.

A detailed soil survey and land capability classification with recommendations for future development of the University Farm.

INDONESIA

Kali Progo/Ojo Basin Study

Client: Overseas Development Administration, London. Study in association with Sir M. MacDonald and Partners.

The objectives of this study were to establish a basic hydrological network to assess the availability of water from all sources, to determine the existing water requirement and to prepare a plan for future development in

the Basin. The need for remodelling and rehabilitating existing irrigation schemes was examined and proposals for new works prepared. The hydrological and engineering studies were augmented by geological, pedological and agricultural surveys and all recommendations were submitted to critical economic analysis.

BRAZIL

Alto Turi Settlement Project

Client: Overseas Development Administration, London, and the Government of Brazil.

A feasibility study for planning the development and settlement of an area of 200,000 hectares of untouched forest in the State of Maranhao.

Several overseas projects have been financed by the World Bank, and studies have been carried out on behalf of the United Nations Development Programme (Special Fund). Several clients have been served by the firm for over forty years.

Water resources surveys have been carried out for large areas of the U.K., Hong Kong, India, Iran, Iraq, Lesotho, Malaysia, Nepal, Panama and Peru, comprising meteorological studies, surface and groundwater investigations, demand forecasts, yield estimates, reservoir operation studies and economic appraisals. Studies have been aided by mathematical models and data analysed by computer. Water resources investigations have included studies of major estuary barrage schemes and of desalting sea and brackish water. Integrated schemes are undertaken for water supply and sewage disposal.

Brief details of studies which have a close relevance to the West-Burma Regional Study are appended below.

Lima region water resources and sewage disposal studies, Peru

In October, 1968, Shute and Partners were engaged by the British Overseas Development Administration to investigate additional water resources for use in the Greater Lima region of Peru. The investigation was part of the programme of technical aid provided to Peru by the British Government.

The studies involved forecasts of population and water requirements for domestic, industrial and agricultural purposes up to the year 1980, and more tentatively up to 2001, and investigations into alternative ways of alleviating water shortage and meeting future demands. The alternatives considered included off-river storage in the lowlands, transfer of water from the Atlantic to the Pacific side of the Andes by trans-Andean tunnels and pumping (utilising hydropower from the additional water thus made available to the Pacific side rivers); storage in natural lakes in the Andean highlands, development and recharge of groundwater storage and desalting sea water.

The final report, submitted in 1970, contained economic and technical comparisons of the alternative methods, recommendations for a more detailed study of specific proposals and an outline of overall governmental administration.

2. A2. BINNIE AND PARTNERS

Countries in which engineering services have been provided by Binnie and Partners include Australia, Brunei, Burma, Camerouns, Ceylon, Cyprus, Hong Kong, Iceland, India, Indonesia, Iran, Iraq, Lesotho, Malaysia, Malta, Nigeria, Pakistan, Panama, Peru, Romania, Singapore and Zambia, as well as the United Kingdom. The firm has associated firms in Malaysia, Brunei, Hong Kong and Singapore and overseas offices in Indonesia, Iraq and Peru.

The clients for most of the firm's projects have been government departments, public authorities and industry. Some of the larger overseas projects have been financed by the World Bank, and studies have been carried out on behalf of the United Nations Development Programme (Special Fund). Several clients have been served by the firm for over forty years.

Water resources surveys have been carried out for large areas of the U. K., Hong Kong, India, Iran, Iraq, Lesotho, Malaysia, Nepal, Panama and Peru, comprising meteorological studies, surface and groundwater investigations, demand forecasts, yield estimates, reservoir operation studies and economic appraisals. Studies have been aided by mathematical models and data analyses by computer. Water resources investigations have included studies of major estuary barrage schemes and of desalting sea and brackish water. Integrated schemes are undertaken for water supply and sewage disposal.

Brief details of studies which have a close relevance to the Miri-Bintulu Regional Study are appended below.

Lima region water resources and sewage disposal studies, Peru

In October, 1968, Binnie and Partners were engaged by the British Overseas Development Administration to investigate additional water resources for use in the Greater Lima region of Peru. The investigation was part of the programme of technical aid provided to Peru by the British Government.

The studies involved forecasts of population and water requirements for domestic, industrial and agricultural purposes up to the year 1980, and more tentatively up to 2001, and investigations into alternative ways of alleviating water shortage and meeting future demands. The alternatives considered included off-river storage in the lowlands, transfer of water from the Atlantic to the Pacific side of the Andes by trans-Andean tunnels and pumping (utilizing hydropower from the additional water thus made available to the Pacific side rivers), storage in natural lakes in the Andean highlands, development and recharge of groundwater storage and desalting sea water.

The final report, submitted in 1970, contained economic and technical comparisons of the alternative methods, recommendations for a more detailed study of specific proposals and an outline of overall governmental administration.

Under the same technical aid programme, Binnie and Partners were engaged in March 1970 to carry out a feasibility study into Lima's sewage disposal problems and to consider the merits of re-using sewage effluent. Schemes were considered for sewage disposal to sea by long submarine pipelines and for treating some or all of the sewage so that it could be re-used for irrigation, industrial or potable purposes.

The report was submitted in March 1971 and contained economic and technical comparisons of the alternative methods of disposal and/or re-use. It recommended that the project be built in two stages to meet requirements up to the year 1980, and to cater for the population and flows envisaged in 2001.

Water resources study, Lesotho

Acting on behalf of the United Nations Development Programme (Special Fund), the World Bank (IBRD) engaged the services of the firm in June 1969 to undertake pre-investment studies of the water resources of the Kingdom of Lesotho, (formerly Basutoland) and a scheme to export water to the Republic of South Africa.

Lesotho covers an area of 33,350 sq. km. in Southern Africa mostly at elevations higher than 1,850 m above sea level: the headwaters of the Orange river rise within its boundaries. Except for agriculture, animal husbandry and a little diamond mining, there are virtually no industries in Lesotho. The firm is being assisted by Kennedy & Donkin and Hunting Technical Services on specific aspects of the study. The final report is in draft and includes an inventory of the country's resources with volumes covering irrigation and domestic water requirements as well as the report on the bulk water export scheme.

Kathmandu water supply and sewerage studies, Nepal

In December 1970 the World Health Organisation, acting on behalf of the United Nations Development Programme (Special Fund), engaged Binnie and Partners to carry out water supply and sewerage studies in Greater Kathmandu and Bhaktapur, Nepal. The work includes preparation of master plans for developing facilities to meet requirements up to the year 2000; proposals for unified management of future water supply and sewerage developments; and a water resources survey, including groundwater exploration, to determine the optimum allocation of water for public supply and for irrigation. A leak detection and performance survey of the existing water distribution system is also to be undertaken.

Other U. K. companies are assisting the firm on specific aspects of the study. They are George Stow & Company (Overseas) Limited (geophysical surveys, test wells), Bristol Waterworks Company (leakage survey, computer analysis of distribution), Hunting Technical Services Limited (agriculture) and Arthur Collins and Company (financial aspects).

Hydrological survey of Iraq

Between 1956 and 1963, Binnie & Partners carried out a hydrological survey of Iraq jointly with Harza Engineering Company of Chicago. The report on the survey, including a reticulation study of the river Tigris, was submitted to the Iraq Government in 1963. The survey covered five main aspects:

- (i) Compiling, evaluating and re-computing existing data on river flows and meteorology in the Tigris and Euphrates river basins.
- (ii) Setting up additional river gauges, sediment measuring stations and rain gauges, including training Iraqi personnel in their operation on a continuing basis.
- (iii) Determining probable maximum floods in Iraq and probabilities of floods of lesser magnitude.
- (iv) Evaluating the degree of flood control and amount of water made available for irrigation and other use on computer-based studies of various combinations of reservoirs.
- (v) Developing rules for operating reservoirs and recommendations for procedures to control the rivers.

Llanos de Cocle water resources and irrigation study, Panama

During 1969-70 Binnie and Partners carried out a water resources and irrigation study of the Llanos de Cocle, a tropical region on the Pacific coast of Panama. The irrigation of some 7,000 ha is possible but, due to marketing and economic constraints, only 1,200 ha are recommended for immediate development. Soil surveys and crop trials were conducted by the Government of Panama under the firm's direction, in association with Hunting Technical Services Limited, London.

Sandakan development of groundwater resources, Malaysia

Two reports on water supply for Sandakan were submitted to the Government of Sabah in 1967 by Binnie and Partners (Malaysia), an associate of the London firm. One comprised an overall survey of water supply while the other covered the development of groundwater resources.

The population of Sandakan, the largest city in the state of Sabah (formerly North Borneo), is expected to expand at the rate of about 4 per cent per annum. By 1966, extraction from the existing wells supplying the city had almost reached capacity, and salt water intrusion occurred when those near the coast were extensively pumped. The firm's task included the preparation of a programme of future development which could be linked with varying growth rates.

Having assessed the current supply and demand, the firm examined the performance of existing boreholes, conducted flow measurements on the streams in the area and investigated the geology of the underlying sandstone beds. An outline scheme of production wells suitable for staged construction to supply 9,100 cu. m a day, together with measurement and control works for a comprehensive hydrological survey, was recommended as a first stage in larger development. In 1969-70 the works were under construction at a cost of M \$4.5 million (about US \$1.5 million).

Kuala Lumpur future development plan, Malaysia

To meet the future water demands of greater Kuala Lumpur, the Government of Selangor invited Binnie and Partners (Malaysia), an associate of the London firm, to prepare a Master Plan for water resources phased development. Simultaneously, the firm was to engineer extensions to the Klang Gates reservoir, the main existing source of supply. The firm submitted reports on phased development in 1966 and 1967.

Population projections for the city over the next 30 years predict an increase from 800,000 to between two and three million. Correspondingly, the daily demand for water will rise from 300,000 to 860,000 cubic metres. The firm examined all potential sources of supply to assess their probable yield, ease of conveyance and whether liable to pollution in excess of World Health Organisation recommendations for domestic water supply. The present and future water requirements of other users were also studied. Five practicable schemes emerged for comparison on a total present worth basis at different discount rates, and at high and low growth rates.

The most suitable for development proved to be a staged scheme on the Sungei Langat, so a programme of expenditure was prepared for each stage of this project, and annual cost and recommended water rate tables were prepared. The firm was later appointed to engineer the scheme, external finance having been made available by the World Bank.

Meanwhile in 1964, following an initial survey, Binnie and Partners (Malaysia) were engaged to establish and operate a comprehensive network of hydrological stations in Selangor to provide the basic data, in conjunction with existing hydrological information, to carry out the Master Plan studies. The work of the hydrological survey continues.

Bandar Seri Begawan water supply and sewage disposal

Since 1960 the firm have carried out a number of water supply works for Bandar Seri Begawan. In 1964 the first scheme was completed; this involved a 21 m high dam on the Sungai Tasek and extensions to the existing water treatment works. Since then the firm has carried out a reticulation scheme for the city and the Sungai Tutong, involving a river intake, a 36,000 m³/day treatment works and 88 km of pipelines are under construction.

Work started in 1968 on a £2½ million scheme for providing Brunei township, the capital of the State of Brunei, with a sewerage system and sewage treatment works. Binnie and Partners of London are the consulting engineers to the Brunei Government for the project.

The presence of exploitable oil reserves in the State has led to rapid development in recent years and the population of Brunei township doubled between 1947 and 1960. This high rate of expansion is expected to continue and there is provision for major extensions in the design of the scheme.

All pipelines are being laid over a foundation of bakau piles because of the poor ground conditions prevailing and they are protected against a corrosive subsoil having pH values as low as 3. There are 29 km of asbestos-cement sewers and rising mains up to 900 mm diameter.

Five sewage pumping stations are included and from the largest of these the whole flow will be pumped 2.5 km through twin 600 mm diameter steel pumping mains to the treatment works. Because of the hot climate, special precautions have had to be taken in the design and construction of the sewerage system to provide sulphide control.

The treatment works occupy a mangrove swamp down-river of the town and this was reclaimed by tipping 69,000 cu. m of material, protected on the river frontage by 15,000 bakau piles and 3,800 cu. m of rip-rap. All the major structures at the works are supported on reinforced concrete piles up to 30 m long. The works can be extended at a later date to provide full treatment if required. Initially sludge will be disposed of by discharge into the river during the first two hours of the ebb tide; eventually it will either be barged out to sea or mechanically dewatered.

Johore State master plan study, Malaysia

Between 1969 and 1971 the firm, in association with Hunting Technical Services, Shankland Cox & Associates and the University of East Anglia, carried out a master plan development study of two regions of the State of Johore, Malaysia. The project included land planning, demographic and economic studies and the firm was responsible for the hydrological studies, domestic and irrigation water demands and resources studies, provision of public utilities, and other engineering studies. The master plan was completed in 1971.

Kudat water scheme, and other works in Sabah

The construction of a 12 m high earthfill dam, treatment works and distribution network for the town of Kudat in Sabah was completed in 1971. Treatment works for the towns of Tawau and Semporna are currently under construction.

2. A3. SHANKLAND/COX AND ASSOCIATES

Shankland/Cox and Associates have carried out several studies for international, national and private clients in the United Kingdom and in overseas countries. Brief details of those which have a close relevance to the Miri-Bintulu Regional Study are appended below.

South East Johore, Malaysia (1969-71)

Client: Hunting Technical Services for U.K. Government
(Ministry of Overseas Development) and Government
of Malaysia

A regional development plan for Johore Tengah and Tanjong Penggerang, in collaboration with specialists in agriculture and forestry, water conservation, and economic and social development. Shankland/Cox were mainly responsible for studies of the pattern and structure of settlements, the transportation network and the potential for recreation and tourism. The firm's representatives played an important role in combining the studies of different experts into a coherent Master Plan for the project area. They acquired a considerable knowledge of social and economic conditions in Malaysia, of the administrative and legal framework and of the objectives of the Federal and State Governments.

Two features of the study were the consideration of several alternative strategies for the implementation of the Master Plan, with varying participation by different public and private agencies; and a detailed recommendation for a new State-sponsored development authority to coordinate the efforts of all agencies.

Split Region, Yugoslavia (1969)

Client: United Nations as executing agency for UNDP

A plan (part of the South Adriatic Project) for the development of the principal city region in Dalmatia, with an area of 1,415 square miles and a projected population of 450,000 in 1990. The region consists of a highly urbanised coastal strip with considerable in-migration, a mountainous interior losing population, and a number of large and small islands with immense potential for tourism. Analysis of the existing plans for different parts of the region showed inconsistencies and inadequacies.

Together with a Yugoslav planning firm, Shankland/Cox made projections of population, economic growth (using a variant of the Harrod-Domar model), employment and land use requirements to 1990, as a basis for a regional development strategy. The main feature of the strategy is a policy for industrial location related to an improved road network, taking account of the limited resources available for investment in infrastructure.

Deeside, North Wales (1968-70)

Client: The Welsh Office of the U. K. Government

A study of the potential for economic and urban growth arising from the construction of a proposed new crossing over the Dee estuary, and the preparation of a planning strategy for the area. Projections of population and employment in the absence of a new crossing were made to provide a base-line for the study. A simple migration model was devised to assess the effects of changing time separations between various areas on the movement of population. The prospects of attracting new industry and other employment were considered in relation to national trends and Government policies.

The recommended strategy included substantial urban growth up to the environmental capacity of the area, with a new major shopping and service centre at a nodal point in the transport network. The economic effect on nearby existing centres was estimated. Special attention was given to the social problems arising from the migration of English people into Wales, and to the administrative problems of implementing a new planning strategy.

Third London Airport (1969-70)

Client: U. K. Government (Roskill Commission)

A study of the urbanisation needs of the proposed airport at two of the four alternative sites. Shankland/Cox worked closely with another planning firm studying the other two alternative sites; the two firms employed the same eight specialist sub-consultants.

The study included projections of population and employment in the sub-region around each site, taking account of the impact of an airport on economic development. Because of the short time available for the study, the consultants devised simplified methods of generating and evaluating alternative land use/transportation strategies for the airport regions. The social and economic costs and benefits of the selected strategy were estimated for inclusion in the Commission's overall cost/benefit study of the airport.

Outer Metropolitan Area of London (1969-70)

Client: U. K. Government (Land Commission)

The Land Commission was a new government agency set up to assemble and dispose of land for residential development in areas of considerable pressure for population growth. Shankland/Cox were appointed to study the need for residential land allocations in two counties in the outer metropolitan area of London, and to suggest modifications to existing development plans to satisfy the projected requirements. Proposals were based on a social, economic and environmental analysis, taking account of the objectives of the local authorities and of the developing transportation network and pattern of urban centres in South East England.

Expansion of Ipswich (1965-67)

Client: U. K. Government

Preparation of a plan for the expansion of Ipswich from 120,000 to 200,000 people by 1981, in the context of the long-term development of the Ipswich sub-region. The work of Shankland/Cox included studies of the history and prospects of all major manufacturing enterprises in the region, and of the projected distribution of retail expenditure between existing and proposed shopping centres. Population projections paid particular attention to the changing age composition at different stages of growth. A simple model was devised to estimate the costs and benefits (especially of transportation, engineering infrastructure and loss of agricultural output) of six alternative patterns of urban growth.

The firm collaborated with the Institute of Community Studies, who made a detailed sociological study of the people likely to move to the expanded town and their social and environmental requirements.

2. B PERSONAL HISTORIES OF STAFF PROPOSED

Post: P. I. Project Manager /Senior Agriculturist

Name: J. V. HARBORD

Date of Birth: 1921

Nationality: British

Education: Tonbridge School; University of Cambridge
Imperial College Tropical Agriculture, Trinidad.

Professional Qualifications: B.A. Agriculture (1942); M.A. (1950);
A.I.C.T.A. (1944).

Background and Experience:

Following post-graduate training in Trinidad, Mr. Harbord spent three years in Guyana as Agricultural Superintendent. Here he was responsible for "the Grow More Food Campaign" for the whole Country; for agricultural extension and development in one District; for the maintenance of a 70 hive queen breeding apiary; for the drafting of the report of the Sub-Committee on the 10 year agricultural development programme; for assisting the Director with editing of reports, publications and leaflets, and with control of budgets. The main crops with which Mr. Harbord was concerned were plantains, bananas, cassava, yams and other root crops; rice pulses, sugar, citrus and grassland. The development of dairying and mixed farming received special attention.

From 1948-1952 Mr. Harbord was an Agricultural Assistant at the London office of the Colonial Development Corporation. He had particular responsibility for rice projects either as a monoculture or in rotation with other crops, and in 1949 spent two months with an Irrigation Engineer in the Gambia, formulating an outline plan for a mechanised agricultural project in the middle reaches of the Gambia River. Rice was the main crop, but annual pulses and groundnuts had a place; also permanent crops (citrus and livestock).

From 1953-1957 he worked in Ceylon - first for Universal Crop Protection Ltd., advising planters on all aspects of pest, disease and weed control, but with emphasis on blister blight of tea. From 1955 he was at the Tea Research Institute as Technical Assistant to the Director, for whom he acted on two occasions when the Director was on leave.

Between 1957 and 1960 he was engaged first with Shell Petroleum Company in the testing and evaluation of new insecticides, fungicides and weedkillers. Later with the Northern Nigerian Government, was Principal Research Officer at Samaru Research Station, where he was responsible for finance and administration.

From 1961-1963 as a Senior Agriculturist at Fisons Leventon Research Station he was engaged in formulating development policies and programmes for the field testing and evaluation of fertilisers on a national scale on a wide range of arable crops, short and medium term leys and permanent grassland.

Hunting Technical Services:

From 1963-1966 he was Chief Scientific Officer with the Lower Indus Project, responsible for the co-ordination of all agricultural and related studies undertaken in the investigation and for agricultural development planning. Crops of particular importance were rice, cotton, wheat, brassica oilseeds, fodder crops. Livestock husbandry improvement received prominent attention. From 1966-1967 Mr. Harbord was in Lahore with the Project Planning Advisory Group. During this time he was responsible for agricultural development planning of the Sehwan Barrage complex, where intensive, irrigated mixed farming was to be developed.

From 1967-1968 Mr. Harbord was Team Leader and Agricultural Planner to the Uda Walawe settlement project (100,000 acres) in Ceylon. He was responsible for the preparation of an outline development plan for the lands to be irrigated from water stored in the Uda Walawe reservoir. Crop diversification and livestock development were important aspects on this project, and the introduction, management and feeding of dairy cattle were thoroughly treated.

In November 1968 Mr. Harbord went to Fiji as Team Leader and Agricultural Planner to the Navua project, to investigate the feasibility of establishing water control and developing intensive agricultural production in this 20,000 acre plain in Viti Levu. Here, although the main arable crop is to be rice, grasslands are of great significance, and schemes for their improvement and for greatly increased livestock production by better feeding and management are being prepared.

In July-August 1969 he returned to Ceylon for 3 weeks as Land Development Expert to the Asian Bank Mission appraising the Uda Walawe project.

In August 1969 he was assigned to the S. E. Johor Project, Malaysia as Deputy Project Manager and Project Agronomist. He was in overall charge of all agricultural planning studies and a senior member of the regional planning sub-team. This task was completed in August 1971.

Post: P. 2. Senior Sociologist

Name: H. S. MORRIS

Nationality: British

Education: Weymouth College 1926-31
Edinburgh University 1931-1935
Law Society 1935-1939
London University,
London School of Economics 1945-1948

Professional Qualifications: B.Sc. (Forestry) Edinburgh 1934
Admitted Solicitor of the Supreme Court of
Justice, England. 1939
Academic Post-graduate Diploma in
Anthropology, London University 1947
Ph.D. Social Anthropology, London University
1963.

Background and Experience:

1934-35 Work in Scotland with the Forestry Commission.

1935-40 Work as Articled Clerk and Managing Clerk in London
Solicitor's Office dealing with formation of companies, finance, and some
landed estates in London and the country.

1948-50 Fieldwork in the Coastal District of the Third Division,
Sarawak, for the Sarawak Government and the Colonial Social Science
Research Council.

1950-52 Temporary Lecturer in Department of Anthropology, London
School of Economics teaching all aspects of social anthropology and in
particular the ethnography of S. E. Asia.

1952-55 Senior Research Fellow at the East African Institute of
Social Research, Makerere College, Kampala, Uganda. Fieldwork on
immigrant Indian traders in E. Africa and participation in a large-scale
survey of the multi-racial development of Kampala and the surrounding
countryside.

1956-71 Lecturer at the London School of Economics teaching all
subjects in Anthropology and many subjects in Sociology for the B.Sc.
Economics degree. Directing research students for M. A. and doctoral
dissertations in S. E. Asia and other parts.

1963-64 Fieldwork among the Melanau of Sarawak and a survey of
potential research and of various development schemes in Thailand.

1965-70 A Governor of the Institute of Race Relations, London.

1967 Further fieldwork in Sarawak and a visit of inspection on behalf
of the Nuffield Foundation to various welfare and development schemes
supported by the foundation in America.

1968 Visiting Professor at the Colegio de Mexico (Mexico City),
teaching Latin American graduate students and inspecting Mexican and
Guataemalan development schemes.

1971 Fieldwork in Sarawak.

Relevance to Post:

For the last twenty years has been teaching the history and ethnography of S. E. Asia and supervising the doctoral theses of students in sociology and anthropology in Malaya and Sarawak, Indonesia and Thailand. Some of these students are now employed in the University of Malaysia at Kuala Lumpur. Some were working on data concerning development schemes in both Malaya and Sarawak, all of which has a direct bearing on the present project.

In addition since 1952 has been actively engaged in writing and teaching and concerned in other places with the problems of multi-racial or plural societies. In his work in East Africa he was particularly concerned with the problems of immigrant traders and the development of entrepreneurship in underdeveloped economies - all these areas of interest clearly have a direct bearing on the present project.

Publications:Books

- 1953 "Report on a Melanau Sago Producing Community of Sarawak". H. M. S. O.
- 1968 The Indians of Uganda. Weidenfeld and Nicholson, London. (Publication date 8 May 1968).

Articles

- 1956 "Indians in East Africa: A Study in a Plural Society". The British Journal of Sociology, Vol. VII, No. 3. pp.194-211.
- 1957 "The Plural Society". Man. Vol. LVII, 148. pp.124-5.
- 1957 "Communal Rivalry among Indians in Uganda". The British Journal of Sociology, Vol. VIII, No. 4. pp.306-17.
- 1958 "The Divine Kingship of the Aga Khan: A Study of Theocracy in East Africa". Southwestern Journal of Anthropology, Vol. 14, No. 4. pp. 454-72.
- 1959 "The Indian Family in Uganda". The American Anthropologist, Vol. 61, No. 5, Part I. pp.779-89.
- 1963 "Immigrant Indian Communities in East Africa". Doctoral Thesis, University of London.
- 1964 "Land Tenure" and "Social Organization" in A Dictionary of the Social Sciences, ed. J. Gould and W. L. Kolb, Tavistock Publications, London.
- 1965 "The Sago Industry of Oya and Mukah". Sarawak Gazette, Vol. XCI, No.1286, pp.107-114.
- 1967 "Shamanism among the Oya Melanau", in Social Organization: Essays presented to Raymond Firth, M. Freedman (ed.). Frank Cass, London. pp.189-216.

- 1967 "Caste among the Indians of Uganda", in Caste in Overseas Indian Communities, B.M. Schwartz (ed.). Chandler Publishing Company, San Fransisco. pp.267-82.
- 1967 "Some Aspects of the Concept Plural Society", Man, Vol. 2, No. 2., pp. 169-184.

Articles Accepted for Publication

- 1968 "Ethnic Groups". International Encyclopedia of the Social Sciences, A. Johnson (ed.). Collier - Macmillan, London.
- 1968 "The Pestou of the Oya Melanau: A mortuary chant". The Sarawak Museum Journal.
- 1968 "Economic and Social Change in the Sago Industry of Sarawak" in Essays Presented to Lauriston Sharp, W. Skinner & R.J. Smith (eds.)
- 1968 "Race Relations", Review Article. Humanist, London.

Post: P. 3. Sociologist

Name: P.S. BEAVITT

Date of Birth: 1945

Nationality: British

Education: The Judd School, Tonbridge, 1956-1963
 University of Leicester, 1964-1967
 School of Oriental & African Studies, 1967-1968
 London School of Economics, 1967-1970

Professional Qualifications: B.A. Social Sciences (Sociology), University of Leicester 1967, Upper Second Honours
 Completing Ph. D., University of London, courses taken in conjunction with Ph. D. research.

Background and Experience:

Before entering Leicester University carried out a one year assignment (1963-64) with Voluntary Service Overseas as a teacher in Sarawak. While at University undertook a study (July-September 1966) in Sarawak of Iban courtship as part of his Social Sciences studies. His report on the subject was published (1967) in the Sarawak Museum Journal.

Further studies were undertaken by him in Sarawak (July 1968-January 1970 and June 1970-January 1971) as part of his Ph. D. research into the processes of social and economic development with special reference to the factors which favour or inhibit these processes among the Iban.

Appointed a Fellow in South-East Asia Sociology in January 1971 at the Centre for South-East Asian Studies of the University of Hull. This post involves both teaching and research on social change in South-East Asia.

Relevance to Post:

Mr. Beavitt has acquired knowledge and experience in Sarawak particularly in regard to the Iban which would be of direct significance to the sociological studies.

Publications:

"Ngayap - Changes in the Pattern of Premarital Relations of the Iban". Sarawak Museum Journal, 1967.

"An Iban Funeral Near Saratok" accepted for publication in the Sarawak Museum Journal, 1971.

In preparation "A critical study of the Sarawak Development Plan 1971-1975".

Post: P. 4. Water Resources Engineer

Name: T. J. REARDON

Date of Birth: 1942

Nationality: Australian

Education: Queensland University
University of New South Wales

Professional Qualifications: B. E. (Queensland)
Certificate in Hydrology (new South Wales)
Member, Institution of Engineers (Australia)

Background:

On graduating in 1963 Mr. Reardon joined the Irrigation and Water Supply Commission, Queensland, in their hydrological section, subsequently being responsible for the supervision of all hydrology studies for the Commission and for the design and implementation of an automatic data processing system for streamflow records and for general analytical programmes using ICT 1904 and GE 225 computers.

Binnie & Partners:

In 1969 he joined Binnie & Partners as a hydrologist on the Johore Master Plan study being carried out for the Economic Planning Unit of the Government of Malaysia. In this study he was responsible for establishing a network of hydrological observation stations, including the training and supervising of staff, and for the hydrological analyses on which the water resources conclusions were based.

Post: P. 5. Physical Planner

Name: B. E. A. EVANS

Date of Birth: 1943

Nationality: British

Education: London School of Economics
University College, London

Professional Qualifications: B. Sc. (Economics and Geography)
M. Phil. (Town Planning)
Member of the Royal Town Planning Institute

Background:

After completion of his post-graduate studies Mr. Evans worked for the Greater London Council Planning and Transportation Department on urban structure plans, economic and social research and development control.

Between 1969 and 1971 he was employed by the Land Survey Department of the State of Sarawak and worked closely with the regional planning team from the University of Wageningen (Netherlands) on the regional plan for the First Division of Sarawak.

He assisted in preparation of terms of reference for regional planning study in the Fourth Division, in which he has travelled widely. For more than twelve months Mr. Evans was the only Chartered Town Planner in the Headquarters of the Land and Survey Department and was responsible for the day-to-day running of the Planning Branch. His work involved co-operation and contact with other Government Departments, semi-public agencies, local authorities and private developers. He is familiar with the social and economic problems of Sarawak.

In 1971 Mr. Evans returned to the Greater London Council where he is at present concerned with the preparation of the Greater London Development Plan.

Shankland/Cox:

Mr. Evans will join Shankland/Cox if the firm is selected for this project.

Post: P 6. Agricultural Economist

Name: J. C. ENGLISH

Date of Birth: 1941

Nationality: British

Professional and Academic Qualifications: B. Sc. (Agric.) Hons. London, 1962
 Dip. Agric. Econ. with distinction Oxford, 1963.
 M. S. 1966 in Agricultural Economics and
 Ph. D. 1968 in Agricultural Economics, University
 of Minnesota.

Background

- 1963-1966 Research Assistant, Department of Agricultural Economics, University of Minnesota.
1. Assistance on general research programme of Prof. Philip Raup in problems of land economics, particular reference to public controls over use of land in developing countries, and agricultural structural reform.
 2. Supervision in 1965 and 1966 of surveys of the rural real estate market in Minnesota and preparation of reports.
 3. Research on cost-benefit analysis of rural development projects.
- 1966-1967 Research Fellow, Department of Agricultural Economics, University of Minnesota.
 Direction at its inception of a research programme on the impact of alternative land use patterns on local government finances in the Minneapolis-St. Paul Metropolitan area. This required formulation of the model to be used in analysis, supervision of data collection and econometric analysis. The research programme is continuing currently. Part of this research was used for his Ph. D. thesis on "The Impact of Land Use Patterns on Public Service Expenditures in the Twin Cities Metropolitan Area", November 1967.
- 1967-1971 Member of the Overseas Development Group of the University of East Anglia. Apart from his academic duties Dr. English was assigned for 2 years from 1969 to August 1971 as an Agricultural Economist to the South-East Johor Master Planning Study. During this time he concentrated on the economics of tree crops and forms of settlement. He prepared investible packages for these activities.

Supplementary Information: Publications: With P. M. Raup, The Minnesota Rural Real Estate Market in 1965, Bulletin No. 26, Institute of Agriculture, University of Minnesota. 1966. With P. M. Raup, The Minnesota Rural Estate Market in 1966, Bulletin No. 30, 1967. With P. M. Raup and E. M. Schebeck, Approaches to Structural Reform in European and American Agriculture; Research Report for Regional Research Project NC53 USDA (mimeo) 1967. With J. S. Mann and D. S. Nelson, Land Uses and their Fiscal Impact in the Twin Cities Metropolitan Area 1968, Institute of Agriculture, University of Minnesota.

Post: P. 7. Development Economist

Name: D. J. W. BERKOFF

Date of Birth: 1943

Nationality: British

Education: Westminster School,
Corpus Christi College, Cambridge.

Professional Qualifications: B.Sc.

Background and Experience:

After graduating he took up an appointment with the Economist Intelligence Unit, London in 1964. He remained with E. I. U. until 1967. Among the assignments undertaken during this period were various reports and studies on South East and East Asia; an opportunity study for U. K. exports to Hong Kong; industrial location study in Nova Scotia, Canada; survey into industrial demand for gas in U. K.

In 1967 he joined the Economic Planning Staff of the Ministry of Overseas Development, London and was engaged on advising the Malaysia and Singapore Department and the East Asia Department. He visited the Far East on general Aid Talks and Singapore and Indonesia for Project Assessment.

Hunting Technical Services:

Mr. Berkoff joined the firm in 1970 and was posted as Agricultural Economist to the Kali Progo Project, Indonesia. He has been concerned with cost benefit studies of a large number of small irrigation projects within the Kali Progo River Basin. These studies have been up to a standard suitable for submission to an international lending agency. In 1971 he was assigned as agricultural economist to the Yom tributaries study where he will be responsible for the evaluation of small schemes within the context of a larger basin plan. He is also undertaking further cost benefit studies in the Nganjuk - Kediri region of Indonesia.

Subsidiary Information:

He has taken a course in Indonesian and has a reasonable working knowledge of the language.

Post: P. 9. Land Classifier

Name: R. D. LAW

Date of Birth: 1936

Nationality: British

Education: Inverurie Academy and Aberdeen University, Scotland.

Professional Qualifications: B.Sc. (Geography, Advanced Geology and Soil Science)

Background and Experience:

Following graduation in 1960 employed for two years in the Soil Survey Department of the Macaulay Institute for Soil Research, Aberdeen, engaged on semi-detailed surveys of soils of Scotland.

Hunting Technical Services:

From 1962 to 1966, Soil Surveyor to the Roseires Survey in the Sudan which involved reconnaissance surveys exceeding 5 million acres, for the selection of lands potentially suitable for irrigation. Semi-detailed land classification surveys of some 4 million acres were also undertaken with the object of assessing land use and establishing land suitability classifications.

In 1967 undertook a land capability study of a number of farms in Easter Ross, Scotland, to determine the quality of land for future development, and also a pilot survey of part of the Strath Kildonan for land use planning purposes. These assignments were followed by a period spent on the Soil Survey of England and Wales.

From late 1967 to the end of 1968 Soil Surveyor to the Brunei Land Capability Survey which studied the entire State to establish a basis for the planned development of infrastructure in addition to the identification of land development projects.

From 1968 to mid-1969 Soil Surveyor to the Navua Pre-investment Study, Fiji, undertaken to establish the feasibility of developing intensive rice cultivation over an area of 20,000 acres on the island of Viti Levu.

From 1969 to late 1970 Soil Surveyor/Land Classifier on the Johor Master Plan Study in Malaysia. This has involved investigating the land resources and assessing the land capability in an area of southern Johor State, including farm land, plantations and forest land.

Team Leader on Natural Resource Survey appraisal mission Southern Darfur, Democratic Republic of the Sudan, April-May 1971.

From October 1971 Senior Soil Surveyor assigned to Investigations and Feasibility Study of an Irrigation Project south of Lake Chad, Nigeria.

Supplementary Information:

Joint author of "Assessment of Land Quality for Primary Production" (with V. C. Robertson and A. P. S. Forbes) presented at the C. S. I. R. O. Symposium, Canberra, Australia, in August 1968.

Post: Land Classifier

Name: D.A. HOLMES

Date of Birth: 1938

Nationality: British

Education: Dauntseys School, University of Bristol.
International Training Centre of Aerial Survey, Delft.

Professional Qualifications: B.Sc. Geology (1960).
Diploma Soil Surveyor of the International
Training Centre for Aerial Survey (1966).

Background and Experience:

From 1960 to 1962 with the Air Ministry as an Assistant Experimental Officer. Carried out soil surveys for airfield construction purposes.

Hunting Technical Services:

From 1963 to 1966, as a soil surveyor attached to the Lower Indus Project in West Pakistan working on the study of waterlogging and salinity over an area of approximately 13 million acres in the Lower Indus Basin. Carried out reconnaissance, semi-reconnaissance and detailed soil surveys and land use surveys. Shared responsibility for the compilation of soils and land use maps and the writing of chapters on Geomorphology, Soils and Climate for the Lower Indus Project Report.

During 1966 attended a special course on the use of aerial photographs in soil science at the International Training Centre for Aerial Survey in the Netherlands.

In 1967 seconded to the Soil Survey of England and Wales and engaged on semi-detailed survey of an area in England.

In 1967 and 1968 was employed in Brunei on land classification and capability studies throughout the State. Duties included aerial photo-interpretation of the survey area. reconnaissance soil surveys to determine soil characteristics, land form and forest type and a study of climate and other significant factors affecting land use capability.

In 1969 and 1970 he served on the south-east Johor Project in West Malaysia, carrying out duties similar to those in Brunei in forest terrain, but at semi-detailed level.

In 1970 he also served on the Yom Basin Study in Thailand as soil surveyor, and in August was assigned to a project for six months in Indonesia, which embraced substantial aerial interpretation of the physical resources and land use in Northern Sumatra with special reference to rubber development.

He is currently working on a soil survey for an irrigation feasibility study in Northern Nigeria.

Post: P. 11. Airphoto Interpreter/Map and Report Control

Name: R. B. TUCKER

Date of Birth: 1943

Nationality: British

Education: Devizes Grammar School, Devizes, Wilts.
University College of Wales Aberystwyth.

Professional Qualifications: B.Sc. Geology (1964)
B.Sc. Geography (1965)

Background and Experience:

From 1963 to 1965 member and leader of several University of Wales sponsored expeditions to Finland, and Norway for studies on land use and social geography. From 1965 to 1968 Research Assistant at the Geography Department, University College of Wales. During this period engaged in land use, soils and vegetation surveys in England and Wales and a survey of climatic peats in Wales.

Hunting Technical Services:

During 1968 engaged as soil surveyor on the Oil Palm Feasibility Study in South Thailand. This oil palm feasibility study was based on a detailed soil survey. Also attached to the Brunei Land Capability Survey Project. This project consisted of a reconnaissance soil survey of the entire State of Brunei aiming at the preparation of a series of maps depicting suitability for agriculture and other land use. Then he was engaged in a detailed aerial photo study of the land use of Cyprus. The object of this study was the assessment of the total area under different crops for irrigation requirements. In 1969 and 1970 he was engaged on the Yom Basin Soil Survey in Thailand. Primarily concerned here with Land Classification for irrigation requirements.

In 1970 worked on a soil survey of Akrotiri Salt Lake in Cyprus to assess the suitability for reclamation of saline soils.

In 1971 involved in soil survey projects for irrigation requirements in Lesotho.

From October 1971 Soil Surveyor assigned to Investigations and Feasibility Study of an Irrigation Project south of Lake Chad, Nigeria.

Supplementary Information:

Co-author of "The Climatic Peats of Wales: An Inventory and Interpretation", presented to the Third International Peat Congress at Quebec, Canada in 1968. In the press "An exceptionally late cold front in South Africa", Weather. He has subsidiary qualifications in Economics and Zoology; and is a Fellow of the Royal Meteorological Society.

Post: P. 8. Deputy Project Manager/Organisation and Administration

Name: M. R. READ

Date of Birth: 1927

Nationality: British

Education: 1933-41 Royal Wanstead School, Wanstead.
1949-52 London School of Economics, London.

Professional Qualifications: B.Sc. (Econ.), Second class honours in Social Anthropology.

Background and Experience:

- 1942-49 Viney, Price & Goodyear, Chartered Accountants, with 3½ years interruption for War Service.
- 1952-56 District Officer in Malaya.
- 1957-60 State Development Officer, Malaya.
- 1960-62 District Officer in Malaya. Official member Port Swettenham Board - President, Town Council, Klang.
- 1963-70 General Manager, Sarawak Development Finance Corporation.
- 1971 Administrative Officer Government Housing Corporation London.

During his service in the above posts he has developed a substantial capability and experience in the following fields:-

Administrative

Committee work: Wide experience as secretary, member and chairman, in preparing agenda, writing minutes, arguing cases, steering motions and taking action on resolutions.

Organisation: Establishing the necessary structure to run land development schemes, including staff requirements, supplies, inventory control.

Office work: Experience of writing memoranda and reports, organising, establishing and managing offices, formulating policy and drafting policy papers for meetings. Created a complete office organisation to cope with a new situation.

Co-ordination: Co-ordinating the work of government departments.

Finance

Government: Custody of public money, preparation of development and ordinary expenditure estimates, budgetary control of funds, long-term financial planning, cash flow analyses of organisations requesting finance, fifteen-year financial prognosis for Development Finance Corporation.

Loan finance: Preparation of models for use in determining viable projects, repayment terms, interest policies. Loans approved totalled over \$M9-million (over £1-million).

Audit and Accountancy

Experience in auditing, book-keeping, accountancy, preparation of tax schedules, and balance sheets.

Commercial

Direction of a bus company, as official appointee. Company losing £60,000 p. a. before Government loan; afterwards making profit of £30,000 p. a.

Managing Director of Sarawak New Rubber Company, established to build and operate factories using new rubber manufacturing process. One factory completed and running, another planned and detailed preparations in hand.

Land Development Planning

Experience in preparing plan for State development, preparing detailed proposals including layouts, flow programmes, housing requirements, staff recruitment and training, roadworks, marketing requirements. Considerable experience in land acquisition.

Training

Organised training courses for all levels of staff; personally trained loan investigation officers.

Languages:

Fluent in written and spoken Malay.
Working knowledge of French.

Post: P.12. Airphoto Interpreter/Fisheries

Name: R.A.J. HARRISON

Date of Birth: 1939

Nationality: British

Education: Universities of Leicester and Cambridge.

Professional Qualifications: B.Sc. (Hons) Botany, Zoology.
Dip. Agric. Sci.

Background and Experience:

From 1963 to 1964 undertook research projects with the National Institute of Agricultural Botany, Cambridge.

Hunting Technical Services:

From 1964 to 1966 employed as a Soil Surveyor/Ecologist on the Roseires Survey in the Sudan. As well as soils work he was responsible for working out vegetation/soil relationships and in developing trials and techniques for bush clearance in a variety of climatic zones.

Attended a course in 1966 at the Directorate of Overseas Surveys on Air Photo Interpretation.

In 1967 and 1968 attended a course of study at the Tropical Fish Culture Research Institute, Malacca, Malaysia. This course covered basic freshwater biology; all aspects of fish culture, and management and extension services.

Also in 1968 he was responsible for carrying out the soil survey and land classification of several sites for the Oil Palm Feasibility Study in South Thailand.

In 1968 and 1969 he assisted in the Present Land Use Survey of Cyprus by means of air photo-interpretation.

In 1969 and 1970 he was with the Johore Project carrying out a study of the freshwater fish resources of the area leading to preparation of plans for their greater utilisation and rationalised development. During the same period he was engaged on a similar but briefer study in the Yom Basin of Northern Thailand.

In early 1971 he undertook a study tour of some important aquaculture centres in the Pacific Region. These included The Fisheries Research Station, Aberdeen; Hong Kong and the associated New Territories fish and oyster culture research stations; The Fisheries Division of the Joint Council for Rural Reconstruction, Taiwan, and the National Taiwan University; The Co-operative Fishery Unit of the University of Hawaii, The Keehi Fisheries Station, The Coconut Island Research Station and the Oceanic Institute, Honolulu, Hawaii.

This tour was followed by an appraisal and report on the fishery potential of the Cordoba No. 2 Project in Colombia.

In March 1971 he made a visit to the Alto Turi Project in Brazil to assess its suitability for fishery development. While in Brazil he visited the U. S. AID fish culture research project in Fortaleza.

From October 1971 Soil Surveyor/Ecologist assigned to Investigations and Feasibility Study of an Irrigation Project south of Lake Chad, Nigeria.

Background and Experience:

From 1967 to 1971 he worked as a Senior Research Scientist with the International Institute of Agricultural Research, ICRAR, in Ibadan, Nigeria.

He has worked in various capacities in the field of soil survey and soil conservation. He has worked in the field of soil survey and soil conservation in a variety of climatic zones.

Attended a course in 1966 at the Directorate of Overseas Surveys on Soil Survey Methods. He has worked in the field of soil survey and soil conservation in a variety of climatic zones.

Also in 1966 he was responsible for carrying out the soil survey and land classification of several sites for the Volta Dam, Ghana.

In 1968 and 1969 he worked in the Present Land Use Survey of the Cyprus by means of air photo-interpretation.

In 1969 and 1970 he was with the United Nations Development Programme in a study of the freshwater fish resources of the area leading to preparation of plans for their greater utilization and rationalized development. During the same period he was engaged on a similar but broader study in the Yon Bait of Northern Thailand.

In early 1971 he undertook a study tour of some important aquaculture centres in the Pacific Region. These included the Fisheries Research Station, Aberdeen, Hong Kong and the Research Station of the Fish and Oyster Culture Research Station, The Fisheries Division of the Joint Council for North West Territories, Taiwan, and the National Taiwan University, The Co-operative Fishery Unit of the University of Hawaii, The Kaula Research Station, The Coconut Island Research Station and the Oceanic Institute, Honolulu, Hawaii.

This tour was followed by an appraisal and report on the fishery potential of the Cordoba No. 2 Project in Colombia.

Post: P. 13. Civil Engineer

Name: A. THOMPSON FAIRLEY

Date of Birth: 1927

Nationality: British

Education: Edinburgh University
Imperial College, London

Professional Qualifications: B. Sc. (Civil Engineering)
Diploma of Imperial College, hydro-power
engineering
Member of the Institution of Civil Engineers
Member of the Institution of Water Engineers

Background:

Prior to joining the firm Mr. Fairley worked in the water departments of two United Kingdom authorities, and from 1956 to 1958 he was employed on the design and planning of large hydro-electric works for the Electric Power Commission, Ontario, Canada.

Binnie & Partners:

Mr. Fairley joined Binnie & Partners in 1958 and worked as a design engineer on the hydraulic and tunnel design for the 104 MW Cameron Highlands hydro-electric scheme for the National Electricity Board, States of Malaya.

Between 1960-62 he was resident engineer on the construction of sewers, a pumping station and a sewage disposal works for a rural community for Caithness County Council in Scotland: and from 1962-1966 was resident engineer on the construction of sewers, sewage pumping stations and sewage treatment works for Boston Rural District Council, England.

In 1966 Mr. Fairley was appointed as Senior Design Engineer and until 1969 was working on a water resources report for the Wessex Water Board, for a report on the control of the Euphrates river for the Government of Iraq and for a number of sewerage and sewage disposal schemes in Lincolnshire, including a 2.5 km. long submarine outfall for Spilsby Rural District Council.

In 1969 Mr. Fairley became a member of the resident team engaged on the Master Plan Study for the south eastern part of the State of Johore for the Government of Malaysia. On this study he has been responsible for the engineering work on water demands and resources and provision of public utilities generally.

Post: P. 14. Roads Engineer

Name: P. P. W. MORRIS

Date of Birth: 1937

Nationality: New Zealand

Education: Canterbury University, New Zealand

Professional Qualifications: New Zealand B. E.

Background:

Mr. Morris joined a firm of Consultants in New Zealand in 1960 and worked on the design and head office supervision of construction of reinforced concrete and steel buildings. In 1963 he took a short course in building at the University of Rome, subsequently joining an Italian firm on the design and specification of 2,700 km. of roads in Iran, Peru and Saudi Arabia, and later working on the technical co-ordination of contracts for 650 km. of roads in Saudi Arabia.

In 1965 he became resident engineer on a road contract in Saudi Arabia. He subsequently moved to Peru, where from 1968 to 1969 he was chief resident engineer on 480 km. of roads on the Central Peruvian Highway, which was being built to World Bank requirements.

Binnie & Partners:

Mr. Morris joined Binnie & Partners in 1969 in their irrigation department and has worked on designs for the Sadova Corabia irrigation project in Romania and the report on the Llanos de Cocle irrigation scheme in Panama.

The Woodley/Earley Master Plan for the Berkshire County Council.

A plan for a rapidly expanding suburb of a major regional centre with acute problems of internal and through traffic. The plan will include proposals for connections to the main regional roads and a traffic management scheme for the district.

The Survey Docks Redevelopment Plan for Southwark Borough Council and Port of London Authority.

London's Surrey Commercial Docks have recently been closed, freeing 450 acres of land and water near the heart of the metropolis for redevelopment. The potential of the area depends largely upon the capacity of existing transport systems and feasible additions to them.

A Planning Reconnaissance Study for the Cross Roads Area in Kingston, Jamaica for the U. K. Government (Overseas Development Administration).

Mr. Findlay spent time in Jamaica preparing this study of the principal nodal point in the capital's mid-town road system. The report determined the transportation surveys that would be necessary to prepare a plan for the redevelopment of the area and estimated the professional input required.

A Town Centre Plan for Rijeka, Yugoslavia for the United Nations.

The principal problem of Rijeka is to accommodate increasing flows of cross-town traffic without destroying the environmental quality of the main commercial centre. Mr. Findlay has designed and is now testing a number of alternative road layouts making the maximum use of existing facilities.

Post: P.16. Sociologist

Name: B.E. WARD (Mrs. H.S. Morris)

Date of Birth: 1919

Nationality: British

Education: 1931-37 Malvern Girls' College, Worcestershire
 1937-40 Newnham College, Cambridge
 1941-42 Institute of Education, University of London
 1947-49 (50) London School of Economics, London.

Professional Qualifications: B.A. Honours (History) Cambridge 1940
 M.A. Cambridge 1942
 Diploma in Education, London 1942
 M.A. (Anthropology) London 1949
 Fellow of Royal Anthropological Institute,
 and member of Council from time to time,
 Chairman of Library Cttee. 1967-69.

Background and Experience:

1942-45 Headteacher village school in Devon.

1945-47 Assistant Mistress, Adminton College, Gold Coast, W. Africa.

1950-53 Fieldwork in Hong Kong.

1953-55 In East Africa.

1949-50 and 1955-66 Lecturer in Social Anthropology, Birkbeck College, University of London.

1959-60 Scientific Director U.N.E.S.C.O. project on changing role of women in Asia.

1964 Visiting Professor, Department of Anthropology, Cornell University, U.S.A. Fieldwork in Hong Kong and Sarawak. Associate Newnham College.

1964-66 Governor Birkbeck College.

1965-71 Lecturer in Asian Anthropology, School of Oriental and African Studies, University of London.

1966 Visiting Professor Chinese University in Hong Kong, fieldwork there and in Sarawak.

1968 Fieldwork in Hong Kong.

1969-1971 Visiting Fellow, then Research Fellow, Clare Hall, Cambridge.

1971 Director of Studies and Special Lecturer in Social Anthropology, Newnham College.

Relevance to Post:

Academic and practical experience in education and social anthropology, and virtually research in the fields of Chinese and South-East Asian studies. Taught courses on most aspects of general social anthropology and on the special areas of China and South-East Asia. During employment at the School of Oriental and African studies was in charge of the teaching in East and South-East Asia in the Department of Anthropology and Sociology. This work included the supervision of graduate students working in Hong Kong, Japan, Bali, Celebes, Java, Sumatra, Portuguese Timor, Thailand and Malaysia. At present writing up the results of 20 year study of the socio-economic changes connected with the mechanisation of the fishing fleets in Hong Kong, most of the fieldwork time being among the fishing populations. Also made a pilot study of a small modern factory in one of the Colony's new towns. In Sarawak work has been limited so far to fairly brief visits to investigate the possibilities of following up Tien Ju-K'ang's earlier work on the Chinese populations. Collaborated with Dr. Tien in the writing of his book, and is now completing a new edition for publication.

Post: C. I. Forest Inventory

Name: Dr. E. F. W. O. BRUNIG

Date of Birth: 1926

Nationality: German

Education: Primary Schools 1932 to 1936 (Diakonissen-School, Kaiserswerth; Grammar School Soltau, Hannover; Grammar School Schkeuditz, Leipzig).
Schiller Realgymnasium, Leipzig, 1936-1943
Matriculation Course, Helmstedt, Dec. 1945 to April 1946
Trade School, Braunschweig, May to Sept. 1946

Professional Qualifications: Forestry Degree of the Göttingen University at Hann. Münden, 1949-1953.

Background and Experience:

1946-1950 Apprenticeship for the Brunsvick State Forest Service at Forstamt Schöningen. Forest Inventory Assistant, Forest Management and Research Station (FEVA), Braunschweig. Logging Supervisor, Forstamt Schöningen. Timber extraction and sawmilling, Nebelung Sawmilling Co., Schöningen, transport and conversion of home-grown timber. Cruiser in the Working Plans Revision of Forstamt Schöningen. Sawmilling and wood-working, Wilhelm Wehrhahn Ltd., Neuss Rhineland.

1952-1954 Forstreferendar in the Hesse State Forest Service. Forest officer's duties at district and divisional level practice and teaching of forest work science at the Forstamt Merenberg (Ofm. Schussler).

H. M. Colonial Service (later H. M. Overseas Civil Service) appointed as probationary Assistant Conservator of Forests, Sarawak, on 15th March, 1954. Retired at the end of 1963.

1954-1955 Section Forest Officer, Kuching; administration at divisional level, forest reservation, land use and forest management planning, control of exploitation. Introduction of the first large-scale silvicultural operations in the area.

1955-1957 Forest Research Officer, Sarawak: Methods of silvicultural treatment of peat swamp forests, supervision of the vernacular forest school, ecological study of the "Heath Forests" in Sarawak and Brunei, botanical collecting, inventory-related mensuration research.

1958 State Forest Officer, Brunei: Representing forestry at Government level, inter-departmental co-operation and co-ordination. Chairing the 3rd Interterritorial Forestry Conference, 1958, at Brunei.

1959-1960 Section Forest Officer, Bintulu; Pilot trial of a proposed management procedure prior to application to the whole country.

1960-1963 Forest Working Plans Officer, Sarawak: Establishment of a management branch of the Forest Department at Kuching. Design and introduction of a new Forest Survey and Inventory Code and of the Forest Working Plans Code, both in 1961. Preparation of long-term regional and local forestry development plans. Planning and execution of forest inventories. Preparation of regional management and local working and felling plans. Research into air-photo interpretation for purposes of inventory and management control. Refinement of inventory methods for different forest types. Continued ecological research.

1956-1958 Warden, Bako National Park: Establishment of the first National Park in Sarawak in addition to the other duties under previous headings.

FAO-Expert in Forest Inventory, Thailand, From Nov. 1963, to March, 1964. Development of an inventory procedure for the UNSF-Project "Paper and Pulp Materials, Pre-investment Survey in Thailand".

Scientific Assistant to the Chair of World Forestry, University of Hamburg, 16th March, 1964 to October, 1967. Lecturing in forest production (especially growth and yield of tropical forests) and in tropical silviculture and management. Preparation of a research programme and a plan of organisation for the silviculture and productivity section of the Institute of World Forestry at the Federal Research Organisation of Forestry and Forest Products.

Universitätsdozent, University of Hamburg, 10th October, 1967 to September, 1968. Research into the synecology of the heath forests of Sarawak. Lecturing courses in forest productivity and silviculture of tropical forests. At the same time head of the Section for Silviculture and Productivity at the Federal Research Institute.

Visiting Associate Professor for World Forestry, State Forestry College, at Syracuse University, N. Y., U.S.A., 15.9.1968 to 15.9.1969. Lecturing in World Forestry and in Silvicultural Management of Tropical Forests. Research into the ecological significance of pattern in tropical rainforests.

University of Hamburg 16.9.1969 to present. Research into structure relationships of forests and environmental influences. Lecturing courses in forest productivity, forest vegetation of the world and silvicultural management of tropical forests.

Special Performances:

Conducting an annual one-week course in tropical silvicultural management at Royal Forestry College, Stockholm.

Conducting regularly seminars at the Forestry Faculties at Freiburg and Göttingen.

Publications:

Pacific Botanists, 1963, Supplement. Pacific Science Information Centre, Honolulu, Hawaii.

Bibliography, Flora Malesiana, Ser. I, Vol. 5, 4: CCLXVI.

Marquis' World Who's Who in Science, 1968.

Kürschner's Deutscher Gelehrten Kalender, De Gruyter, 1970.

Dictionary of International Biography, 7th Edition, Melrose, 1971.

Post: C. 2. Forest Utilisation

Name: R. L. HEDLEY-MILLER

Date of Birth: 1924

Nationality: British

Education: Taunton School, Taunton, Somerset. 1933-42
Queen's College, Oxford.

Professional Qualifications: Honours Degree in Forestry

Background and Experience:

1950-70 Denny, Mott & Dickson Ltd., Timber Importers, London.
The last three years as Manager, Hardwood Dept.

- 1) Purchasing and sales of Hardwoods from all parts of the world, chiefly West African logs and lumber, S. E. Asian lumber including Teak and European Boules and dimension stock.
- 2) Handling and Control of Stocks.
- 3) Preparing Sales Forecasts and Budgets.
- 4) Management of Hardwood Dept. and participating in company management through the Management Committee.

Overseas business visits included many to France, one to Denmark and three to West Africa.

1970 J. & S. Agate Ltd., Timber Merchants, Horsham, Sx. Attended four-week course at Ashridge Management College in 1968.

Post: C. 3. Land Classification

Name: I. L. A. YSSELMUIDEN

Date of Birth: 1929

Nationality: Dutch

Education: Secondary School, Holland. State College for Tropical and Sub-tropical Agriculture, Deventer, Holland. International Training Centre for Aerial Survey, Delft, Holland.

Professional Qualifications: B.Sc. Tropical and Sub-tropical Agricultural (1954).
Diploma International Training Centre for Aerial Survey on the use of aerial photographs in soil science (1963).
Ing. (Neth. Professional Engineer) Holland (1970).

Background and Experience:

From 1953 to 1958 Assistant Manager/Research Officer attached to an oil palm plantation in Sumatra; working on plant breeding, nursery management and control of pests and diseases. During 1958 attached to the Soil Survey Institute in Holland. From 1958 to 1961 Research Officer Soil Survey of the Cameroons Development Corporation, West Cameroons; engaged in routine detailed soil surveys and land classification for plantation purposes.

Hunting Technical Services:

From 1961-1965 employed as a soil surveyor on the Lower Indus Project, West Pakistan, and from 1964 in charge of the Soils and Land Use Section of this project. Duties included reconnaissance, semi-reconnaissance and detailed soil survey and land use surveys of parts of the Lower Indus Basin. Responsible for the field survey and correlation between soils teams. On completion of the field studies was responsible for the co-ordination and preparation of soil and land use maps and the soil section of the Report.

In 1965 transferred to the Sylhet and Chittagong Tea Irrigation Project as pedologist. Mainly engaged in soil moisture studies in connection with the irrigation of tea.

In 1966 attached to the Jengka Triangle Project, Malaysia. Duties included semi-detailed surveys, land capability classification for the development of oil palm and rubber.

During 1967 Senior Soil Surveyor attached to the Brunei Land Capability Survey Project. Duties included the direction and correlation of the soil studies, map and report compilation. The project consisted of a reconnaissance soil survey including an intensive study of the aerial photographs of the entire State, land classification and capability studies.

For a short period during 1968 as pedologist attached to the Oil Palm Feasibility Study in South Thailand.

1969-1971 Assigned to the Johor Master Plan Study in Malaysia as Senior Land Classifier. This has involved investigating the land resources and assessing the land capability in an area in southern Johor State, including forest and agricultural land, allocating crop and livestock enterprises to those areas most suited to them.

During this period also attached to the North East Sumatra Smallholder Rubber Survey in Indonesia, in an advisory capacity.

After completion of his assignment to the Johor Master Plan Study, a member of a team for the appraisal of the development possibilities of an extensive area in Central Sumatra, Indonesia.

Supplementary Information:

Fluent in German, Malay, Indonesian and Dutch, has knowledge of French and Urdu.

Post: C. 5. Hydraulics

Name: A. RYLANDS THOMAS, O. B. E.

Date of Birth: 1905

Nationality: British

Education: University of London
University College of South Wales
Cardiff Technical College

Professional Qualifications: B. Sc. (Eng.), Joint Diploma, Eng.
Chartered Engineer 1945;
Fellow, Institution of Civil Engineers
Fellow, American Society of Civil Engineers

Background:

Mr. Thomas was for some years in the Indian Service of Engineers, with experience in the irrigation department of the Government of Bombay before appointment as Deputy Director, under Sir Claude Inglis, and acting Director of the Central Irrigation and Hydrodynamic Research Station at Poona, India, where he was concerned with model investigations for river training, barrage schemes and other irrigation works and a tidal model of the Hooghley. He then became Secretary to the Central Board of Irrigation, Government of India. After leaving India he had construction experience in South Africa and later directed model investigations in Iraq of the Batmah and Samarra barrage schemes. He was a member of the United Nations Commission (1957) reporting on flood control in East Pakistan.

Binnie & Partners

In 1959 Mr. Thomas joined Binnie & Partners as a full-time consultant on hydraulics and irrigation. After appointment as consultant to the firm Mr. Thomas was adviser on hydraulic design of the Mangla dam project and has been responsible for model studies of the project including river closure and other diversion problems, and slope protection of the dams. He was concerned with model studies for Plover Cove, Shek Pik and Batang Padang schemes, and also for river training works for the Dera Ismail Khan bridge over the Indus and the Teesta barrage project in Pakistan. He is currently directing the firm's work on model studies for the Dee and Wash estuary schemes, Plover Cove spillway and High Island scheme, Hong Kong.

Mr. Thomas was for some years chairman of the Hydraulics Panel for the Construction Industry Research and Information Association, and is a member of the Advisory Committee for the Hydraulics Research Station, Wallingford. He is the author of many technical papers on hydraulics and allied subjects. He was awarded a Telford Silver Medal by the Institution of Civil Engineers in 1968 for his co-authorship of a paper on the Mangla dam project.

Post: C. 4. Livestock

Name: W. J A PAYNE

Date of Birth: 1918

Nationality: British

Education: Downing College, Cambridge 1936-1940
University of Glasgow 1945-1949

Professional Qualifications: B. A. , M. A. Cambridge;
Ph. D. Glasgow;
Fellow of the Institute of Biology;
Member of FAO International Expert
Panel on Animal Nutrition

Background and Experience:

1949-1956 In charge of animal husbandry and forage research in Fiji. Major domestic animals utilised; beef cattle, dairy cattle, goats and pigs. Major fields of research; breeding, feeding and management in a humid tropical environment.

1956-1957 Commonwealth Fund Fellow and Visiting Professor, Louisiana State University, Baton Rouge, U. S. A. Travelled widely in the United States, Central America and the Caribbean at this time and conducted research on the effects of environment on productivity in dairy cattle.

1958-1961 Head, Animal Husbandry Division of the East African Agriculture and Forestry Research Organisation, Muguga, Kenya. Major domestic animals utilised; beef cattle and pigs, but also concerned with experiments using dairy cattle, goats, sheep, camels, and wild game. Major fields of research; breeding, feeding and management of domestic livestock in an arid or semi-arid tropical environment; a study of the possibilities for the 'farming' of wild game; carcass evaluation studies with tropical - and temperate - type cattle and wild game; studies of the overall improvement of animal and forage productivity in various East African environments.

1961-1963 Deputy Director, East African Agriculture and Forestry Research Organisation. Concerned with the organisation of agriculture, forestry and animal husbandry research in East Africa.

1963-1968 Project Manager, UNDP/FAO, Dairy Training and Research Institute, Philippines. Concerned with organising training (at post-graduate level) and research; in forage husbandry, in the nutrition, breeding and management of cattle and water buffalo, and in milk processing. Also with the organisation of artificial insemination services, and the planning of a survey of all aspects of the livestock industry of the Philippines. Specially concerned with encouraging the training of livestock economists and the conduct of economic feasibility trials, and in organising business executive/animal husbandry courses. During this period served as Visiting Professor of Animal Husbandry in the College of Agriculture, University of the Philippines.

1968 to date Consultant in tropical animal production. Consultancies completed during the period 1968-71:-

- (i) 1968: FAO
A report on the livestock industry of Sierra Leone.
- (ii) 1969: FAO
A report on "Animal Production Education in Six English Speaking African Countries".
- (iii) 1969-70: Hunting Technical Services, London.
A report on the livestock industry in Cordoba No. 2 Project, Colombia.
- (iv) 1970: FAO
A report on the livestock industry of the Caribbean.
- (v) 1970-71: UNDP
Consultant on animal production projects to the Administrator.
- (vi) 1970: Hunting Technical Services, London.
A report on the livestock industry in the State of Johore, Malaysia.
- (vii) 1971: Hunting Technical Services, London.
A report on the possibilities of a livestock industry on a settlement scheme in the State of Maranhao, Brazil.
- (viii) 1971: FAO
A report on the livestock industry in the State of Sinaloa, Mexico.

1970 Visiting Professor of Tropical Animal Science, Centre for Tropical Agriculture (Department of Animal Science), University of Florida.

General Editor for the Longman Group of a new series of intermediate level textbooks concerned with agriculture, etc., in the tropics.

Publications:

- (i) Over 60 scientific and general papers
- (ii) Joint author of the textbook "An Introduction to Animal Husbandry in the Tropics", published by Longman Group, 1960, (2nd Ed. 1966).
- (iii) Author of the textbook "Cattle Production in the Tropics", Vol. 1, published by the Longman Group, 1970.
- (iv) Contributed chapters to several other books concerned with animals in the tropics or with specific areas of the world such as East Africa

Post C. 6. Ports EngineerName: J. R. GWYTHERDate of Birth: 1923Nationality: BritishEducation: Manchester UniversityProfessional Qualifications: B.Sc. (Eng.)
Fellow, Institution of Civil EngineersBackground:

Mr. Gwyther started his professional career in 1941 as an apprentice welder in a steelworks. This was followed by four years' war service in the Royal Engineers in the course of which he carried out port repairs in the United Kingdom and N. W. Europe, and railway maintenance in the Middle East.

After graduating Mr. Gwyther spent two years with John Cochrane and Sons Limited, civil engineering contractors, as assistant engineer responsible for constructing spillways on a concrete gravity dam at Mullardock in Scotland.

In 1953 Mr. Gwyther joined Coode & Partners London Consulting Engineers, and as resident engineer supervised the construction of the \$1.8 million Queen's graving dock in Singapore. In their London office he was engaged on the design of Famagusta outer harbour, Cyprus. After qualifying as a diver at the works of Siebe Gorman & Co. Ltd., Mr. Gwyther was appointed resident engineer for the \$96 million deep water harbour in Barbados where he supervised construction of quay works, breakwaters, reclamation, sheds and a bulk sugar installation.

Following a period in their London office on preparing documents and assessing tenders for barrages of the Indus Basin project, West Pakistan, Mr. Gwyther was appointed resident engineer on the Sidhnaï barrage. He supervised its construction as well as the associated canals, a highway bridge and a railway bridge across the Jhelum river.

Binnie & Partners:

Mr. Gwyther first joined Binnie & Partners London Consulting Engineers in 1951, and for two years was an assistant engineer engaged on the design of earth embankments and overflow structures for reservoirs, including that at Hanningfield, Essex.

In 1963, Mr. Gwyther returned to Binnie & Partners as chief resident engineer supervising construction of the \$400 million Mangla irrigation and hydro-electric project, West Pakistan. This included the 116 m. high earth dam at Mangla, two other large earth dams, a power station with 100 MW turbo alternator sets and a major irrigation canal. In 1967 he moved to the London office as project engineer responsible for the design and management of the \$26 million Ely-Ouse Essex water transfer scheme, involving construction of a tunnel, pipelines and pumping stations. He is currently engaged on the technical appraisal of engineering requirements of the firm's potential clients. Since his return from West Pakistan, Mr. Gwyther has been technical editor of the Mangla completion report. He is a joint author of papers on the Mangla dam project and was awarded a Telford Silver Medal by the Institution of Civil Engineers in 1968.

Post: C. 8. Senior PlannerName: D. WALTONDate of Birth: 1938Nationality: BritishEducation: Kings College, University of Durham
(now University of Newcastle Upon Tyne)Professional Qualifications: B. A. (Hons).
Member of the Royal Town Planning InstituteBackground:

Between 1962-64 Mr. Walton was employed by the City of Coventry Department of Architecture and Planning. He was a member of a team which produced a report on the social and economic structure of the city and its region, with major responsibility for research into future growth and distribution of shopping facilities throughout the city.

In 1964 he joined Skelmersdale New Town Development Corporation, Lancashire, and until 1966 was Senior Planner concerned with a general plan for an area to accommodate 30,000 people and its integration with the master plan for the new town.

Between 1966-67 Mr. Walton was Deputy County Planning Officer for the County of Ross and Cromarty, Scotland. He had general responsibility for all planning matters including the review of the County Development Plan.

Shankland/Cox:

In 1967 Mr. Walton joined Shankland/Cox as Senior Planner in charge of the implementation of the firm's Master Plan for the expanding town of Winsford, Cheshire.

In 1968 and 1969 he visited Isfahan, Iran, Salvador and Brazil to carry out UNESCO studies of the conservation of the historic towns and their exploitation for tourism.

Between 1970-71 Mr. Walton was Resident Planner on the South East Johore Project, Malaysia where he worked on settlement network and design, transport and infrastructure, recreation and tourism in the context of the regional study led by Hunting Technical Services.

Mr. Walton is accustomed to a central role in a multi-disciplinary project team. In South East Johore he was a member of the Planning Committee composed of senior representatives of all consultant firms. He played a major part in integrating the various studies into a coherent Master Plan. He is experienced in client relations at all levels and in working with local counterparts.

Post: C. 9. Organisation and Administration

Name: D. SEARLE

Date of Birth: 1925

Nationality: British

Education: Brixton School of Building, London

Professional Qualifications: B.Sc. (Estate Management)
Associate of the Royal Institution of Chartered Surveyors

Background:

Between 1958 and 1962 Mr. Searle was Senior Lecturer in Valuation at the College of Estate Management, London.

Shankland/Cox:

Mr. Searle joined Shankland/Cox in 1962 and has been responsible for the direction of the legal, administration, financial, market and property management aspects of all planning studies. Mr. Searle has been especially concerned with recommendations for improved implementation of development plans in a number of Caribbean countries and in Yugoslavia.

Between 1966-68 he worked on the Kingston Waterfront Redevelopment Plan, Jamaica for the U. K. Government (Ministry of Overseas Development) and the Government of Jamaica.

As part of the task of preparing a detailed plan for urban renewal in downtown Kingston, Shankland/Cox recommended the establishment of a new public agency charged with the duty of implementing the proposals. Mr. Searle advised the appropriate department on the contents of a Cabinet submission covering the constitution of the agency, its relationship to the Central Government, the appointment of its governing body, its power to acquire and dispose of land and to control development, and its financial structure. The Urban Development Corporation was set up in 1967 with island-wide powers to promote and manage large-scale schemes of comprehensive development and redevelopment. A partner in Shankland/Cox was seconded to the agency to give general advice and to help recruit its permanent professional staff. The Corporation's powers have been successfully used in a number of places to assemble land, put in infrastructure, dispose of land to private developers and co-ordinate their activities.

In 1968 Mr. Searle worked at the Hvar Island Project, Yugoslavia for the United Nations (as executing agency for UNDP).

The Master Plan for Hvar was part of the South Adriatic Project. Shankland/Cox's report included proposals for modifications to the system of planning administration to improve the implementation of this and other plans. Yugoslavia has a comprehensive planning legislation but the system often fails to achieve its objectives because of the excessive demands on small and poor local authorities with inadequate professional and technical staff.

Mr. Searle proposed simplifications in the system to enable the limited resources to be concentrated on areas that were critical to the success of the planning developments. A new form of planning control was put forward in a draft for a new set of by-laws.

Between 1970-71 Mr. Searle was concerned with a project in Dominica for the U. K. Government (Overseas Development Administration) and the Government of Dominica.

As part of a Tourist Development strategy for the Island, Mr. Searle prepared a comprehensive document on the realisation of plans, covering the legal framework, development control policies, financial incentives to developers and the establishment of a new agency for planning and implementation. Special consideration was given to the rights of landowners and it was proposed that they be offered an equity share in development schemes.

Post: C. 10. Credit

Name: D. N S. EVANS

Date of Birth: 1925

Nationality: British

Education: County High School, Coalbrookdale, 1935-1942
Shrewsbury & Derby Technical Colleges, 1943-1956

Professional Qualifications: Diploma, Institute of Bankers
Certificate, Corporation of Secretaries
Member, Institute of Bankers

Background and Experience:

1942-1957 Lloyds Bank Ltd., Lombard Street, London. Served at various Branches and Departments in London and the Provinces. Courses in advanced securities, Executor and Trustee, Income Tax etc.

1957-1965 Uganda Credit and Savings Bank, Kampala, Uganda. Branch Manager, Senior Manager, Inspector. Served at Arua, Mbale, Jinja and Kampala. The Bank was highly successful in the stimulation of local savings and the channelling of internal and external funds into agricultural and other forms of rural credit. He was seconded to work with Dr. Rian in the formulation of the co-operative credit scheme which is still the most successful operation in agricultural credit in East Africa.

1965-1967 Uganda Commercial Bank, Kampala, Uganda (successor to Uganda Credit and Savings Bank). Adviser to newly appointed Uganda Managing Director. Responsible for transition from Credit and Savings Bank to full Commercial Bank. Bank representative in all discussions with Government and Clients. Responsible for amalgamation of various loan funds into Uganda Development Loans Fund.

1967-1969 Food and Agricultural Organisation of the United Nations. On assignment to Lesotho with terms of reference "to evaluate existing sources of Agricultural Credit and to assist Government in the establishment of a Development Bank".

As funds were not available for the establishment of a Development Bank he re-organised the existing Agricultural Development Fund and the FMCUL to enable the A. D. F. to satisfactorily supply and control agricultural credit for individuals and co-operatives respectively. Following a subsequent widening of his terms of reference he:-

1. Prepared a detailed scheme and assisted in the drafting of the legislation for the introduction of a Development Levy.
2. Set up the machinery and supervised the initial operation of the collection of the Levy together with Income Tax on a P. A. Y. E. basis.

3. Carried out a detailed evaluation of the livestock marketing system and submitted proposals for the establishment of a Livestock Marketing Corporation which were accepted by Cabinet and by H. M. G. for Development Aid.

May 1970 Member of an I. B. R. D. Mission to Argentina with responsibility for the study and evaluation of credit.

Hunting Technical Services:

1970-1971 Member of a team undertaking an agricultural credit survey in each of the countries comprising the Windward and Leeward Islands and British Honduras with specific responsibility for the study of credit institutions and the formulation of plans to meet future development requirements.

1971 Member of I. B. R. D. team as Financial Analyst on agricultural credit appraisal mission to Taiwan.

Post: C.11. Industrial Economics

Name: J. FULLBROOK

Nationality: British

Professional Qualifications: B.Sc. (Econ.), London School of
Economics (1st Class Hons.)

Background and Experience:

1957 Economics Department of Midland Bank Limited, London.
Post of economist in Overseas Developments section of Department. From
1964, officer in charge of Industries and Commodities section.

1969 Joined Economic Consultants Limited and has had the following
responsibilities:

1969-70 Project leader on study of prospects for industrial estate
development in South East England.

1970 Chief economist, Dominica tourist development plan. Main
responsibilities: demand assessment and implications for employment and
economic development of Dominica; fiscal aspects; potential for comple-
mentary industrial development (commissioned by O. D. A.).

1971 Chief Economist, Turks and Caicos Islands study of tourist
development (commissioned by O. D. A.).

1971 Project leader, study of inter-relationships of major economic
activities in Central London with their "support" industries (workshops,
subcontractors, services etc.); and implications for planning and re-
development (commissioned by City of Westminster).

1971 Chief economist, development studies of Wickham's Cay and
Anegada, British Virgin Islands (commissioned by O. D. A.).

Present Position: Senior economist, Economic Consultants Limited.

Name: R. J. SPOONER

Date of Birth: 1918

Nationality: British

Education: Highgate School; Wye College, London University

Professional Qualifications: B.Sc. (Agriculture) 1939
Dip. Agric. 1940

Background and Experience:

1940-1942 Field Officer to Provincial Advisory Chemist, Seale-Hayne Agricultural College, Devon. Responsibility included the sampling of soils in South Devon for analysis at S. H. A. C. and giving recommendations for the application of fertilisers, particularly in the lime-deficient central areas of the region; also responsible for advising on crop selection, field operations, pest and disease control in areas ploughed from grass and on rotations suited to cultivated land.

1941-1943 District Technical Officer to Warwickshire County Agricultural Committee. Responsibility included advice to farmers on fertilisers, crop rotations, farm-grown feedstuffs and pest and disease control; initiated and executed the programme for lime application to about 70,000 acres of deficient land in North Warwickshire which was of low productivity; also resuscitated the Young Farmers' Club movement in the areas; participated in one of the earliest programmes for certified cereal seed production.

1943-1946 Technical Officer to the Farms Department of the County Agricultural Committee, responsible for development and increased productivity of farms totalling 12,000 acres under the control of the Committee; including the preparation of programmes for the clearance of derelict land and its subsequent cropping; recommendation of fertilisers for increased production; the operational management of the land; preparation of comprehensive farm development plans. These included proposals for crop production, livestock development, building layout and construction, mechanisation and supervision of implementation; was associated with the earliest developments of temporary grass farming in the country, supervised grassland variety and production trials on behalf of Sir George Stapledon and Dr. William Davies pioneers of ley farming; the development of temporary pastures on the Committee's farms and 200 acres of pedigree grass and clover seed production; organised field days, demonstrations and study tours for the farming community.

1946-1948 Farm Manager to the late Mrs. M. Patten of Ol Kalou, Kenya, involving the management and further development of 10,000 acres of high land of which 400 acres was devoted to cash and stock feed crops; an Ayrshire dairy herd and Red Poll beef herd totalling 1,000 head; the maintenance of all farm records and accounts and the conduct of all farm business.

1949-1957 Agricultural Officer to the Kenya Department of Agriculture, posted as District Agricultural Officer to the Uasin Gishu District of Northwest Kenya; also Executive Officer to the Uasin Gishu Agricultural Committee, which implemented official policy for the development of agriculture, including targets for production, disbursement of land rehabilitation and farm development loans; initiated a programme of comprehensive farm planning of 65 farms including restorative crop rotations, grass planting and livestock farming; gave evidence before two Commissions, one on cereal production and prices and another on mixed farming potentialities; served through 1955-56 on the Government's Special Commission on Rural Wages and Conditions of Service.

He also served throughout his 8 years as a member of the Regional Water Board, which was concerned with river maintenance and protection and the allocation of water rights.

Much of his spare time was spent on the affairs of the Royal Agricultural Society of Kenya; regenerated the Uasin Gishu branch and participated in the re-introduction and subsequent organisation of the District Agricultural Show. For 8 years he served on the Council of the Royal Agricultural Society of Kenya.

He served two relief periods as Assistant Director, Rift Valley Province.

1957-1959 In 1957 posted as Provincial Agricultural Officer, Southern Province; responsible for the implementation of all agricultural policy, particularly the development of coffee under the Swynnerton Development Plan, as well as a range of low rainfall smallholder crops such as sorghum, millet, sisal, cassava and groundnuts. In one of the three districts under his control, he was involved in the application of a comprehensive district-wide programme (5,000 square miles) of range management, water development and livestock control. He was deputy Chairman of the Provincial Agricultural Committee for two years.

1959-1962 Posted as Assistant Director of Agriculture Tanganyika. For five months he was on relief in the Lake Province, where he gained experience particularly of large scale smallholder cotton production, ginning and co-operative handling; then assumed post of A. D. A. in Dar-es-Salaam, responsible for all departmental extension and land planning activities, including the maintenance and expansion of the Land Planning Training Centre; was instrumental in preparing the Three Year Agricultural Development Plan (1961-1964). When Tanzania gained independence, he was additionally responsible for the agricultural aspects of land settlement and participated in preparation of and technical discussions on submissions for international technical assistance; retired in 1962.

1962-1965 Joined the Forestry & Land Use Section of the Directorate of Overseas Surveys; participated (1962-63) in a reconnaissance survey, with an ecologist, of the land use prospects of 34,000 square miles of Northern Botswana. This study identified 8 areas for development primarily for improved range management and irrigated agriculture; study employed uncontrolled mosaics and stereopairs of aerial photographs, followed by extensive field inspection and checking.

In 1964 the Section became the Land Resources Division. In this year and in 1965 he carried out, with an ecologist, a reconnaissance of the land potential of three areas of Tanzania, the Kilombero Valley, along the Mgeta River and near Dodoma. The second was selected for a development planning study with a soil surveyor and led to an intensive development plan for settlement of 6,500 acres under a mixed cropping regime. In 1963-64-65 Mr. Spooner organised three training courses in air photo-interpretation and resources survey methods.

Hunting Technical Services:

1965 Joined Hunting Technical Services and assigned as Chief Agriculturist and Deputy Project Manager to an 18-month study in Malaysia and preparation of a comprehensive outline development plan for settlement of the Jengka Triangle, including inventory and appraisal of the land, water and forest resources, design and evaluation of crop and forest exploitation proposals, agricultural and economic assessment of holding size, definition of scope and scale of processing facilities, infrastructural and social services, project design and design of management and staffing needs, economic and financial evaluation at farm project and national level.

In 1967 appointed Area Manager for the Far East and Australasia, responsible for the preparation of proposals for and supervision of projects including:

- (1) A study of the salinity conditions in the River Murray including origin, influence on irrigation agriculture and measures of control.
- (2) A development plan for 100,000 acres of irrigated and non-irrigated land in Ceylon.
- (3) A land capability survey of the State of Brunei.
- (4) A feasibility of two areas for oil palm development in Southern Thailand.
- (5) A review of agricultural data for a water control and irrigation development project in East Pakistan.
- (6) A pre-investment study of 20,000 acres for irrigation development in Fiji.
- (7) A pre-investment study of 3,600 sq. km. of land in N. Thailand for irrigation improvement and development.
- (8) A comprehensive co-ordinated planning study for 700,000 acres in S. W. Malaysia.

Supplementary Information:

- (a) Reports:
- (i) Land Use Prospects in Northern Bechuanaland with Dr. I. Langdale-Brown (1964).
 - (ii) The development of the Lower Mgeta River Area with R. Jenkins (1965).

Name: D. T. SINKER

Date of Birth: 1938

Nationality: British

Education: Stowe House, Broadstairs: Winchester
Trinity College, Cambridge

Professional Qualifications: B.A. Economics (1961), A.C.A. (1964).

Background and Experience:

From 1961 to 1964 Mr. Sinker was with Peat, Marwick Mitchell & Company, Chartered Accountants, where he served three years articles and qualified in 1964 as a Chartered Accountant.

From 1967 to 1969 he was employed at the National Board for Prices and Incomes as a financial and economic adviser, seconded to the Board by Cooper Brothers. Work at the Board included the survey, investigation and analysis of a wide range of manufacturing and service industries in the U.K. as a member of a multi-discipline team, and was closely concerned with statistical analysis, investment appraisal procedures and some operational research analysis, as well as the general financial and economic aspects of production, distribution and marketing of industries.

Hunting Technical Services:

In 1964 to 1965 he was project Economist in the Sudan responsible for the analysis and planning at farm, agency and national level of the Rahad and Roseires irrigation projects, which involved comprehensive studies in depth for the identification and planning of projects totalling some 2 million acres. The work included the planning of optimal resource allocations for the project and financial and economic evaluation of the projects identified for development.

From 1966 to 1967 he was Economist on the Jengka Triangle project in Malaysia, a comprehensive study of 500,000 acres in the preparation of a Master Plan for settlement and development, including a full financial and economic analysis of the planned developments. Rubber was one of the two principal crops selected for development. Initially he was involved in the planning and evaluation of the project at farm level, and latterly his work included analysis of transportation, processing and overall planning and project evaluation.

1969 - Resident Economist based primarily in U.K. His responsibilities are the provision of advice on economic aspects of projects and of analytical services in the field of planning, resource allocation, project evaluation and investment appraisal. He is also responsible for planning the economic aspects of all proposed surveys and studies. His far ranging responsibilities demand that he should be thoroughly conversant with analysis and evaluation of projects, including infrastructural aspects, in a wide range of environments and involving field and tree crops both under rainfed and irrigated conditions.

Name: H. A. RANCOM

Date of Birth: 1919.

Nationality: British

Education: Priory School, Hastings.

Professional Qualifications: A. B. S. C.

Background: From 1948 to 1963 served in the Overseas Civil Service in Tanganyika.

Following 6 years Provincial work appointed head of Treasury Section responsible for all outstation sub-accountancies and Ministry accounting units. Further responsible for fiscal legislation and regulations, and the training of selected local staff in Treasury function. Duties included field inspection, guidance and improved methods of revenue levy and collection, and the introduction of mechanised accounting systems. Worked extensively with punched card data processing system.

From 1963 to 1966, Principal Assistant Secretary to the Ministry of Natural Resources comprising divisions of Agriculture, Forest, Game, Water Development, Veterinary Services and Co-operatives. Duties included the financing of the Development Plan through national and international agencies and the general administration of the Ministry.

Hunting Technical Services: From 1963 to 1966 and 1967, Administrative Officer to the Lower Indus Project in West Pakistan. From 1966 Administrative Manager of Hunting Technical Services in the United Kingdom.

From August 1969 to September 1971, Administrative Manager to the Johor Tenggara Project, West Malaysia; responsible for the financial and administrative aspects of the Study. Appointed Administrative Manager Hunting Surveys and Consultants on completion of the Johor Tenggara Project.

Relevance to Post: Mr. Rancom has had very wide experience in district, provincial and central government administrations in East Africa and more recently on a multi-discipline/consultancy regional planning project in West Pakistan.

He has visited Sarawak (including Kuching and Miri) and is aware of the logistic and service requirements of a study of this nature.

Name: J. A. N. M. HOLT

Date of Birth: 1929

Nationality: British

Education: St. Andrews University
Wageningen

Professional Qualifications: B. Sc. (Eng.)

Background:

Binnie & Partners:

Mr. Holt joined Binnie & Partners in 1956 to work in the field on the Hydrological Survey of Iraq. During this period he was responsible for the supervision of construction of stream gauging weirs and for the instruction of stream gauging personnel. In 1957 he transferred to the firm's Baghdad office working on the design of the Batmah barrage and of other irrigation structures.

In 1960 Mr. Holt returned to the United Kingdom and from then until 1963 was employed as assistant resident engineer on the construction of the Llyn Celyn reservoir scheme. He then joined the London office and from 1963 to 1966 worked in the irrigation section on the report and design of the Orontes irrigation project in Lebanon and the design of structures for the Kirkuk and Ishaqi irrigation projects in Iraq. He attended the Centre for land drainage and reclamation at Wageningen in the Netherlands in 1964.

In December 1966 Mr. Holt was seconded for two years, subsequently extended by six months, to the Ministry of Overseas Development to act as hydrologist/water resources engineer in a CENTO team of engineers setting up the Technical Bureau for the Ministry of Water and Power in Iran. Since his return to the London office in 1969 he has been engaged on the design of various irrigation projects in Romania, Colombia and Iraq. He is currently project engineer for the Civil Engineering aspects of a master plan study of two regions of the State of Johore, Malaysia, and is project engineer for general concept and hydraulic design of the Sadova Corabia irrigation project in Romania, which includes reclamation and drainage works in the Danube flood plain.

Mr. Holt is joint author of a paper, "Some aspects of the design of large scale sprinkler irrigation projects", to be presented to the 8th European Regional meeting of the International Commission on Irrigation and Drainage at Aix-en-Provence.

Name: D. GROVE

Date of Birth: 1923

Nationality: British

Education: Balliol College, Oxford University (Philosophy, Politics, Economics)

Professional Qualifications: M. A.

Background:

Between 1948 and 1961 Mr. Grove worked for the Northern Industrial Group (a regional development association in North East England), was Research Officer to two New Town Development Corporations (Crawley, Sussex and Peterlee, Durham), was Project Leader with the Max Lock Group for the Bedford Town Plan, and spent five years with the former London County Council where he was responsible for the land use survey, population and employment studies for the First Review of the London Development Plan. He is especially experienced in the designing, editing and writing of planning reports, and in the integration of social, economic and environmental planning.

In 1961 Mr. Grove went to Ghana and from 1961-65 he was Head of the Research Department in the Faculty of Architecture and Planning at the University of Science & Technology, Kumasi, Ghana.

The department assisted the United Nations Regional Planning Mission to Ghana by carrying out a number of nationwide surveys. As a result of this work Mr. Grove wrote (jointly with Laszlo Huszar) "The Towns of Ghana: the role of service centres in Regional Planning" (Ghana Universities Press, 1964); this is a practical application of central place theory in the conditions of a tropical country.

For the Volta River Authority Mr. Grove's department planned new settlements in a regional framework for some 40,000 of the people whose homes and land were flooded by the creation of the Volta Lake. This assignment required close collaboration with all the agencies concerned in the Volta resettlement operation.

Shankland /Cox:

In 1965 Mr. Grove joined Shankland/Cox as a Senior Associate and subsequently became a Partner in 1968.

From 1965-67 he was concerned with the Expansion of Ipswich for the U. K. Government (Ministry of Housing and Local Government). This involved a Regional Study and planning strategy up to the year 2000; selection of areas for the expansion of Ipswich from 120,000 to 250,000 people; and a draft basic plan for the expanded town.

Between 1968-71 he was employed on the South Adriatic and Upper Adriatic Project in Yugoslavia (a United Nations Project). The project involved the preparation of a regional plan for Split Region; master plan for Hvar island; detailed plans for eight areas of substantial development

for tourism; traffic and environmental study of Rijeka town centre; contribution to Upper Adriatic Regional Plan. All these assignments were carried out jointly with Yugoslav planning firms. Mr. Grove has spent a total of 15 months in Yugoslavia.

In 1968 Mr. Grove worked on the Deeside Planning Study for the U. K. Government (Welsh Office). This was a study of the potential for development in North Wales resulting from a proposed new crossing of the Dee Estuary which included regional planning strategy and recommendations for implementation.

Between 1969 and 1971 Mr. Grove has worked on studies concerning the Third London Airport for the U. K. Government (Roskill Commission). These studies included urbanisation needs of a new airport at two of four alternative sites; projections of population and employment; cost/benefit evaluation of alternative land use strategies according to transportation, environmental and financial criteria. Mr. Grove coordinated the work of experts from eight different consulting firms.

Between 1969 and 1971 Mr. Grove has also worked on the South East Johore Project in Malaysia in association with Hunting Technical Services Limited for the Malaysian and U. K. Governments. The project involved the preparation of a Regional Master Plan for rural settlement and economic development. Shankland/Cox were mainly responsible for studies of settlement pattern and structure, transportation, tourism and social services. Mr. Grove directed the firm's input and together with principals of the other firms made a major contribution to writing and editing the draft and final reports. He made two visits to Malaysia during the course of the study.

Post: P. 5. (Alternate)

Name: A. EDWARDS

Date of Birth: 1938

Nationality: British

Education: University of London
Regent Street Polytechnic, London

Professional Qualifications: B.A. (Hons.) Geography
Diploma in Town Planning
Associate of the Royal Town Planning Institute

Background:

Between 1961 and 1962 Mr. Edwards was employed by the Surrey County Council Planning Department and in 1962 he joined the Planning Division of London County Council. In these two posts Mr. Edwards gained general experience of urban planning and of writing reports for committees. Towards the end of the period his main responsibility was in the control of development in central London.

In 1964 Mr. Edwards joined Freeman, Fox, Wilbur Smith and Associates as a Planner and between 1964 and 1967 was a member of interprofessional teams responsible for the transportation studies for the West Midland Region of the U. K. , Washington New Town, Durham, and Greater London. He was responsible for data collection, formulating alternative land use proposals for transportation tests, and appraising the impact of road environments on the local environment.

Between 1967 and 1969 he joined the Town Planning Department of the Jamaican Government where he had island-wide planning functions and was responsible for several town development plans, a number of research projects, and a study of alternative alignments for new main roads in downtown Kingston. He gained valuable experience of the planning environment in a tropical developing country.

Shankland/Cox:

Mr. Edwards joined the staff of Shankland/Cox in 1969 and has been a full-time Senior Planner on two major Planning Projects: The Outer Metropolitan Area and the Woodley/Earley Master Plan.

The former project was carried out between 1969-70 for the U. K. Government Land Commission. It was a Regional study in South East England to locate areas suitable for residential development (but not so allocated in existing plans), having regard to socio-economic and environmental criteria, including their relationship to the evolving regional pattern of land use, transportation, and population and employment distribution.

The Woodley/Earley Master Plan (1970-71) for the Berkshire County Council involved the preparation of a Master Plan for the development of a large suburban area adjoining Reading, a rapidly growing regional centre. The study is especially concerned with providing guidelines for the investment programmes of public and private agencies to ensure the orderly implementation of the Master Plan.

Professional Council, 1965
B.A. (Agriculture), 1965
Diploma in Tropical Agriculture, 1965
specialising in tropical agricultural
extension and farm management.
M.A., 1968

Background and Experience

In 1960-61 was District Officer (V.P.) in British Guiana (now Guyana) in charge of a programme of agricultural, administrative and social development in an Amerindian settlement.

Teaching Technical Services

In 1966 he joined the Ministry Technical Services and worked with the agricultural extension of the Ministry in Jordan, a scheme to divert the flow of the Wadi Mujib to irrigate land around the Dead Sea.

In 1968 he was assigned as socio-economist to the Jordanian Investment Survey in Jordan, working on the planning of the Kafar Project, a large scale irrigation and settlement scheme in the dry plains of central Jordan.

In 1967 he returned to Jordan again as socio-economist on a study of schemes for the private development of pumped irrigation along the banks of the Taurus and the Yarmouk.

For a year from mid-1961 he was a member of the Advisory Planning Group in Lahore, West Pakistan, with responsibility for the economic appraisal of the Kotli North tubewell project and the Sialkot barrage scheme and other aspects of the Group's activities as advisers to the Government on the project planning and implementation of the Lower Indus development programme.

From mid-1968 for a year he was the agricultural economist with the Murray Valley Salinity Investigation team in Australia. This study for the River Murray Commission was concerned with the complex inter-related problems of high water tables, soil salinity and river salinity throughout the Murray Valley. An economic analysis was carried out of various proposals for controlling or ameliorating the effects of high water tables and salinity.

After leaving Australia he was concerned as agricultural economist with the planning of settlement schemes in both Fiji and Panama before being appointed as a member of the Indian River Research Mission. This team was constituted under the auspices of the I.C.D. to review the past performance and future prospects of the agricultural and socio-economic development programmes of West Pakistan.

Post: P. 6. (Alternate)

Name: A. J. BLACKWOOD

Date of Birth: 1941

Nationality: British

Education: Sevenoaks School.
St. Catherine's College, Cambridge.
University of the West Indies, Trinidad.

Professional Qualifications: B.A. (Agriculture) 1964.
Diploma in Tropical Agriculture, 1965,
specialising in tropical agricultural
economics and farm management.
M.A., 1968.

Background and Experience:

In 1960-61 was District Officer (V.S.) in British Guiana (now Guyana) in charge of a programme of agricultural, administrative and social development in an Amerindian settlement.

Hunting Technical Services:

In 1965 he joined Hunting Technical Services and carried out the agro-economic studies of the Mujib Project in Jordan, a scheme to divert the flow of the Wadi Mujib to irrigate land around the Dead Sea.

In 1966 he was assigned as socio-economist to the Roseires Pre-investment Survey in Sudan, working on the planning of the Rahad Project, a large scale irrigation and settlement scheme in the clay plains of central Sudan.

In 1967 he returned to Sudan again as socio-economist on a study of schemes for the private development of pumped irrigation along the banks of the Nile and Blue Nile.

For a year from mid-1967 he was a member of the Advisory Planning Group in Lahore, West Pakistan, with responsibility for the economic appraisal of the Rohri North tubewell project and the Sehwan Barrage Scheme and other aspects of the Group's activities as advisers to the Government on the project planning and implementation of the Lower Indus development programme.

From mid-1968 for a year he was the agricultural economist with the Murray Valley Salinity Investigation team in Australia. This study for the River Murray Commission was concerned with the complex inter-related problems of high water tables, soil salinity and river salinity throughout the Murray Valley. An economic analysis was carried out of various proposals for controlling or ameliorating the effects of high watertables and salinity.

After leaving Australia he was concerned as agricultural economist with the planning of settlement schemes in both Fiji and Panama before being appointed as a member of the Indus Basin Review Mission. This team was assembled under the auspices of the I. B. R. D. to review the past performance and future prospects of the agricultural and power development programmes of West Pakistan.

In the summer of 1970 he was assigned to a team undertaking an agricultural credit survey in each of the countries comprising the Windward & Leeward Islands of the Caribbean. In addition to the study of the scope of existing facilities and their effects on agricultural production, he was required to ascertain future requirements and to formulate proposals for effective disbursement and repayment of credit in different environmental conditions.

He is presently assigned to a livestock study in Sudan.

Post: P. 7. (Alternate)

Name: A. F. BOTTRALL

Date of Birth: 1938

Nationality: British

Education: University of Oxford.

Professional Qualifications: B.A. (Classical studies) 1960.

M.A. 1967.

Diploma Agricultural Economics 1968.

Background and Experience:

After leaving Oxford University, spent one year in Yugoslavia on Yugoslav Government scholarship. On this and subsequent visits acquired first-hand knowledge of Yugoslav economic issues, especially in the agricultural sector,

In 1962 joined Administrative Class of British Foreign Office and worked in London on East European and Soviet affairs, with special interest in agricultural policies. May 1963 to December 1964, appointed to British Embassy, Djakarta, Indonesia and Regional Information Office, Singapore. On return to London specialised in Asian affairs. Research papers included detailed studies of land tenure problems in Indonesia and Vietnam.

After obtaining Diploma in Agricultural Economics at Oxford (1967-68), returned briefly to Foreign Office. Then, February to July 1969 appointed to Nairobi by the Tropical Products Institute, London, to participate in a study on fruit and vegetable marketing commissioned by the Kenyan Ministry of Agriculture and conducted by the Institute of Development Studies, University College, Nairobi. After extensive field investigations, wrote four reports recommending improvements in the marketing systems of selected rural areas and a section in the main report on transportation.

Hunting Technical Services:

Joined Hunting Technical Services in August 1969 and assigned as agricultural economist to the Advisory Planning Group, Lower Indus Project, Lahore, West Pakistan, until June 1971, with responsibility for assessing the economic and financial feasibility of irrigation and drainage projects in the Lower Indus Region (Sind). During this period helped to prepare planning reports for three of the 30 projects proposed in the Lower Indus Report (1966), which envisages the ultimate development of over 13 million acres of irrigated land. Made several visits to Khairpur tubewell project in Sind to study and advise on economic aspects of production and marketing. Also helped to train local counterparts within the West Pakistan Water and Power Development Authority in techniques of economic and financial analysis, and the collection of field data.

From September 1971 to March 1972, assigned as marketing and transportation specialist on HTS review of livestock sector in Sudan commissioned by the Kuwait Fund for Arab Economic Development. Tasks include one month's travel in Middle East countries to identify possible export markets for Sudan livestock products, and three months in Sudan examining transportation, distribution and supply problems.

Name: F. A. SOLE

Date of Birth: 1937

Nationality: British

Education: St. Bonaventure's Grammar School, London
University of London

Professional Qualifications: B. Sc. Agriculture (1959), M. Sc.
Agricultural Economics (1968)
N. D. A (1959)

Background and Experience:

From 1955 to 1963 farm management in the United Kingdom. From 1963 to 1964 Agriculturist engaged in planning and management of rubber and oil palm estates in Malaya.

In 1967 to 1968 at Wye College - awarded an M. Sc. in Agricultural Economics.

Hunting Technical Services:

From 1964 to 1966 engaged on water course studies as part of the Indus Special Study, West Pakistan, commissioned by the World Bank. The work involved close liaison with the farming communities and a combination of observation, measurement and questioning in obtaining the fullest possible record of farming activities on selected water courses, with particular emphasis on the economics of the enterprises.

In 1967 undertook the preparation of an index of agricultural research work in the Sudan, commissioned by F. A. O. The work involved the abstraction of all experimental data and its transference to 'clip' cards, supplemented by an abstract of each experiment and a comprehensive bibliography.

In 1968 appointed Agricultural Economist to the Land Capability Survey of Brunei State, involving the study of agriculture and land utilisation under the ecological, market and economic conditions appertaining to Brunei, leading to the production of an appreciation of the broad financial and economic implications of developments to be advocated or considered.

In 1969 appointed Agricultural Economist to the South East Johore Project, Malaysia. This involved the study and appraisal of a wide range of tropical crops, but with particular emphasis on livestock for the development of a first stage livestock development for South Malaysia. His work also involved the appraisal of potential mechanised grain and crop production in this area. Latterly in the project he has been closely involved with the overall plan for the South East Johore regional development plan and the planning of the first phase livestock development.

He has particular experience in the study of farming practices at a detailed level, in the planning of crop and livestock enterprises and in the appraisal of mechanised agriculture, as well as the overall assessment of projects in broad financial and economic terms.

2. C SOIL ANALYSES REQUIREMENTS

2. C SOIL ANALYSES REQUIREMENTS

We would seek substantial assistance in the provision of laboratory facilities for carrying out analyses of soil samples taken during the field surveys. We hope that these would be provided in Sarawak or West Malaysia, alternatively we would discuss the part Hunting Technical Services' environmental chemistry laboratory might play in doing this work.

The following determinations would be requested:-

(a) Full Series Analysis

- (i) full mechanical analyses of clay, silt, fine sand and coarse sand fractions; gravel and stones on the original sample;
- (ii) pH (distilled water and 0.01 N KCl);
- (iii) easily soluble potassium and phosphorus;
- (iv) total available phosphorus, potassium, calcium and magnesium;
- (v) cation exchange capacity;
- (vi) exchangeable cations;
- (vii) percentage saturation;

(b) Representative Profiles

As above plus percentage Ferrous Oxide.

(c) On Mucky and Peaty Soils

Determinations from (a) and (b) as appropriate plus:-

- (i) percentage carbon and nitrogen;
- (ii) carbon/nitrogen ratio.

(d) On Saline Marine and Suspected Acid Sulphate Soils

- (i) percentage clay, silt, fine and coarse sand fractions;
- (ii) pH (distilled water and 0.01 N KCl);
- (iii) cation exchange capacity;
- (iv) percentage saturation;
- (v) soluble anions and cations;
- (vi) exchangeable cations;

- (vii) total phosphorus and potassium;
- (viii) electrical conductivity;
- (ix) total nitrogen;
- (x) organic carbon;
- (xi) base saturation;
- (xii) percentage sulphate;
- (xiii) percentage chloride;
- (xiv) exchangeable aluminum.

(e) On Representative Soil Samples

- (i) trace elements: copper, zinc, manganese;
- (ii) silica/sesquioxide ratio;
- (iii) clay minerals;
- (iv) analysis of fine clay fraction;
- (v) available water capacity; soil moisture retention at 1/10, 1/3, 1 and 15 atmospheres; bulk density.

ANNEXURE:
TERMS OF REFERENCE

ANNEXURE

TERMS OF REFERENCE

Part I : Introduction

1. The population of Sarawak, which is concentrated in the First, Second, and western part of the Third Division, is increasing at a rapid rate, to the extent that land resources within and around the more intensively settled areas are proving insufficient to meet the traditional subsistence agriculture needs of the indigenous peoples or the permanent agricultural land requirements of the immigrant groups. Furthermore, opportunities in other sectors of the economy cannot fully satisfy the rising aspirations of both these groups within these areas. On the other hand, conditions in other parts of Sarawak, particularly in the Fourth Division, are favourable to settlement and development by people from outside the Division, and the State Government has accordingly identified an extensive region of predominantly unencumbered land with considerable agricultural and forestry potentials as suitable for priority development during the coming decades, primarily to meet the employment needs of a large proportion of the population from the more congested areas.
2. This Miri-Bintulu Region comprises approximately 3 million acres, or just under 4,700 square miles. It extends roughly from 4° 35'N to 3°N and from 113°E to 114° 35'E. It includes approximately 1,500,000 acres of land that is believed to be suitable for agriculture, of which approximately 1,000,000 acres is unencumbered State land that is not under cultivation at present. This constitutes the largest contiguous area of potential agricultural land in the State. Additional details about Sarawak and the Region are provided in the appendix.
3. It is the intention of the Federal Government and State Government of Sarawak that this region be developed, primarily to permanent agricultural settlement and large scale forest management, exploitation and processing, and to other economic activities which a close study of the region may show to be viable.
4. In order that such developments can be carried out in a systematic and expeditious manner, the Governments require the services of Consultants to carry out a feasibility study and to prepare a perspective plan to guide the future development of the region over the longer term, and in addition, to draw up more detailed plans for specific areas and sectoral activities to be undertaken during the later part of the Second Malaysia Plan and during the Third Malaysia Plan (1967-80) within the context of the 20 year perspective masterplan. This feasibility study will be undertaken in two phases.

5. The plans will encompass public and private investment consistent with financial and managerial resources, and give special emphasis to the urgent need to improve the economic position of the rural population in the State as a whole and minimize rural underemployment and uneconomic practices. This emphasis is to be commensurate with the resettlement of the greatest number of people on holdings sufficient to provide reasonable incomes and to induce incentives for higher productivity and progress either through traditional, but greatly modified and more economic practices, or through the introduction of more modern agricultural systems, depending upon the social inclinations of particular settlement groups.

Part II : Study Requirements

6. The feasibility study shall be carried out as follows:-

(a) Phase I

7. Analyse relevant socio-economic data, and particularly those data concerned with human resources within the State as a whole, and with natural resources within the region, and where necessary survey and collect additional data sufficient to:-

- (1) put forward broad land use proposals in the form of a zonation plan, sufficient to guide development over the long term;
- (2) identify the socio-economic needs of the peoples within and outside the region who are likely to provide the bulk of the future population for the region, in so far as this is possible over a 20 year perspective plan period;
- (3) assess the probable scale of development needs within the region, by sectors, necessary to meet the employment targets arising from (2);
- (4) locate an area, or areas, within which such development needs as assessed in (3) might be best sited;
- (5) make proposals for undertaking specific sectoral studies and preparing project plans, encompassed within the 20 year perspective plan, in the area(s) identified under (4) above, in the form of separate investible packages, to cover priority developments which will take place during the later years of the Second Malaysia Plan and in the Third Malaysia Plan.

(b) Phase II

8. Within the context of the broad perspective plan prepared during Phase I, (the Consultants) will prepare a semi-detailed masterplan, sufficient to meet projected settlement requirements for 20 years (currently estimated at about a quarter of a million acres of permanent crop land), and supplemented by detailed project plans for short-term sectoral activities, in the form of investible packages, to cover immediate development requirements during the later part of the Second Malaysia Plan and the Third Malaysia Plan (currently estimated at about 50,000 acres of permanent crop land). These plans will require the survey or collection of additional data to supplement existing information sufficient to:-

- (1) determine the optimum cropping pattern and the agricultural sector programme required to achieve this;
- (2) advise on changes necessary in current forest exploitation programmes sufficient to ensure that land acquisition needs for agriculture are not prejudiced by forest clearance delays;
- (3) utilize and conserve the inland water resources in an optimum manner to meet potable and industrial, including crop processing and irrigation, requirements;
- (4) locate public communication and transportation facilities, including port requirements for the export of produce from the Region and the Fourth Division;
- (5) locate sites for major centres of population and industrial facilities for processing the agricultural, forest and other products; and
- (6) determine the institutional, including marketing and management needs required by the individual programmes as outlined above.

