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THE WORK OF THE BRITISH  
TROPICAL AGRICULTURAL MISSION IN  
BOLIVIA  
1963-1972

AN EVALUATION

by

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and  
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## PREFACE

Each year the Overseas Development Administration (ODA) commissions a number of ex-post evaluation studies with two aims in mind; firstly, to assess the effectiveness of its aid activities and secondly, to learn lessons for improving the effectiveness of future aid activities.

This evaluation is one such study.

Evaluation studies are undertaken by individuals or by teams especially recruited for their particular knowledge with regard to the subject under study. Sometimes these teams will include personnel from ODA (increasingly teams are a mix of ODA and external personnel).

In all cases the reports and conclusions are attributable to the authors, who are finally responsible for their contents, and not to ODA.

Evaluation Unit  
Manpower and Evaluation Department

THE WORK OF THE BRITISH TROPICAL AGRICULTURAL MISSION IN BOLIVIA

ERRATA

- p.2, para.5 h. line 2: "Tea Development" should read  
"Bolivian Development Corporation (CBF)".
- p.11, para.5, last line )  
p.26, para.3, line 11 ) for "cocoa" read "coca".  
p.29, para.11, line 7 )
- p.22, para.13, next to last line, ADD, at end, "Alto Beni I".
- p.37, para.3, line 8: after "planting" insert "material".
- p.38, line 4 from top: "Para 'Beneficiaries')" to be replaced by  
"X. Beneficiaries para. 11)".
- p.40, para.3 last line: "cocoa" should read "coca".
- p.45, para.9, line 8, for "notionally", read "notoriously".
- p.50, para.1, last line but two: after the word "research" insert  
"Johnson on tea, cotton and coarse fibres  
and Ballantyne on soils".
- p.58, para.3, line 13, for "changes in cocoa" read "oranges or coca".
- p.76, Appendix 1,  
A.i. Mr D E Glason's name should be marked with \*.  
B.1. Miss Robertson and Mr Featherstone belong to H.M.  
Embassy not HM Treasury.
- p. 77, B.ii. Dr Daniel Candia (not Cardia).  
Mr J van Rooi (not Rooif).
- B.iii. Ing. Raul Hinajosa (not Himajora).
- p. 78. San Benito Experiment Station (not Berito).  
B.iv. Ing. Raul Salas (not Sulus).

ABBREVIATIONS UNEXPLAINED IN THE TEXT

- BAB - Bolivian Agricultural Bank
- CBF - Bolivian Development Corporation
- GOB - Government of Bolivia
- INC - National Colonisation Institute
- MINAG - Ministry of Agriculture

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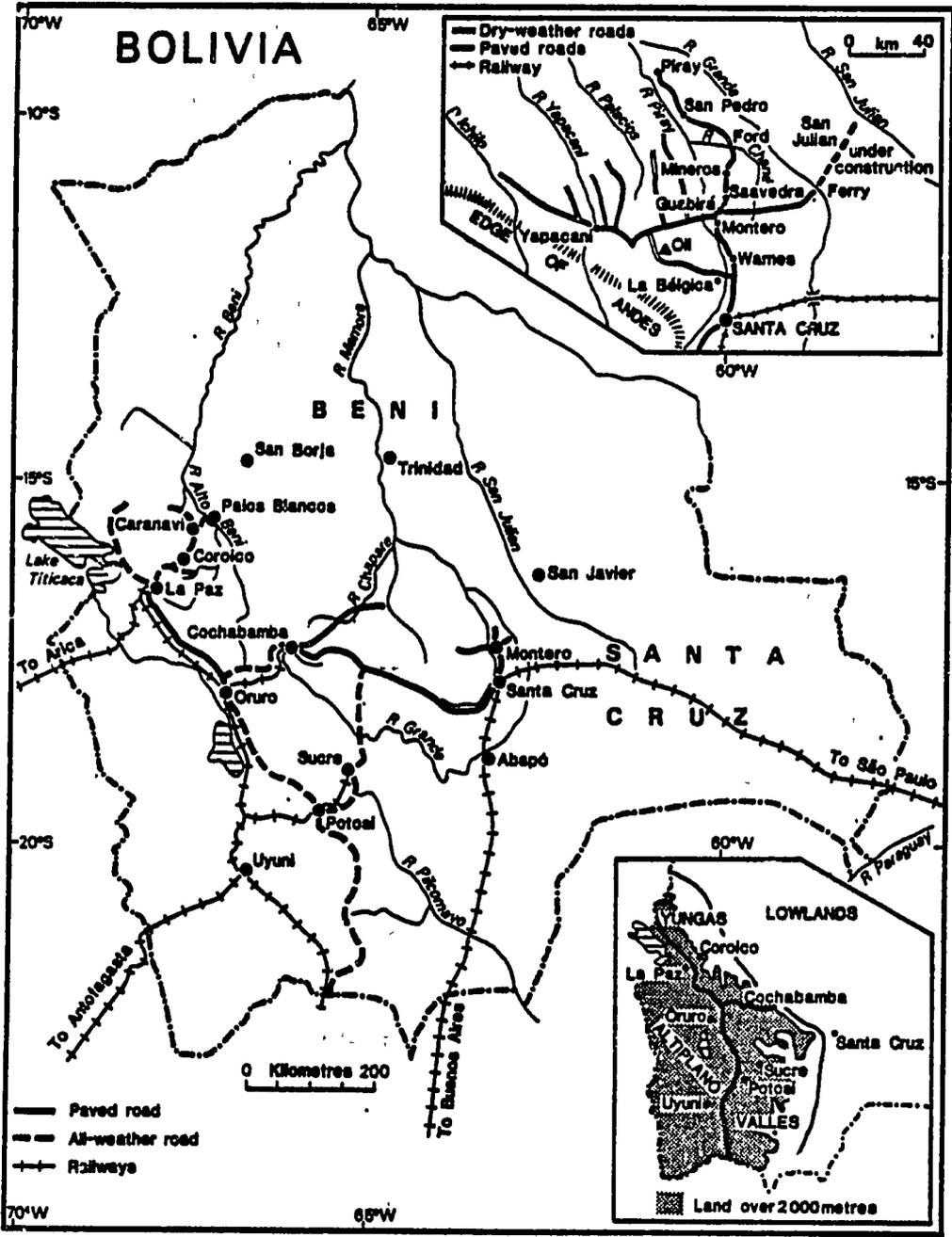
## PREFACE

"Writing and ploughing are two different talents: and he that writes well must have spent in his study that time which is necessary to be spent in the fields by him who will be master of the art of cultivating them."

Jethro Tull, one of the great  
agricultural improvers, 1731.

This study was commissioned by the Ministry of Overseas Development and carried out by Dr J C Crossley, Lecturer in Latin American Geography in the University of Leicester, and Mr C E Johnson, a former head of the Tropical Agricultural Mission in Bolivia.

We are indebted to many people for their helpful cooperation, and especially to the ODM and the Bolivian authorities who gave us every assistance: Mr C R Horrell, Head of the new Mission in Bolivia who made available to us the offices and files of the Mission and helped us with our contacts in Santa Cruz: Dr T T Cochrane who gave us much information about the Mission: Ing Armando Torrico A. who regaled us with his extensive knowledge of the Mission and made all our contacts in Cochabamba: and Her Majesty's Ambassador at La Paz and his staff who looked after us there. We are most grateful to the many Bolivians we met, who answered our probing questions with great forbearance.



## I. SUMMARY

(Chapter references in brackets)

1. The purpose of the study was to assess the impact of each of the activities of the British Tropical Agricultural Mission in Bolivia 1963-1972, the effectiveness of a multi-disciplinary mission as a means for technical cooperation in agriculture and the results of two consultancies on the Bolivian sugar industry (1972 and 1974), (II).

2. The method was by interviews with people having knowledge of the Mission or its work and impact, study of reports, memoranda, correspondence and publications produced by or relating to it and visits to the scenes of its activities. It occupied a geographer and an agriculturist for about six months of intermittent work including preliminary study in London and a month in Bolivia. Lack of suitable statistics of agricultural output in Bolivia made it impracticable to assess whatever increase might be attributable to the Mission, (IV).

3. The Mission was established early in 1963 following a request in 1961 by the Government of Bolivia for assistance in developing tropical agriculture in accordance with the ten-year national plan for economic and social development then being drawn up. An appraisal team sent out by the DTE in 1962 recommended that 26 experts should be provided and the DTC accepted a commitment to build up a team of 16, (VI. 1-15).

4. Twelve experts had been supplied by the end of 1964, but the capacity of the host government to provide local support proved less than had been foreseen and some of the plans had to be abandoned, (VI. 16-26). In 1965 the new government in Bolivia asked for the team to be limited to 10, the maximum which they felt able to absorb, (VI. 29). The redeployed Mission found some useful activities but difficulties with local financial and logistic support continued, (VI. 27-33). It was reviewed by the ODM in 1967 when a Bolivian request to continue for a further five years was agreed to, (VI. 29). After a further review in 1971 it was decided to terminate it, (VI. 34).

5. The activities of the Mission are described and appraised in Chap VII. Its main achievements were:

a. Production of soil maps and information on the soils of the tropical areas embodied in a number of reports and a major work on the Land Systems of Bolivia published locally in Spanish, and establishment of a soils laboratory agreed by many of our informants to be the best in Bolivia and one of the best in South America. Both the reports and the laboratory are being utilized by government and other organizations and to a limited extent by farmers in planning land settlement and the development and improvement of crop production (VII.C.).

b. Establishment of a model cooperative coffee pulper and hulling plant, both in use though sufficient grass-roots interest has not been generated to secure the extension of cooperative processing and marketing throughout the 10,000 small coffee growers in the area, (VII.B. and IX.D.).

c. Development of cocoa and a cooperative fermentary for small farmers in the colonization area of the Alto Beni, providing a valuable cash crop though now threatened by plant disease and inadequate arrangements for extension, credit and marketing. (VII.A.)

d. Improvement of cattle husbandry and management through limited adoption of methods and facilities demonstrated by the Mission, contributing in part to an increase of about 20% in the average carcass weight of animals slaughtered at the abattoirs. (VII.G. and IX.C. 3)

e. Introduction of improved pasture grasses and legumes utilized as yet to a limited but apparently increasing extent by cattle farmers and by cotton growers and small farmers as an aid to the maintenance of soil fertility. (VII.H.)

f. Production of technical bulletins on crops, pastures, pests, animal husbandry etc which are in demand mainly from government and missionary extensionists. (VI. 34, VII.H. 23, VII.I. 5, IX.C. 4)

g. Training of a few Bolivian technicians in crop and pasture agronomy, soil analysis, biological control of pests, coffee and cocoa processing etc most of whom are still employed in tropical agriculture though not all in Bolivia and few still in government service. (VII.C. 23-24, VII.H. 4-5, VII.I. 6, VIII.B. 3)

h. Introduction of tea planting material, providing a basis for development now in progress by Tea Development with cooperation from a Taiwanese technical mission. (VII.A. 19)

6. The Mission failed in its attempt to:

a. Establish a coordinated technical service for tropical agriculture. (VI. 6, 16, XII. 6)

b. Establish effective biological control of major crop pests. (VII.I. 3-4)

c. Develop small farmer production of cotton (VII.E. 2-3) and pyrethrum (VII.F. 2)

d. Improve crop yields by the application of experimental results. (VII.F. 4-5, IX.B. 5)

e. Develop the local production of pasture seeds. (VII.H. 20, IX.C. 7)

f. Develop exports of high quality coffee and cocoa. (VII.A. 16, VII.B. 7)

7. The principal reasons for successes were:

a. The practical nature of those activities. (VI. 10, 22)

b. Ability of the staff concerned to mobilize resources, cooperate with local and foreign technicians and voluntary workers and reach out to farmers. (VIII.B. 1, IX.A. 1-2, XI. 2, XII. 11)

c. Sustained effort over a long enough period to produce results. (VII.A. 20, VII.C. 1, also VII.B. 1)

d. Cooperation of several Bolivian institutions (VIII.B.4), USAID and the Peace Corps (VII.A. 10, VII.B. 4, 6) and missionary workers (VII.H. 14-17, IX.C. 4, X. 10).

e. Financial support by USAID (VII.B. 6) and the ODM (VI. 28, VIII.A. 10, VIII.B. 4).

f. Assistance from advisory visits and temporary attachments (VII.A. 3, 7, 20, VII.B. 2, XII. 12).

8. The main factors which limited success were:

a. Inability of the Bolivian Ministry of Agriculture to provide adequate local support (VI. 26-27, VIII.A. 7-13, VIII.B. 2-3).

b. Over-ambitious initial objectives due to misjudgement in the appraisal of the constraints and by the DTC of the resources needed to achieve these objectives (VI. 8, 11, 16, XII. 6).

c. Insufficient recognition at appraisal and subsequently of socio-economic factors and the need for extension (VII.A. 23, VIII.A. 2, IX.B. 5-8, IX.D. 2, IX.E. 5-6, XI. 3).

d. Imbalances in staffing of projects arising from reductions in the size of the Mission and long delays in recruitment to fill gaps (VI. 11, 30, VII.A. 18, VII.H. 21, VIII.A. 4, IX.B. 3, XII. 6-8).

e. Inadequate reporting of activities and results (VI. 23-24, VIII.A. 19, IX.A. 3, IX.C. 2).

f. Dispersion of the limited staff and other resources over too wide a field (VIII.B. 6, XII. 6, 11).

9. The Mission's successes demonstrate that multi-disciplinary teams offer a suitable means for technical cooperation in agriculture where different technical skills are required to introduce, adapt and disseminate new techniques. The difficulties of coordination and local support experienced must be expected where services and institutions for agriculture are at a rudimentary level, a point of special relevance to ODM's present policy of emphasis on aid to the rural poor. These difficulties might be minimized by:

a. Adequate and realistic appraisal. (XII. 9)

b. Selection of compact projects with limited and clearly defined objectives to be agreed with the host government in both their social and technical content. (XII. 10-11)

c. A sufficient range of expertise to meet all requirements to be provided, but not so wide or diverse to make coordination in the host country unduly difficult, and to be supported by advisory visits and temporary attachments designed to fill gaps rather than extend the field of effort. (XII. 11-12)

d. All potential sources of local cooperation and financial and logistic support to be explored at the start and any gaps realistically identified to be covered by ODM, (XII. 9)

10. Action is being taken to implement some of the recommendations of the two consultancies on the sugar industry (new factory and research station, rationalization of cane deliveries to factories, introduction of individual cane sampling and payment based on individual sugar content). There are no plans to improve the effectiveness of CNECA and administration of the quota system or to make a radical change in the cane price formula (VII.D. 4-5).

## II. OBJECTIVES OF THIS EVALUATION

The objectives of this evaluation were defined in the Terms of Reference for Evaluation of First British Tropical Agricultural Mission in Bolivia as follows:

- i. To assess the impact of each of the activities of the First British Tropical Agricultural Mission in Bolivian Agriculture. In particular:
  - a. To make a quantitative assessment of the increase in value of agricultural output attributable (in part at least) to the work of the Mission, eg in introducing new varieties and systems of pest control.
  - b. To assess in quantitative terms the contribution of the Mission to such activities as training, cooperation, extension and research.
- ii. To evaluate the effectiveness of the multi-disciplinary mission concept as a means of giving technical assistance and to see what lessons are to be learned from this experience vis-a-vis the ODM's current objectives in rural development, eg could it have been organized and managed more effectively? In particular, what logistic and administrative difficulties did the Mission have to face, and how could these difficulties be minimised in similar future projects?
- iii. If time permits, the consultants should also assess the extent to which the policy recommendations of two recent consultancy reports (Bolivian Sugar Industry (1972) and Report on the Pricing of Sugar Cane in Bolivia (1974), both by a joint Bookers Agricultural and Technical Services Ltd and Tate and Lyle Technical Services Ltd team) have been implemented, and whatever lessons are to be learned by ODM from these two consultancies. However, this additional evaluation should not prejudice work on the main study, ie of the achievements of the Tropical Agricultural Mission.

### III. THE SCOPE AND LIMITATIONS OF TECHNICAL ASSISTANCE: TO AGRICULTURE - THEORY AND PRACTICE

1. Aid to agriculture, be it technical or capital, is designed to bring about changes for the better in a country or region. Specifically, the fundamental objective is to increase agricultural production and/or the net income of the target rural population. This end will be achieved by means of improving one or more of the six systems which embrace agriculture: (1) the Information Collection System, (2) the Systems of Production and (3) Marketing, Processing and Storage, (4) the Social System, and (5) the National and (6) International Political Systems. Improvements to the first include research, data collection and surveys pertaining to any of the other systems and to the mechanisms of change. Improvements to the other systems all involve persuading people to make changes. Since all the systems are interdependent, aid focussed on one alone will have a ceiling to its potential achievements; in extreme cases it will be rendered totally ineffective by some crucial deficiency in another system.

2. Technical Assistance to agriculture is the provision by the donor to the recipient of technical skills for the fundamental objective defined above. Its scope is not inherently confined to some of the systems identified; indeed BTAM worked at times to improve most of them. Technical assistance does however have inherent limitations because it excludes capital aid and because it is of restricted duration.

3. For the objective to be capable of realisation by means of providing skills, it must be assumed either that the injection by the donor of higher skills than those currently available to the recipient will alone be a sufficient condition; or that the necessary additional inputs of skill and capital will be provided separately by the donor and/or by the recipient and/or by third parties, in order to create the sufficient conditions. Where capital inputs are necessary and where those inputs are not provided by anyone, it follows that technical assistance by itself will not produce the effects intended. Hence both capital and technical inputs must be considered at the appraisal stage, so that if capital aid is necessary for the technical assistance to be effective steps can be taken to secure it either from the same donor or from another source.

4. If the immediate objective is to transmit existing knowledge and skill to all the producers, for reasons of time and efficiency, efforts must be concentrated on the most effective intermediary transmitters, be they innovating types of farmer or governmental or non-governmental extension agents. Those efforts may be of two kinds: actually imparting knowledge and skill, and enhancing the effectiveness of the intermediaries as transmitters. In this context it may be observed that aid to governments is predicated on the assumption that the government has or will have the means and the will directly to help the farmer.

5. If, alternatively, the objective is to acquire new knowledge, eg by adaptive research, and then to transmit it, the duration of assistance must be long enough to ensure that the goal is achieved within the life of the Mission. Either the type of knowledge required must be identified and the duration extended, or - if the duration is predetermined - the types of knowledge must be scaled down to those capable of being obtained and transmitted within the available time.

6. Thirdly, if the objective is solely to acquire new knowledge, the full period of assistance may be devoted to it. It will be of value however only if adequate transmission structures exist by the time required; in this case there will be nothing to transmit during the life of the Mission and hence no opportunity for testing transmission structures.

7. Reliance on intermediary transmitters brings with it the added problem of ensuring continuity of effort if the aid is to be effective. Movement of transmitters to other employment is in a free society an inescapable threat to the donor's investment. Providing special training solely for key personnel is a form of insurance which runs especially high risks where frustration and low salaries lead to high job mobility or where the very acquisition of scarce higher qualifications leads to promotion to posts where the person is unable fully to apply the training which he has received. Less risky ways of protecting the investment in such cases would be consciously to widen the types of intermediary used, to aim at numbers rather than quality alone, and to subsidise the transmitters before and after the Mission has ended. To insist that such financing must always be someone else's responsibility may serve simply to waste the investment.

8. For aid to achieve its objective by design requires firstly an adequate diagnosis of the constraints that operate in the various systems and, secondly, the prescription of action which is both feasible for the donor and capable of benefiting the farmer. If the appraisal - the diagnosis and prescription - is inadequate the most appropriate skills will probably not be recruited. If skills are recruited more for their availability than for their fitness for key tasks, the effectiveness of aid may be impaired, but there may be no alternative.

9. In projects of the type under consideration - and we have not investigated others - the diagnosis and prescription should include:

i. a study of available literature (including the documentation of other donors), providing a description of the agriculture and its problems, and an assessment of the factors agronomic, economic, social, political, historic and geographical which account for the problems; and

ii. a field assessment of what useful contribution the potential donor might realistically make. The team should be composed of people capable of understanding the factors enumerated and the practicability of possible actions.

10. In practice this ideal is never attainable: data are often lacking; time, finance and expertise available for appraisal are limited; the ability of the donor to respond is restricted by finance, availability of staff, political considerations and terms of reference: thus at the time BTAM was established DTC had not taken on board responsibility for capital aid. In time everything changes: new political, economic and social considerations arise, new technologies are developed, and new perceptions of the problems are formed. At one time when the expertise that could be offered related only to production and marketing there was a tendency to take into account only technical factors and to pay relatively little attention to broader ones. BTAM's experience illustrate the disadvantages that can result from this restricted approach. Today, however, ODM can draw on its greater experience, on better planning procedures and on special studies. There is more emphasis on integrated rural development in which all components of the systems are covered. It remains true

that in some cases what can be done can only be found out by doing it, and a project may have to be started without an ideal appraisal.

11. These practical considerations do not serve to invalidate the case for more thorough analyses. The initial appraisal must be as adequate as circumstances permit and the project merits. All this serves to emphasise the need for ongoing evaluation and reformulations of policy in the light of increased experience, information and changed circumstances. Effective aid cannot therefore result from an inaugural monologue but only from a continuing dialogue. For that dialogue to be successful, reporting and communications procedures must be adequate.

#### IV. METHODS OF EVALUATION

1. The evaluation was carried by a university geographer specialising in Latin America who had previous field experience in Bolivia and in aid management as Chairman of the Oxfam Latin American Committee, and a tropical agriculturist with experience as a former Colonial Director of Agriculture in Africa, ODM Adviser on Agriculture in the Middle East and Head of the BTAM in Bolivia from 1965 to 1968. This team had the advantage of its collective knowledge of Bolivian agriculture and Latin American affairs with the drawback from the point of view of objectivity of a degree of personal involvement in certain aspects of the Mission's work. One member, as a former Head of the Mission, was in the position of poacher turned gamekeeper. The other had a special interest through his previous field studies and Oxfam connections in colonization in the tropical areas.

2. The purpose was to find out to what extent objectives were achieved and contributed to development, whether in the way envisaged when the project was formulated or in other ways, and to analyse the reasons for both successes and failures. It is not a substitute for permanent on-going evaluation during the life of the project, since it cannot influence the objectives or the way in which it was carried out. It can only provide information after the project has been completed which can be used to assist the identification of factors which have contributed to or limited the success of the project in promoting development, to reveal whether the methods used in formulation, appraisal, operation and on-going evaluation were effective or require modification in future projects and to indicate what further steps may be needed to achieve the objectives or consolidate what progress has been made.

3. The project was designed as a multi-disciplinary technical assistance team to assist the development of agriculture in the tropical areas of Bolivia. It arose from a request made to the newly formed Department of Technical Cooperation by the Government of Bolivia in 1961 and became operational in 1963 under an agreement concluded between the British and Bolivian Governments in February of that year. It was the DTC's first venture in technical assistance in Latin America and one of the first to be attempted outside the Commonwealth. The resources for technical assistance to agriculture at that time consisted largely of ex-officers of colonial agricultural departments the majority of whom were trained and experienced in agronomy and related natural sciences and technology. The Ministry of Overseas Development with its wider functions had not yet come into being, the DTC was concerned only with technical assistance and procedures and resources for aid management had not yet been developed in the way that occurred subsequently. The scope and kind of aid that could be offered and facilities for appraisal and management were thus more limited than those now available.

4. The period covered by the evaluation extends from 1961, when the request for assistance was made, to 1976, when we visited Bolivia to trace what influences could be discerned of the Mission's presence from 1963 to 1972. The trail is faint in places and evaluation depends on what can be gleaned from reports, memoranda, correspondence and publications, the opinions and recollections of those who participated in, observed or made use of the Mission's work and the visual evidence provided by laboratories, processing plants, farm improvements and other developments which have left a mark and which the Mission had a hand in starting or influencing.

5. We were unable to obtain figures in support of our assessments because reliable and detailed agricultural statistics are sparse in Bolivia and because the Mission's activities were widely dispersed, both geographically and over different products, and any effects they may have had on production were indirect and not readily traceable to the Mission's influence. For these reasons also it was not practicable to make a rigorous with/without project evaluation. There has been significant development of tropical agriculture in Bolivia since the Mission began its work, and many factors have contributed to this which would have been at work without the Mission. And while there are records of its experimental work none have been kept of its extension activities. Any quantitative evaluation of these is thus not possible.

6. There was no precise initial definition of the objectives of the Mission as a whole or of several of the projects which it undertook. One or two set specific objectives but most aimed to "improve" farm practice or to provide information for future use in improving production without defining exactly what degree of improvement was to be effected or what use was to be made of the information gained. Evaluation of the Mission's effectiveness in achieving its objectives is thus limited to a subjective assessment of what was achieved and what contribution it made to the dynamics of development. A more extended study might reveal how many and what kinds of farmers have adopted improvements recommended by the Mission and made use of the information gained in experiments or by soil survey and analysis.

7. An earlier evaluation might have found more solid evidence of what the Mission actually did but less of its significance in terms of what survived after the Mission left. Much of what the Mission did or failed to do is only now beginning to show and much remains to be exploited. To wait longer would probably not show much more than can be seen now, except perhaps for the sugar consultancies which need more time to produce their full effect. Only time will show how much use will be made of the experimental results, the technical bulletins, the model coffee cooperative and cacao fermentary and the soils laboratory, but new knowledge and new inputs will increasingly obscure the Mission's influence and this is probably a good time to assess the value of its contribution.

8. The study was carried out in three phases. The first was a review of the documentation available at the ODM and questioning of people in the UK who had knowledge of the Mission's antecedents, administration and operation. This was followed by a month in Bolivia to interview people who had associations with the Mission, study the documentation available there and look for visual evidence of the Mission's activities. After that some two months was spent in further study and discussion and in writing the report.

9. A list of places visited and people contacted by interview, telephone or letter will be found in Appendix 1 . It will be noted that while we were able to contact a fairly wide range of people with knowledge of the Mission we were able to get evidence from only six of the seventeen officers who (apart from Mr Johnson) served with the Mission during its life and only three of these we met personally , and from only a few of the Bolivians who were associated with its activities. We found many gaps also in the documentation of some phases of the Mission's work. Our conclusions have had to be based on the incomplete evidence we could find.

## V. BACKGROUND TO THE MISSION

### A. THE BOLIVIAN AGRARIAN REFORM

1. To understand why Britain was invited in 1961 to assist Bolivia in tropical agricultural development requires a brief consideration of events of the previous decade. The Agrarian Reform law of 1953 abolished serfdom and authorised the expropriation and redistribution to the ex-serfs of the large private estates. By 1961 the reform had been largely completed in the Highlands (Altiplano and Valles) and as a result a social revolution had occurred that was more sweeping than any then to be found in Latin America. In the tropical lowlands pressure for reform had been less, larger minimum sizes of holding were permitted under the Law and indeed the Law had been implemented only to a limited extent.

2. The MNR government under President Paz Estenssoro, which had introduced the Agrarian Reform Law, was re-elected in 1956, 1960 and 1964 but by the early 1960's it had begun to disintegrate and was replaced in November 1964. All seven succeeding governments have recognised the permanence of the Agrarian Reforms and have sought to govern with the support of the peasants, who constitute the majority of the Bolivian population.

### B. BOLIVIA'S GEOGRAPHICAL DIVERSITY

3. Bolivia is normally divided into three regions:

	<u>Area (sq km)</u>	<u>Rural Population (1961)</u>
The Altiplano	180,000	905,000
The Valles	236,500	1,479,000
The Lowlands	652,500	401,000

4. (1) The Altiplano is a cool-temperate plateau lying at over 3,700m above sea-level; the northern part has enough precipitation for crops and pasture. Holdings, since the reform, are all small and fragmented, the labour force is underemployed but there are opportunities for more fully utilising the land.
5. (2) The Valles are a complex alternation of valleys and basins at about 2,000-2,500m and intervening plateaux and mountains. The flat floors occupy only 10% of the area, enjoy subtropical to warm-temperate climates and are densely populated with tiny permanently cultivated holdings, often irrigated. Population pressure has compelled the use of marginal hillsides resulting in serious erosion. The northern valleys, the Yungas, are lower, wetter and devoted to coffee, cocoa and citrus growing.
6. (3) The Lowlands comprise the eastern plains mainly below 500m and the outer valleys and hills of the Andes below about 1,500m. The climate is tropical with rainfall decreasing southwards. Close settlement has long characterised only the vicinity of Santa Cruz city, with the rest of the plains sparsely settled and devoted to extensive cattle ranching and forest industries. Since 1950 spontaneous and directed migration from the Altiplano and Valles has led to the occupation, mainly by small farmers, of the outer valleys north-east of La Paz and Cochabamba (Alto Beni and Chapare respectively) and of the alluvial plains north of Santa Cruz.

7. The Santa Cruz area is the only part of Bolivia where large and small farms both occupy large areas of land. The former occupy a 50-mile long cove stretching north from Santa Cruz City to Saavedra and Mineros along either side of a paved highway; the latter occupy a 50-mile wide peripheral zone which flanks the cove to the west, north and east, and is reached but not crossed by all weather roads.

8. The construction of paved roads and railways in the 1950s linked the Santa Cruz area to Brazil, Argentina and the Bolivian Highlands encouraging the modernisation of the large estates.

### C. THE 1962-71 SOCIO-ECONOMIC DEVELOPMENT PLAN

9. The economic benefits expected from individual ownership of land did not materialise. Product marketing systems were dislocated for a period and production fell. The peasants lacked access to modern technology, remained largely illiterate and continued often to be underemployed since in much of the Highlands redistributed plots were still of inadequate size. The only dynamic area of the agricultural sector was that of the large estates of Santa Cruz where production especially of sugar cane was expanding rapidly, aided by the improved infrastructure, credit facilities and the seasonal influx of harvest labour from the overpopulated Highlands. The rising urban population could be fed only by increasing food imports, which had a serious effect on the balance of payments.

10. The 1962-71 Development Plan's agricultural programme aimed at solving both the economic and social problems by 1971 and the tropical lowlands were to provide the key. By bringing 272,000 ha into cultivation it was planned to increase production of import-substitution commodities such as rice, sugar, edible oils, and fibres and of new export products like coffee, cotton and beef. The increase in cultivation was to be brought about by the transfer of 455,000 people from the overcrowded Highlands to new colonies, thus achieving an absolute reduction in the population of the Valles and a lowered rate of increase on the Atiplano.

11. Although the large Santa Cruz farms were the most dynamic in the country, their replication was specifically excluded as a model for resettling highlanders, even if it meant "the sacrifice of possible productive advantages". The government did not wish that "the ex-serf converted into a free producer by the agrarian reform (should be) moved to the Lowlands to revert to the condition of day-labourer". It is doubtful whether this constraint had the full support of the governing party; nor perhaps could a Minister of Economy afford to forego the advantages of still greater production by the large enterprises.

12. Nevertheless the thrust of the Plan was clear and, to improve the hitherto slow pace of colonization, it envisaged an integrated development employing highway construction, soil surveys, ecological appraisal of lands for colonization and programmes of extension and research, the provision of seeds, storage and marketing facilities.

13. If the 10-year Plan's diagnosis of Bolivia's problems were sound, its prescription was incapable of being implemented, for a combination of administrative, financial and social reasons. Indeed the Plan was little more than a statement of intent.

VI. EVOLUTION OF GENERAL POLICY, OBJECTIVES AND  
RELATIONS WITH GOVERNMENT

1961-64

1. In August 1961 Sr Gamucio, Minister of National Economy, sought British help with the implementation of the tropical agriculture aspects of the 10-year Plan. At first the request was for a British team to assume responsibility for the technical direction of the necessary research into soils, agronomy, plant and animal diseases and agricultural economics. In none of the documents forwarded to London (except the copy of the Plan, in Spanish) was it made clear that the underlying spirit was social and hence that colonization schemes were to occupy not merely an important but the central role. Only after two years was this spelled out.
2. In January 1972 DTC responded to a specific request to send a three-man appraisal mission, selecting Mac Kenzie, a general agriculturist with wide tropical experience, and two specialists, one in soils, Coulter and one in animal science, Wilson.
3. The terms of reference for the appraisal had been widened from purely research to embrace all technical assistance needed to achieve the objectives of the Plan as far as concerned tropical agriculture.
4. Following a 10-week visit the team submitted in mid-June its "Report on the Needs for Technical Assistance for the Development of Tropical Agriculture in Bolivia". The Report recommended a team of 26 experts, 15 on the research side and 11 in extension and administration.
5. Because of the existing division of responsibility for agriculture among eight Ministries and Agencies, a Coordinating Committee on Tropical Agriculture was recommended, whose Secretary General would be the Head of the British Mission. Additionally a Technical Committee under a Technical Secretary would coordinate research and extension. Four development officers were recommended for the colonies, a dairy technologist for Cochabamba in the Valles, and, for the Beni ranching area, a development officer, a vet and an animal husbandry officer. A marketing adviser would serve generally. Recommended research posts included: three soil surveyors, an entomologist, a pasture ecologist, a dairy cattle geneticist, and agronomists for a host of different crops. Detailed projects were to be worked out later in the light of what proved practicable; in the circumstances this was as far as it was reasonable to go in this direction.
6. A number of other recommendations were made for action by GOB which did not involve technical assistance. For example, proposals were made for the improvement of agricultural education, a field where grave existing deficiencies were noted.
7. The Appraisal Report included no general review of the development plan or of the economic, social and political conditions in which the proposed research and development projects would have to operate. Some of the difficulties subsequently experienced might have been foreseen had the appraisal mission been more broadly based and included someone with general experience in administration and someone familiar with the recent course of Bolivian development. A wider perspective would have made it easier to judge the priority of the activities proposed and

their chances of success in contributing to development. By shifting the balance rather than increasing the size of the team higher priority could and probably should have been given, for example, to the problem of declining yields under systems of annual cropping and to marketing problems which affected every product differently.

8. In this last connection it may be noted that a similar appraisal team reporting to USAID in 1964 particularly warned against seeking major increases in production, either through colonization or yield-increasing technology, of those crops that could be sold only on the home market. Since the latter is small and purchasing power is low overproduction could easily result. In contrast it advocated that reductions in transport and marketing costs and the expansion of processing industries be sought as economically sounder policies. By 1976 the colonies were certainly overproducing both rice and oranges.

9. Nevertheless the British Report identified many important needs and, what is more, recommended specific action. The Bolivian Government accepted it and soon asked DTC to provide the team of experts. To their pleasure MacKenzie was available to head the Mission.

10. The records of DTC's reactions to the Appraisal Report and the Bolivian request are not extant, though the commitment eventually accepted by DTC was substantially less than that originally proposed. It cannot therefore be known whether a team of the size and form originally proposed could have exercised enough influence to be able to coordinate the whole field of tropical agricultural development. Nor does the documentation reveal what changes were intended to be made in the activities and objectives of the Mission in view of its reduced size. Certainly some of the early difficulties faced by the Mission arose in part because it attempted a bigger task than it had the resources to carry out successfully.

11. The establishment of the British Tropical Agriculture Mission was formalised in a Memorandum of Understanding, signed on 20 February 1963. The Mission's functions were defined in general terms, as promoting the development of agriculture in Bolivia. The British Government if it had suitable people would "provide experts to undertake specialised technical or professional tasks". The experts would make all efforts to instruct any technical staff, which GOB desired to associate with them, in professional methods, their techniques and practices, and the principles on which they were based. In view of later attitudes it should be observed that GOB was not required to provide counterparts; indeed DTC informed a visiting Bolivian Minister that its desire to have counterpart contributions, largely as a token of the importance the recipient country attached to the project, did not amount to an immutable condition.

12. For the rest the Memorandum dealt with responsibilities for support costs: the British Government would provide salaries, passages and normal allowances; GOB would furnish housing, offices, secretarial staff and interpreters as well as such equipment and other services as were mutually agreed; it would contribute to local travel and subsistence costs at the rate of \$200 per month per expert (to be paid three-monthly in advance to the British Embassy).

13. In the build-up of the Mission GOB's priority was for help with colonization schemes. Cochrane, on hand from January 1963, advised on soils; Murray, the University of West Indies Cocoa Research Institute cacao expert, paid his first advisory visit in mid-year, and Ricketts and Collins, development officers for the Alto Beni and Santa Cruz respectively, arrived in September.

14. Initially the Mission was established under the control of the Ministry of National Economy. This was to prove an embarrassment since most of the Bolivian staff with whom the team had to work were in the Ministry of Agriculture. The latter were ignorant of why the Britons had come or what they were supposed to do, for the proposed Coordinating Committee never got off the ground. This was perhaps inevitable as the many ministries and agencies with an interest in agriculture had overlapping or ill-defined responsibilities.

15. After several months with little sign of the necessary coordination of planning emerging, Gamucio proposed that a National Agriculture Service for the Tropics be created to bring all the fragmented responsibilities under one authority. For the sake of unity and continuity it was also suggested that the Mission should take complete administrative control of this service, much as Britain had done in her colonial days.

16. After protracted negotiations, during which adequate assurances of US financial support were sought, it was provisionally agreed in July 1964 that the Mission should assume executive responsibility for the technical direction of research stations and colony agricultural development, but not responsibility for finance, administration and staffing.

17. A complicating factor was that there had since 1943 been a strong American presence in Bolivia and among its many activities the US was supporting the Ministry of Agriculture's budget and its technical services through the Inter-American Agricultural Service (SAI). Interests in the tropical areas included support for the experiment stations, the extension service, the marketing of rice and sugar, the Okinawan colony and supervised credit for small farmers in the Santa Cruz area. Policy was in the process of change at this time. It was desired to phase out budgetary support in favour of project aid and to disengage US personnel from the autonomous SAI, integrating them into the USAID Mission and the Bolivian technicians into the Ministry of Agriculture. There was concern about the proliferation of independent bodies with various activities in agriculture, which included the SAI itself and the BTAM. While British expertise in tropical agriculture was welcome, there was little enthusiasm in USAID for Gamucio's plan to set up a separate service under the Ministry of National Economy with BTAM in executive control, spending American money.

18. At the same time the US approach to technical aid for agriculture was changing in the direction of a broader rural development concept. Recommendations were made by a USAID/Utah team that the Ministry of Agriculture should take on Rural Development functions and expand its research activities to include the economics of marketing and processing and studies on motivation and cultural change, as well as traditional subjects like agronomy, soils and animal health. It was implicitly recognised that just as traditional extension work must be based on relevant agronomic research so must sound programmes of social action depend on the results of relevant social research. This new approach, it seems likely, was in Dr Crossley's view more in tune with a Bolivian Government committed to social and economic change.

19. There is evidence that the full extent of American involvement and American fears of losing control of its financial commitments in the tropical areas were not at first appreciated either by the DTC or by the Mission. Nor was it immediately seen that the wider approach including social as well as technical objectives provided a reason for a continued American presence in the tropical areas where British assistance was confined mainly to the technical field.

There was confusion and misunderstanding while these changes were being worked out. In the end USAID posted a Rural Development Coordinator to Santa Cruz, but the USAID/GOB Agreement of June 1964 to convert experimental stations into Rural Development Centres was not implemented.

20. Before USAID, BTAM and GOB could negotiate a solution to these problems and a definition of their respective roles, the government of Paz Estenssoro was overthrown on 5 November 1964. MacKenzie had also tendered his resignation from the end of the year. The new government continued with the proposed re-organisation of the Ministry of Agriculture. It was unhappy however with the proposed 'technical executive' role for BTAM, preferring it to remain advisory, in keeping with the 1963 agreement.

21. When this confused period of changing proposals ended, BTAM had been built up to a team of 10 experts now with purely advisory roles. Although the Appraisal Report and the draft agreement on executive responsibility had both emphasised research somewhat more than extension, the team so far was decidedly practical. Two themes, colonization and livestock development were to the fore, but the experts were scattered over five districts: Santa Cruz (colony and livestock development officers, pasture officer), Alto Beni (colony development officer), Yungas (cooperative marketing officer), Chapare Colony (soil conservationist), Beni (vet). The soil surveyor was seeking colonization sites more widely. The entomologist at Cochabamba was the only pure researcher.

#### 1965-68

22. The military government which succeeded the MNR administration at the end of 1964 adopted at first a reserved attitude towards the Mission. There were no reports of the Mission's activities, most of its previous relations with the Bolivian Government having been conducted by personal contact between MacKenzie and Gamucio himself and his principal officers. There were three vacant posts following the resignations of MacKenzie, Stevenson and Ricketts early in 1965 and the government was in no hurry to have them filled until it knew more about what the Mission was up to. Eventually it agreed to the appointment of a new leader and later to have Ricketts replaced by a crop development officer who was to explore the possibilities of growing pyrethrum rather than continue Rickett's work among colonists in the Alto Beni.

23. The first job of the new leader was to prepare a report of what the Mission had done since it began in 1963 and what its present programmes were. Meantime the payments of the Bolivian contribution to local costs, which were met from a suspense account held by the Embassy against quarterly reimbursement by the Ministry of National Economy, had fallen into arrear. It was a requirement of the new government that these claims should be supported by a report of the Mission's work during the period in question. The costs were large in relation to the costs of local technicians whose salaries were low and who were given minimal facilities for transport and operating expenses. The Bolivian Government was not unmindful of the need for foreign technicians to have adequate housing and transport if they were to work efficiently, but other technical assistance Missions in the country did not demand such contributions. Payment was in the end made up to the middle of 1965, but this problem was a source of difficulty throughout the life of the Mission.

24. The new government gave its attention to the reorganisation of the Ministry of Agriculture and enacted a decree in June 1965 vesting the Ministry of Agriculture with sole responsibility for rural development policy and services for agriculture. This provided for the integration of the BTAM and the SAI into that Ministry, and the Mission was transferred to it at the end of that year. The Mission was now accepted by the military government and the transfer to the Ministry of Agriculture brought the advantage of an office in the Ministry with ready access to the Minister, Director-General and other principal officers and to the Rural Development Division of USAID which had now absorbed the US officers of SAI. Relations with both the Ministry and USAID greatly improved as a result.

25. The Ministry was however inadequately equipped to shoulder the great responsibilities now thrust upon it. Twenty years of American effort to improve its technical staff had been only partially successful because low pay had driven out many of those who had been trained. It was stated in a report by the Inter-American Committee for Agricultural Development in 1963 that almost all the 57 technicians trained abroad in agricultural extension between 1957 and 1960 had gone by 1963. Its already exiguous budget declined as American budgetary support was phased out, and the combined expenditure of it and the Ministry of Rural Affairs, with which it was fused in 1970, fell between 1967 and 1972 from 1.2% (= \$3.5m) to 0.7% (= \$3.6m) of total government expenditure. Both research and extension services were short of qualified technical staff and of money, and there were difficulties in getting the release of such budgetary provision as was made. Field operations were severely curtailed during the major part of each crop-growing season through delays in approving the budget.

26. Within the limited resources that were available, cooperation between the Mission and local staff was good in some places in others less so. The Saavedra experiment station opened its doors to the Mission, and the National Institute of Colonization and CNECA cooperated with Cochrane. Squire established good relations with entomologists both at the Faculty of Agronomy at Cochabamba and in the government service. On the other hand the soils department of the Ministry of Agriculture and the cooperative department of the Ministry of Rural Affairs largely ignored the Mission. Cochrane was driven to finding his own counterparts outside the Ministry, and promises made to absorb these into the establishment were never fulfilled. Kelly found help in cooperative development from the Peace Corps and the Xaverian Missionaries in the absence of any extension staff from the cooperative department.

27. In 1966 Britain contributed £5,000 towards the equipment of a technical centre consisting of offices and laboratories at Santa Cruz. and Mr Bert Oram, Parliamentary Secretary to the ODM was invited by the Minister of Agriculture to perform the opening ceremony. Both the gift and Mr Oram's visit were greatly appreciated and did much to cement the Mission's relationship with the Ministry of Agriculture and the USA. In August of that year the military government gave way to the constitutional government of President Barrientos, which brought a change of Minister but no other change in the relations of the Mission with the government.

28. Early in 1967 the Mission was reviewed by the ODM in accordance with the normal practice for the review of long-term technical assistance projects. It was of some urgency to do this because contracts were ending and could not be renewed or replaced until it had been decided whether or in what form the Mission should continue beyond the five-year term due to expire early in 1968. The

Minister expressed satisfaction with its work and asked for its extension for a further five years. The size of the Mission, restricted to ten, excluding short-term assignments, by the previous government on the grounds that it could not provide local costs or other support for a larger Mission, was confirmed by the new Minister. He had before the review asked for alleviation of the burden of local costs and on being told that the ODM's resources were fully stretched promised his best endeavours to meet the Bolivian Government's obligation but hoped that some alleviation would be possible in the future should ODM's finances improve. After lengthy discussion it was agreed that the Mission should continue, with a few changes in the team's programme. The veterinarian and the soil conservation specialist were to be replaced by an animal science expert and a crop agronomist, the work on pyrethrum was to be discontinued and emphasis was to be given to livestock improvement and trials with oilseed and fibre crops.

29. As a result of these changes Badcock and Calderbank were not offered re-engagement when their contracts ended in 1967. Horrell also left in September to take an appointment with FAO and Johnson, leader of the Mission, left in February 1968 to take up another post with ODM. This brought the strength of the Mission down to six, and the duties of leader fell to Squire in the course of periodic visits to La Paz from his entomological work in Cochabamba. It was not until late in 1968 that these vacant posts were filled, and for most of the year the Mission was at little more than half strength. Ballantyne, the new head, arrived towards the end of the year and the team was back to its full establishment by the beginning of 1969.

#### 1969-72

30. The period from 1969 to 1972 was complicated by political instability in Bolivia. President Barrientos was killed in a helicopter crash in April 1969 and a few months later his Vice-President who had succeeded him was overthrown by General Ovando. He was ousted by a leftist coup led by General Torres whose administration in turn gave way in September 1971 to the right-wing and moderate coalition of General Banzer. There were many changes in the Ministry of Agriculture which made it difficult for the Mission to recover the ground lost while its strength was depleted in 1968. Ballantyne has reported that he was never once asked by the Ministry for advice in his capacity as General Adviser on Tropical Agriculture and that no support was given to the Mission when its cooperative development project in the Yungas came under fire and was undermined by vested interests for their own ends. Contacts with the Ministry suffered with the frequent changes of Minister and staff. A need to improve these had been perceived in 1968 when the head of one of the Ministry departments was appointed as the official liaison officer between the Mission and the Ministry. The services of Ing Alandia in that capacity are referred to in cordial terms in the Mission's annual reports from 1968 on.

31. No solution had yet been found to the problem of local costs, which engaged much attention from the ODM, the Embassy and the Mission at this time. The Ministry of Agriculture had been unable to fulfil the promise made at the 1967 review and the amount outstanding was now very large. It included not only the Bolivian contribution to the housing, transport and medical costs of the British experts but also the cost of engaging local staff to provide essential support which the Ministry did not itself provide, including a bilingual secretary, the soils laboratory staff and various others. In an effort to furnish the Ministry with the resources to meet this obligation a British grant of £2m in Food Aid

was made in 1969, but continued difficulty was experienced in getting local cost contributions from the Bolivian Government, though some of the arrears were eventually paid off from the proceeds of Food Aid.

32. In 1969 the Mission withdrew from the Yungas as a result of pressures mentioned elsewhere. Kelly joined the Santa Cruz team, which now had six of the nine field officers of the Mission and Penn was sent to do pasture experiments at Cochabamba. After a brief attempt to reorganize rice cooperatives, which turned out to be a non-starter, Kelly joined with the livestock officers in a survey of cattle ranches but also found time to look into possibilities for cooperative development among small farmers for milk and beef production. Except for this and the extension activities of Hobbs and Edwards among cattle farmers and of Dixon for cacao the Mission was now largely engaged in experimental work and surveys. Hobbs left to join the Agricultural Bank in January 1971 and Dixon ended seven years of valuable work among small farmers in the Yungas and Alto Beni in July. By that time almost the whole resources of the Mission were devoted to the collection of agricultural data for future use. Cooperation with Saavedra experimental station had broken down after Horrell left the Mission and Kushner Saavedra and the Mission established a small experimental plot of its own near Santa Cruz.

33. In May 1971 a second review was carried out by Turner, head of the Latin American and Caribbean Department of ODM. MacKenzie, who was to have accompanied him as agricultural adviser, died tragically on the way out, and this deprived the review of a broad-based assessment of the technical activities of the Mission from the outside. The Mission was in difficulties. The local support promised in 1967 had not materialised. The main activities were now data collection and the production of technical bulletins for use by extension workers, and the Mission had now no active extension programme. Agonizing delay ensued while the future was being pondered over following the review, and in this atmosphere of uncertainty the Mission was melting away. Numbers were down to five by early 1972, again with no full-time leader. Finally it was decided to end it in 1972, though the soils laboratory continued to be supported for some time afterwards and consideration of a new technical assistance effort with a different type of agreement began in the ODM at this time.

## VII. ACTIVITIES OF THE MISSION

### A. THE ALTO BENI COLONY AND COCOA PRODUCTION AND MARKETING

1. Implementation of the 1962-71 Development Plan's colonization programme began in 1962 with the First Alto Beni Scheme for settling an area mainly on the left or nearer bank of the River Alto Beni. This lasted until 1965 when USAID and CBF organization and support were withdrawn. The Alto Beni II Scheme began in 1965 on the right bank where a larger area has been settled with IDB finance and CBF (later INC) control. All-weather roads link the area to La Paz but the river is still unbridged.

2. From the start cacao was planned as the main cash crop. In 1962 CBF and Brazilian experts recommended the introduction of hybrid planting material from Ecuador and the establishment of nurseries from which settlers could be supplied. By 1975 Alto Beni I and II had almost 4,000 colonists of whom about half were growing cacao. About two million plants had been distributed.

3. BTAM was associated with the Alto Beni in 1963-65 and 1967-71 and assisted greatly with the introduction and diffusion of hybrid planting material. Denis Murray of the University of West Indies Cocoa Research Institute paid advisory visits in 1963, 1968, 1971 and 1974. In the second period aid was concentrated firstly on the establishment of processing facilities adequate enough for the production and sale of dry beans on the world market, and secondly on the development of a cooperative marketing organization in Alto Beni II. Both goals were reached. After the withdrawal of BTAM the fermentary has operated intermittently, exports have been erratic at best, and the cooperative has been abolished.

4. In 1963 MacKenzie, noting the deficiencies in the soil surveys for the colony and the limited Bolivian expertise in cacao, decided to focus British aid on soils and crop development. Cochrane helped correct soil surveys. Murray on his first visit found that nurseries had only just been established and were incapable of meeting demands; he offered to assist in getting Witches' Broom resistant cacao seed from Trinidad. As no trials had been carried out, the settlers themselves would have to discover which hybrid crosses were most resistant locally. The crop development officer, Ricketts, arrived in September 1963, took over the development of both nurseries, selected soils suitable for cacao in each colony nucleus, gave instructions in planting and cultivation, wrote in the colony magazine on the cultivation of various tree crops and on soil conservation, and conducted trials with grasses and legumes. In the nearby hills he made trial plantings of tea on soils selected by Cochrane. Little interest was shown at the time in either tea or pastures. In 1971 however a Taiwanese Mission working with CBF on a project to make Bolivia self-sufficient in tea selected the same locality as its base because of the thriving state in which it found Ricketts' plants. Interest in pastures has also revived (see Para VII H ).

5. Between 1965 and 67 there was no BTAM presence in the Alto Beni. The new governor did not wish the crop development officer to be replaced and Dixon, an associate expert, found cooperation difficult with the then head of colonization in Alto Beni II.

6. Following enquiries about the possibility of extending to cacao the Mission's work with the cooperative marketing of coffee Dixon returned in 1967 to try to develop a world-market-quality fermented bean. The existing alternative was unfermented washed and dried beans suitable only for the local market. Initial trials were made in collaboration with American Methodist agronomists in

Alto Beni I. In 1968 INC funded two small fermentaries in Alto Beni I and II. For three years Dixon wrestled with the technical difficulty of producing a uniformly fermented bean. Advice and reports on samples were obtained from TPI, the Cocoa Research Institute and major world chocolate manufacturers. In 1969 Laband and Cadbury's cocoa estate manager, paid an advisory visit. By 1970 Dixon had succeeded in producing an acceptably fermented bean by both the tray and box methods. Ten tons were sold to Germany through Gill and Duffus who looked forward to bigger future consignments.

7. Dixon's second aim was to develop cooperative collection, processing and marketing. BAB accepted proposals by Dixon and Zeballos (of INC) for a loan to establish a Cacao Section of the Alto Beni Cooperative. In 1969 Dixon was accorded executive authority to develop the organization and to construct a full-scale fermentary. Palos Blancos the centre of Alto Beni II was selected. There the settlers did not share the Alto Beni I memories of a cooperative which had saddled the colonists with huge debts.

8. A system was established for regularly collecting wet beans by truck and for payment on the spot. This encouraged regular picking. A drier was built to overcome the problem of uncertain sun. Output of dry beans was expected to reach 100 tons in 1971. We estimate this to account for the greater part of the production of the Alto Beni II settlers at that date, though as young plants matured other fermentaries would soon be needed.

9. On the agronomic side Dixon trained three Peace Corps Volunteers who participated in 1968 in an INC campaign for better pruning and for the adoption of more resistant hybrids. On his second visit in 1968 Murray noted signs of several diseases, stressed the need for a start on research and extension and for more effort to meet demand for seedlings; he also produced a guide to cacao cultivation and the control of pests and diseases. In 1971 he found diseases now to be serious and had to reiterate his previous advice.

10. Having demonstrated the possibility of cooperative production and marketing of exportable beans, Dixon was withdrawn in 1971. BAB could not be persuaded to appoint a manager to replace him or to finance the necessary expansion. Neither was MINAG interested. However after BTAM left in 1972 capacity at Palos Blancos was tripled and another drier built. When Dixon left, the board of management of the cooperative remained to be educated in the economics of the cocoa trade: against Dixon's advice they insisted on paying the producer more than was justified by world prices or by the more favourable price which CBF had agreed to pay for supplies to its factory. Nor was cacao-growing as yet a highly profitable enterprise for the settler: in 1973 average net returns were estimated at only \$42 though by 1975 this had risen to \$288 thanks to higher yields and prices.

11. In his end-of-tour report in 1971 Dixon noted that a sound commercial industry remained to be established and proposed that ODM should at least recruit another expert to build more fermentaries, arrange for storing in La Paz, expand the collection system and train a manager. He also saw scope for a much larger 10-15 year technical assistance project. Both ODM and the Head of Mission recognised that it was premature to withdraw, yet with the end of the Mission under consideration no replacement for Dixon was provided and no exception made.

12. In 1976 we found that since the Mission left diseases and pests had become increasingly serious. By 1973 Witches' Broom was badly affecting trees based on

Ecuadorean material, which according to one estimate is the parent of 70% of all cacao planted in Alto Beni II. Yields had fallen by up to 50% and many colonists were replanting with Trinidad crosses: one of the latter however was now also succumbing. INC called on the services of Murray again in 1974 and he advised spraying to control capsids. Although this advice was followed, we found that in 1976 one-third to half the crop was reportedly being killed in some areas by capsids and blackpod. Despite pressure by INC staff for the establishment of a research station at the Sapecho nursery nothing had materialised, perhaps because INC was soon to begin its withdrawal from the area. The need for improved planting material remained; indeed settlers had now lost confidence in Sapecho as a source of healthy material.

13. The Ministry of Agriculture was in 1976 taking over the agricultural tasks of INC in Alto Beni II and, so the Director-General of Agriculture told us, had plans for research, nurseries, extension and disease control and for assistance with cooperative marketing. Their implementation is urgently needed, for, we were told, settlers were becoming demoralised by the problems of cacao growing and their declining real income; increasingly farms were reverting to subsistence agriculture. The governmental advisory services were said to be very weak, but had for ten years at least had the benefit of the advice of Methodist agronomists.

14. On the processing and marketing side the venture in cooperative organization ended in 1972 through foreclosure by BAB following the inadequate administration of its loan. The Palos Blancos fermentary was bought by INC and remained in charge of the works manager trained by Dixon. In no year had it been fully stopped and in August 1976 we found it working well, with a full-time staff of eight. It was independently confirmed that the wet bean collection system also still operated efficiently. Although still the only fermentary it competed with other outlets and did not operate to capacity. All outlets indeed were viewed with much distrust by the colonists. CBF bought unfermented dry beans directly but had not been a reliable purchaser as its supply of purchasing finance had been erratic. Colonists distrusted the price offered by Palos Blancos probably because growers did not understand the conversion ratio of wet to dry beans. Those who delivered directly to La Paz encountered problems in securing payment. Alto Beni I colonists, enjoying better transport facilities, had taken to personally retailing home-made  $\frac{1}{2}$ -lb balls of roasted beans ('pasta').

15. Exports since Dixon's successful trial have been erratic and details are uncertain. Gill and Duffus confirm that the 40-ton consignment planned for 1971/72 never materialised. Neither they nor the International Cocoa Organization have records of any export of Bolivian beans in subsequent years. From one point of view the 1971 export was premature, as it is not clear that an export surplus existed. Bolivian manufacturers consumed 400 tons, traditionally supplied by now declining wild cacao sources in the lowlands. Additionally the policy of CBF has been to stimulate further manufacturing to replace the annual imports of 200 tons of chocolate. CBF also has its own factory which makes cocoa butter for export and powder for home consumption; with a capacity of 500 tons its output has yet to exceed 40% of capacity. Since Alto Beni production in 1975 was estimated variously at 450 and 670 tons it is apparent that CBF and manufacturers have some reason for opposing exports at this stage. We do not have evidence whether growers are thereby disadvantaged. The situation may now be changing, for INC reported exports of 118 tons of beans worth \$135,000 in 1975.

16. It was clear to us that there is widespread dissatisfaction with present processing and marketing arrangements and there are many proposals for their improvement. INC is expected to pull out of Palos Blancos. CBF wishes to buy and expand it as part of a suggested programme of establishing nurseries, disease control measures, new fermentaries and a marketing organization in which they would be happy to see the participation of cooperatives; renewed British assistance would be welcome. No mention was made of exports of beans. MINAG also informed us that they too wish to acquire Palos Blancos and favour cooperative involvement. Meanwhile INC itself seeks authority to export beans and envisages the development in the area of cocoa manufacturing to reduce transport costs and provide cattle feed as in Ecuador. The colonists are now forming new cooperatives: one group has marketing funds and permission to export; others with Caritas and Oxfam funds are emphasising disease control as well as marketing. A large private landowner with cacao also contemplates establishing a nursery and fermentary for general use.

## CONCLUSIONS AND EVALUATION

### Staffing

17. In a new settlement area where agronomic practices and social and economic infrastructures must be developed ab initio, the Mission's contribution on both the agronomic and marketing sides was rightly conceived, as was the priority given to the appointment of a development officer. It was unfortunate that the intended cacao specialist had fortuitously not been recruited by the time the Mission was restricted to a dozen experts. The serious increase in disease and pest problems highlights the soundness of Murray's repeated urging of the Bolivians to conduct research. Nothing was done however although a suitable site was available and the attitude of key Bolivians was most cooperative. If we are to believe the end-of-tour report of Edwards, the livestock breeding officer 1968-72, the marginal utility of appointing a second livestock officer would have been exceeded by that of appointing a first cacao agronomist. Nevertheless, given that the Mission had only one full-time officer in the Alto Beni, its achievements there both tangible and intangible rank among its best.

### Achievements

18. i. Facilitating the introduction of improved cacao planting material. Enthusiastic and able Bolivians had already introduced hybrid cacao and continued to obtain further supplies. Journeys by Murray and Dixon from Trinidad were used to increase the pace of introduction, and Murray guided the selection of material. It is impossible to estimate the relative contributions of Bolivians and Britons either in terms of quantity or quality though the Trinidad varieties introduced by both BTAM and the Bolivians seem to be less susceptible to Witches' Broom than the Ecuadorean material brought in by the Bolivians alone.
- ii. Developing the nurseries at Sapecho and Km71, which provided - and in the case of Sapecho continues to provide - the settlers with planting material not only for cacao but also for citrus and other trees. This work is almost entirely attributable to Ricketts, and the colonists are still dependent principally on the fruits of his work.
- iii. The tea trials by Ricketts on soils selected by Cochrane, though not followed up initially, laid the foundations on which the Taiwanese Mission

and CBF plan to build an import-substitution tea industry. This will allow the settlement of considerable areas of soils that could not otherwise be developed for cash-crop production.

iv. The effectiveness of the pruning campaign by Dixon-trained Peace Corps Volunteers is not known. One of the latter still works in the Alto Beni I - which has no state extensionists - along with a Methodist agronomist. Both acknowledge their debt to Ricketts and Dixon.

v. Developing a commercial-scale plant to ferment beans to a grade acceptable on the world market. Developing a system of regularly collecting and paying for wet beans that was efficient and acceptable to the colonists. Training people to run both without British supervision. Providing a local fount of technological knowledge which can be used to duplicate the enterprise. These achievements owe most to the initiative and effort of Dixon and constitute one of BTAM's most tangible successes.

vi. It cannot be claimed that the fermentary enterprise has brought incomes to the colonists that are higher than they might earn by selling unfermented or improperly fermented beans, or pasta; the data are not available. The enterprise does provide the means to move out of the domestic market on to the world market, thereby preventing the fall in incomes which would otherwise occur when supplies begin to exceed domestic demand.

vii. Establishing the administrative and economic feasibility of shipping Alto Beni cacao to the world market. Regular shipments have yet to be initiated, but knowledge of their feasibility appears now to be stimulating others to try.

#### Reasons for Achievements

19. Both Ricketts and Dixon were well chosen for their tasks, having the technical training and practical ability necessary, the willingness to live and travel in rough conditions and the ability to cooperate with Bolivian staff and get on with the farmers. Their postings were well-timed, Ricketts in the early days of the colony and Dixon when the cacao was coming into production. They were well supported by the ODM which arranged the visits of Murray and Laband, whose expert knowledge was most valuable. They had good cooperation from several senior Bolivian officers, notably Torrico and Maticado of the CBF and Zeballos and Terrazas of the INC, and from Peace Corps and American Methodist volunteers whose assistance helped to overcome the weakness of the Bolivian extension service in the area. The BAB's action in providing finance for the fermentary and giving Dixon executive authority to manage it was another factor.

#### Failures

20. The Mission failed:

i. To persuade INC to follow Murray's advice on nurseries, extension and research.

ii. To persuade the Agricultural Bank - or any other Bolivian or foreign organization - to provide and fund a counterpart to Dixon as manager of the Cacao Section of the Alto Beni Cooperative.

iii. To find alternative means of handling the international marketing.

iv. To generate among colonists sufficient interest in the workings and fortunes of the Cacao Section or a commitment to its future success.

21. ODM failed in 1971-72 to separate the Alto Beni project from the whole of the Mission's work, in arriving at a decision on its future. Whilst recognising that the priority accorded to cacao was right and that Dixon had more than enough to do in that direction, we consider that after Ricketts left having assisted in many different aspects of the colony's development, the Mission retreated from a comprehensive approach to agricultural development thus no work was done to identify the best crop combinations agronomically and economically. (It is worth noting that in 1973 cocoa accounted for only one-third of the net income of Alto Beni II settlers.)

#### Reasons for Failures

22. We have no evidence of the varied reasons for and incentives behind the lack of Bolivian response. On the British side it would seem that the need for action on the social side was not fully recognised. It is also suggested (see below para IX A3) that the Mission's approach to agricultural development was chiefly monocultural rather than system-oriented. With regard to terminating the Mission, it may be noted that an exception was made of soils. ODM was more aware of the value of that work having visited Santa Cruz frequently whereas seasonal communications problems had prevented as many visits by advisers to the Alto Beni. It is possible therefore that Santa Cruz projects were uppermost in ODM's mind at the time of the decision to end the Mission.

## VII

### B. THE YUNGAS COFFEE COOPERATIVES

1. Work in the Yungas was begun by the cooperative marketing adviser, Kelly, who had originally been asked for separately from the Tropical Agricultural Mission to organize, advise and generally direct cooperative marketing for peasant farming communities on the altiplano and train Bolivian staff in cooperative methods. He arrived in June 1964 and after investigating the cooperatives on the altiplano found it not practicable in the conditions prevailing to attempt the comprehensive reorganization needed and proposed instead that the development of cooperative marketing for peasant farmers would best be approached by formation of a new model cooperative to provide practical experience and education for members and extension staff.
2. Suitable conditions for this enterprise were offered by the peasant production of coffee in the Yungas. It was not proposed by the exploratory Mission to do more than provide some attention by the marketing adviser and an agronomist who would be mainly concerned with development in the Alto Beni. In the event it became one of the Mission's major activities, requiring most of Kelly's time from 1965 to 1969, four short-term assignments of a coffee specialist, Benson, the assistance of a crop development officer, who was also concerned with cacao and tea between 1965 and 1967, and the more or less full-time services of a crop development officer, Penn, from mid 1967 till the end of 1969 and occasionally thereafter.
3. Coffee of good inherent quality grows well in the Yungas but its value is reduced by primitive methods of processing and marketing. The Mission had experience of peasant coffee production in Africa which demonstrated that quality can be improved by cooperative pulping and marketing. If a cooperative for coffee could be successfully established in the Yungas it would serve as a model for the marketing of other products, notably oranges which are grown in quantity and marketed by women who sit on the fruit in transport and sell it in the markets and streets of La Paz and other towns, and the growing production of cacao by peasant farmers in the Alto Beni. It was important to improve the returns from these crops and to enlarge the market in order to provide alternatives to the growing of cocoa. This is the most profitable crop of the region and finds a ready market for chewing as a narcotic by large numbers of people in the Andean region and the illicit extraction of cocaine.
4. Work began in 1965 on the formation of a cooperative at Carmen Pampa near Coroico. A loan was obtained from USAID for the construction of a small pulping, washing and drying plant and for crop purchase and storage. A Peace Corps volunteer was available to assist in management. There was no Bolivian field staff of the Cooperative Department or of the Agricultural Extension Service in the area. Brother Nilas of the Zaverian Missionaries Order and Principal of the Carmen Pampa Secondary School helped to nurture the cooperative and later kept it going after both the Mission and the Peace Corps had left. The pulperly began operating in 1966 and processed cherry to produce after hulling in La Paz about 6 tons of clean coffee. This was not enough for economic working of the plant and it was feared that the target of 15-20 tons, about a quarter of the estimated total crop of the area served by the pulperly, might not be achievable. The growers were accustomed to selling their coffee as semi-dry parchment ("corriente") after primitive pulping and washing on their farms and could not work out the price relationship between this and unpulped cherry. Moreover cherry is bulkier and requires daily delivery to the pulperly over mountainous country. A trial was therefore made of re-washing, fermenting and drying the parchment produced on the

farms, and it was found that while the result was not equal in quality to the cooperatively pulped coffee it was better than the "corriente" sold straight from the farms.

5. A second cooperative was formed at Munaypata for re-washing parchment in 1967, and the two plants processed parchment to produce over 60 tons of clean coffee in addition to 9 tons from the pulperly at Carmen Pampa. Two more cooperatives were formed in the following year at Suapi and Capellania to extend facilities for re-washing parchment. Throughput at the Carmen Pampa pulperly went up to 12 tons. A central cooperative was formed at Coroico to supervise credit and accounting for the four societies. Most of the coffee was exported after contract hulling in La Paz and satisfactory prices were realised, ranging from 36 to 41½ cents per lb fob Matarani for coffee derived from the pulperly and from 29 to 33½ cents per lb for that from re-washed parchment. These prices indicated an advantage of about 29% in favour of cooperative pulping, confirming the view that this should be the long-term aim. Two pulpers donated by Britain were installed at Munaypata and Capellania in 1969.

6. All the societies had Peace Corps volunteers as management advisers, and USAID financed as an extension agent a former volunteer to assist in the management of the central cooperative. Unfortunately he was called up for military service shortly afterwards and a Bolivian accountant engaged to manage the central proved unequal to the task. A fall in international coffee prices in 1969 brought financial difficulties to the cooperatives and to the processors and exporters in La Paz. The Mission was criticized in the press for its involvement in marketing, rather than confining its activities to technical advice to growers, and was blamed for the alleged loss of 1,500 jobs at the processing factories. This was false, since all the cooperative coffee was being processed in La Paz, but machinery had been donated by Britain for a proposed cooperative hulling plant and the processors and middlemen were becoming alarmed at the progress of cooperating enterprise fostered by the Mission. Because of the pressures thus generated the Mission staff was withdrawn from the Yungas in 1969 and for the next two years until the Mission ended assistance for coffee development was limited to advice by correspondence and occasional visits. Supervision of credit was taken over by the local agent of the Agricultural Bank.

7. The cooperatives now had about 1,000 members, roughly 10% of the coffee growers in the Yungas, and were handling parchment to produce some 200-300 tons of clean coffee per annum and a few tons of cherry for pulping. Buying was hampered by short and erratic supply of credit for crop purchase but the quantity being handled was as much as the shaky management could cope with. The hulling machinery donated in 1969 was installed in a cooperative plant built near Coroico in 1971. In that year the cooperatives lost their Peace Corps advisers and were in financial straits, having failed to recoup the losses suffered when prices fell in 1969 and were in debt to the Agricultural Bank. They continued to buy coffee but except at Carmen Pampa, where the American Xaverian Mission were able to fill the gap left by the departure of the Peace Corps, the washing plants and pulperies fell into disuse. During our visit in 1976 we found the Carmen Pampa still producing high-grade coffee and the central cooperative working the hulling plant, to which a drier had been added, to process semi-dried parchment. The other societies had become buying agents for this plant. Carmen Pampa had withdrawn from the central cooperative and was selling its coffee to a processor in La Paz at prices which vary from the local price for corriente when exports are restricted by Government to a substantial premium for quality when it can be exported. Farmers served by the central cooperative are producing coffee beans in the traditional way which the Mission had sought

to improve and the cooperative exported 2,000 bags in 1975 and 1,500 bags in the first eight months of 1976. It should be of marginally better quality than the general average since it avoids the deterioration that damp parchment must suffer during the long journey to La Paz and there should be a saving in the cost of transporting dried beans instead of damp parchment from Coroico to La Paz. Whether the grower gets any benefit from this we were unable to discover.

8. The scope for increased production at the time the Mission began was limited by the international market, at that time overshadowed by the huge surplus in Brazil, hence agronomic work was subsidiary to the main aim of improving the processing and marketing of coffee. Kelly assisted in the formation by the Bolivian Government of a national institute for coffee (INBOLCA) whose aim was to improve the quality and quantity of exports, and in Bolivia's joining the International Coffee Organization. This led to the granting of an export quota starting at 50,000 bags and rising by annual increments to 100,000 bags. Experiments and demonstrations by the Mission showed the possibility of improving yields by simple measures. In 1970 the Ministry of Agriculture established a new experiment station for coffee at San Pedro near Coroico and the Mission advised on its programmes. A striking demonstration of improved methods of coffee growing started by the Mission still exists on the Xaverian Mission land at Carmen Pampa. We saw little sign in our brief tour in the area of the adoption of these improvements by farmers generally. It was recognized by the Mission that progress in this respect would be very slow, having regard to the limited education and resources of the farmers and the weakness of extension services in these areas. The Mission reports did indicate that some farmers had bought pruning knives and shown interest in the Mission's Agronomic Work. A technical bulletin on coffee growing was produced in 1968 and reprinted with further information later.

9. Other activities of the Mission in the Yungas include an investigation by a fruit technologist of the Tropical Products Institute of present production and potential for expansion of tropical and subtropical fruit, including citrus and bananas in the Yungas, covering growing, collecting, handling, packing, transport, grading and marketing and the training of Bolivian staff. There was also an investigation by a plant pathologist of Rothamsted Experimental Station into diseases of fruit. Reports with recommendations were made, but there is no evidence that any action of consequence has followed as yet.

10. The Mission's work in this area has resulted in the establishment of a first class demonstration of improved growing and processing of coffee which survives only at Carmen Pampa, where there has been energetic follow-up, without any further technical advice, by the Xaverian Mission School. A cooperative hulling plant is in operation which, though it falls short in several respects of what it was hoped to achieve, does provide the grower with an alternative to the middlemen as a market for his crop and has also the possibility of reviving the washing and pulping plants at Munaypata and Capellania. We saw evidence that some processing had been done this season at Capellania. Except for Carmen Pampa the primary cooperatives are moribund. The central union appears to be more a private business run by the manager and a small group than a true cooperative and seems likely to remain so unless the primary societies which are its members can develop sufficient strength to make their influence felt. Their weakness stems from causes that are endemic in any attempt at cooperative development, in rural communities with a low standard of education and technical services and established trading interests opposed to change. The Mission has provided the

technical base necessary for development but did not succeed in integrating Bolivian staff into the management structures of the cooperatives or in improving cooperative extension and training in the area.

11. Future efforts to achieve the improvement of the quality and marketing of coffee pioneered by the Mission will depend largely on the growers themselves, supported by adequate services for extension, training and credit. If the will is there to do this very little in the way of technical assistance would be needed to get the pulperies and washing plants working again. USAID intends to stimulate cooperative marketing as part of a campaign to develop alternatives to cocoa. Essential requirements will be to provide an adequate extension effort and credit arrangements that are better supervised locally and free of political manipulation in the interests of the established middlemen and processors.

## VII

### C. SOIL AND LAND USE POTENTIAL STUDIES

#### Introduction

1. The most continuous input of effort by BTAM was in the field of soil studies. Cochrane, who was in charge throughout, arrived in January 1963 and was employed by BTAM until 1974 - almost two years after the end of the Mission. His surveys were the first to attempt the scientific classification of soils. Hitherto rapid surveys had been made of land capability according to criteria not wholly appropriate to the Bolivian context. Cochrane's output was prodigious and culminated in 1973 in the commercial publication of the massive work "The Land Systems of Bolivia". It is generally acknowledged by all who are professionally concerned with agricultural development in Bolivia that the importance now attached to the soil is due very largely to Cochrane's efforts. Official recognition came in 1973 with the award to him of Bolivia's highest decoration, the "Condor of the Andes".

#### Policy on Soil Studies

2. The main purpose of the soil work shifted over the years from aid to colonization to rational land use planning for large sugar-cane farmers. Initially in 1963 surveys were made of small areas of actual colonization. The work in the Alto Beni is mentioned elsewhere (para. VII G); work in the Santa Cruz area revealed that the site planned for the Comibol colony had unsuitable soils and plans were recast.

3. Surveying was then systematised into a programme of reconnaissance work covering all the Piedmont and Santa Cruz areas. This belt constituted the territory most apt for colonization since it was well-watered and lay closest to the overpopulated highlands. The results were first issued in 1966<sup>1</sup>. The San Julian district was highlighted as the area most suitable for colonization, followed by the Chane-Piray district and the interfluvies on both sides of the River Palacios.

4. In 1967 a further report summarised the previous study and also incorporated work on the central plains<sup>2</sup>. Two classes of land were revealed as unsuitable for colonization: the foothills of the Andes where the soils were derived from tertiary sandstones, and plain areas formed of alluvium originating from the same sandstones; in both areas the soils were of low nutrient status. Conversely, in the plains where poor drainage affected vast areas, some land between San Borja and Trinidad offered settlement prospects. Cochrane therefore recommended that the Marginal Highway, scheduled to be constructed along the foothills, should be rerouted in a great loop via San Borja, Trinidad, San Julian and Santa Cruz. This route would also open up a large area with great cattle farming potential.

5. With the reconnaissance survey of areas suitable for colonization completed, future policy was formulated in 1967 in consultation with Coulter. The logical and ideal policy would have been to proceed to more and more detailed surveys of areas identified as suitable for colonization, leading to pilot projects to test crop responses and ultimately the preparation of detailed land use plans. INC however was unable to await the fruits of such a programme; furthermore it was pursuing a policy of 'minimum aid' to colonists and would lack the necessary

extensionists. Apart from meeting INC's wishes for further guidance on drug limitations in the San Julian and Ixiamas areas, the soil programme would need reorientation.

6. Priority was given to work in the sugar-cane area of Santa Cruz, including semi-detailed soil mapping, cane-yield trials on the different soils in order to reveal those best for that crop, the study of alternative uses for inferior soils, and the design of better agronomic practices in general. Pot tests had already begun. CNECA (The National Commission for the Study of Cane and Sugar) was anxious not only to cooperate but also to finance the programme. Kushner, Director of the Ministry of Agriculture's Experimental Station at Saavedra in the centre of the cane growing area, also wished to cooperate. There were good economic reasons for this new priority: cane yields had in a few years fallen by 50%; how much was the result of its being grown on inappropriate soils, and how much was due to bad management?

7. Second priority was accorded to extending the reconnaissance survey to the whole of the Bolivian tropics to provide the basis for planning the settlement and agricultural development of the whole. Coulter recommended that the methodological basis of the work be changed to the identification and mapping of land systems. Hitherto Cochrane had classified his material by soil suites, underemphasising the roles of lithology, geomorphology, vegetation and climate.

8. Other objectives were to assist the Ministry of Agriculture's Soil Division in its work, to train Bolivian soil scientists, and to administer and develop the Soil Laboratory in Santa Cruz. This had been financed jointly by the British Government and USAID in 1966 and equipped to Cochrane's specifications to facilitate the survey work. Hitherto analyses had been made at Muyurina Agricultural School's smaller laboratory.

9. The results of the new work appeared in 1968-72,<sup>3</sup> as the collaborative work of Cochrane and several Bolivian soil scientists, including Paz (who later went for further training to Reading University). No further reconnaissance surveys were issued until the final study - of the whole of Bolivia - appeared in 1973.<sup>4</sup> Work in the Highlands and part of the Lowlands was contributed by 15 soil scientists of the Ministry of Agriculture and 22 of the INRA (National Institute of Agrarian Reform), among others. The INRA soil scientists had been trained by Cochrane as part of a project whereby the land-titling teams of INRA would be accompanied by soil surveyors to advise the peasants on more rational land use practices.

10. In late 1968 Ballantyne, the new Head of Mission, was anxious that as far as possible the work of BTAM should have a quantifiable economic justification. At the same time discussions with the Ministry of Agriculture revealed the lack of information on crop response to fertilisers. By 1970 Ballantyne could claim that the main emphasis of the Mission's soils work was no longer on soil mapping but on agronomic trials related to the different soils previously identified. A newly recruited member of the Mission, Vickers, devoted his attention to trials with crops other than sugar-cane, and Cochrane and his assistants continued their studies of cane. Results began to be published in 1973.<sup>5</sup> During Ballantyne's direction of BTAM there appears to have been little contact with INC, the Colonization Institute.

11. For further information on the agronomic work, see under Sugar Industry, Paras VII D , and Crop Trials, Paras VII F 4 and 5.

## The Usefulness of the Soil Studies

### 1. For Colonization

12. The services of Cochrane in planning the layout of Alto Beni colony are referred to elsewhere (para VII 4). Plans of the colony indicate that the flood plain of the river has been largely avoided, with the lots laid out on terraces. Such precautions may appear obvious yet, a year before the arrival of BTAM, an area was designated in the Chapare for settling 4,000 families and, too late, it was discovered that three-quarters was liable to flooding.

13. The San Julian area, first suggested by Cochrane in 1966, is now the scene of a 1975-1980 scheme for settling 5,000 families, coordinated by INC. The infrastructure is being financed by a \$9m USAID loan, whilst orientation of the settlers is being provided by agronomists and social workers of the United Church Committee, funded to date by OXFAM. Cochrane's maps are being used to avoid locating settlements on the poorer soils. The maps do not however indicate the precise locations of areas subject to inundation and further surveys are being undertaken. The general description "up to 25% poorly drained" is proving correct. The laboratory is being used to analyse soils submitted by INC.

14. In the Chane-Piray area, identified by Cochrane as a potential area for settlement in the mid 1960s, and later as the location of the best sugar-cane soils in the Santa Cruz District, colonization has proceeded spontaneously, with groups organised into cooperatives making petitions for concessions and then arranging their own layout of lots. It is not known whether Cochrane's work was used either by the cooperatives or by INC in according the concessions. In the case of the ultimate colony, Piray, settled in 1971-75, the United Churches Committee funded by OXFAM sought the advice of BTAM on the best locations for the individual holdings. Again the laboratory conducted analyses of soils.

15. The Mission's work in Chapare was also used by the Methodist Church in selecting an area for a small colony. This incomplete list of examples indicates that public and private organizations have used the soil surveys for the purpose for which they were intended.

16. What would have happened in the absence of Cochrane's studies? In 1964 the National Planning Secretariat identified potential settlement areas north-east of Santa Cruz. Both the first and second-choices lay on the Brazilian Shield where only limited areas are apt for intensive cultivation. The richer alluvial soils of San Julian were ignored. The boundaries recommended for these settlement areas were defined chiefly in terms of lines of latitude and longitude, suggesting that land survey criteria were more important than land use potential.

17. The La Paz-Alto Beni road is currently being extended to San Borja and Trinidad where it will link with another road under construction through San Julian. Cochrane's recommendations thus appear to have influenced the national road network programme. It is probable though not certain that speculators have pre-empted land proposed for colonization by Cochrane.

### 2. For Rational Land Use Planning

18. The concentration of effort on the sugar-cane area was undertaken because it appeared that prospects were high for a scientifically based land use emerging. So far the main aim of moving cane growing to the most suitable soils has been

thwarted for several reasons:

- a. for many farmers with less than optimal soils - especially the small ones - there is no alternative cash crop which has an earning capacity equal to that of cane;
- b. the traditional practice when yields fall is to clear forest re-growth elsewhere on property for planting new cane. This option is still open to many farmers both large and small;
- c. the existing sugar-cane quota arrangements (described in para. VIID4) actively deter scientific attempts to increase yields.

19. Nevertheless the economic vicissitudes of both sugar-cane and cotton in the 1970s have led to changes in the principal crops and to an increased demand for agricultural consultants to advise. The latter value the work of Cochran and his team as providing the basis for more intensive soil studies, in which the facilities of the soils laboratory are also employed.

#### The Usefulness of the Soil Laboratory

20. The Laboratory continued to be financed by the British Government until February 1976 when it was taken over by the Ministry of Agriculture. After the departure of Cochran it was operated entirely by British-employed Bolivians. Analytical services have been offered to all. Records allow some analysis of the main users (see Table 1). The main customer has been the USAID Wheat Programme. This has operated in various forms since 1949. According to a USAID Report in 1973 it had been largely experimental and had yet to achieve a breakthrough in increased commercial production. Cumulatively the main effort of the Laboratory has gone into the analysis of soils for the survey programmes of BTAM itself and of its associates, the Ministry of Agriculture and the Agrarian Reform Institute.

21. Work on these clients has naturally declined greatly. Analyses for "farmers" have increased, though neither the number of farmers nor the size of their farms is recorded. According to the Head of the Laboratory the farmers are mainly owners of small to medium properties. According to other sources American missionary agronomists working throughout the Santa Cruz colonies are responsible for bringing hundreds of samples for analysis, one alone bringing 50 a year. Use by professional agricultural consultants has already been mentioned. It may be presumed that most of these are employed by large farmers though one at least advises colonist cooperatives.

22. Demand for the Laboratory's services is highly irregular through the year (Table 2), indicating considerable underemployment at certain times. On average in 1973 it has worked at 40-50% capacity. Some complaints were heard about "bureaucratic delays"; it was not possible to pursue these to ascertain whether the delays were due to temporary overwork or to real deterioration in the service offered. A USAID report in 1974 noted that the delay was mainly in delivering samples to the Laboratory.

#### The Value of Training

23. It is not known how the Agrarian Reform Institute soil scientists, trained by Cochran, are now employed, nor what influence Cochran had on the Soils Division of the Ministry of Agriculture.

24. Paz, Cochrane's closest associate, later trained at Reading University, has subsequently worked for CIMCA, the sugar-cane research organisation, and now for San Aurelio sugar factory in a capacity unrelated to his training. He expects to take up another post advising farmers. Oros, another associate, is now employed on soil investigations for the FAO Abapo project.

### Conclusions

25. The soil surveys and laboratory services have been and will continue to be of considerable value to the colonization process and to agricultural development, not only of the tropics but of the rest of the country too. The surveys were carried out at very low cost compared with other less successful surveys.

26. The Mission office cannot act as a reference library however until it obtains a complete collection of the surveys and reports: the Piedmont and Santa Cruz Survey is a notable omission.

27. Large and small farmers have benefited perhaps equally from the surveys and Laboratory.

28. The fertility studies have yet to prove their value. The institutional barriers to higher productivity of sugar-cane may fall when the cane-grower-owned sugar mill is fully operational.

29. As only 28% cane in 1975 was grown by colonists, the sugar-area detailed investigations are likely to benefit principally the larger farmers.

30. Conversely little or no attention has been paid to the serious problem of declining yields of rice, 85% of which was grown by colonists in 1975.

31. Discontinuing soil surveys of colonization areas cannot be justified solely on the grounds that INC was not sufficiently interested. On 1 January 1975 official colonies embraced only 6,500 families throughout Bolivia whereas 38,200 lived in spontaneous colonies. In the Santa Cruz area the respective figures were 3,000 and 16,000 families. Many colonizing organisations existed to which advice could have been offered.

32. BTAMs greatest contribution has been in getting the value of soil studies widely accepted where they were ignored before. This may be attributed to

i. the credibility of Cochrane's work because it was based on field work, which is rarely undertaken either by Bolivians or by other foreign advisers;

ii. Cochrane's appreciation of the need to convince people of the relevance of the work;

iii. Cochrane making himself accessible to all in search of advice.

TABLE I - SOIL LABORATORY: CATEGORIES OF CLIENT (No. of samples)

	1969	1970	1973	1974	1975 (1st half)
Wheat Programme	3,630	2,134	122	288	31
Soil Mapping	1,242	-	-	-	-
British Mission	-	1,540	1,744	579	42
Agrarian Reform Institute	-	2,688	1,105	-	-
Ministry of Agriculture	-	1,081	460	1,094	288
Experimental Stations	150	-	324	161	44
CNECA/CIMCA	275	-	197	70	-
Agricultural Extension	29	-	-	-	-
Peace Corps	-	114	-	-	-
Farmers	663	684	889	882	133
Others	61	-	15	133	62
	6,050	8,241	6,009	3,555	1,094
Irrigation Projects	-	-	1,153	348	494

TABLE II - MONTHLY DEMAND FOR ANALYSES 1969-70

	1969	1970
January	227	81
February	129	194
March	84	93
April	148	287
May	668	686
June	146	813
July	384	325
August	424	517
September	500	1,531
October	1,378	881
November	1,164	1,732
December	798	1,101

## PUBLICATIONS OF THE MISSION ON SOILS AND RELATED TOPICS

1. **Apreciacion Inicial del Potencial del Uso de Suelos de las Regiones del Pie de Monte Central y de Santa Cruz del Tropico Boliviano (Initial Assessment of the Land Use Potential of the Central Piedmont and Santa Cruz Regions of the Bolivian Tropics)**. First issued 1966, published 1968 as Boletin No 35 of BTAM. A supplement in 1968 detailed 185 profiles and associated soil analyses.
2. **Mapa de Agrupaciones de Suelo del Tropico Central de Bolivia. 1967. Boletin No 34 of BTAM. Reprinted 1970 and issued also in English as: A Land Systems Map of Central Tropical Bolivia.**
3.
  - a. Report on soils of Rurrenabaque - Ixiamas Colonisation Project Area.
  - b. **Apreciacion del Potencial del Uso de los Suelos del Distrito de Santa Cruz (Assessment of the Land Use Potential of the Santa Cruz District), 1968** several volumes.
  - c. **Informe sobre los Mapas de Suelos Semidetallados del Distrito de Santa Cruz (Report on the Semi-Detailed Soil Maps of the Santa Cruz District published 1970, by CNECA)**
  - d. The results of the sugar-cane trials appeared in the Annual Reports of CNECA, 1969-1972.
4. **El Potencial Agricola del Uso de la Tierra on Bolivia: Un Mapa de Sistemas de Tierra (The Agricultural Land Use Potential of Bolivia: A Land Systems Map). 1973, Editorial Don Bosco, xxiv + 826 pages.**
5. **Sugerencias para el Cultivo de Caña de Azucar (Suggestions for Sugar-Cane Cultivation). Issued by the Camara Agropecuaria (mimeo., 1000 copies), but previously appearing as a series of newspaper articles.**

## D. THE SUGAR INDUSTRY (INCLUDING NOTES ON TWO CONSULTANCIES)

1. Sugar production has developed fairly rapidly in the Santa Cruz area over the past twenty years, enabling the country to reach self-sufficiency by 1964. Weaknesses in its structure accentuated by severe drought in 1971 caused production to fall and imports were necessary in the following two years, since when there has been some recovery. Soil surveys initiated by the Mission have shown the existence of large areas with soil and climate suitable for growing sugar-cane and in 1968 the Mission began in cooperation with the National Commission for the Study of Sugar-Cane and Sugar (CNECA) investigations designed to utilize the knowledge gained by these surveys for improvement of production. Previous to that the first leader of the Mission, who had considerable experience of sugar production, advised on the organization of the industry, and arranged visits by experts in both agronomy and management. The fundamental weakness persisted and following a further request for assistance by the Bolivian Government in 1971 a comprehensive study of the industry was made by consultants engaged by the ODM in 1972, and extended by a separate study of the pricing of sugar-cane in 1974. These last two studies were not part of the activities of the Mission but made use of information that had been gained by the Mission during its existence and an assessment of the extent to which their recommendations had been implemented was included in our terms of reference, if time were to permit.

2. The problems of the industry identified by these studies stem mainly from primitive methods of cultivation, pests and disease, poor organization of cane deliveries to the factories and high costs of transporting cane. Most of the cane is grown on some 3,000 scattered farms without fertilizers or any effective control of weeds, pests and disease, and after a few years cultivation shifts to new land. The average yield of sugar per hectare is said to be the lowest in South America. Much of the original cane area has been abandoned or turned over to cotton or pasture and the crop has moved northwards to new and better lands further from the factories. Shifting cultivation makes the planning of a permanent road system for the efficient and economical transport of cane difficult, because cane fields are constantly moving and spreading away from the factories. Defective administration of production credit and cane delivery quotas and a system of pricing cane based on average sugar content and not on individual sampling favour the persistence of low-yield and low-quality production. The reports of the two consultancies made far-reaching recommendations for reform.

3. The work of the Mission has not so far had any significant effect on cane production but has provided information on fertilizer response and pest and disease control which is available to the new sugar research station (CIMCA) recently established by CNECA. A plant for the hot water treatment of cane planting material against ratoon stunting virus which is prevalent in the area though largely unrecognized by farmers except in droughty seasons when it seriously affects yield was designed by the Mission and set up at the Guabirá factory, and all planting used by the research station and issuing from it to farmers is treated there as a matter of routine, though it is not yet used to any extent by farmers themselves. One variety of cane which did not reveal much promise in experiments at Saavedra has turned out, after treatment prior to planting at the new research station, to be one of the best presently under trial there.

4. The reaction to the two consultancy reports on the Bolivian Sugar Industry and the Pricing of Sugar-cane in Bolivia has been mixed. The first report is accepted by CNECA as a valuable statement of the present problems of the industry

and some of its recommendations have been taken into account in actions already put into effect or contemplated for the future. The proposed new factory north of Montero is under construction, but not at the location recommended (see below, Para 'Beneficiaries'), and the research station has been established near Guabirã as was recommended with a programme broadly in line with the ideas put forward in the report. The recommended changes in organization and the pricing of cane are more controversial. We were told that they are not acceptable to some influential cane growers who profit from the weak administration of the quota system by trading in quotas or buying cane cheaply from unregistered growers and do not want to be tied to one factory, and that CNECA sees no advantage in departing from the Chardon-Leigh formula for pricing cane which is well understood by growers. The La Paz office of CNECA has however produced a plan for zoning the cane area for each of the four factories that will be operating in the Santa Cruz region from 1977, and intends to introduce individual sampling for sugar content while retaining the Chardon-Leigh formula. If these plans can be put into effect that will be a positive step forward.

5. It is not clear however to what extent the consultants' recommendations to improve the effectiveness of CNECA and the Agricultural Bank in the supervision of quotas and loans and in stamping out the prevalent abuses of the quota system and misuse of agricultural credit will be implemented.

## VII

### E. COTTON

1. Cotton production has developed in the vicinity of Santa Cruz over the last two decades to supply the local mills and in recent years there has been a large surplus for export. Large scale methods have been employed, with mechanized cultivation and spraying, including aerial spraying, and hand picking by migrant labour. Seed and technology have been imported from the USA. There were a few small growers in the Mennonite colony and also near Monteagudo in Chuquisaca, and the Mission attempted to assist them by introducing improved seed, knapsack sprayers and small ginning machines.
2. This work was done by Collins, a crop development officer who worked in the area from 1964 to 1967 and made strenuous efforts to develop peasant production of cotton. These failed for lack of support from government and opposition by the big growers who did not want the competition on the small local market that might have resulted. The USA was at that time holding large stocks of cotton so the Agency for International Development was not anxious to promote more cotton production elsewhere in the Americas.
3. Cotton growing has been abandoned in the Mennonite colony. We have no information on what has happened in Chuquisaca. The big growers with their American technology have not needed or looked for assistance from the Mission until about 1971 when the industry began to look more critically at its high production costs, being now an exporter of cotton. The Mission was then asked to assist in the development of local production of seed, which from the beginning had been imported annually from the USA at considerable expense. There was no money for the scheme at that time and the Mission ceased to exist shortly afterwards. This development followed from advice given by Collins, and short advisory visits in 1966 and 1971 by specialists of the Cotton Research Corporation (CRC).
4. The growers have now formed an association (ADEPA) which has as its agronomist a Bolivian who worked with the Mission at Saavedra and was given advanced training at the faculty of agriculture of the University of the West Indies in Trinidad with a British technical assistance scholarship. He had not seen the report of the CRC adviser's visit of 1971, an omission that has now been rectified. It is probable now that a grower's organization exists and has an agronomist to work full-time on cotton that the question of local seed production will be pursued, and if it can be successfully and efficiently established should result in a substantial saving in the cost of production of cotton.

## VII

### F. CROP TRIALS

1. Trials with a wide range of tropical crops were conducted by Penn in Cochabamba Department in 1965-67 and by Vickers at Santa Cruz in 1969-72.
2. Penn was contracted, at the request of the Bolivian Government, especially to investigate the possibility of growing pyrethrum in the Highlands. A high-value cash crop was particularly needed by the many small farmers who occupy tiny plots of unirrigated land at temperate altitudes. Local supplies and improved varieties from Rothamsted were employed in trials over two years at a wide variety of sites. The results were disappointing: sites that were wet enough suffered from soils that were too acid and from temperatures that were too low; most sites proved too dry without irrigation and under irrigation pyrethrum was not competitive with vegetables and flowers. Some years later the Development Corporation had greater success in La Paz Department beside Lake Titicaca and Penn's advisory bulletin was reissued to help growers. TPI sent experts to advise both Penn and CBF. Processing problems proved an obstacle to CBF's efforts.
3. Limited trials were carried out in the lowland Chapare colony with annatto and papain. Good quality products were obtained from both, with the help of TPI. The market for annatto however was unstable and trials were not pursued. Neither was papain followed up, though the reason is not clear. Papain is extracted from Papaya, a popular food crop in all the colonies and the excessively wet Chapare colony undoubtedly needs a high-value crop, other than cocoa.
4. The Santa Cruz trials involved variety testing and NPK-response experiments. Vickers, who had 20 years' experience of tropical agronomy, was a painstaking investigator. Varieties of cotton, bananas, sunflower, soya beans, groundnuts and sweet potatoes were obtained from Africa, USA, West Indies and elsewhere. NPK tests were then conducted with those giving the best yields as well as with maize and sugar-cane. In most cases no significant responses were obtained despite low yields without fertilizers. Cane showed a significant response to urea but at prices then obtaining its use was not economic. The Mission was terminated before studies could be made of other factors limiting growth.
5. According to one informant much of the work replicated investigations already carried out by USAID at Saavedra Experimental Station; whereas these results had been lost, Vickers submitted to ODM a full report on his work. No attempt was made to circulate locally any of the findings, it would appear, although the variety trials gave potentially useful results, on sunflower and cotton especially.

## VII

### G. CATTLE IN THE BENI AND SANTA CRUZ

#### The Beni

1. The natural suitability of the Beni for rearing cattle cheaply on grass was considered by the exploratory Mission to be favourable for the development of exports of beef. Apart from transport, now well developed by air to the main consuming centres in the country, the most important technical problems identified were the prevalence of animal disease, primitive standards of ranch management, animal husbandry and marketing and lack of knowledge of pasture management. It was proposed that a veterinarian with laboratory facilities, should be posted to the livestock experiment station at Reyes for extension work throughout the region, an animal husbandry specialist should give practical instruction in management and husbandry and a pasture ecologist should study the natural pastures and carry out large-scale experiments in pasture management on the experiment stations at Reyes and Trinidad. It was also proposed to introduce a small herd of water buffaloes for trial under the local conditions.

2. The first two posts were filled in 1964. The veterinarian, Calderbank, carried out a survey of animal diseases, produced preliminary reports on the livestock industry of tropical Bolivia and on the marketing of beef in the Beni, established a small diagnostic laboratory at Trinidad and provided both practical veterinary attention and advice on the improvement of facilities on ranches and at slaughtering centres for cattle handling, disease control, slaughtering and the curing of hides. The animal husbandry specialist, Hobbs, gave practical demonstrations of improved techniques for cattle handling and management including the introduction of a new type of fence that was much cheaper to erect than the type in use which because of its cost was in evidence on very few ranches, planning construction and use of fencing, pens and crushes to control breeding and facilitate handling, and improved methods of castration and dehorning.

3. It soon appeared that though this work was appreciated by the more progressive ranchers the vastness, isolation and sparse population of the region and lack of infrastructure were not conducive to the diffusion of new technology on any wide scale and most ranchers continued to pursue their primitive methods of open-range ranching. How far this was due to economic constraints and how far to satisfaction with the existing way of life is not known. A study by R W Clark of Wisconsin University in 1969-70 revealed that many of the larger ranches are understocked and a survey by the Mission of similar ranches in the Santa Cruz area concluded that marketing difficulties, shortage of skilled labour and management staff and the leisure preferences of the ranch owners, many of whom do not live on their ranches, are deterrents to the full development of these ranches. The local veterinary and animal husbandry extension staff were too few in numbers and ill-equipped by training and resources to provide the support needed if the two British advisers were to make any significant impact and this view was endorsed by the ODM Adviser on Animal Health who toured the area early in 1965 and wrote that "this fundamental lack of state services can never be made good by the attachment of individual foreign experts". The two men were withdrawn to Santa Cruz during 1965 but continued to make occasional visits to the Beni from there.

4. The pasture ecologist proposed in 1962 was never recruited. The Mission did have a pasture agronomist at Santa Cruz who toured the Beni and concluded that except on a few fully stocked ranches where some over-grazing was evident there

was plenty of grass and likely to be little interest in or immediate need for pasture improvement. He supervised with collaboration from FAO an ecological study of the grazing resources by a British volunteer qualified in botany who was attached to the Mission during her year of voluntary service and an ecological map was produced. This work was designed as a preliminary study forming part of a wider FAO project to compile an inventory of the forage and livestock resources of tropical America.

5. We were not able to visit the Beni and in view of the somewhat discouraging reports of the Mission on its work there did not expect that any important results would be apparent. However a World Bank project to promote development in the Beni through supervised credit for ranch and animal husbandry improvement began in 1969 and a former manager of this whom we met in La Paz told us that some of the improvements demonstrated by the Mission had spread. We have no assessment of this in quantitative terms nor of the part that must have been played by the World Bank's capital aid in achieving it. It does appear that the Mission's relatively slight presence in advance of the World Bank project did contribute to development. Our inquiries in the Santa Cruz area where the two men worked after leaving the Beni revealed much admiration for their practical approach, and though evidence of success there is rather sparse it does seem to have been effective where conditions were suitable for it. One lesson that emerges from this experience is that technical assistance of this kind needs to be combined with soundly based and properly supervised agricultural credit and organized marketing arrangements for cattle and beef. However, Clark's study, mentioned above, made before the World Bank project had begun to bite, estimates that 20% of the ranches had good installations and husbandry methods, 40% had good installations but less up-to-date husbandry methods and 40% could be classed as primitive in both respects. This indicates that a good deal of progress had already been made by 1969, and it is possible that some of it had been assisted by the Mission's work.

6. The Mission's reports on the Beni were made available to the World Bank in preparing its project and as has been mentioned Hobbs and Kelly collaborated in a survey of a pilot group of cattle farms in the Santa Cruz area to collect data for it.

#### Livestock: Santa Cruz

7. Calderbank worked from Santa Cruz from mid 1965 till he left in 1967 and was replaced at the end of 1968 by Edwards, an animal breeding specialist. Hobbs stayed in Santa Cruz until he left the Mission to form the Agricultural Bank early in 1971.

8. The Mission's main activities were practical extension work among farmers and ranchers, experimental work in cattle feeding and management, surveys of dairy production and marketing, advice on cattle breeding and management at Saavedra experiment station, the CBF livestock development project at Todos Santos and the agricultural school at Muyurina, production of technical and advisory bulletins and assistance in the improvement of marketing cattle and in veterinary and animal husbandry education. The animal husbandry staff collaborated with US: AID in an investigation of the marketing of beef in Bolivia for the Agricultural Bank and with Kelly, in a survey of a pilot group of ranches in the Santa Cruz area to collect data for the World Bank's cattle project in the Beni. A pilot scheme in artificial insemination for dairy farms was introduced and Calderbank instituted

in collaboration with the veterinary faculty of the university (the only one in Bolivia) a "college practice" for the local dairy farmers.

9. The evidence we obtained indicated that the practical demonstrations of improved cattle management and husbandry techniques were universally admired and, as in the Beni, there has been some adoption of the improvements demonstrated. It was thought that Santa Cruz, having a market for beef and milk, a more developed farming industry and availability of molasses and cotton seed cake for supplementary feeding would offer a more favourable environment for this work than the Beni. Clark's survey however showed that as in the Beni the larger ranches had plenty of land and only on the medium and small cattle farms was there a need for more intensive husbandry. Though a market exists it is still very primitive for both beef and milk.

10. The improved facilities designed by the Mission at Santa Cruz abattoir illustrate the difficulty of changing traditional practices. Horsemen with lassos and whips go into the small pens designed for the orderly sorting of cattle, chasing the unfortunate beasts in the confined space as though on the open range. Sales by weight recommended by Hobbs have become established practice but there is as yet no organized system of grading. We were told that the average carcass weight at the abattoir has increased over the last ten years from 150 to 180 kgs as a result of the progressive introduction of Zebu blood (not a Mission activity) and improvement of animal husbandry, in promoting which the British and Swiss Missions were both active. It is not possible to say how much of this improvement can be attributed to the Mission. There is said also to be more awareness of the possibilities for improvement and this too owes something to the Mission's work, perhaps particularly the practical demonstrations given at the annual agricultural show in Santa Cruz.

11. The animal breeding specialist was concerned mostly with animal husbandry and feeding, having little opportunity for doing more in animal breeding than advisory work at Todos Santos, Saavedra, Muyurina and a few farms and ranches. Possibly a few better bulls have resulted than would otherwise have been bred and their effect may be seen over the years, but follow-up at Saavedra has been poor and there are insufficient facilities at Todos Santos and generally in the district for the long-term control and evaluation of breeding performance necessary to test and exploit results.

12. Information for the development of dairying was provided by surveys of milk production and marketing in the Santa Cruz area carried out in 1965-66 by the Mission with the assistance of a British Volunteer and updated in 1969-70 by a Volunteer and Suarez an experienced Bolivian extension officer attached to the Mission. An investigation of the feasibility and cost of developing a small farm made available by a cooperative group near Santa Cruz for milk combined with beef production was undertaken in 1970-71 with participation by the cooperative marketing adviser. These activities do not appear to have been followed up when the Mission withdrew shortly afterwards. A basic requirement for development is improvement of milk marketing in Santa Cruz and this has not happened yet. A pasteurizing plant is being set up near Montero by the CBF milk industry enterprise at Cochabamba (FIL) and the information gained by the Mission may be useful to it when it starts operating. The Mission also did a survey of cheese-producing dairy ranches in the San Javier district 200 kms north of Santa Cruz in 1965-66. No action has yet resulted but the possibilities for development indicated by this survey are being followed up by the new British Mission recently established at Santa Cruz.

## VII

### H. PASTURE IMPROVEMENT

#### Activities

1. The Appraisal Report recommended the appointment of a range management expert for the extensive livestock rearing area of the Beni. It also advised that existing experts pay more attention to pasture management on the intensive dairy farms in the Valles. When BTAM actually appointed a pasture officer his task became pasture development for intensive livestock production in the Santa Cruz area.
2. The reasons for this shift of policy appear to have been technically sound: in the Santa Cruz area (large) farmers were diversifying their enterprises away from crops. In the absence of natural pastures in this forested area cultivated pastures were being established, using yaragua (Hyparrhenia rufa), markeron (Pennisetum purpureum), guinea (Panicum maximum) and Para (Panicum purpurescens). These pastures were generally deteriorating after two or three years, partly as a result of nitrogen deficiency. The possibility of introducing tropical pasture legumes, of improving pasture management and of devising suitable temporary leys all appeared potentially fruitful fields of investigation. The staff at Saavedra Experimental Station were receptive to a programme of experimentation in these fields.
3. The Mission's activity in pasture work was divided into two periods, with fifteen months separating the work of Horrell (1964-67) from that of Rossiter (1969-72). Horrell was responsible for introducing dozens of tropical legumes and grasses from Africa and elsewhere and for testing these introductions as well as species already present in the area. Among the legumes introduced were Lab-lab (Dolichos lablab), glycine (Glycine javanica), and atro (Phaseolus atropurpureus), and among the grasses short Guinea, Setaria sphacelata, and gramalote (Paspalum dilatatum). Delays in obtaining supplies and shortage of funds at Saavedra prevented much research being undertaken, but it was demonstrated that glycine, atro and lab-lab grew well and were adapted for mixture with guinea, markeron, yaragua and buffel. Horrell visited many farmers to interest them in improved pastures. Although there were major difficulties in multiplying the more successful seeds, 100 bags of the three legumes were sold in 1966. No record was kept of who bought them.
4. During the hiatus between Horrell and Rossiter, Suavez at the Ministry of Agriculture office in Santa Cruz established demonstration plots of 6 grasses and 4 legumes. At Saavedra others were destroyed and few written records survived. The hiatus coincided with the absence of Delgadillo, Saavedra's pasture specialist, on a two-year scholarship at Aberystwyth.
5. Rossiter carried out trials on the productivity and management of markeron, yaragua and pangola (Digitaria decumbens), and introduced Rhodes grass (Chloris gayana) from Africa. Lab-lab and Cowpea were proved to be successful as green manure. On the extension side many farm visits were made, farmers' courses held, and twenty bulletins published each on a different grass, legume or forage crop (See Appendix 3). Reprints of some were soon needed. Although Delgadillo co-authored these bulletins, practical cooperation at Saavedra with trials was less than hoped for since Delgadillo was appointed Director and had inadequate time to devote to research. Reports on the trials have disappeared between the

end of BTAM in 1972 and the return of Horrell as Head of the new Mission. Again there was no success in trying to persuade farmers to grow seed commercially.

6. In 1970 Penn was transferred from Coroico to Cochabamba where he began a series of experiments in collaboration with the Swiss Mission and the local University, the object being to improve dairy pastures and forage. Penn's responsibilities were lucerne, sunflower and sorghum. He also introduced British and Australian grasses and legumes including fescues and rye-grasses.

Evaluation: (1) The Large Farmers of Santa Cruz.

7. Saavedra Experimental Station retains vestiges of Horrell's sowings of green panic and glycine and limited supplies of seed or vegetative material are sold to farmers. It also retains pastures of this mixture for all year grazing by its own herds. As yet it has no programme for multiplying seed. With little commercial interest in producing seed for sale, scarcity of planting material still constitutes a major hurdle and only keen farmers are undertaking the protracted task of providing their own seed from small beginnings.

8. A further obstacle to the adoption of improved pastures as a means of providing winter feed is the simple fact that in the Santa Cruz area of large farms - where Horrell and Rossiter principally worked - there are alternative cheap supplies of nutritious feed in the form of sugar-cane growing on the farms themselves, and easily obtainable cotton-seed and molasses from nearby mills.

9. Nevertheless cultivated pastures are on the increase and, although the longer-established markeron and yaragua are the most common species, dwarf guinea and green panic are both quite frequent. As yet however there appears, according to well-informed farmers, to have been virtually no adoption of grass-legume mixes. There are probably several reasons for this difference in farmer behaviour. Grass-legume mixes require management and a commitment to pasture for several years to be profitable. But a large number of Santa Cruz farmers are, even by their own admission, notionally speculative in their choice of enterprise, shifting from cane to cotton and more recently from cotton to soya-beans or grass according to the rapidly fluctuating economic conditions of the respective crops. Recently bank loans have become available for conversions to livestock and thus stimulated an interest in grasses but not as yet in permanent pastures. Especially in the vicinity of Santa Cruz city many farms are owned by city dwellers who are unable and unwilling to provide the management required for careful agricultural practices.

10. Legumes are in contrast beginning to be adopted on a notable scale by cotton farmers as green manure. The company which originated cotton-growing now also grows lab-lab commercially. There are also several dozen Peruvian cotton-growers (who left their estates after the 1968 left wing military revolution) who have brought with them the behaviour patterns of a group already committed to scientific agriculture.

11. A further stimulus to interest in pastures will shortly come from the large milk factory now under construction halfway between Santa Cruz and Saavedra.

12. In sum, among the larger farmers there is a growing interest in pastures, an interest which is not confined to the long-used species of grass but is still far from accepting mixed grazings. Soil exhaustion is also encouraging the use of leguminous cover crops though soya-beans as a cash crop may well make greater economic as well as agronomic sense.

13. What channels of diffusion appear to have been the most successful? Even from the better educated farmers (which often means only 4 years of schooling) we gathered that the numerous pasture bulletins had had little impact, that the farmer here as elsewhere prefers to see or hear something rather than read about it. In this respect the enthusiastic farm-visiting undertaken by Horrell was remembered whereas Rossiter, much more recently in the area, was almost forgotten except by professionals. Since no records were kept of the names and addresses of people to whom bulletins had been distributed, or visits paid, even spot checks were impossible.

Evaluation: (2) The Small Colonists

14. In the colonies of Santa Cruz and the Alto Beni American missionaries have been working in agricultural extension continuously since the mid-to-late-1960s. In the Santa Cruz area they include Methodist and Catholic agronomists and Mennonite volunteers, in the Alto Beni Methodists alone. These groups working in close collaboration have constituted an important channel of diffusion of BTAM's work especially on the livestock side. Grass and legume seeds were obtained from Saavedra and Santa Cruz, and from the Methodists' own farm - which independently introduced some species, for example Bermuda grass. The Mission's bulletins served them as a valued source of expert information which has been conveyed to colonists either individually or through short courses, or through a specially prepared simple manual on livestock and pastures of which 600 copies have been sold to settlers. The missionaries also attended courses given by members of BTAM.

15. Curiously the latter, in conversation and from records, appear to have been only slightly aware of this missionary interest. One report of BTAM even in 1972 lamented the lack of mechanisms for diffusion.

16. The Mennonite volunteers who live in the colonies plant a range of grass and legume species around their houses to serve as a demonstration and source of material; 100% adoption has been achieved in one village. From first-hand experience in 1975 it is known that about 20% of Piray colony's 120 settlers were keen to share a truckload of dwarf guinea grass. In the Alto Beni we observed that the Methodist School at Km 73 maintains a nursery of grasses and legumes, including green panic and glycine. There the trigger to settler interest has been Heifer Project whose participants are committed to attending courses of instruction and to planting grasses. The project has been under way long enough for milk consumption to have led to detectably lower mortality and fewer hospital visits. A similar project is under way north of Santa Cruz in the Chane-S. Pedro district. Lab-lab and atro have also been adopted by small numbers of colonists at Cuatro Ojitos for grazing. In virtually all cases the pasture areas are small, the number of cattle per colonist of the order of 4 or 5, and the purpose is to keep milk cows for domestic use and for local retailing.

17. In sum the missionaries have been clients of BTAM for almost a decade but the response of settlers to livestock possibilities has been more recent. Colonists' initial efforts tend to focus on a leading cash crop; only later do they begin to diversify and look for a better diet from their enterprises.

Evaluation: (3) Cochabamba

18. Despite the shortness of Penn's work in Cochabamba on pasture trials, two results were noted: in the University's Faculty of Agronomy three recent theses

presented for the degree of Ingeniero Agrónomo deal respectively with fodder sorghum, maize and lucerne; all particularly acknowledge the help of Penn and Delgadillo; secondly at least one member of the Association of Dairy Farmers, which collaborated with BTAM, has thriving mixed pastures of rye-grass, clover and lucerne.

### Conclusions

19. BTAM had a definite but as yet unquantified impact on the use of improved pastures. In the case of large farmers the channel of diffusion was principally word of mouth and direct demonstration by Horrell. In the case of colonists the channel was mainly the publications of Rossiter and Delgadillo in association - unrecorded in the Mission's reports - with the work of non-governmental extension workers. The social effect of the programme may therefore be judged neutral.

20. To an unknown extent the pace of diffusion was slowed down by the failure to multiply seeds. To Dr Crossley it is not clear why the Mission was unable to assume the task and the risk of multiplying seed on the scale required when it was able to finance and operate a 9 hectare experimental plot. Mr Johnson doubts if the effective demand for seed would have justified the necessary investment and the time of Mission staff in managing it.

21. The failure rapidly to replace Horrell was partly responsible for a loss of information and hence for a waste of time and money. Also responsible was the failure to send copies of all reports of research findings to ODM - and the failure of ODM to require that they be sent.

22. It is possible that at the time of BTAM the climate among both large farmers and colonists was largely hostile to the adoption of improved pastures. In the absence of contemporary reports on economic and social factors influencing the receptivity of farmers, it cannot be judged whether or not the Mission's efforts were premature nor whether they were directed to the most appropriate groups.

23. The Bulletins continue to be in demand. The failure of the office to return copies of some of them, eg the one on atro, will make re-issue difficult. Neither did ODM receive, or require to receive, a complete set. The value of the Mission's work is thus again diminished.

## VII

### I. ENTOMOLOGY

1. An entomologist was proposed in the Appraisal Report for the study of insect pests of sugar-cane and of other crop pests in the country. Preliminary studies were made in 1963 by Stevenson the Mission's technical secretary for investigations, and the Director of the Commonwealth Institute of Biological Control, which led to proposals for the investigation of the biology and parasitism of the sugar-cane borers and three other pests of widespread economic importance in the country; the corn earworm causing serious damage to maize and a major pest of cotton and two fruitflies affecting especially citrus. Biological control was thought to offer the best prospects of the economic control of these pests in the conditions prevailing in Bolivia, since if it can be permanently established it can significantly reduce pest damage without further action and avoids or greatly reduces the need for chemical spraying on farms. A general entomologist, Squire, joined the Mission at the end of 1964, two Bolivian entomologists who had worked on sugar-cane borers were sent for advanced training in the USA, laboratory equipment was acquired with funds provided by the National Committee for the Study of Cane and Sugar (CNECA) and somewhat makeshift laboratory accommodation was found at the La Tamborada experiment station of the agricultural faculty of the University of Cochabamba. There were Bolivian entomologists at the university and at Ministry of Agriculture experiment stations in the area and a technical library and insect collections in the university.

2. Squire began his work with a study of what was known about insects in the country and a broad assessment of the economic importance and existing measures of control of the more important pests. He reviewed these in a comprehensive report in 1967, later expanded into a scientific paper published in PANS in 1972. Following preliminary studies of the pests proposed for biological control research a scheme for the experimental introduction and study of parasites in cooperation with the Commonwealth Institute of Biological Control was begun in 1967 with financial assistance from the ODM. This ended in March 1972 and was reviewed in the final report by the Institute.

3. The object of the scheme was to import a variety of insects which parasitize these pests in other countries for experimental release in small numbers on the chance that some of them would become permanently established without an elaborate and expensive mass-breeding programme. Experience has shown that permanent control is only occasionally achieved by this technique, but it is a useful and relatively inexpensive first approach where resources are limited. The numbers released were too small to control sugar-cane borers, and further efforts, including mass breeding to produce very much larger numbers of parasites, would be necessary. None of the releases made for the control of the corn earworm were successful. With the fruitflies it was possible to obtain much larger numbers of parasites from laboratories already engaged in mass breeding, and all of these were at least temporarily established. It was not possible to say whether any lasting benefit would result or whether further mass releases would be necessary and economic.

4. No major success in controlling crop pests has been achieved by these experiments and their value rests on the use that can be made of the information gained. It is clear that more intensive and larger scale investigation is needed if economic control is attained. The Mission's work has increased knowledge of the biology, parasitism and seasonal incidence of the pests, the damage they do and the techniques of biological control under Bolivian conditions. This is available in technical reports produced by Squire and his Bolivian counterparts

and the experience of the Bolivians who worked with him. It will be of use to the new sugar research station (CIMCA) established by CNECA in the Santa Cruz area, whose first priority will be to find means of controlling insect pests which are causing the loss of some 20,000 tons of sugar annually from the existing cane production. We were told that it is intended to resume the work at La Tamborada which was started by the Mission and stopped when the Mission left.

5. Squire also investigated and advised on the control of a number of pests of field crops, fruit trees, stored products and livestock in the tropical areas and the altiplano and high valleys. Recommendations were given to the extension staff and to farmers and bulletins produced in collaboration with Bolivian staff. He investigated the control of fruitflies by trapping with the use of chemical attractants and took part in preliminary discussions on male sterilization techniques for the control of fruitflies as an adjunct to biological control. Finally he made a study of the Vinchuca beetle which is the vector of Chagas disease, said to affect eight million people in Latin America, on which he published a scientific paper in PANS in 1968. As a result of this work a scheme was initiated after Squire left with a grant from WHO to investigate biological control of this medical pest in collaboration with the Commonwealth Institute.

6. The temporary laboratory set up at La Tamborada by the Mission has been absorbed into the new building of the University Faculty of Agriculture together with Squire's insect collections. The small laboratory at Saavedra for work on sugar-cane borers has been transferred to the Agricultural Faculty at the University of Santa Cruz, where one of the Bolivian counterparts is now Dean of the Faculty and Professor of Entomology. Of the other Bolivian counterparts one is Head of the Entomology Department at La Tamborada, one is at an experiment station near Cochabamba and one is in Brazil but has prepared a report on his work at Saavedra which is awaited by the Director of the new sugar research station.

## VII

### J. GENERAL ADVICE ON TROPICAL AGRICULTURE

1. The Mission leader was designated as General Adviser on Tropical Agriculture to the Government of Bolivia and his advice and that of other members of the Mission was sought on a variety of questions. Advice to the government on development policy was in the main confined to questions of the dispositions and activities of the Mission within the existing structure and limitations of the Ministry of Agriculture and other institutions concerned with agriculture. The Mission was not asked to advise on how these services might be made more effective or on general policy for tropical agriculture. Apart from advising on the deployment of the Mission MacKenzie advised extensively on the sugar industry, his deputy Stevenson on research, the cattle industry and citrus. There is no evidence of any important decisions being taken by the government on their advice.

2. All members of the Mission advised on many details of production, processing and marketing both within and outside their own particular fields of activity, for individuals, firms and public and private organizations. A number of advisory visits, apart from those relating specifically to the Mission's projects, were arranged at the request of the Bolivian Government on such questions as the production of jute and kenaf and the manufacture of sacks and hessian from locally produced fibres, cotton production and ginning, plant diseases, marketing of fruit for export, etc. We were not able to assess the use that may have been made by individual producers, processors, exporters, extensionists and others of the advice given. As regards the advisory visits no action appears to have resulted from several of these except in the sense that, for instance, Bolivian plant pathologists now know that Panama disease on bananas exists in the country and know how to diagnose it and the newly formed association of cotton growers has expressed interest in, but not yet taken any action on, the local production of cotton seed. In general we feel that the casting of bread on the waters by advice that cannot be followed up by the Mission or put into effect by competent local technicians, while it may leave some useful residues, has not made any discernible impact on agricultural output and is not an effective way of utilizing a multidisciplinary Mission.

## VIII - EVALUATION OF THE MISSION'S RELATIONS WITH GOVERNMENT AGENCIES

### A. ODM POLICY ON THE MISSION

1. ODM's policy was two-fold: certain issues were decided by ODM, while for the rest the Head of Mission formulated and executed policy in collaboration with GOB, ODM always being ready to advise if requested.

2. It is the opinion of one of us (Dr Crossley) that the composition of the initial appraisal team was too heavily weighted in favour of the natural science aspects of agriculture (see Para IX B7 ) and that the resulting Mission was similarly biased, partly for the same reason and partly by virtue of the kind of experience then available. Nor subsequently was this balance changed in the light of the Mission's accumulating experience of rural problems. At no time was anyone formally qualified expressly to advise on socio-economic problems. Nevertheless there were those who grasped in varying degrees the need to take human factors into account. We are both agreed that the Mission would have benefited from advice by specialists on the social, economic and political aspects of agricultural development in Bolivia.

3. We agree with MacKenzie who recommended in his end-of-tour report that the Head of Mission should arrive well ahead of the team in order adequately to survey the field of work, the facilities available, and the nature and extent of involvement of other Aid Missions, and in order to plan the Mission's work in cooperation not only with the relevant government departments, but also with other Aid Missions, especially USAID. Dr Crossley believes it probable that some of the initial misunderstanding with the USA may be attributed to British perceptions of aid being largely focussed on agronomic needs at a time when the USA were moving towards a more integrated rural development approach.

4. We consider too that the assistance finally offered in men and kind of commitment was much less than the Bolivians were expecting. Gomucio who had made the request was certainly disappointed, as he made clear to us in 1976. In part this may have been due to the fact that for some considerable time the Head of Mission and Embassy were left to negotiate under the mistaken impression that DTC had accepted the level - 25 experts - recommended in the Appraisal Report, when for good reasons a maximum of 16 had been decided upon. It does not appear that DTC considered how, in cutting the size of the team, it would also be necessary to alter its aims. As a result the Mission was not able to fulfil the expectations which the Bolivians had of it.

5. ODM's only formal agreement with GOB was the Memorandum of Understanding of February 1963 (see Para VI 11 ). On the whole we consider the terms were about right: the looseness of the definition of the Mission's responsibilities probably saved ODM from having to re-negotiate with every change of government and gave BTAM's work a degree of continuity it might otherwise not have enjoyed. The Memorandum has been criticised by some for allowing rather than requiring the attachment of counterparts. Given the political uncertainties which surrounded the Mission for most of its life, and GOB's failure to provide the required support costs, it is doubtful whether an obligation to attach counterparts would have served any useful purpose (see Para VIII, B.3. below).

6. Time has shown that, when BTAM was pressed to assume full responsibility for tropical agriculture, ODM was right in conceding only that it might assume technical executive responsibility. Anything less would have been unacceptable to the then Bolivian Government; any deeper involvement would probably have made BTAM unacceptable to succeeding governments.

7. In several of its decisions the ODM did not fully confront the realities of Bolivia's administrative situation and their implications. Given that the fundamental objective was to aid farmers to improve production it follows that to achieve it by advising a government will succeed only if that government has the will and the resources to utilise that advice in the interests of farmers. In 1962 there was no doubting the will of the Minister of Economy or the President to have a British Mission; in 1967 there was no doubt of the Ministry of Agriculture's desire for its continuation. Promises to pay support costs, it had become clear by 1967, indicated a will but not an ability, since those costs would have absorbed at least 1% of the Ministry of Agriculture's total budget. For several years much time was fruitlessly spent by the Mission, Embassy and ODM trying to recover support costs from the Ministry, in order to comply with Treasury instructions.

8. It was equally futile to insist on counterparts, for the Ministry of Agriculture suffered from an acute shortage of qualified people even for manning on-going services, let alone for providing counterparts for all the aid projects. For the same reason it was unwise to allow BTAM to increase its emphasis on research when the Ministry was incapable of adequately utilising the results to the benefit of the farmer.

9. This experience, which we are sure is not limited to Bolivia, raises general issues of aid policy to the poorest countries. Should programmes be designed around such principles as the recipient government's responsibility for local support costs, for the attachment of counterparts and for the provision of agricultural extension services? If so, it follows that aid programmes, singly or collectively, will be either beyond the capacity of the country effectively to absorb and support, in which case the overall efficiency of aid will be low or within the country's capacity, in which case efficiency may be high but the level of total aid will be far below the country's needs. A corollary of this approach is that only programmes receiving high priority at the highest level from the recipient government are likely to be effective and efficient. In Bolivia's case, according to Wennergren and Whittaker ("The Status of Bolivian Agriculture", Praeger, 1975), successive governments over the year 1967-73 only once allocated over 10% of public expenditures to agriculture and, if allocations to the Development Corporation and Agricultural Bank - which benefit mainly large farmers - are excluded, the percentage never rose to three. Despite pressure from the relatively powerful USAID Mission, governments in the years 1967-73 were never willing to accord anything but a low priority to those public authorities concerned with the livelihood of the rural majority.

10. Should programmes of aid, then, be designed around the different principles? Specifically, should close collaboration with the most interested public body be sought but objectives and projects be tailored to those that are capable of fulfilment within the limitations of the human physical and financial resources which the donor is willing and able to devote? The greater the resources the local body is able to provide the better, but should these not be regarded as a bonus rather than a necessary condition for effective aid? In the case of BTAM, ODM recognised up to a point the realities of the Bolivian situation and practice differed from declared principle: ODM made grants for the construction of the

soil laboratory and the coffee pulperies and hulling plant; it also paid the running costs of the soil laboratory including the salaries of Bolivian staff; an annual discretionary grant of £2,000 for local expenses was also made. BTAM also cooperated with several public bodies (see below Para VIII B.4.) but its formal attachment could only be to the Ministry of Agriculture since GOB policy after 1964 was to concentrate responsibility for agriculture within that Ministry.

11. In accommodating conflicting principles and practice ODM allowed BTAM to achieve more than it would otherwise have done. It is not clear from the evidence that ODM - or the Treasury - fully recognised that the principles behind the two approaches to programme design discussed above can be reconciled. We assume that in appraising, designing and executing aid programmes one overriding principle is cost-effectiveness, especially in the use of scarce foreign exchange. In some circumstances the greatest cost-effectiveness will accrue from concentrating British expenditure on experts' salaries and requiring aid recipients to provide the necessary back-up; in other circumstances the most effective strategy will be to spend less on salaries and more on support.

12. If this assumption is correct, it might have been possible at the time of the quinquennial evaluation in 1967 to have pressed successfully for a rearrangement of the agreement. The Ministry of Agriculture was seeking a reduction in support costs and also pressing for two experts who had worked directly with farmers to be replaced by researchers. ODM, unable to allocate more funds to BTAM, conceded the latter but not the former. As a result in part of this decision BTAM's balance shifted from being largely practical and it ended up as mainly a data-collecting mission. If the opposite decision had been taken the effectiveness of BTAM might have been enhanced at the expense of some reduction in size.

13. The general lesson from this experience would be that where the recipient country is unable to guarantee support costs, counterparts and the effective utilisation of technical assistance to the benefit of the farmer, a Mission should be designed initially to achieve practical results through the deployment of its own resources. As the host country, with the encouragement and help of the Mission gradually revealed its ability and will to accept specific responsibilities, so would the Mission give them up and, if requested, accept new commitments to the same total cost. Some departure from this framework may be politically desirable. Its abandonment would be acceptable only if fundamental objectives other than aid to the farmer were uppermost.

14. By mid-1971 when the Head of the Latin American Department and MacKenzie, as agricultural adviser, left to review the Mission, its character had become almost completely that of an information-gathering team. Not only had the research side been expanded after 1967 but the extension side had also independently largely withered away: Kelly had been withdrawn from the coffee project in 1969 and had found no equally practical task in Santa Cruz; the animal husbandry officer had left BTAM in January 1971; Dixon had been withdrawn from the management of the cocoa cooperative early in 1971 and his contract expired in July 1971. Whilst we accept that experiments and surveys provide the vital information on which extension can be based, research without extension is of very limited value. We conclude that for practical reasons the decision painfully reached to terminate the Mission was right. GOB's failure to allocate to support costs half the Food Aid granted by the British Government made termination also necessary for tactical reasons. In making an exception of the one practically useful project, the soil laboratory, and agreeing to its continuing support, ODM was right. For the same reason, its practical value, it was an error to allow the cocoa project

to lapse with the end of Dixon's contract. It was the view of all concerned that ending aid to cocoa was premature yet the administrative convenience of treating the Mission as a single entity overrode better judgement.

15. It is clear that the problem in 1971 and 1972 of a steadily dwindling Mission arose because of the incompatibility of 5-year projects and 3-year contracts. A similar run-down had occurred in 1967-68. With a build-up taking place in the first 18-24 months and a run-down in the last 18-24 months, a 5-year Mission is at full strength only in the middle year or two. We would therefore suggest that all contracts for staff required for the full period should, after successful completion of an initial probationary 18 months, be extended to the end-date of the 5-year period. If the Mission is likely to be extended it would be important to reach a decision by the end of the fourth year and then arrange the renewals and replacements needed.

16. During the life of the Mission it seems probable that ODM was undermanned and overstretched when confronted with the problems described: it had few (initially no) advisers experienced in Latin American affairs; Geographical Department officers were not always able to gain first-hand experience; too often visits were made during the wet season when the Alto Beni was well-nigh inaccessible and there was no opportunity to inspect potential new areas of activity which lay beyond the few all-weather highways. The Mission was however fortunate in enjoying full Embassy support: without exception the ambassadors gave unstintingly of their experience in political matters and showed an enthusiastic interest in the affairs of the Mission. Matters of administrative detail were handled by FCO officers who also had other responsibilities.

17. It is clear from the files that visits by ODM staff served to establish and cement personal relations with team members that were much valued by individuals. Such visits did not and could not however substitute for an adequate formal system of personnel management. On this score there were many criticisms voiced. There was no system of automatically informing new staff of the code of regulations: it was only late in the life of the Mission that members discovered they had been entitled to soft furnishings allowances and to part-day subsistence allowances. Of greater concern towards the end of contracts was the absence of a system of informing staff of opportunities for employment in technical assistance elsewhere. Even the most valued and highly regarded left on terminal leave with no idea whether they would be appointed elsewhere or join the unemployed.

18. We would suggest that consideration be given to the idea of attaching an HEO of the ODM to the Embassy to act as administrative assistant to the Head of Mission, to take charge of the office work, to act as liaison officer between team members and ODM and to assume some of the duties performed by the Embassy. We believe that ODM would benefit not only from a more systematic organisation of the administration at the field end but also from the experience of the HEO when he returned to ODM.

19. If ex-post evaluations such as this afford a useful historical perspective, of greater value are on-going evaluations and reappraisals. For these as well as for improved project management adequate reporting is necessary. Examination of the materials available to ODM leads us to recommend certain improvements (Appendix 2). Except for the files of Annual Reports (which were introduced and designed to meet the needs of the Bolivian Government as well as the ODM) an officer requiring a full perspective and information past policy decisions must turn to voluminous general files of correspondence, briefs and reports. Nor are there any sources of information at ODM available to new Heads of Mission or team members, other than the Annual Reports. Rapid but comprehensive briefing is thus impossible.

## VIII

### B. THE MISSION'S RELATIONS WITH BOLIVIAN INSTITUTIONS

1. During its ten-year life the Mission faced the difficult task of working with eight governments and more than twice that number of Ministers. The Head of Mission, who was also General Adviser on Tropical Agriculture to the Bolivian Government, worked extremely closely with Gumucio at the Ministry of Economy to which the Mission was initially attached. In 1965 following a change of government the Mission was transferred to the Ministry of Agriculture; after initial uncertainties the second Head of Mission was able to collaborate well with the Director-General. The third Head, whose period of tenure coincided with a rapid succession of ministers, was not once consulted.

2. For reasons given the Ministry of Agriculture was unable to provide the research and extension facilities necessary to take full advantage of the Mission's advice. In Santa Cruz the Regional Director of Extension, Ing N Suarez, gave the Mission warm and continuing support to the limit of the facilities available. Cooperation with the Saavedra Experimental Station suffered from changes in senior staff; continued research became impossible and the Mission in the later years set up its own small research station. Cochrane, with his own able Bolivian staff, worked increasingly independently of the Ministry's Soils Department. These actions provoked bitter resentment among some senior Ministry staff but were accepted as a regrettable necessity by others. It was the Minister himself however who decorated Cochrane and wrote the preface to his magnum opus; clearly there was no resentment there.

3. Counterpart training was in fact undertaken if not on the scale envisaged. Few of those trained locally and none of those trained overseas remain in the Ministry posts for which they were prepared. Salaries have been too low to retain some, but in other cases, owing to the scarcity of highly qualified staff, the very acquisition of a higher degree has accelerated promotion to posts for which the specialised training has been of limited practical value. As long as both these circumstances obtain, counterpart training will usually fail to serve its intended purpose. The only simple answer would be for ODM to pay or subsidise the salaries of key counterparts. The experience of the Soil Laboratory, whose British-paid Bolivian staff performed apparently efficiently in 1972-76 with little or no British supervision, demonstrates the feasibility of such action in some circumstances. The further education of those trained under British auspices has however not been wasted: most remain in the agricultural professions in Bolivia or elsewhere in Latin America. Nevertheless, if ODM's aim had been simply to increase the general level of qualified manpower, different courses might have been offered and perhaps different methods of selection would have been employed.

4. Some of BTAM's more important work would have been impossible without the financial assistance of public bodies that were better-heeled than the Ministry. Agricultural Bank funds were vital to the development of both the coffee and cocoa processing cooperatives. CNECA entirely financed Cochrane's later work; cooperation was cordial and fruitful at the research level. BTAM also cooperated closely with the Development Corporation and Colonization Institute; relations with some of their officials were particularly warm.

5. We consider it would be wrong to conclude that BTAM would necessarily have fared better had it been attached to a public body equipped with better financial resources. A continued commitment to common goals as well as adequate

finances is required. The Agricultural Bank failed to provide either regular credit to the coffee cooperatives or a manager for the Cocoa Section of the Alto Beni Cooperative. CNECA has been unable to implement certain recommendations of the Tate and Lyle/Booker Brothers Missions. Research activities harm no-one but when more practical advice and developments threaten vested interests, public bodies are not always wholly immune to their influence.

6. It must be concluded that as a result of the institutional defects, particularly of the Ministry of Agriculture, the BTAM projects most likely to have already had an impact on agriculture are those which: provided farmers, individually or collectively, with direct advice that related to immediate needs and was capable of being implemented; provided similar information to effective non-governmental extensionists; established facilities for the use of farmers (eg the soil laboratory, processing plants); provided information of priority value to governmental agencies that were capable of using it (eg soils suitable for colonization). In contrast much information was collected, often at the request of the Ministry, that was unrelated to any existing or intended feasible plan of action. Some of it has apparently been lost; the rest remains to be utilized, for example the knowledge how to prepare cocoa and coffee of exportable quality, how to improve pastures and cattle management, and how to control biologically some of the major crop pests. The impact of this knowledge could in time be greater than that of the first type, but only if means are established to use it.

## VIII

### C. RELATIONS WITH FOREIGN AND INTERNATIONAL MISSIONS

1. USAID, IDB and FAO maintained programmes many times larger than BTAM's. It proved impossible to establish any formal effective coordinating mechanism. At first there were cases of antagonism and suspicion from some USAID staff; satisfactory informal links were however established between the different Missions to promote cooperation and prevent overlap. Whatever formal structure might theoretically have been preferable, informal links were the only feasible ones and were useful.

2. As has been related in previous chapters the Mission collaborated with USAID in the coffee project (VII B.4.), the establishment of a technical centre for the Ministry of Agriculture in Santa Cruz (VI 27.), and a beef marketing study (VI G.8.) with the World Bank and Inter-American Development Bank in ranch improvement and studies of the cattle industry (VII G.5-6), with FAO in a study of natural pastures (VII G.4.) and with the Peace Corps in the Yungas and Alto Beni (VII A.9, VII B.6.).

## IX - ACHIEVEMENTS AND LIMITATIONS OF THE MISSION'S PROJECTS

### A. GENERAL

After meeting the wishes of ODM and GOB on policy, it remained for the Head of Mission to introduce his own modifications and for individual members to express their preferences. Once programmes were agreed individuals were left to get on with the job, consulting the Head of Mission when they ran into problems and wanted advice or money for local supplies or services. Some of the researchers stuck to their experiments and did not get out on to the farms, either from personal preference or because, rightly or wrongly, they thought it premature to start extension. Horrell, for example, in contrast, saw the need to get tested pasture plants into the fields and to organise seed multiplication.

2. Some shifted their approaches radically and showed a good understanding of human factors impeding improvements to farm income. Cochrane realised that the results of soil-crop studies had little chance of wide adoption purely on their technical merits and began to work in the socio-political milieu in which major decisions are taken, advocating the grower-owned sugar mill now under construction. Kelly saw the need for export-quality coffee processing as a means of freeing the producer from the threat of a glutted home market and for cooperative processing and marketing as the means to secure for the farmer the highest share of market prices. Dixon recognised similar needs in the cocoa-growing colonies.

3. Right from the Appraisal stage the work of the Mission was conceived very largely in terms of single-product projects. Only the work of the colony development officers was conceived more comprehensively as the promotion of farming systems, but that was shortlived. Yet with the exception of the cattle ranchers of the Beni most farmers actually employ or appear to wish to employ crop-combinations or crop/livestock-combinations which are desirable agronomically, economically and socially. Equally the readiness of farmers to shift from one enterprise to another over time in response to price stimuli is widely observable both in Santa Cruz and the Yungas. The Mission's approach was therefore not completely in harmony with the objectives of the farmers. Thus those who counselled the advantages of long-term care of plants did not fully recognise the outlook of farmers who will shift from sugar-cane to cotton, soya-beans or cattle or will neglect coffee in favour of changes in cocoa. In contrast the efforts of the soil surveyor to determine the appropriateness of each soil for different crops was in Dr Crossley's view more in keeping with the farmers' objectives and his work has been widely appreciated. This approach of the Mission it is suggested by Dr Crossley was a deterrent to multidisciplinary team effort of the kind which might have coordinated different skills in the identification of agronomically and economically desirable crop - or crop/livestock combinations. Elsewhere however we have suggested (XII 8.), that the entomologist, who did address his efforts to pests of a variety of crops, would have aided the multidisciplinary concept better by concentrating on pests of sugar-cane, and Mr Johnson feels that multidisciplinary effort can be applied with equal effect to single-crop as to multi-crop problems.

## IX

### B. RESEARCH

1. The research activities were mainly of the type variously described as 'adaptive', 'husbandry' research or 'field experimentation'. They led to extension bulletins rather than learned papers. Some projects concerned the introduction and testing of new species and varieties (eg pyrethrum, grasses and legumes); some sought to discover improved methods of cultivating and managing existing species (eg NPK response trials, cane treatment). Somewhat 'purer' were the soil surveys and biological control investigations, but these too were selected for their potential utility. The soil surveys have served as a practical guide to the selection of colonization areas and of appropriate crops; biological control, if successful, would have reduced pest damage without the use of chemicals which are costly to employ and slow to be diffused especially in peasant farming areas. There were also brief studies seeking to cost small dairy-farm enterprises and ranch improvements. The establishment of suitable cacao fermentation procedures lay in the field of appropriate technology.
2. The major research achievement of the Mission was in the field of soils and resulted from long, sustained effort, from guidance into new but logically consecutive aspects and from the ability of CIMCA (whose foundation was encouraged by BTAM) to take up and expand on the work done.
3. Some research projects suffered seriously from discontinuity of effort. The failure to replace the first pasture expert for 18 months was a major setback. The termination of the Mission also brought to an end a number of recently started projects such as the fertilizer response trials which had progressed as far as discovering little statistically significant response but had yet to find the explanation. Not all the Mission's research activities were adequately written up and, if written up, adequate steps were not taken to ensure the survival of the reports. Recommendations for improvements are made in Appendix 2.
4. Except for the few technological and economic studies the Mission's research thrust lay in the natural sciences. In several cases the natural environment was found not to be a factor seriously limiting successful introductions or yield improvements. Given the perennial controversy over the potential of tropical lands these findings were important though of course they applied only to the districts and experimental conditions in which the research was conducted. It would for example be premature to conclude that weeds rather than declining soil fertility always accounted for falling yields.
5. Disappointment was expressed by both researchers and extensionists in the team at the limited farmer response to different recommendations for improved practices. The fault, it was generally concluded, lay with "management". This was as far as researchers in the natural sciences could reasonably be expected to go into the social sciences, though in cases the high cost of fertilizers was identified as an economic deterrent. It highlighted the need for complementary research into the social, economic, locational, political and behavioural factors influencing farm management. Also highlighted, by Kelly, was the key economic problem of the Santa Cruz small farmer: defining and developing stable product markets - many crops can be grown but few offer the prospect of regular sales at sustained prices. Until answers are found to such social science questions the adoption of the Mission's findings will be limited. The prescription of medicine is useless if the patient leaves it on the shelf.

6. We do not wish to convey however that the Mission's objectives could have been achieved better simply by 'plugging-in' social scientists to complement the natural scientists. Rather we suggest that a three-stage strategy is needed for research:

- i. What improvements are desirable and feasible, from a technical/natural science point of view?
- ii. What improvements are desirable and feasible from a social science point of view?
- iii. What procedures and actions are needed to induce the adoption of those improvements which satisfy both tests?

We must then ask what contribution British aid (capital as well as technical assistance) can make to each stage. At each stage 'field trials' as well as 'laboratory experiments' will be called for. Stage three involves much more than extension and we admit poses the most intractable problems.

7. The continued emphasis of the Mission's research on natural science is not (to Dr Crossley) wholly explicable. It is true that the appraisal team was heavily slanted towards the natural sciences though it was led by an agricultural administrator of wide experience. It is also true that Britain could at that time call on people with much experience of the practical application of natural science to agricultural development in the tropics and it would appear that it was that experience which the Bolivians wished to tap. Conversely there was little expertise available in Britain that could have been called in for practical technical assistance in the social sciences. It is possible but less certain that ODM was aware of the social science research which USAID began to commission in the mid-1960s, and was happy to leave it to them. Although most of that research has been conducted in the Highlands and is therefore not applicable in the main to the tropics, there is no mention in BTAM reports, for example, of the major study, directed by Clark in 1969-70 for the Agricultural Bank, into ranching in the Lowlands. It is also possible that ODM was aware of USAID's practical involvement in extension, marketing and credit schemes in the Santa Cruz area, and was therefore happy to leave those fields to the USA. Whilst fully accepting the desirability of avoiding overlap between foreign aid missions as well as the appropriateness of specialists ploughing their particular furrows, we nevertheless suggest that natural and social science research should be closely coordinated.

8. In future, with much more understanding now available in British Universities of the social science problems of Latin America, there should be less difficulty in staffing more balanced research teams. We would add that just as graduate volunteers carried out useful natural science research, under the guidance of BTAM members, so could future Missions employ them on social science investigations.

9. Mr Johnson wishes to add that there were a number of other gaps in the research effort. There was a need for research in plant pathology, especially in the cocoa project. The land resource studies were confined to soils and did not extend to the study of such important aspects of land capability as the hydrology of rivers which give rise to severe and extensive flooding in the Lowlands which may be affected by agricultural development in their catchments, nor to resources of surface and underground water for agricultural development. Nor was any attention given to the improvement of farm tools and implements for small farmers. The list could be multiplied. There was also a serious lack of information on

economic and social factors which affect the adoption of new technology and improved farm management. Only a very few of these needs could be tackled by the Missions and the question of what research should be attempted, or whether there should be any research at all, can only be assessed in the context of the particular contribution the project is intended to supply, the resources that can be made available and the chances of achieving success with those resources. These considerations, regrettably, limit the quantity and kind of research that can be attempted.

IX

C. EXTENSION

1. The Mission's extension work was of five kinds:

a. Diffusion to farmers of information and experience gained outside Bolivia, by crop and livestock development officers and the veterinarian. These officers worked in the colonies and the longer-settled Yungas and the Lowland ranching areas.

b. Diffusion to farmers of the Mission's research by the researchers. Only the two pasture experts devoted any time to this, though the soil scientist disseminated his results to a range of audiences with considerable effect.

c. Extension by a development officer of the research findings of others. Hobbs cooperated with Horrell and Edwards in the fields of pasture and animal management respectively.

d. More passive types of extension, including the organization of open days at experimental stations and the preparation of bulletins. The latter were suitable chiefly for extensionists and the more educated farmers.

e. Promotion of cooperative action (see Para VIII.B.4.).

2. No records were kept of any of these activities. We were therefore unable to make spotchecks of farmers known to have been contacted by the Mission. Nor was the Chamber of Agriculture in Santa Cruz able to orient us. Within the colonies a high turnover rate of holdings in the early years is well documented. We cannot say whether the Mission's work was therefore largely lost or conversely contributed to stabilisation.

3. At the Santa Cruz abattoir a 30 kg increase in beef carcass weight since 1962 was reported. Many factors must have contributed to this improvement including the work of five Mission staff. Given an estimated slaughter in 1972 of 37,800 cattle weighing 6,600 tons and a value of \$800/ton, the increased yield must have been worth about \$900,000 or £375,000 (@ £1 = \$2.4). If the Mission's 15 man/years devoted to pasture and livestock work in Santa Cruz are costed at £150,000 and if we assume that 5% of the improvement can be attributed to that work, then the annual return on investment would be 12½%. In addition a smaller proportion of the much larger increase in beef production in the Beni may be attributed to the Mission, which devoted about two man/years to that district.

4. Whereas the foregoing is entirely speculative, we are certain, from reports, information and the personal experience of one of us (Dr Crossley) in 1975, that missionary agronomists made extensive and effective use of the Mission's bulletins and open-days, and distributed planting material obtained from Saavedra in the colonies. Farmers themselves appear to have made little direct use of the bulletins. Improved pastures we observed had been adopted on a limited scale by some larger farmers.

5. The Mission's extension work on the whole was not part of a coordinated programme of research and extension. Indeed the two activities for the most part were divorced in time or space. Thus of 28 man/years devoted to extension 15 were spent in the Alto Beni and Yungas and 10 in Santa Cruz. Of 28 man/years devoted

to research 18 were spent in Santa Cruz, 10 in Cochabamba and none in the Alto Beni and Yungas. Within Santa Cruz in the period 1963-67, 6 man/years were spent on research and 7 on extension, whereas in 1968-72, when material for diffusion was more likely, 12 man/years were devoted to research and 3 to extension. These figures are not strictly accurate since they refer to people primarily recruited for research or extension rather than to actual activities; they do however emphasise the extent to which individuals had to rely on their own resources. Some of the researchers were as active in extension as in experimentation but others lacked the inclination, personal qualities and training for extension work.

6. The reasons for this separation of effort are several: the Appraisal Report envisaged that development officers would be attached to experiment stations to work in conjunction with researchers. The station planned for the Alto Beni did not materialise, it proved impossible to recruit a cocoa specialist in the early years and subsequently the idea was dropped when the Mission was cut back to 40% of its proposed size. Conversely the Bolivian Extension Service for reasons given above was incapable of filling the gaps left where the British thrust was directed to research. It was thus only with reluctance that the Mission acceded to the Ministry's request in 1967 for a shift away from extension. A further factor we believe was that in British colonial experience it was common (and therefore acceptable) for agronomists to have to turn their hands to educating the farmer; in this case it is not clear that Recruitment always paid sufficient attention to the need for staff with qualifications and qualities for both tasks.

7. It is clear that the effectiveness of British advice on pasture improvement was reduced by the limited availability of seeds and planting material. Small scale production was instituted at Saavedra but attempts to persuade farmers to undertake multiplication as a commercial venture failed. As ODM was able to provide grants to support the soil laboratory, the Clara Cuta experimental station and crop processing plants it seems surprising to one of us (Dr Crossley) that a loan was not made to facilitate the supply of pasture seed and thus to enhance the potential effectiveness of the livestock programme.

8. More generally it is suspected by one of us (Dr Crossley) that the Mission did not wholeheartedly accept the idea that extension had a central role to play in technical assistance to the farmer, as the vital link between the practice and the pursuit of knowledge. The extensionist, it is suggested, should exist to convey the problems of the farmer and to convert those problems into questions; he should exist to convey the results of investigations and to convert those results into feasible practices. Exceptions exist, in the cases of biological control and of soil surveys for colonization planning. The extension arm of the Mission was only occasionally able to function in this way. It is also suggested (by Dr Crossley) that the experience of the crop and livestock development officers gave the lie to the belief that 'research should have priority over extension since extension without research is harmful'. Drawing on previous knowledge, both kinds of officer performed usefully for several years; their achievements were only ultimately restricted by their need for additional knowledge both agronomic and socio-economic. These officers were however applying research and experience imported from other tropical and neighbouring Latin American countries which could be used in Bolivia without further adaptation.

9. Mr Johnson does not think that this Mission was unmindful of the important role of extension. For the first half of its life it was oriented primarily to extension with Ricketts (later Penn), Collins, Dixon, Kelly, Hobbs, Calderbank

and Badcock all working mainly in this field, Horrell partly so and only Squire and Cochrane exclusively on research. The balance changed with the departure of Collins, the replacement of Calderbank and Badcock by research men (Vickers and Edwards), the diversion of Penn from coffee extension to pasture experiments, Rossiter apparently less effective in extension than Horrell had been and finally the departure of Hobbs and Dixon. The primary cause of this change of emphasis was the desire of the Bolivian Ministry of Agriculture to utilize the Mission in this way. A contributory cause may have been a feeling that extension was not getting anywhere and research offered an escape. Cochrane though, moved in the opposite direction from research to application. What the Mission did fail to do was to generate interest in its work by the Bolivian extension service. The USA, who have put much greater resources into this field, have had some limited success.

10. For future Missions of similar type we recommend that:

i. where a technical assistance team undertakes research which is intended to lead to action by farmers there should be adequate arrangements for its extension into farm practice.

ii. Full advantage should be taken of missionaries and other non-governmental workers willing to cooperate as well as of effective extensionists in government service.

iii. If necessary the team should have complementary research and extension sides. Volunteers might usefully supplement both.

iv. Research officers employed in investigations of this kind must have an interest in and some capability for extension, for they must be able to appreciate and respond to the problems of the farmer and extensionists, and be able to give practical advice.

v. Research officers should collaborate with available extensionists in the preparation, publication and diffusion of technical bulletins, leaflets and audio-visual material. If necessary the Mission should finance these activities.

vi. Publications recommending the adoption of new inputs should include annually updated inserts listing public and private purveyors of those inputs.

vii. Publications should always list other publications in the series and should quote the Mission's address, box number, telephone number and office hours.

viii. The Mission should take steps to persuade third parties to supply necessary inputs to farmers. If necessary the Mission should be able to call on financing sufficient to allow the team to work effectively.

ix. Records must be kept of all extension activities of the Mission, to improve coordination and to facilitate evaluation.

x. A system of on-going evaluation must be devised and implemented to monitor not only the effectiveness of the diffusion activities, but also the responsiveness of the Mission to practical farm problems.

## IX

### D. COOPERATIVE MARKETING

1. Three schemes were attempted: with coffee in the Yungas, cocoa in the Alto Beni and rice in Santa Cruz. The last was futile since cooperatives at the time had political not economic aims. The other two were soundly based, economically, on developing under cooperative ownership processing industries that were beyond the means of farmers individually to finance and that offered the opportunity of high returns from a high-grade exportable commodity. The state or private enterprise could have developed both industries, but the producer, it was assumed, would not have benefited as much. The cocoa fermentary still operates, under state control; the coffee hulling factory is managed by a small group, nominally a cooperative, with state finance; the pulperies have collapsed for want of management and trust, except for the oldest still run by missionaries for the farmers. True cooperation is non-existent.

2. We suggest there are five necessary conditions which together would have made for success: members' commitment to the cooperative, competent and honest management, a reliable regular and adequate source of credit, transport costs that are not prohibitive, and political acceptability. Commitment will not be accorded unless benefits are perceived and management is trusted. With both cocoa and coffee benefits are not obvious since the price of wet beans or cherry sold to the factory is not comparable with the price of dry beans or parchment sold to merchants; an understanding of the processing economics takes time to develop, as does confidence in the value of communal action. It is probable that neither of these processes had progressed far enough within the short time taken to develop the processing and marketing activities. Neither were adequate management and credit forthcoming except from the church at Carmen Pampa. Transport costs were not prohibitive but we gather that cooperatives' attempts to lower them by using their own trucks for getting produce out are now precluded since the Hauliers' Federation bans the carrying of return loads in non-members' trucks. Politically, the coffee cooperative's mistake was to achieve such a commercial success that it usurped the function of influential merchants. The Alto Beni cooperative for external reasons became unacceptable for a time.

3. In the circumstances we are unable to identify alternative courses which would have ensured lasting success. Merchant antagonism might have been avoided by the coffee cooperative refraining from reprocessing and selling non-members' parchment. More attention to developing grassroots interest and understanding might have resulted in surer if slower progress. Perhaps too much emphasis was placed on the pursuit of economic viability to the exclusion of training and adaptation to social needs, leading to the creation of a top-down structure which could not survive when the expatriate staff withdrew. A more soundly based organization might have weathered the political storms of 1970-71 by hibernating, but it is far from certain. Yet there is no doubt that the Mission was served by competent staff who appreciated the needs and problems; it is possible that they were being pressed from above to go too far too fast.

## X - THE MISSION'S BENEFICIARIES

1. The Mission was designed initially to benefit small settlers and Beni ranchers and ended, as related in para VI 32, seeking mainly to benefit large cattle and sugar-cane farmers. As far as we can judge the actual impact of the Mission did not exhibit the same trend. Several reasons are responsible for each of these tendencies.
2. Regional differences in the agrarian structure determined the availability of farms of different size. Farms in the Yungas, Alto Beni and Cochabamba Basin are almost entirely small, therefore benefits from the Mission's coffee and cocoa projects and fruit-pest control in these three areas, respectively, could accrue only to the small farmer. In contrast in the Santa Cruz area there is a core of medium and large farms along the paved Santa Cruz-Saavedra road, and a far larger but remoter periphery of small settlers. The rest of the Lowlands are mainly ranchland or unoccupied. The ranchers too exhibit great differences in size: half of them are relatively small, averaging under 300 ha; over half the land however is held by private companies whose properties average over 7,000 ha. According to Clark's authoritative study for the Agricultural Bank, this proportion was on the increase in the late 1960s/early 1970s since large enterprises, stimulated by favourable beef prospects, were extending their possessions by widespread illegal land-grabbing from small ranchers and Indian tribes. The Mission's work in the Lowlands could thus benefit all types of farmer.
3. Changes in Bolivian Government policy gradually altered the thrust of the Mission's work. Social objectives dominated at first and the Mission concentrated on aid to resettled highlanders on small farms. Later governments were more preoccupied with the need to improve the balance of payments by stimulating import substitution agriculture (rice, sugar) and by expanding exports (beef, cocoa, coffee). Thus the Mission's emphasis shifted towards livestock and sugar, both produced mainly on medium and large farms. With the Colonization Institute adopting a policy of minimum aid the Mission's concern for colonies per se ended in 1967, but it returned to the Alto Beni to promote cocoa, experimented with pyrethrum on small Cochabamba farms and remained active in the Yungas, though these activities had all ended by 1971.
4. The Mission's own policy also shifted in favour of concentration in the Santa Cruz area. Ballantyne like many observers was impressed by the dynamic growth of cotton and sugar-cane and expected the predominantly large producers, who enjoyed access to credit and good roads, to be receptive to the efforts of the Mission. At the time it was also generally accepted that colonies were costly to establish and not very successful. These views may be seriously questioned. Large numbers of spontaneous settlers have also benefited from the infrastructure established at high cost per settler in the organised colonies. Colonists now produce over four-fifths of Bolivia's cocoa, rice and bananas and three-tenths of the maize, manioc and sugar-cane.
5. In the later years there is, with the exception of Kelly's unsuccessful involvement with rice cooperatives, virtually no evidence in the files or reports of any interest in the Santa Cruz colonists. It is possible that the apparently sound reasons for concentrating on the large Santa Cruz farms provide a sufficient explanation. We would suggest that unconscious factors may have also reinforced this tendency. Because of the poor roads to the colonies visits from Santa Cruz, where most experts lived, require at least two days and living conditions are rough; establishing a rapport with settlers is harder than with hospitable

larger farmers. Most of the team were not deterred by arduous conditions, but the easier option could well have been subconsciously preferred by some.

6. One danger of concentrating on nearer and larger farms was that visiting advisors with different interests could be misinformed. Thus the fruit marketing adviser in 1971 was given to understand that the farms beside the Santa Cruz-Saavedra road along which he travelled were representative of the area. Since most rural people in the area live in the colonies this was incorrect. More pertinently he remained unaware that 40 km further on commercial banana growing was an important colonist activity, occupying 2,000 ha.

7. It is worth noting that in Africa, where several of the Mission had previously worked, more was done to provide rest-houses and camping facilities, and this is an aspect worth considering in any project involving work among small farmers in remote areas.

8. As far as we have been able to judge, the impact of the Mission on large farmers has been less than expected and greater on small farmers than foreseen. In the Beni large ranches are absentee-owned, small and medium ones owner-operated. The Mission's work may therefore have been concentrated on the latter. In the Santa Cruz area much expansion has occurred on large farms owned by absentee city-dwellers who depend on contract-harvesting, employ but small permanent labour forces and are unwilling to devote their full attention to careful management. The typical long-established resident farmers are well known for their charm and easy-going ways. Traditional practices applied to a large property assure them of a reasonably comfortable living.

9. Exceptional are community leaders: large farmers of standing with a measure of social responsibility, who not only innovate but also help their smaller neighbours. We know from two missionaries that such people exist in the Santa Cruz core area where large and small farms are found together. In other parts of the world large farmers often stimulate improvements in the economic infrastructure from which peasants also benefit.

10. A considerable number of missionary agriculturalists have taken full advantage of the Mission's services; their work is exclusively with colonists, in Santa Cruz, the Chapare and the Alto Beni. From the experience of one of us (Dr Crossley) who lived with them for several months in 1975, as well as from their detailed progress reports, it is known that the effectiveness of their work is considerable. The same missionary groups are also officially associated with the USAID-Colonization Institute San Julian settlement scheme, begun in 1975, on land originally selected by the Mission's soil surveyor.

11. The new sugar mill at Mineros will be of mixed value to the colonists. It lies 20 km nearer to the colony zone than the hitherto nearest mill at Guabirá, and at the actual junction of the large-farm core and the small-farm periphery. Provided they can get quotas - and several cooperatives are doing so - hundreds of settlers will benefit from lower transport costs; the economic margin of production will also be pushed 20 km northwards into the colonies, beyond Chane at the end of the paved road, incorporating many new producers. But the new mill is not located where the Tate and Lyle/BATS Mission recommended, on the advice of Cochrane, namely in the heart of the more distant colonies on the best soils in Santa Cruz. It is 30 km nearer to Guabirá. As a result a group of large farmers near Mineros will benefit most as will settlers in the nearer colonies. But many rice-growers in the remoter colonies will lie beyond the margin of the Mineros mill and have no chance of converting to more profitable sugar-cane and all the new growers of cane beyond the end of the paved road will be permanently burdened with higher transport costs than might have been.

12. In sum we conclude, from the limited evidence obtainable, that small farmers have on balance probably benefited as much as large from the work of the Mission. We are however unable to say whether farmers or intermediaries (both public and private) have benefited most.

13. It is perhaps pertinent at this point to mention the Mission's part in providing opportunities for British exports. The UNAGRO sugar mill being equipped with British machinery and built under British technical direction is worth over ten times the cost of the whole Mission, and while Tate and Lyle's reputation and enterprise were the prime factors in getting this contract for Britain there is no doubt that the Mission's long association with the Bolivian sugar industry was of material help. The coffee machinery in the Yungas is in a different category, being a gift from the ODM, but may be of assistance to British exporters in penetrating this market should there be further development of coffee processing in Bolivia. Agro-industry generally has prospects for growth in Bolivia - farm machinery, sugar extraction, oil milling, coffee, tea and cocoa processing, meat and dairy industry, seed harvesting and cleaning - and these are all sectors in which technical cooperation could aid British exports.

## XI - STAFFING OF THE MISSION

1. Many staff appear to have been inadequately or incorrectly briefed on the conditions in which they were to live, on the country and its people, and on the nature of their employment. As a result many experienced more culture shock and frustration than necessary. It is doubtful if they were apprised of the different morality and customs of Bolivia or of the educational system which even at university level usually emphasises rote memory rather than independent thought.
2. There seems little doubt that staff were well chosen and competent in their respective spheres, whether recruited for research or extension posts. However the unexpected need for researchers to engage directly in extension found several wanting: some of those with long research experience were not always willing to accept duties for which they had not been recruited and to which they were unaccustomed; those who were willing did not always have the personality for readily establishing the necessary rapport with local people. All senior staff who reported to ODM thought that more important than officially recognised was the quality of youthful flexibility - in approach to work and more generally to local conditions. It is particularly worth noting that much of the Mission's most tangibly successful work, in soils and cocoa, was carried out by two officers, Cochrane and Dixon, who had no previous field experience; occasional visits by highly experienced advisers provided necessary guidance additional to that of the Heads of Mission. In practice flexibility was not however wholly confined to the most youthful.
3. We have noted elsewhere that in certain circumstances a team should be adequately staffed with extensionists to work with researchers, and also that an understanding of the extension side is necessary for staff engaged in many kinds of research. We therefore suggest that consideration be given to the possibility of such research staff, where they have no extension experience, being given a short practical course before they go out or during their first mid-tour leave.
4. According to reports some staff never acquired an adequate level of proficiency in Spanish. Only one, an Anglo-Argentine, had an initial fluency. Most took 18 months to acquire a reasonable understanding. Those who returned for a second tour became fluent. Since Bolivians set great store on foreigners being able to speak their language, these deficiencies must have affected staff efficiency, some more than others. Linguistic proficiency is a necessary part of an officer's total competence, though different proficiencies are required for different tasks: high standards - yet of different kinds - are required in officers spending much of their time communicating with farmers or engaged in at times delicate negotiations: in the case of researchers who must communicate chiefly with people with whom they work closely, personal qualities may to a degree compensate for a lesser linguistic proficiency in building up the necessary level of mutual understanding.
5. We believe that a short concentrated course would be desirable for all whose knowledge of the language is limited, before leaving the UK. It is possible that such a course would reveal whether a person is unlikely to pick up enough to be effective, in which case his appointment could be reconsidered. We are unsure of this possibility however and recommend that the question be pursued with those best qualified to advise. Further training will be necessary, probably a minimum of three months' intensive study, before the officer starts work. We believe that where possible this should be done in the country concerned, so that the training

takes place in the context of the local culture and the particular variety of Spanish spoken there. Bolivia certainly possesses suitable language schools, such as the Catholic Centre in Cochabamba.

6. We believe it possible that ODM, and especially Recruitment, was not sufficiently apprised of the range of living conditions which it was necessary for different officers to accept. The norm is moderately comfortable rented accommodation in a town of some size. This is the only option suitable for married officers with children requiring local education and probably also for those with younger children for whom access to medical services is required. La Paz, Cochabamba and Santa Cruz were the only such cities appropriate to the area of work of the Mission, though only the last lies in the tropics proper. We note that Bolivian research staff at outlying stations commute from these centres, which we believe were also perfectly satisfactory in all respects for Mission staff whose tasks were primarily research or administration. The location of these towns was less satisfactory for extensionists (except in so far as work in the vicinity of Santa Cruz was concerned). Daily commuting was possible from Cochabamba and Santa Cruz (not La Paz) but only at the expense of many hours of tiring and time-wasting driving; the alternative was to go on extended tours, which meant living rough.

7. Better located but smaller towns were therefore preferred as extension bases, including Trinidad, Caranavi, Coroico and Montero. Accommodation there was more spartan and facilities were inadequate for those with children of the kinds named (Montero with its good Methodist hospitals and school would now rank in the first category in these respects). It was possible adequately to serve the coffee cooperatives from Coroico (Dixon) and the nearer Santa Cruz colonies from Montero (Collins). Long drives and extended tours living rough were still necessary to serve the Alto Beni from Caranavi (Dixon) and the Beni ranches from Trinidad (Calderbank) and Santa Ana (Hobbs). No alternative is possible where the population is widely dispersed as in the ranching areas. It would have been preferable if the closely settled colonies had been served by officers provided with comfortable local quarters, inevitably at some cost to ODM, not only for the sake of reducing the arduous and time wasted in travel but also for the psychological advantage to the extensionist of living among his clients. Such was the case in the Alto Beni and would have been true of the remoter colonies of Santa Cruz, had they been served. Even then such posts are suitable only for people willing to live up-country - mainly bachelors - and there remains the problems of isolation and lack of amenities granted to such posts. We think it essential that officers living in such conditions should spend a few days in town at not too infrequent intervals for shopping, business, recreation and contact with their colleagues in the Mission and with Bolivian institutions connected with their work, and should be encouraged to do so and perhaps allowed extra local leave to be taken on these occasions in compensation for weekends spent in the bush.

8. We believe that rather than leave all these arrangements to be sorted out when an officer arrives in the country it would be better if the Personnel Department at ODM was able to give precise information about the living conditions appropriate to and necessary for the efficient execution of each post and took these different circumstances into account in making appointments. This would help reduce the danger of the job having to be tailored to meet an officer's particular circumstances and preferences. Flexibility still remains desirable since future needs cannot always be foreseen. It is widely recognised that the normal insistence of local extension officers on living in cities is a prime obstacle to improving agriculture in remote areas. It was one of the reasons why the Mission found difficulty in achieving an adequate outreach and why those British officers willing to rough it we found to have been much appreciated.

9. Finally the peculiar problems of living at 12,000 feet in La Paz, the world's highest capital, deserve mention. Mental strain and tension is commonly experienced and other physiological difficulties are well-documented. No Head of Mission sought a second tour.

## XII - MULTIDISCIPLINARY ACTIVITIES

1. One of our tasks is to evaluate the effectiveness of the multidisciplinary team concept as a means of giving technical assistance and draw lessons from the Mission's experience vis-a-vis the ODM's current objectives in rural development. We understand by this concept the coordinated application of several distinct skills to the solution of a single problem or set of closely interrelated problems. We would exclude the concurrence of several skills separately applied to mutually unrelated problems. We take effectiveness to mean that the assistance has materially improved farm production and income.

2. Multidisciplinary technical cooperation can be applied to problems of varying scale and amplitude. The Mission was intended to cooperate in the improvement of tropical agriculture in Bolivia, a problem of very wide scope both in the area to be covered and in the number and diversity of activities. Within this are many component problems each susceptible to a multidisciplinary approach, such as for example the control of cocoa disease in the Alto Beni requiring research in plant pathology, varietal resistance, agronomy, production of resistant planting material, extension etc on one aspect of the production of one crop in a particular locality. Of wider scope are such questions as the development of farming systems for the various conditions found in the tropical area, the improvement of yields of one or several crops, improvement of livestock production, raising farm incomes and so on.

3. The essence of the multidisciplinary concept is that the various skills are coordinated. Coordination requires an effective administrative structure. Large-scale effort would normally be coordinated at the national level within or between Ministries and other Government Agencies. In the experience of Aid Missions to Bolivia with a purely advisory role it would appear virtually impossible for them successfully to bring about coordination at the national level. At the other extreme efforts to solve purely local technical problems can probably be coordinated within the administrative structure of the local experiment station, especially if the Mission can reinforce its advice with some material aid. Practical results however will be obtained only if the experiment station has effective contacts with the farmers. In between these two extremes coordination may be possible by such bodies as provincial divisions of central government departments (provided that the necessary authority is delegated to them), provincial governments, farmers' organizations or cooperatives. The simpler the structure the easier it should be to encourage coordinated effort, but the more likely it will be that its authority and scope are circumscribed. Experiment stations for instance cannot coordinate extension or credit services, and a team cooperating with an experiment station will probably have to do this job itself.

4. Often improvements to farm production and income can be achieved only by tackling problems which extend from production through marketing to processing and perhaps the export or local sale of the final product. In such cases agencies with vertically-grouped responsibilities like the Agricultural Bank, the Development Corporation, the Sugar Committee or the Santa Cruz Public Works Committee may be potentially more effective as coordinators than those with horizontally-grouped responsibilities like the Ministry of Agriculture or of Commerce and Industry. If however the need is for grass-roots action coordinating agronomic, economic and social approaches a Ministry of Rural Affairs and Agriculture is better structured to tackle it than for instance the Agricultural Bank whose objectives are purely economic. Thus the Mission's coffee project

which, in the absence of any interest by the Ministries of Agriculture and of Rural Affairs (then separate) worked through the Agricultural Bank, achieved some success with the marketing, processing and export of coffee but failed to generate the grass-roots interest that would have improved its chances of survival.

5. However suitable the administrative structure may be there remain the questions of the ability and will of the different bodies with which the Mission might cooperate to provide the necessary coordination. If these are in doubt or lacking the only recourse for a multidisciplinary team is to address itself to sets of problems to which it can make a significant contribution through its own coordinated efforts, seeking but not relying on the assistance of others. Such a policy would of course depend on the de facto acceptance of the host government, which may or may not be content to leave it all to the Mission, and unless a local organization can be built up within or outside the existing institutions that will be able to take over from the Mission when the project ends, there will be a danger that progress will stop when the Mission leaves. Even so the risk may be worth taking, for if the Mission does its work well something will remain to provide a platform for further advance. The present position as regards coffee in the Yungas and cocoa in the Alto Beni as a result of the BTAM's work indicates the possibilities though in both cases the projects ended prematurely.

6. BTAM was conceived as multidisciplinary. The scale of the problems it was designed to address was national. The level at which coordination was required however quickly proved to be too ambitious: the proposed National Coordinating Committee never got off the ground, the National Tropical Agricultural Service of which the Mission was to be the lynch-pin never materialized and the Ministry of Agriculture to which the Mission then became attached lacked the resources for running effective coordinated programmes. The Mission then found itself a collection of individual experts working hundreds of miles apart from each other, each seeking to develop projects in his own field in collaboration with whatever Bolivian institutions were at hand and willing to cooperate and with such resources as the Mission possessed. The basis on which coordination could be founded was now the Mission itself and redeployment was the only way of achieving it. With the team limited to ten men, recruited in the expectation of being part of a larger team rather than as a viable unit in itself, the skills available did not readily lend themselves to grouping into new multidisciplinary units and of course some individual projects were already under way.

7. The projects that emerged thus fell short of being truly multidisciplinary in that they were cobbled together out of the resources at hand rather than planned from the beginning as multidisciplinary projects. The pasture agronomist, veterinarian (later replaced by an animal breeding specialist), cattle management expert, assisted for a time in pasture ecology and animal husbandry by two graduate volunteers and in some investigations by the cooperative marketing adviser, cooperated informally in attempts to improve beef and dairy production with collaboration from the Bolivian Regional Director of Extension. Smaller, more closely knit and with less widely dispersed activities was the team for coffee improvement led by the Cooperating Marketing Adviser with a Crop Development Officer, a coffee specialist at several stages and Peace Corps volunteers. Coordination at the centre was provided by the Head of the Mission with an office in the Ministry of Agriculture and close contact with the Embassy.

8. The original plan envisaged a team of three for soils investigations but only one soils agronomist was provided and he operated with his Bolivian assistants

as virtually a one-man multidisciplinary team encompassing soil survey, chemical analysis, fertilizer trials and later, as the soils work focussed on the application of soil research to the problems of growing sugar-cane, widened his field in collaboration with CNECA to several aspects of sugar production. A broader base could have been given to this work had the entomologist been provided with laboratory facilities at Santa Cruz or Saavedra rather than Cochabamba and limited his activities to the study of sugar-cane pests. Similarly it had been intended that a cocoa agronomist should work with a crop development officer in the Alto Beni, but only the latter was provided and he too, in the later stages as the cocoa trees began to produce a crop, turned from agronomy to processing and marketing with collaboration from the cooperative marketing adviser and the Peace Corps.

9. The ODM's current objectives in rural development are primarily to improve the conditions of the rural poor. This was not the explicit policy of the ODM during the life of the Mission, but it was a major objective of the Bolivian 10-year plan of social and economic development which the Mission was established to assist and much of the Mission's initial effort was devoted to it. The plan had social as well as economic objectives. Quite possibly the general objectives set for the Mission at the beginning would pass muster in the light of present ODM policy, though there would certainly be more critical examination of social and political factors which impede progress in the poorest sectors of the rural population. This is one lesson that can be drawn from the Mission's experience. A second is that not too much should be expected of the host government's capacity to coordinate effort over any very wide field, and provide supporting sources and facilities. The supply by the donor of "tools of trade" may need to be extended to cover such of these requisites as may not be available locally.

10. A third emerges from consideration of the change of emphasis in the direction of aid away from small farmers towards the larger farms round Santa Cruz. This was not contrary to ODM's policy then or to the Mission's broad objective to develop tropical agriculture, and as has been seen (Chap VIII E. above) there were benefits to small farmers in the Santa Cruz area though the Mission's work there was not in the later phases directed to their particular requirements. There must be flexibility in the composition and programmes of a multidisciplinary Mission since new problems will emerge, work on some will be completed and on others may be found unprofitable to pursue further. Government policies can change both at home and abroad. If the aim to give priority to development of the poorest sector is to be kept on target it will be necessary at the initial appraisal and at subsequent reviews to consider how this sector can best be helped, agree with the host government the content and staffing of programmes designed to this end and ensure that all concerned, not forgetting the Mission itself, are clear about the objectives both social and technical.

11. The Mission's experience suggests that these criteria may be easier to meet in a more compact project with limited and clearly defined objectives which take realistic account of the technical logistic and socio-economic constraints in the host country, and staffed with a range of expertise sufficient to deal with all these constraints but not so wide or diverse as to make the team unmanageable. The experience of the Mission demonstrates the adaptability and resourcefulness of the British technical cooperation officer. This is a tremendous asset in a multidisciplinary team, shown by the ability of (for instance) Horrell, Cochrane, Dixon, Kelly and Penn to undertake a wide range of duties. Not all had this ability, and our evidence suggests that those who did not have it had less impact than those who did.

12. The resources available to the team were augmented from time to time by advisory visits, short-term assignments and consultancies and small capital inputs. Several of these were of particular value, notably the visits of Coulter on soils, Benson on coffee, Murray and Laband on cocoa and the ODM advisers and administrators, as also were the small capital grants for the soils laboratory and coffee machinery. Some of the other visits were wasted because though they were within the wide terms of reference set when the Mission was established they were not related to work the Mission was actually doing, and there was nobody else to act on their recommendations or even in some cases to brief them adequately on the problems they had come to investigate. On the other hand there were as has been indicated several fields directly related to the Mission's work in which there was a shortage of expertise which might have been relieved to a useful extent by advisory visits or temporary attachments. We think that broader appraisal, and selection and definition of objectives and activities that are realistic in terms of the resources that can be made available, would help to identify the real gaps in the Mission's multidisciplinary composition, so that supplementary inputs can be designed to contribute to its effectiveness by filling these gaps.

13. Our study of the Mission's work has revealed several fields in which relatively small coordinated projects might be fruitful and which may serve as examples of the type of multidisciplinary activity we have in mind. One is the further development of cocoa in the Alto Beni on the lines proposed by Dixon at the end of his assignment. Another would be to follow up Burden's proposal for the development of exports of fruit, principally from the Yungas. A third might be to work out farming systems for colonists and other small farmers in the Santa Cruz area, where the Appraisal Mission noted the problem of declining rice yields. Kelly saw the need to increase the number of marketable products and missionary extensionists are experimenting with legumes introduced by Horrell as an aid to the maintenance of soil fertility and diversification of farming. Finally the cattle industry has many problems affecting both large and small farmers. In addition to the technical problems of husbandry and disease the marketing situation has deteriorated for exports from the Beni as a result of competition in the main export markets in Chile and Peru from Argentina and Columbia, and complex social issues have been observed by R W Clark in his study for the Agricultural Bank.

APPENDIX 1

ITINERARY AND LIST OF PERSONS CONTACTED

A. In London

i. ODM

*Mr A R Melville, CB CMG	-	Chief Natural Resources Adviser
*Mr P Tuley, MBE	-	Agricultural Adviser
Mr M Watson	-	"
*Mr G A Bridger	-	Economic Planning Staff
Dr Basil Cracknell	-	"
Mrs J White	-	"
Mr B Clackson	-	"
*Mr A Turner	-	Former Head of Latin American Department
Mr C R O Jones	-	Present " " "
Mr P Scott	-	Latin American Department
Mr T McCall	-	"
Mr D E Glason	-	Organisation Department

ii. FCO

Mr A Bullock

iii. Former Members of BTAM

*Dr A O Ballantyne		
*Mr H J Hobbs	-	(By telephone)
*Mr H R H Kelly	-	"
*Mr E A Dixon	-	(By letter)

iv. Others

Mr M Brunt	-	Land Resources Division of ODM
Mr A Blair Rains	-	"
Mr D R Dickinson	-	Tate & Lyle Enterprises Ltd
Gill & Duffus Ltd	-	(By telephone)
International Cocoa Organization	-	"
Dr Greatbatch	-	CIBC (by telephone & latter)

B. In Bolivia 28 July - 27 August 1976

i. La Paz 28-29 July

Miss Jean Robertson	-	H M Treasury
Mr Alan Featherstone	-	"
Mr R Moffett	-	USAID Rural Development Division
Dr E B Wennergren	-	"
*Mr H Peacock	-	Methodist Mission Santa Cruz

ii. Santa Cruz 29 July - 10 August

*Mr C R Horrell, MBE	-	BTAM 1 & 2
*Dr T T Cochrane	-	BTAM 1
Mr J V Wilkins	-	BTAM 2
Mr J C Burgess	-	"

APPENDIX 1 - ITINERARY AND PERSONS CONTACTED (Cont'd)

Mr J Tollervey	-	BTAM 2
*Ing Rufo Angulo	-	Soils Laboratory
*Ing Nestor Suarez	-	Regional Director, Agricultural Extension Service, Santa Cruz
Ing Vacadiez	-	Regional Director, CIAT
*Ing Progress Paz	-	ex-BTAM Soil Research, now Agronomist, San Aurelio Sugar Co.
*Ing Oscar Tapia	-	ex-Agronomist, Saavedra, British Scholarships to UWI now Agronomist ADEPA.
*Dr Daniel Cardia	-	Entomologist, now Dean of Faculty of Agronomy, University of Santa Cruz, friend of BTAM 1.
Father Dante	-	Muyurina Agric. School
Dr Guillermo Kenning	-	Director of CIMCA
Ing Mario Duran	-	GNECA Santa Cruz
Ing Constantino Weise	-	DESEC (consultant firm for Social and Economic Development).
Mr P C Eatherley	-	Tate & Lyle Engineering Ltd. Agric. Products Div.
Miss Wendy Cooper	-	English student researching into sugar industry off Santa Cruz.
Mr Ken Graber	-	Methodist Agronomist
*Sr Abelardo Suarez	-	Farmer near Saavedra (ex-President Camara Agropelulina) Saavedra.
Sr Eladio Suarez	-	" " "
Sr Van der Veen	-	" " "
*Mr Harry Peacock	-	President United Churches Committee & Methodist Missionary.
Dr Mark Epp	-	Director San Julian Colonist Orientation Programme.
Mr Jerry Mumaw	-	Director Mennonite Central Committee.
Bro. Bernad Budkewicz	-	Catholic Missionary Agronomist.
*Saavedra Experiment Station GNECA Sugar Research Station (COMCA) La Belgica Ranch Santa Cruz Abattoir Unagro Sugar Factory and Experimental Canefields.		
*Mr J van Rooif	-	FAO Country Representative

iii. Cochabamba 10-12 August

*Ing Armando Torrico	-	ex-CBF, now CORDECO (Development Corporation of Cochabamba).
*Ing Jose Kushner	-	ex-Director Saavedra Expt. Stn., now private consultant.
*Ing Segundo Alandia	-	Regional Director of Agriculture, Cochabamba, former branch officer for BTAM 1 In Ministry of Agric.
*Ing Raul Himajora	-	Entomologist Ministry of Agriculture.
Sr Camela	-	Dairy Farmer

APPENDIX 1 - ITINERARY AND PERSONS CONTACTED (Cont'd)

San Berito Experiment Station  
Faculty of Agronomy, University of Cochabamba, La Tamborada  
(Entomology Laboratory, meeting with Dean, August Gonzalez, and some  
of staff).

Ing Angel Fandla - (Assoo with BTAM 1).

iv. La Paz 13-18 August

Sr Boris Marinovic - Under Secretary, Ministry of Rural  
Affairs and Agriculture (MACA).  
\*Ing Gover Barja - Director-General of Agriculture  
\*Ing Humberto Ganderrillos - Director, Sectoral Planning Office,  
MACA and former Director-General of  
Agriculture.  
Dr Simon Riera - Director of Agricultural Research, MACA.  
Ing Raul Sulus - Director of Statistics and Marketing, MACA.  
\*Cnl Giro Mealla - Institute of Colonization.  
\*Ing Arturo Posnansky - " "  
Father Jovier Albo - { CIPCA (Private organization for  
Ing Adolfo Aramayo - { " peasant development).  
Mr John Moffatt - ex-Manager IBRD Cattle Project.  
Mr Ian Hornsby & Archie - Owners of Cotton Estates in Santa Cruz  
\*Ing Hernan Zeballos - ex-Director INC, now Private Consultant.  
Sr Herbas - Central Bank  
Mrs Madeleine Crampion - Bank of Santa Cruz  
Sr Roberto Gumuocio - { Agro Industrias del Norte  
Sr Antonia Sanchez de - { (owner of Tomonohoco Cacao Plantation:  
Lozada in Alto Beni).

v. Coroico 19-20 August

Carmen Pampa Coffee  
Cooperative  
\*Bro Nilus - Xaverian Mission, Carmen Pampa  
Mumaypata Coffee Cooperative  
Capellania Coffee Cooperative  
Central Coffee Cooperative  
and hulling plant  
Sr Vito Barrionuevo - Manager, Central Coffee Cooperative

vi. Alto Beni 21-23 August

Rev Robert Caufield - Methodist Mission  
\*Mr Jim Hoey - " " (associated BTAM 1)  
\*Mr Spike Young - Manager, Tomonohoco Cocoa Plantation,  
ex-PCV associated with BTAM 1.  
\*Ing Frederico Elena - ex-CBF associated BTAM 1.  
\*Sr Orlando Ustares - Cacao Fermentary Peter Blancos Nursery,  
\*Sr Hernan Trujillo - Supeoho

APPENDIX 1 - ITINERARY AND PERSONS CONTACTED (Cont'd)

Sr Felix Paredes - Manager Rice Mill, and Farmer, Supecho.  
Tomonohoco Cacao Estate of  
Agro Industrias del Norte.  
CBF Tea Development Project,  
kil 52  
Charlie Cho

vii. La Paz 24-26 August

H M Ambassador, H E Mr R Hope-Jones, CMG  
Don Alfonso Genucio - Minister of Natural Economy, 1960-64  
Dr Thomas Greaves - University of Texas anthropologist  
Research worker with CIPCA  
\*Ing Marcial Machicado - CBF Director of Agricultural Projects.  
\*Ing Juan MacLean - Manager CNECA  
\*Mr Earl Smith - ex USAID  
Cnl Ing Oscar Flores - Abopoc-Izazog Project (CORGEPAI)

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\* indicates association with BTAM 1

## APPENDIX 2

### RECOMMENDATIONS FOR IMPROVED REPORTING

#### ANNUAL SERIES OF REPORTS

- I. Annual General Report of Head of Mission  
Along present lines, but briefer.
- Appendices: Annual Reports of Team Members.  
Full documentation of what done and what achieved,  
expressed as quantitatively as possible.
- Annexes: Reports of Visiting Experts  
Mission's Publications.
- Uses: Within ODM and Mission.  
Public consumption at home and abroad.  
Briefing new team members and new Heads of Mission.
- II. Annual Confidential Report of Head of Mission.  
A frank account of problems encountered and the reasons;  
of relations between the Mission (individually and  
collectively) and Host Government, other aid organizations,  
and the local public; of relations within the Mission.  
People and not just their position should be named since  
this is essential to a full understanding by ODM.  
Proposed action for the coming year and longer, and why.
- Annex: Confidential Reports to Host Government.
- Uses: Within ODM. Briefing new Heads of Mission.
- III. Annual Confidential Report of ODM  
Summary of policy decisions and reasons why.
- Appendices: Reports by visiting ODM staff;  
Inter-Governmental Agreements.
- Uses: Within ODM. Briefing new Heads of Mission. ?Circulation  
to Head of Mission and Ambassador,

#### TRIENNIAL OR QUINQUENNIAL SERIES OF REPORTS

- IV. Summary of Annual General Reports of Head of Mission.  
Appendices: Cumulative list of Reports of Visiting Experts;  
Cumulative list of Mission's Publications.

IV (Cont'd)

**Annexes:** End-of-Contract Reports by Head of Mission and Team Members;  
End-of-Research Project Reports by Team Members.

**Uses:** Within ODM and Mission for quick reference.  
Public Consumption at home and abroad.  
Briefing new Mission staff.

V. **Summary of Annual Confidential Reports of Head of Mission and On-going Evaluation.**  
Including review of political changes, policy changes within relevant ministries and agencies. End-of-Contract assessment of staff.

**Appendix:** Cumulative list of Confidential Reports to Host Government.

**Uses:** Within ODM. Briefing new Heads of Mission.

VI. **Summary of Annual Confidential Reports of ODM.**  
Review of policy decisions, periodic evaluations.

**Appendices:** Cumulative list of Reports by visiting ODM staff.  
Cumulative list of Inter-Governmental Agreements.

**Annexe:** Evaluation Reports by visiting ODM staff.

**Uses:** Within ODM. Briefing new Heads of Mission.  
?Circulation to Head of Mission and Ambassador.

**DISTRIBUTION AND FILING OF REPORTS**

**Abroad:** General Distribution: I, IV  
Mission Office: I, IV. Reference-only copy, Loan copies,  
Circulation copies.  
Ambassador: I, IV; ? II, III, V, VI.

**Home:** General Distribution: I, IV  
ODM: Main Library } (open access: I, IV , catalogued as series;  
NRA " } (closed access: II, III, V, VI,  
LRD " ( catalogued as series.  
Files: separate files for I, II, III, IV, V, VI;

IV (Cont'd)

NON-SERIAL INFORMATION FOR MISSION STAFF

- A. Regulations on rights, privileges, responsibilities of staff.
- B. Background on the country and living conditions.
- C. Handing-on Instructions for Head of Mission } Files on these should
- D. Handing-on Instructions for Team Members } be opened.....

... at the start of a contract, as it is then that a person can best judge some of the questions he would have liked answers to. Answers to be filled in and instructions detailed at end of contract, for successor.

Uses: Briefing Heads of Mission and Team Members.

Distribution: ODM, Mission Office.

APPENDIX 3

LIST OF PUBLICATIONS OF THE MISSION

<u>No.</u>	<u>Title</u>	<u>Author(s)</u>
1.	Plantas Forrajeras para el Trópico Boliviano I Yaragua ( <u>Hyparrhenia rufa</u> )	J Rossiter & G Delgadillo
2.	Plantas Forrajeras para el Trópico Boliviano II Merkeron ( <u>Pennisetum purpureum</u> var. <u>merkeri</u> )	J Rossiter & G Delgadillo
3.	Plantas Forrajeras para el Trópico Boliviano III Lablab ( <u>Dolichos lablab</u> )	G Delgadillo & J Rossiter
4.	Plantas Forrajeras para el Trópico Boliviano IV Guinea ( <u>Panicum maximum</u> )	J Rossiter & G Delgadillo
5.	Plantas Forrajeras para el Trópico Boliviano V Pangola ( <u>Digitaria decumbens</u> )	J Rossiter & G Delgadillo
6.	Plantas Forrajeras para el Trópico Boliviano VI Gramma Negra ( <u>Paspalum notatum</u> )	J Rossiter & G Delgadillo
7.	Plantas Forrajeras para el Trópico Boliviano VII Buffel ( <u>Cenchrus ciliaris</u> )	J Rossiter & G Delgadillo
8.	La Industria Lechera en Santa Cruz	Ing Néstor Suárez M
9.	Plantas Forrajeras para el Trópico Boliviano VIII Panico Verde ( <u>Panicum maximum</u> var. <u>trichoglume</u> )	J Rossier & G Delgadillo
10.	Plantas Forrajeras para el Trópico Boliviano IX Bremura ( <u>Cynodon dactylon</u> )	J Rossiter & G Delgadillo
11.	Plantas Forrajeras para el Trópico Boliviano X Atro ( <u>Phaseolus atropurpureus</u> )	G Delgadillo & J Rossiter
12.	Plantas Forrajeras para el Trópico Boliviano XI Glycine ( <u>Glycine javanica</u> )	G Delgadillo & J Rossiter
13.	Plantas Forrajeras para el Trópico Boliviano XII Capin Gordura ( <u>Melinis minutiflora</u> )	J Rossiter & G Delgadillo
14.	Plantas Forrajeras para el Trópico Boliviano XIII Gramalots ( <u>Paspalum dilatatum</u> )	J Rossiter & G Delgadillo
15.	Plantas Forrajeras para el Trópico Boliviano XIV Setaria ( <u>Setaria sphacelata</u> )	J Rossiter & G Delgadillo
16.	Plantas Forrajeras para el Trópico Boliviano XV Capin Plants ( <u>Brachiaria mutica</u> )	J Rossiter & G Delgadillo

APPENDIX 3 (Cont'd)

<u>No.</u>	<u>Title</u>	<u>Author(s)</u>
17.	Plantas Forrajeras para el Trópico Boliviano XVI Gramma Phodes ( <u>Chloris gayana</u> )	J Rossiter & G Delgadillo
18.	Plantas Forrajeras para el Trópico Boliviano XVII Stylo ( <u>Stylosanthes quyanensis</u> )	J Rossiter & G Delgadillo
19.	Guia para Cultivo de Algodón en el Distrito de Santa Cruz	M E H Vickers
20.	Majoramiento del Manejo del Ganado. Recomendaciones Prácticas para el Ganadero	H J Hobbs
21.	Plantas Forrajeras para el Trópico Boliviano XVIII Sorgo para Ensilaje Parts 1. Técnicos de Cultivo y Ensilaje	J Rossiter & G Delgadillo
22.	Majora Práctica del Ganado. Una Guía Sancilla para el Ganadero Boliviano	H A Edwards
23.	Majoramiento del Hato. 1 Cruzamiento de Absorción (Folleto)	H A Edwards
24.	Majoramiento del Hato. 2 Selección (Folleto)	H A Edwards
25.	Majoramiento del Hato. 3 In Plan de Acción (Folleto)	H A Edwards
26.	Majoramiento del Hato. Cruzamiento de Absorción (Folleto ilustrado)	H A Edwards
27.	Majoramiento del Hato. El Plan de Acción (Folleto ilustrado)	H A Edwards
28.	Plantas Forrajeras para el Trópico Boliviano XVIII Sorgo para Ensilaje. Parte 2. Composición y Valor Nutritivo	J Rossiter & G Delgadillo
29.	Plantas Forrajeras para el Trópico Boliviano XIX Maiz para Ensilaje	J Rossiter & G Delgadillo
30.	Una Guía para el Cultivo de Semillas Oleaginosas en el Distrito de Santa Cruz I Mani	M E H Vickers
31.	Una Guía para el Cultivo de Semillas Oleaginosas en el Distrito de Santa Cruz II Soya	M E H Vickers
32.	Una Guía para el Cultivo de Semillas Oleaginosas en el Distrito de Santa Cruz III Girasol	M E H Vickers
33.	El De-lintine Acido y Aplicaciones Fungicidas y Insecticidas de la Semilla de Algodón	M E H Vickers

APPENDIX 3 (Cont'd)

<u>No.</u>	<u>Title</u>	<u>Author(s)</u>
34.	Mapa de las Agrupaciones de Suelos dal Trópico Central de Bolivia	T T Cochran
35.	Apreciación Inivial del Potencial del Uso de Suelos de las Regiones del Pie de Monte Central y de San-Cruz del Trópico Boliviano	T T Cochran
36.	A Guide to the Production of Citrus in Bolivia	A O Ballantyne
37.	Coffee: Cultural Practices for Growing the Crop	A O Ballantyne
38.	La Hormiga "Sepa"	F A Squire & Carlos Montellano B
39.	Vinohucas in Bolivia	F A Squire (in PANS Section A V ol 14, 1968)
40.	Industria lectera en Santa Cruz	Néstor Suárez M
41.	Mejoramiento para la Crianza	H Edwards
42.	The Ecology and Fisheries of the Pilcomaya River in Bolivia	P B Bayley
43.	Insect Pests of Citrus	F A Squire Raul Hinojosa & H A Doft
44.	Pests and Diseases of Tomatoes	F A Squire & Raul Hinojosa
45.	Storage Pests of Grain	F A Squire & H A Doft
46.	The Control of Peach Borer in the Cochabamba Valley	F A Squire & Raul Hinojosa
47.	Citrus Production in Bolivia	A O Ballantyne
48.	Cocoa Production in the Alto Beni	E A Dixon
49.	A Guide to the Production of Maize in Bolivia	A O Ballantyne, F A Squire & M E H Vickers

APPENDIX 3 (Cont'd)

<u>No.</u>	<u>Title</u>	<u>Author(s)</u>
50.	Credit - Crutch or Crucifix?	A O Ballantyne (in World Crops)
51.	The Dairy Industry in Santa Cruz (Mimeographed)	G Calderbank & Gillian Cole
52.	A Survey of Milk Consumption in Santa Cruz	Gillian Cole (Mimeographed)