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THE CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

REPORT OF

THE TWELFTH MEETING OF THE TECHNICAL ADVISORY COMMITTEE

TAC SECRETARIAT

FOOD AND AGRICULTURAL ORGANIZATION OF THE UNITED NATIONS

Rome, 1976

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TWELFTH MEETING OF THE TECHNICAL ADVISORY COMMITTEE

OF THE CONSULTATIVE GROUP ON  
INTERNATIONAL AGRICULTURAL RESEARCH

2-6 February, 1976

Rome, Italy

SUMMARY RECORD

ATTENTION IS DRAWN TO THE CHAIRMAN'S  
SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

1. The Twelfth Meeting of the Technical Advisory Committee of the Consultative Group on International Agricultural Research was held from 2-6 February at FAO Headquarters in Rome, Italy. Sir John Crawford was in the chair.
2. The meeting was attended by twelve members, fifteen observers and eleven other participants in specific discussions. A list of participants is attached hereto as Annex I.
3. On opening the meeting the Chairman welcomed five new members to the Committee: Dr. A. Blumenschein, Professor of Genetics and Executive Director of EMBRAPA, Brazil; The Honourable Dr. Hussein Idris, Minister of State for Agriculture, Food and Natural Resources, The Republic of the Sudan; Dr. J.C. Madamba, Director-General, Philippine Council for Agriculture and Resources Research, Los Baños; Dr. H.J. Oslage, Professor of the Faculty of Veterinary Medicine, University of Berlin and Director of the Institute of Animal Nutrition, Agricultural Research Centre; and Dr. T. Ajibola-Taylor, Professor of Agricultural Biology and Dean of Agriculture, University of Ibadan, Nigeria. He also welcomed back Dr. Sauger, a former member of TAC, who had been invited to the present meeting to provide some degree of continuity in view of the large turnover of members, as well as to assist in discussion on some important matters such as vegetable research.
4. For the benefit of new members, The Chairman briefly explained the way in which the TAC worked pointing out that the rules were very simple and flexible, that is, within the constraint of his having to limit, now and again, the time devoted to discussion on items of the agenda, the floor was always open to any TAC member and if he desired could speak more than once or even open a debate. He invited free discussion amongst members and, in open sessions, contributions from observers by way of question or comment. He also pointed out that rarely were formal votes taken but that normally the debate revealed a consensus of opinion for which he was obliged to state and with the help of members reach agreement and report accordingly. He invited new members to indicate at any time any difficulties they were experiencing as regards procedures.



Adoption of the Agenda (Agenda Item 1)

5. The revised provisional agenda was adopted subject to any further revision which might prove necessary during the course of the meeting; to the inclusion under Item 8 of a discussion of Research on Water Use and Management and limiting discussion of CATIE to closed session only.

Adoption of the Report of the Tenth Meeting of the TAC (Agenda Item 2)

6. The draft report of the Tenth Meeting of the TAC was adopted. Due to the fact that members had insufficient time to read the draft report of the Eleventh Meeting, it was agreed to defer its adoption until the May meeting.

Report of the TAC Quinquennial Review Mission to IRRI (Agenda Item 3)

7. The Chairman requested Dr. Swaminathan, Leader of the Mission, to introduce the report, reminding members that the quinquennial reviews were not intended to be inspections but were essentially joint examinations, by TAC appointed teams and Centres' Directors and staff, to appraise the scientific thrust, its progress and direction, of the Centres' research and outreach programmes. The content of the Report was the prerogative of the Mission members, but the Committee was free to comment and to request clarification; any such comments would be expressed in its own meeting report.

8. Dr. Swaminathan welcomed the opportunity offered for members' comments to be utilized in clarification or improvement of the final text of the report. Giving a brief resumé of the membership of the Mission and its modus operandi he stressed that the basic approach had been the Mission's attempt to assist the Institute to a greater degree of effectiveness through an analysis of achievements and constraints. A framework for the report had been agreed on at the outset and members allocated specific tasks according to their disciplines, to the extent possible. The Mission had access to Dr. Ruttan's paper on research evaluation, an earlier TAC review report on the Agricultural Engineering Programme and excellent background provided by IRRI. With few exceptions the views and recommendations expressed in the report represented the collective views of the Mission members.

9. He emphasized the usefulness of the visits to certain aspects of the collaborative outreach work in Thailand and Indonesia, prior to the visit to IRRI Headquarters, which gave members an insight into the diverse nature of IRRI's work at the country level and the various problems encountered in conducting off-campus core research work (deep-water rice in Thailand); and sub-contractual work aimed at strengthening national services (rice research station development in Indonesia).

10. Referring to the draft report itself Dr. Swaminathan explained the layout and sequence of the chapters (to which some changes might be desirable) and commented first on the breakdown of IRRI's research budget between programmes, which the Mission had endorsed in principle, pointing out the need for changes which might arise in the future. The Mission also noted with satisfaction that the allocation of resources as between rice growing systems corresponded broadly to the contribution of those systems to total-rice production.

11. Reviewing the highlights of the report on a chapter by chapter basis Dr. Swaminathan referred first to the Genetic Evaluation and Utilization Programme which accounted for 34% of the research budget and was a multi-disciplinary effort comprising all the work entailed in the collection, conservation and improvement of rice germplasm. The contribution of breeders and other disciplinary scientists is organized on a team basis, and currently comprises thirteen inter-disciplinary teams whose work is integrated by an Operations Committee.

12. Of an estimated 100,000 distinct genotypes of rice IRRI had over 30,000 in its collection. Facilities for housing this collection in short, medium and long-term storage conditions were grossly inadequate. IRRI had already submitted proposals for improving this storage facility, and for the provision of related laboratory and seed handling facilities, and the Mission had been specifically charged with reviewing and commenting on this proposal.

Recognizing the fundamental importance of adequate germplasm storage the Mission had unequivocally endorsed IRRI's proposals for the improved facilities, indicating that in the face of rising building costs the work, especially for storage, should be put in hand as soon as possible; a proviso had been added suggesting the use of a modular plan if total capital requirements could not be realised at once. It had also recommended the provision of duplicate storage elsewhere.

13. IRRI had a continuing programme of classification of its germplasm collections for a wide range of characteristics, and had to date classified some 25,000 of its total 30,000 accessions. An international system, subject to computerization was employed and the mission had strongly endorsed the early establishment of a proposed improved computer facility to be shared with other institutions on the Los Baños campus.

14. Screening of the germplasm was mainly undertaken at IRRI but it had become clear that screening for specific traits needed also to be undertaken more extensively outside the Philippines. The Mission had therefore recommended the provision of additional core funding for extension of the screening of materials in natural 'hot spot' locations.

15. International testing of germplasm was undertaken by an extensive International Rice Testing Network. This was so fundamental to the continuing research programmes of IRRI that the Mission had recommended, as a matter of some urgency, it be funded as part of the "core" budget rather than as a Special Project, as at present.

16. Turning to the Pest and Disease programme of the Institute, Dr. Swaminathan stressed the necessity seen by the Mission for an integrated approach, combining breeding, chemical and agronomic control practices; agronomic practices (wider spacing for example) had been shown to be particularly beneficial in the control of brown plant-hopper, one of the pests constituting a major preoccupation at IRRI.

17. Recommendations had been made for certain strengthening of the pest and disease research programmes, for the provision of needed new facilities, and notice drawn to the advisability of giving attention to diseases especially which were currently classified as of minor importance.

18. The importance of post-harvest entomology and pathology was also highlighted as these became even more significantly important with changing cultural practices, particularly those which enabled more than one crop to be taken in a year, with one coming into harvest.

19. Among the strengthening of certain activities and consequently of staff in the entomology division the team had given prominence to work on insect ecology, becoming more and more important as the cropping systems programme extends its parameters, and as more knowledge was required for integrated control work. Recommendations were made for cooperative work with ICIPE on the physiology and epidemiology of insect pests (probably with an ICIPE staff member stationed at IRRI) and for additional headquarters staff competence.

20. Weed control also raised specific problems in the context of the present day prices of commercial chemical herbicides, as most effective control measures were found to be beyond the economic reach of the average small size farmer. Thus, added attention to non-chemical weed control was urged, in the form of improved cultural and agronomic practices and systems.

21. The cropping systems programme, whilst still in its infancy, had provided some very convincing demonstrations of the possibility, both agronomic and economic, of taking more than one rice crop a year, and of alternating rice with other selected crops in rotation. The feedback from this programme, as suggested earlier, was of considerable assistance to the disciplinary investigators in pointing up gaps and new problems requiring solution. These related to many topics including photo-sensitivity and susceptibility at different seasons to pests and diseases. A mild note of caution was sounded by the Mission with respect to the need to restrain extension activities to proven results of research, and on a location specific basis.

22. The cropping systems programme was, in general terms, well supported by the Mission and its continuation was recommended, with attention being given to new problems as they arose (as indicated previously), and to the development of a sound conceptual framework of cropping systems which could lead to the development of models subject to extrapolation to varying conditions.

23. Effects of the environment on rice production were being closely examined in IRRI's new phytotron facility and the Mission had made some suggestions for additional physiological work which could prove profitable. Other members of the Mission present were invited to comment on the soil fertility, water control and machinery sections of the report in due course.

24. Dr. Swaminathan gave attention to the involvement of IRRI in post-harvest technology research on which subject the Mission had supported the views earlier expressed both by the TAC and its first mission to IRRI to evaluate the engineering research programme, to the effect that IRRI's work on post-harvest technology should be confined to the farm and village level operations of threshing, transport, grain drying, cleaning, milling and storage. Certain aspects of improved technology, promulgated by IRRI (e.g. short stiff-stemmed varieties; maturation of first crop in the wet season, etc.) necessitated attention to, and changes in, accepted practices as a matter of some urgency.

25. A considerable role was nevertheless foreseen for IRRI at this level of technology, both within its own programme and as a contribution to any further reaching regional scheme on post-harvest technology research which might be developed.

26. The programme of the economics group at IRRI consisted broadly of work in two fields. The constraints to the adoption of new technologies, and the consequences arising from their adoption. The team had been highly impressed with the work of this group and had applauded the very close integration of the work of the economists with that of agronomists, production research staff and statisticians, and had suggested only that closer integration be sought with the engineers.

27. The main approaches of the 'constraints' programme were on two levels and aimed at two recognized performance 'gaps'. The first that between experimental farm and farmers field, using the same practices and the second, and more important, the difference between performance by farmers utilizing new technologies and neighbours using old practices. The IRRI group analyzed the factors responsible for both gaps and has recognized important policy implications outlined in the report.

28. The strengthening of both the "constraints" and the "consequences of the adoption of new technology" sectors of the work of the economics division, by the addition of experienced Asian economists was stressed by the Mission. The division was working in a field in which it had a strong comparative advantage and its work was essentially complementary to that of the national level economists in the region. Already their work on input pricing and income distribution was making a desirable impact. In particular fertilizer pricing policy in the Philippines had been affected by the former and a result of the latter was to indicate that the new technologies were essentially scale neutral.

29. Three major areas had been reviewed by the Mission in handling research concepts and organization. Firstly the comparative advantages and disadvantages of disciplinary versus multi-disciplinary research programming. The Mission had concluded that whilst the current multi-disciplinary approach of IRRI, as well exemplified by the GEU programme, was the most appropriate, single disciplinary research should not be discouraged, but rather encouraged (especially in those fields in which fundamental problems still existed, e.g. physiology).

29. A second area of discussion was the concept of "finished product" research. IRRI had to date maintained the practice of releasing serially numbered varieties. Shortly before the mission's visit however this policy had been changed in favour of the continuing release of improved breeding materials, leaving varietal naming and release to national authorities. The Team welcomed this approach which it felt to be in the best interests of the development of strong national rice research and production programmes.

30. Regarding basic research, the Mission having seen a continuing role for IRRI in "Mission-oriented basic research", Dr. Swaminathan explained that the term as used implied that the basic research undertaken e.g. on nitrogen fixation or insecticide resistance, was oriented towards the improvement of the rice plant and its production, and was not purely speculative. It could be defined as "applied fundamental research work with a clear purpose in mind". In this field there was also opportunity for collaborative work with other advanced centres and national institutions and the current IRRI agreements with Cornell University and the Boyce-Thompson Institute on non-symbiotic nitrogen fixation provided an excellent example of this.

31. The training record of IRRI was most impressive and the team's impression during its 'field visits' was that the research and production training efforts of IRRI were most highly appreciated by the participating countries and were regarded as the first priority requirement. IRRI trainees were proving invaluable in the running of national programmes, particularly those including network activities with IRRI, and the two-way exchange established subsequent to the trainees' return to the home country laid the basis for profitable collaboration.

32. Whilst recognizing the appropriateness of concentration on research training as a first priority the Mission nevertheless recognized that, as national research programmes grew stronger more emphasis might need to be given to production training. Some proposals had therefore been included for strengthening production training courses, including, where appropriate, at the national level.

33. The cooperative relationships of IRRI with rice producing countries were examined in detail by the Mission which had been struck by their complexity and wide-reaching nature. Some very strong links had been established but the Mission saw the need to sound a note of caution on the necessity to avoid any tendency for IRRI to substitute for national programmes.

34. In addition to the special international nurseries handled by the International Rice Testing programme IRRI had special contract agreements in a number of countries, including the host country, to assist in the handling of production programmes, experiment station development and research training. The Mission had suggested that efforts be made to interest other developmental agencies in the purely production development aspects of rice outreach work in order to release IRRI from this type of work and allow its staff to concentrate on research aspects. This, it was felt, would remove some frustration currently felt by outreach staff. Proposals had also been made for improving the lot of outreach staff through better terms of service, particularly of tenure.

35. Cooperative relationships with other international centres were also discussed and it was noted that formal agreements with CIAT and IITA/WARDA for work in Latin America and West Africa respectively, were currently being worked out. The Mission had also recommended that closer working relationships be developed with FAO particularly with reference to specific aspects of the outreach work dealing with the adoption and application of new technologies at the national level. In this respect the appointment of an FAO Liaison Officer for IRRI affairs was noted and the Mission foresaw opportunities for a working relationship to be developed also between IRRI and the new FAO Regional Plant Productivity and Farm Management Commission, based on the Regional Office in Bangkok.

36. The work of the new Consultative Group on Food Production and Investment (CGFPI) was also foreseen as having considerable relevance to the furtherance of the application of IRRI's results and the establishment of a rice sub-group had been mooted in preliminary discussions with the Chairman of the CGFPI.

37. With respect to cooperative research at the national level the Mission had suggested an evolutionary change in relationships to one of an equal partnership basis with a recommendation for the provision of further funds for more off-campus 'core' research programmes of the type exemplified by the deep water rice research work in Thailand. Such work could be concentrated in the first instance on site-specific problems, such as those of acid sulphate soils and 'hot spot' disease and pest research.

38. The personnel policies of IRRI's had been commented on by the Mission, which commended IRRI's approach to maintenance of the internationally recruited composition of the staff and its intentions to reduce salary differentials. Specific recommendations had been made to provide holding funds for outreach staff between assignments in order to ensure them of the security of tenure referred to above.

39. The Library, Information and General Services of IRRI had demonstrated a high level of efficiency and the Mission had made some recommendations for further training to be offered in information service operations for interested countries. Recommendations had also been made for additional building space, greenhouses, and for the early completion of negotiations for an advanced computer facility on a shared basis.

40. Referring to the returns on investments in IRRI since its establishment in 1960, which amounted to some \$50 million for capital and core operating budgets, Dr. Swaminathan pointed out the very real difficulties in quantifying returns to research in general and separating these, particularly in production increases, from returns due to other factors than simply increase in acreage. However, the team had pointed out that a 1% growth increase in rice production in S.E. Asia meant an additional \$300 million worth of output. Many countries of the region had shown growth rates in excess of 1%. Although the attribution of reasons for these increases was difficult to specify, being the product of many inputs, research was a necessary associate to, rather than a substitute for those inputs, in that it made it possible to raise the return on other investments.

41. It was also extremely difficult to quantify the effects of a training programme although the observations of the Mission in the field were, as already stated, that IRRI trained personnel were at the core of many national rice research and production programmes. The Mission had concluded that the investment so far made had been more than worthwhile, and that continued, or rather slightly increased investment over the next five years would have a measurable pay-off. One of the indications to be carefully watched should be the closing of the yield gap between the experimental station and the farmers' fields.

42. Concluding his presentation Dr. Swaminathan gave an indication of the Mission's views expressed in the final chapter - "IRRI - The Next Phase". Some minor changes had been proposed in the body of the report with regard to research priorities but in the main IRRI's approach had been commended. The need for a continuing process of appraisal of priorities was pointed up however, with a concomitant flexibility in the programme enabling adjustments to be made as required. The three areas seen as deficient in the early days of IRRI, namely attention to grain quality, cropping under monsoon conditions and contact with farmers had now received, and were continuing to receive, adequate attention. The budget was considered adequate and subject to the increases suggested it should meet IRRI's needs satisfactorily.

43. Finally the Mission had expressed its views on the need to establish the financing of IRRI and the other IARC's on a more permanent basis than that of the annual funding exercise, and had suggested ways in which the long-term provision of funds, necessary to ensure the continuity of long-term research undertakings, could be achieved.

44. Dr. Pereira, also a member of the Mission, supported the presentation of Dr. Swaminathan and commented on his excellent handling of the most difficult task of leadership of the Mission. Before turning to his specialist sector of the Mission he commented on the endless process of review by various bodies with which the relatively small staff of IRRI had to contend and their extremely good application to their research despite such pressures. The Mission had, in fact, made a recommendation regarding the need to decrease the review pressure at the Institute. He also supported strongly the Mission's proposals for improving the terms of appointment of key outreach staff - the major personnel management problem encountered at the institute.

45. On the question of soils research he explained the new realm of soil physics created by the taking of two rice crops in certain upland situations in which, during the same year, the soil was puddled into a structureless mud and was then subsequently dried out and treated as a normal dry soil seed-bed for the dry season crops. This contradicted a great deal of what was known of the physical possibilities of soils and posed a major problem. For this reason the Mission had recommended that IRRI obtain the services of a soil physicist.

46. He felt that the benefits of research had been well demonstrated to the Mission by its contacts with farmers who had already during the year taken two good crops of rice (5 ton/ha) and were not too disturbed at the thought of any getting half a crop from their third sowing!

47. Referring to the Agricultural Engineering Programme, Mr. Webster had been concerned to know to what extent the recommendations of the earlier TAC review of the Engineering Programme had been put into effect. It was found that most had been acted upon with one major exception - the closer association of that programme with the economics department's 'constraints' programme, and the inclusion of power source as one of the variables in the analyses of farmers' practices. The impact that a power tiller could make in speeding up soil preparation could make the difference in some circumstances between the ability to take two crops or only one.

48. The Mission had endorsed the views of the earlier team which, as pointed out by the Chairman, were also shared by TAC with regard to post-harvest technology research, to the effect that IRRI should limit its activities whether within its own programme or as a contribution to any regional programme, to the farm and village level.

49. In opening the discussion the Chairman expressed the wish to reach conclusions on the Report not later than the next meeting of the Committee in May, in order that these might be presented to the Consultative Group in July. He was therefore prepared to give adequate time for discussion at the current meeting in order to advance the formulation of a position as far as possible.

50. Several members and observers participated in the open discussion which followed. All interventions commended the quality of the report and offered congratulations to the leader and members of the Mission for the admirable conduct of the review. Comments and questions were mostly framed in such a way as to facilitate the clarification of obscurities in the report or to point up findings which speakers felt warranted more emphasis.

51. The concern of the Mission that IRRI might be becoming too involved in national programmes was referred to by one speaker with particular reference to the Philippines. Members were assured that both research and extension were quite firmly in the hands of the national services responsible. This was not to deny the very valuable assistance and inputs still being accorded by IRRI staff, but these latter were being concentrated more and more in those fields in which IRRI still had a comparative advantage, for example in water resources use, and management; farming systems; micro-economics, and the definition of research priorities.

52. Whilst recognizing the inherent dangers of premature application of preliminary results emanating from experimental work in the use of new technology in production programmes, he felt that the dramatic success obtained in increasing national rice yields vindicated the rather wide-scale employed. Nevertheless it was clearly understood that the production operations were still in the study stage and current efforts were directed to ironing out difficulties encountered and evaluating possible consequences.

53. Remarking on the fact that the revised draft of the report already reflected many of the points he had made in advance, the Chairman expressed the hope that the rather artificial distinction drawn between mission-oriented basic research and applied research could be avoided by some clearer definition. The problems currently being brought to the notice of the Institute by feed-back from field programmes, such as that in the Philippines, indicated clearly the need for more applied work, especially for example in entomology, as well as for more basic laboratory work, e.g. in physiology. Thus he would help to discourage any idea that one type of research should be pursued to the exclusion of others, or that

necessarily all the required research should be done at the centre itself. He was also pleased that the Mission had examined other possibilities of getting needed research done, including if necessary, bringing of specialist staff from other centres to work at IRRI.

54. The provisions of the report with respect to work at the national level also pointed up the need for organizational flexibility and the employment of different approaches to collaboration and cooperation depending on specific circumstances and the task to be done. The essential two-way nature of such partnerships, and the avoidance of any suggestion of 'paternalism' could not be too strongly stressed.

55. Finally the Chairman commented that the three weeks allocated for the IRRI review, including time spent in the field, appeared to be the minimum which TAC should allow for such reviews, which could have an enormous bearing on the future of the Centre concerned. He felt therefore some concern that insufficient time might have been allocated for the forthcoming CIMMYT review. Further attention might be given to this question.

56. One member commented that three weeks was probably the longest period for which people of the right calibre could make themselves available for review missions. A very useful purpose could be served therefore, if as in the present case, some or all of the members of the Mission could be brought together briefly, following the first presentation of the draft report, in order to work together on reflecting the views expressed in a final, more polished, version. The costs of such a second meeting would be negligible in comparison with the expenditures of a Centre over a five-year period.

57. Another member sought clarification and confirmation of the very strong emphasis given by the Mission to the genetic resources evaluation programme, which was something of a departure from the emphasis given maybe only five years previously. Similarly he, and other speakers wondered whether the provisions of the report with regard to the cropping systems programme, conclusions on which appeared to be somewhat ambiguous, could be clarified. The less specific question, of the probable best role for cropping systems research at an international centre as distinct from that at the national level, might usefully be felt, form a theme for a TAC sponsored international symposium.

58. Attention was also called to the rather positive recommendations for support of agricultural engineering research. The dichotomy between simulation work, which tended to support peak labour demand as a constraint on intensification, and ex-post analysis which tended to deny this, suggested a need for considerable caution in reaching conclusions.

59. The economics programme of the Institute and the proposals made by the Mission for its continuation and strengthening, were strongly supported by several speakers. Further caution was needed though in the selection of collaborative agencies, and the careful evaluation of the professional programmes and potential inputs of such agencies into a collaborative programme, in order to preserve the integrity and productivity of the IRRI effort.

60. There was a strong case made by the CGIAR representative for the members of the Mission present to assign some level of priority to the various recommendations made for increases or adjustments in staffing and in the provision of additional facilities. Whilst agreeing in principle with the proposal to take the International Rice Testing Programme into the "core" budget he explained the difficulties met by some donors who found 'Special Project' support often the most convenient form of financial support. This was a point which the CGIAR would need to face however, and he was glad that it had been raised by the Mission. Similarly the CGIAR would be interested in another question raised by the Mission, namely the relationships being developed between IRRI and the other IARC's, the formalization of which was awaited with interest.

61. The disease and pest research work of the Institute was also warmly supported, along with the Mission's recommendations for wider testing in the so-called 'hot spot' locations and the attention called to currently minor diseases and pests. In the same way future needs for fundamental work on insect physiology and ecology and for post-harvest storage work had been foreseen.

62. Referring to the nomination of an FAO liaison officer for IRRI, the representative of FAO stated that this action had been taken with most of the International Centres in order to improve mutual contacts and exchanges. With specific respect to IRRI it was intended to ensure that FAO kept up-to-date with the work of the Institute and that the applicability of IRRI's research results to over 200 field projects managed by FAO involving rice and the opportunities for collaboration on these, be explored. He commended the report of the Mission but sought some reassurance that sufficient cognizance was taken by the Institute of the genetic vulnerability of certain IRRI materials with vast areas being sown with uniform varieties.

63. One member specifically commended the inter-disciplinary approach of IRRI to the problems of constraints to the adoption of new technology and saw the desirability for clarification of the respective emphasis suggested by the Mission to be given to disciplinary and inter-disciplinary research. He hoped that the real needs of the farmer would not be lost sight of through an over sophisticated or too theoretical approach to experimentation.

64. Referring to the strong emphasis now being given to upland rice in IRRI's programme, and its particular relevance to Latin American conditions he requested the team members to clarify, if possible, the conclusions regarding the most appropriate mechanism for the desired collaboration between IRRI and CIAT (or alternatively a selected national centre) for the better conduct of its work in S. America.

65. Responding to members comments and suggestions Dr. Swaminathan expressed his gratitude for the constructive way in which these had been made. Referring to the cropping systems programme he agreed that the final draft would clarify the position of the Mission. The recommendation would be to the effect that although a continuation of this programme at the present level was currently foreseen it could be envisaged that if rice improvement programmes were eminently successful then increased yields could lead to the replacement of rice as a crop on some marginal lands by other, better adapted crops. Consequently the Mission had felt that collaboration with other international centres interested in other crops could be valuable for intensifying research on rice-based farming systems involving, for example, sorghum, wheat and maize. It was not the intention to suggest that IRRI should attempt to coordinate all cropping systems work, but should simply aim at collaboration in those involving rice. This would be adequately clarified by reference to the Mission's examination of farming systems work in the outreach programmes. He also supported the suggestion that TAC itself might consider a symposium discussion on this question.

66. Similarly with regard to upland rice it would be made clear that the Mission intended to convey a wish to see this work continued, but to indicate at the same time that future reappraisal and possible reduction of the programme might be necessary. He would also attempt to clarify the Mission's views on upland rice programmes in Latin America with especial reference to Brazil.

67. He confirmed that the Mission was anxious to see a balance maintained between multi-disciplinary and single disciplinary approaches to research. The report had indicated those fields in which it considered disciplinary research needed to be continued or strengthened and had made proposals for alternative approaches involving other centres of excellence.

68. Reiterating the firmly expressed conviction of the Mission that the proposals of IRRI for germplasm conservation were thoroughly sound he emphasised that these were based on the urgent need to collect and conserve rapidly disappearing germplasm which could make valuable contributions to future breeding programmes. The table to be issued with the report made quite clear the very narrow base on which current resistances, for example, were established, and he felt that the need for diversifying genes for resistance alone merited a very major effort.

69. The much discussed question of post-harvest technology had been raised by several members and the Mission had clearly expressed its views, endorsing those of the TAC, that IRRI should concentrate on farm and village level technology, with especial reference to threshing, crop drying and milling. The engineering department were making a valuable impact on this



work and this formed one of the reasons for the Mission's support of that programme. A revised form of words would be sought to indicate the view of the Mission that the main reasons to continue support for engineering research were its role in the reduction of drudgery and its contribution to increased production; rather than any suggestion of reduction of labour input.

70. Dr. Swaminathan expressed his full agreement with the proposal that the Mission members present should attempt an indication of priorities within their recommendations for increased staff and facilities. He believed that first priority should be given to those proposals which were associated with the consolidation of existing gains and the more rapid elucidation of felt constraints. In this connection he referred to crop protection specifically, as a majority of Asian farmers had indicated, in IRRI's recent review, that pest problems formed the prime constraint on production.

71. The recommendation to strengthen IRRI's staff by the secondment of Asian national staff, particularly economists in the first instance, stemmed from a desire to see a better balance between developed and developing country staff without robbing developing countries of their best personnel. The mutual contributions which could be made through a process of short term (3 - 5 year) secondment, could, the Mission felt, be of tremendous benefit to both IRRI and the national services concerned.

72. A point omitted from the presentation of the report, which Dr. Swaminathan wished to convey to members, related to an exchange of germplasm between IRRI and the People's Republic of China which had taken place during a visit in 1974. Many of the strains from China were very early maturing and the Mission had been informed that at least one of these very early strains had been found to be free of undesirable association with photo-sensitivity. He thus saw considerable merit in collaboration with China in future germplasm collection programmes, and expressed the hope that this might prove feasible.

73. In closing Dr. Swaminathan gave specific attention to a question from the Chairman regarding the judgement of the Mission on the precise germplasm storage facilities proposed by IRRI. He indicated that the Mission had reviewed the architect's proposals and had been given an explanation, using a model, of the purpose of the facilities. Its comments and recommendations were in respect of that particular building. This would be made quite clear in the amended draft which would also emphasise the Mission's suggestion that a modular form of construction (to which the building proposals lent themselves) should be adopted if necessary to ease the capital load at any one time.

74. The representative of the World Bank then informed the Committee that the Bank was working with IRRI on a proposal to hold a symposium to share the experiences of workers in some 17 development projects involving rice and the dissemination of new varieties. Some encouraging extension developments had occurred and there was great merit in sharing these, as well as exposing IRRI and production staff to each other's thinking.

75. In opening the closed session discussion the Chairman reiterated his suggested procedural outline, emphasizing that the final report would be the responsibility of the members of the Mission and that TAC comments, at this and the next meeting, would be incorporated in the TAC's own report which would be submitted to the Consultative Group members at the same time. He offered members the opportunity to endorse the report if they wished, with or without comment or request for additional emphasis, reminding them again that a final position would be taken at the next meeting.

76. Several members expressed their complete satisfaction with the report, provided that suggestions for improvement already made could, to the extent possible, be incorporated in the final version, and asking for specific attention to be drawn to the recommendations for accommodating outreach staff between assignments and the request for minor amendments to the titling of the chapter on pests and diseases.

77. There was general agreement also that priorities within the recommendations should be allocated, and cleared with Mission members. Failing this it might be necessary for the Committee itself to formulate some proposals for priorities at its next meeting.

78. The Chairman sought the agreement of members to give some specific attention in their comments to the Agricultural Machinery Development and Post-harvest Management programmes. In respect of the latter he wanted to make it clear that TAC was fully cognizant of the importance of the subject but did not think it appropriate for IRRI to accept a management responsibility for any regional or global programme, and that its own programme should be limited to the farm and village level. In this respect, and at that level, it could make a valuable contribution to other programmes of wider concept and handled by another agency or agencies. The recommendation of the report should therefore make it clear that it is made in terms of IRRI's responsibility only, without implying a negative attitude towards other work. TAC would, in fact, welcome the opportunity of examining more embracing proposals perhaps of a network nature.

79. In suggesting endorsement of the Machinery Programme it would be fair to reflect the view taken at a previous TAC meeting that mechanization research must be related to the processes of production and harvesting by the small farmer. Thus, as expressed earlier, it should indicate that mechanization can assist labour, without reducing its intensity, and can improve production. In this connection one member proposed that an earlier wording used by the Committee, should be employed. This form of words emphasized the principle that work on mechanization should be considered relevant if its main thrust was directed towards increasing the amount of rice that becomes available on the market rather than towards a reduction in labour requirements. There was general agreement that this formula should be used and the Mission leader undertook to incorporate this in the final version.

80. A further question was raised by the Chairman on the relative allocation of resources as between irrigated and rainfed and upland rice. The report indicated that the Mission felt that IRRI had achieved a fair distribution, which tallied rather well with the production figures of the different areas. However the Committee had earlier endorsed a rather faster development of work and interest in rain-fed rice and he wondered if this growing strength was recognized fully.

81. Another member again questioned the amount of emphasis placed on upland rice - as distinct from rainfed rice in general terms - in view of its rather more limited potential when the physiology of the rice plant itself was considered, and questioned whether there was a scientific base for expecting productivity increases in that sector.

82. Dr. Swaminathan, supported by other members, referred to the considerable areas of the world in which upland rice was the major cultivation system followed and that in which increases would have to be sought. Consequently the work at IRRI, although showing the feasibility in the Philippines of taking two rain-fed crops of rice through the use of short duration varieties and improved cropping management, agronomy and weed control, had much wider application elsewhere. This was amply confirmed by TAC members from Africa and Latin America. The widespread testing programmes of IRRI ensured that all materials were tested in as diverse situations as possible. Following adequate study of climate analyses (average duration and intensity of rainfall, rainfall distribution, etc.) it should then be possible to develop 'packages' including appropriate varieties for a wide range of upland conditions. It was not felt by the Mission that irrigated rice were in any way suffering from neglect: rather that a more equitable balance of programme had been achieved.

83. In reply to a question from the Chairman regarding the choice of crop as between say, rice and wheat when given a limited water supply situation and the considerably smaller water needs of wheat, Dr. Swaminathan pointed out that a further choice of crops existed, given the availability of water, as between wheat and cold-tolerant rice. Hence the importance of the IRRI testing programme for cold tolerance. However where water really was a constraint it was clear that the crop with the least requirement should be selected. This question was not raised in the report but it was agreed that it might well be raised with IRRI economists.

84. In summing-up the closed session discussion the Chairman remarked that there appeared to be emerging a clear consensus for general endorsement of the Mission's report. It would also appear to him to provide a fine contribution, as a pioneer, to the further process of TAC quinquennial reviews. Further comments, especially on the priorities for change in the IRRI programme, would be welcome at the next meeting.

Report of the TAC Vegetable Research Appraisal Mission (Agenda Item 4)

85. Before inviting Dr. Marcano to present the report of the TAC Vegetable Research Appraisal Mission, the Chairman, for the benefit of the new members, briefly related the antecedents of this mission. He recalled that in the old (1973) Priorities Paper, or for that matter, in the revised paper to be discussed at the present meeting, vegetables were included in the priorities statement in view of their potential importance as a food even though they were not placed in the first priority. Not only were they important from the aspect of the quality of food but also it was clearly recognized that in some areas they comprised a vital ingredient in the total food supply in terms of calories as well as other components.
86. There had been suggestions made for the creation of special centres for vegetable production on the grounds that particularly in Asia, but not only there, vegetables were a much more significant part of the diet than recognized and apparent from TAC's confining of priorities to cereals. In point of fact even before TAC had been appointed there was the beginnings of an institute in Taiwan working on vegetables under the leadership of the former director of IRRI, Dr. Chandler. Apart from any political difficulties and notwithstanding certain other problems not wholly at the disposal of TAC, the proposal for supporting the centre in Taiwan, if and when vegetables were prosecuted seriously under TAC's aegis, was open to doubt for reason that Taiwan was ecologically less well situated.
87. However, while these matters were of some consequence, the primary reason why TAC decided to re-open the question of vegetables was the clear recognition that vegetables were a major priority in the diet of a vast number of people in the developing countries.
88. The Vegetable Research Appraisal Mission mounted by TAC was not the first of its kind since there had been an earlier mission volunteered and very usefully carried out by the Rockefeller Foundation under the leadership of Dr. McClung, although this latter mission dealt more specifically with the need for an international centre to replace AVRDC in Taiwan.
89. In presenting the report of the appraisal mission, Dr. Marcano firstly extended a welcome to Professor Munger who had been an important member of the team through his knowledge of vegetables in the tropics and in this capacity invited to the meeting to assist the discussion.
90. For the benefit of members who had not had time to read the report in detail, Dr. Marcano dealt at length with the salient points of the report.
91. Initially he referred to the Terms of Reference prepared for the mission and then he named individual members of the team (vide Appendix II, Report of the TAC Vegetable Research Appraisal Mission, DDDR/IAR:76/1 RESTRICTED, January 1976).
92. He proceeded with an account of the mission's assembly and briefing in Rome, followed by visits to five countries: Senegal, Nigeria, India, Thailand and Indonesia, and discussions in Nairobi during an overnight stop.
93. Although the schedule was a very heavy one, Dr. Marcano remarked that the team had managed to hold discussions with many diverse groups of people including vegetable researchers and nutritionists as well as the research administrators and policy makers. Time was also taken to visit field stations and inspect the work done.
94. Altogether the mission travelled for 30 days returning to Rome for preparation of the report for which the assistance of the TAC Secretariat was gratefully acknowledged.

95. He pointed out that a primary aim of the mission was to obtain a clear picture of the situation of vegetable research in all the countries visited. A major problem confronting the team was the dearth of statistical data.

96. The team concluded that apart from in India where there were some well established research institutions, vegetable research in all other countries visited was only at the developing stage. Some of the development in this field was by means of UNDP/FAO or World Bank projects.

97. The mission had found the research emphasis in all countries placed on what the team had coined as "conventional" vegetables, that is, the vegetables grown for commercial use or export and very little attention was given to the "native" tropical vegetables extensively eaten by the rural people.

98. Dr. Marcano remarked that in spite of the lack of substantive data the team believed there were adequate reasons on economic grounds to justify additional research on vegetables. These were enumerated in paragraph 11 of the Report.

99. The mission established that all the countries placed high priority on the need to support the expansion of vegetable production and in most vegetable research was a component of the national economic development plans. But, here again as the team had discovered, this development was given over almost exclusively to those vegetables primarily for marketing or export.

100. In view of the fact that the bulk of the rural and urban peoples in these countries consume mostly "native" vegetables the team in its report had placed relatively greater emphasis on these.

101. It was verified that vegetable production and marketing were labour intensive generating employment for many rural and urban people. In fact in all countries visited vegetable growers were found to be among the high-income farmers, and in Thailand, for example, more and more rice farmers were going more for vegetable growing because they could derive a much better income than from their rice paddies.

102. In all the developing countries visited, it was clear the demand for vegetables would continue to grow in line with the growth in population. The consequences of a possible increase in real income concomitant with the efforts to solve the hunger problem of the under-nourished populations indicated the urgent need for serious attention to be given to the accelerated expansion of vegetable production in tropical countries.

103. With regard to nutritional aspects the team had given considerable emphasis to the finding that in all countries nutritionists had stressed the importance of vegetables in supplying not only vitamins, particularly vitamin A, and some minerals but also adequate amounts of proteins and calories. Especially were vegetables considered to provide a good balance of amino acids in diets low in animal protein as well as adding variety and taste to the diet. That some vegetables such as the leafy greens, were capable of producing proteins and calories at rates equal to those of the more important staple crops was emphasized in the report.

104. As regards the various crops and species and the problems needing additional research, Dr. Marcano commented on the protracted discussion amongst team members on the best approach to adopt. The team had finally decided to place more emphasis on a few of the most important vegetables. These were listed under three main groups of crop species: (1) tomatoes and related solanaceus crops; (2) leafy green vegetables; and (3) leguminous vegetables.

105. In every country visited tomatoes were regarded as the most important crop. They were grown extensively in all countries and there existed a good source of germ plasm and wealth of information of constraints to production and for these reasons the team believed that rapid and significant progress could be made on this crop as soon as a serious and stable research programme had been established.

106. The mission considered the leafy green vegetables of the tropics as of almost equal priority to tomatoes although it was difficult to establish where of the leafy greens should be given attention. The amaranths were selected as deserving initial attention because they were eaten by the rural poor in every country, the protein percentage on dry matter basis almost equalled that from the daily grain intake, and they were reported to have high amounts of sulphur-containing amino acids. Amaranths were known also to have high contents of minerals and vitamins, particularly vitamin A and they have the more efficient C4 type of photosynthesis. Other apparent advantages of this crop are the existence of a wide genetic variation, relatively few pest and disease problems and they grow equally well in semi-arid and tropical humid environments.

107. The cold water convolvulus, Ipomoea aquatica, was regarded as another species deserving special attention.

108. The third priority group, the leguminous vegetables, included the immature pods and weeds, the sprouts, and occasionally the leaves of many legumes. One advantage of these over the leafy greens is the reduced proneness to rapid post-harvest deterioration. The mission had suggested that initially research should be concentrated on the Vigna species including cowpeas, yardlong bean and the mungbean.

109. Turning to the subject of the needs for additional internationally supported research, Dr. Marciano stated that the mission had listed six good reasons why vegetable research should be assisted in the developing countries. These were: (1) the grossly inadequate scope, depth and organization of current research activities in most countries; (2) an international programme would be in a better position than a national one to carry out research on those vegetables which were of less commercial importance but of great nutritional value to the population; (3) it would be difficult for national programmes to generate adequate support to work on but a few species; on the other hand the combined area in tropical countries planted in any given species could justify international support for research on that species; (4) international assistance could assure continuity of effort, mostly lacking in national programmes, by providing information, and experimental materials and help in planning the programmes; (5) it would not be economically feasible for most national programmes to assemble and evaluate the large germ plasm collection needed for the improvement of each species; and (6) the scope and depth of research on pests and diseases, a major constraint to increased production of vegetables in the tropics, was beyond the capability of most national programmes.

110. With regard to the mission team's deliberations on the organizational form, activities and location of an international effort he recalled the long discussions in which several possibilities had been considered. They reached the conclusion that the former proposal for organizing a network of existing institutions working on vegetables was not likely to be successful. In the team's opinion only by establishing a new international centre as a base for the network would the required boost to vegetable research be achieved. Particular advantages of the proposed centre over a more diverse effort were greater efficiency in activities, a clear rather than diffuse responsibility for deciding on priorities and making any necessary programme changes, and the stimulating effect on the staff of having vegetables as the focus of thought and activity. As well, an international centre would provide a counsel for national research workers with specific problems.

111. On the second-last point Dr. Marcano cited the case of the work on tomatoes at IITA as an example of what the mission team believed would happen if instead of a new centre one or more of the existing international centres took on the responsibility for vegetable research. In this tomato research was a component of the farming systems programme and thus, in effect, was only of secondary consideration.

112. Before proceeding to deal with other aspects of the report he called on Prof. Munger to add his comments particularly on the nutritional importance of vegetables.

113. Professor Munger commented that while the many people he had talked to recognized the importance of vegetables in supplying vitamins and minerals to the diets of people in tropical developing countries, they were not convinced of the need for research on vegetables relative to that for staple crops as long as there remained a deficiency in the supply of calories and proteins in these diets. He felt his main contribution to the report and this further discussion was to counter this belief that vegetables were only good for minerals and vitamins. On the contrary a number of vegetables compared favourably with cereals and legumes as producers of calories and proteins as well as supplying minerals and vitamins in large amounts. These were the vegetables to which the mission had given priority for research.

114. He was of the opinion that the vegetable specialists had not generally recognized and called attention to the total nutritional contribution of vegetables because they had not been correctly interpreted the tables of composition of plant foods in respect of nutrient content. Whereas the composition of seeds, with relatively low moisture content, was reported on a dry weight basis that for vegetables was usually given in terms of fresh weight and therefore gave by comparison a much lower value for nutrients. He referred to Table 3 of the report which listed twenty-five vegetables with after-cooking protein content higher than that of rice (2.2 per cent wt. basis). While the list was dominated by legumes it did include a number of leafy vegetables which ranked in protein content right up amongst the legumes and higher, in fact, than some of the edible pods of the immature legumes, for example, cowpeas.

115. However, as Professor Munger pointed out, these data were not sufficient to justify the claim of vegetables as good protein producers. It needed to be supplemented with data of production per unit area of land combined with a time factor because of the different lengths of growing periods of the various crops and the possibility of intensive cropping in tropical environments.

116. He referred to Table 4 of the Report which showed production of protein per hectare per day for the more important crops in the United States. Apart from the legumes soya-bean, beans and peas, and potatoes of which the white variety produced a surprisingly high protein yield, vegetables were not prominent in this list of crops but on the basis of experiments and a search of the literature he had established that vegetables, such as mungbeans and amaranths, could produce protein at the same rate per unit area per day as soyabeans.

117. He again commented on the fact that vegetables also supply considerable amounts of vitamins, particularly A and C, as well as important minerals.

118. Further to this he had included Table 7 in the Report to indicate the high amount of edible dry matter in terms of Kg/ha/day produced by vegetables (in this example the edible pods of mungbeans) as compared to sugar cane and rice.

119. Additional evidence indicating the nutritional value of vegetables is given in Table 8 of the Report. These data, from a German source, show that on a yearly basis it was possible to obtain higher yields of protein from some of the green vegetables, or combinations of vegetables, than from a cereal crop while the same vegetables give comparable amounts of calories in addition to very important amounts of vitamin C.

120. Impressive as these data were, Professor Munger emphasized the need for much more information of this kind and he stated he would regard one of the functions of an international effort was to find out more about the relative productive potential of the lesser known vegetables of tropical developing countries.

121. In respect of the mission's decision on priorities among the vegetable species he believed that on the basis of the nutritional information available to the team it had been rather difficult to justify the first priority afforded tomatoes. However, he had just recently come across data which revealed a surprisingly high protein content in a good crop of tomatoes.

122. He had also come to realize the nutritional value of onions after making a comparison of the protein content of average yields of this crop with soya beans. He reported that with average yields of soya beans in the New York State they obtained 289 Kg. On this evidence onions and tomatoes were producing more protein than a leguminous crop. He obtained similar results from a comparison of these crops grown in California where overall yields were higher.

123. Professor Munger referred to information from a large onion dehydrating company in the United States which had bred onions with a higher dry matter content and obtained yields of 600 to 1200 pounds protein per acre, or 672 to 1344 Kg. protein per hectare.

124. On the basis of these data on protein content and data on total world production of tomatoes and onions he contended that these crops were grossly underrated as protein suppliers. Overall he believed the nutritional value of vegetables was a subject deserving of much closer study. He realized that as compared to the green legumes, tomatoes, onions and the leafy green vegetables were not so well placed in terms of ready storage of protein but because in the tropics they could be grown at most times of the year protein storage was of lesser importance and was outweighed by the extra nutritional value of the vegetables.

125. In conclusion he pointed out that nutritionists emphasized the importance of vegetables in providing a diversity of proteins and therefore a better amino-acid balance to the diet and that this made the body less vulnerable to disease.

126. Dr. Marcano then referred back to that part of the Report dealing with the establishment of criteria for selection of the location of an international centre for vegetable research if, and when, TAC decided to recommend this. The team did not attempt to fix a location for the suggested modest-sized centre but recommended a special study group using the following guidelines: (i) a location in Asia; (ii) a tropical lowland site with marked wet and dry seasons; (iii) easy access to a range of altitude to provide different temperature ranges; (iv) a country with a tradition of good diverse vegetable growing, and (v) location preferably near an existing strong university faculty of agriculture for development of cooperative training programme. In addition to these specific requirements there were several other generally accepted criteria which members were aware of when considering the location of an international centre in the CG system.

127. With regard to the recommendations on requirements for supporting action in relation to extension, marketing, price policies, etc., the team placed particular emphasis on the need for the supply of good seeds since in almost every country visited this was regarded as one of the most limiting factors besides research. The team considered that an international centre could play an important role by not only producing seeds, but also by providing information, training and other assistance for countries producing their own seed stocks.



128. The TAC Secretary, at the invitation of the Chairman, then explained the supplementary data which he had prepared in attempt to help strengthen the mission's case for an international effort. His own experience in information gathering at FAO had led him to the opinion that the scarcity of data on the nutritional contribution of vegetables to the diets on an individual or family basis in developing countries, or for that matter, on the actual amount people spent on vegetables, was a major weakness in the case for strengthening research on vegetables.

129. He suggested that the collection of up-to-date data should be the fundamental starting point for a research programme in any institute and/or network that might be set up.

130. He thought the additional information from FAO sources substantiated the case of the mission team for the importance of certain species in the diet of peoples of the developing countries, namely, tomatoes, onions, leafy greens and species of melons, which latter were often regarded as fruits.

131. The data in the FAO Production Yearbook for 1974 showed that the total area under vegetables in developing countries exceeded the total area for white potatoes, for example, a crop for which the CG supported an international centre. It also exceeded the total for crops like tobacco and fibres. Another interesting fact was that the total area under vegetables in the developed countries exceeds that in the developing countries even though the total population was much less. However the list reported only the marketed vegetables and probably did not represent more than one third of the total consumption in the developing countries.

132. Other tables produced by the Secretary confirmed the evidence presented by Dr. Munger on the contribution of vegetables to calories and protein in the diet.

133. A basic question in the light of these interesting statistics was why, in fact, don't vegetables contribute more to the diet of people in developing countries. He thought this was a problem that members may wish to explore further. Data from the Philippines revealed that expenditure on vegetables was of the order of 12 per cent of total expenditure on food which was higher than their contribution to the diet in terms of calories and proteins.

134. He felt that one important consideration not specifically covered in the Report was the high income elasticity of vegetables. This meant that there was a tendency for more vegetables to be consumed in the better endowed countries than the very poor, although the data may be somewhat skewed since so many of the vegetables, and particularly the leafy greens, were not marketed and thus not recorded.

135. Other data presented by the Secretary included Table 5 showing that in Madagascar nearly three-quarters of vegetables produced were of the leafy kind (brèdes) while tomatoes, onions, green legumes and curcubits were the main marketed species; and Table 6 giving data from Togo which indicated the very large number of species consumed as well as the important complementary role of vegetables in the diets of the various tribes regardless of whether they consumed cereals or root crops as the staple food. Data from the Philippines (not shown) revealed rather more strikingly the extraordinary large number of species, particularly the leafy greens, consumed although the figures suggested that only about ten of these were really important to the diet.

136. The Chairman, in opening the general discussion, took up the question of why vegetables rather than grain were not used more extensively as a source of food if it were possible, as the data had demonstrated, to produce on a unit area basis the essential calories as well as an enriched diet from vegetables. The answer became clear when vegetables were compared with grain, acre by acre, at a given level of cost. It was simply a case of Engel's law becoming firmly established whereupon with rising income people

tended to diversify their diet and consume more expensive foods. This was true of both the developed and developing countries wherein with higher incomes the consumption of vegetables increased in proportion to grain or potatoes which at low levels of income provided the essential calories and minimum protein supply.

137. He stressed the importance of understanding this relationship since the problem before TAC was not so much to provide food for higher incomes but to recognize the possibility that vegetables were an important, though not necessarily predominant, part in the diets of the low income people. If TAC took this approach then within its terms of reference it had a stronger case for doing special work on vegetables.

138. While realizing the difficulties faced by the mission in obtaining substantive data he invited Professor Munger and TAC members to comment on the question he had put. He would like to know why the tomato, for example, was given priority by so many people. Did it promise to provide the benefits of a vegetable diet more cheaply than other vegetables or was it simply because the tomato was richer than any other vegetable, kilogram for kilogram? On the other hand, were the leafy vegetables such high yielders as people made out that they might be at a favourable cost advantage as compared with cereals? Or in other words, could any of the mission team or TAC members on the basis of their own observations make a more definite statement on the extent to which vegetables in developing countries provided a critical and significant proportion of the diet under present conditions?

139. Professor Munger responded by comparing the data presented by the Secretary and the information he had himself collected during the mission. He commented on the apparent decline in the daily intake of vegetables per capita in the last decade or more. For example, in India the 1970 figure he obtained was around 53 grams of vegetables per capita per day which was only 23 per cent of the intake recommended by nutritionists. This compared with an average daily vegetable consumption of 142 grams according to the Indian Council of Medical Research surveys over the period 1935-48. In Thailand and Indonesia the present average daily intake was also around 50 grams.

140. He felt the production data he had presented applied more to potential yields and not those actually realised in tropical developing countries. Mainly as a result of diseases such as the bacterial and Fusarium wilts, tobacco mosaic virus, and nematode problems, the yields of tomatoes, for example, were generally very low. He emphasized the need for a rather concentrated and sustained multiple disease resistance research effort on tomatoes in order to realize the potential of this crop in the tropics.

141. Production of the leafy vegetables and some of the legumes was probably closer to potential values. In China they appeared to be making greater use of the leafy vegetables with daily supply rates of around a half kilogram per person which was slightly greater than the figure reported for most developing countries.

142. In many developing countries, as in China, the benefits from the high labour intensity of vegetable production were recognized and for this reason any efforts to boost production were welcomed. Professor Munger, however, along with others emphasized the need to increase the vegetable production of the poorer people. In Indonesia, for example, virtually all of the research effort was applied to the European-type and readily-marketed vegetables such as cabbage, white potatoes and French beans on land representing only 20 per cent of the total area under production. On the other hand, in the poorer lowlands, making up the 80 per cent of the acreage but only 66 per cent of total production, vegetables like yard-long beans grown in small plots received scant attention.

143. He concluded that the statistical data was not reliable in respect of the production of these so-called native vegetables very few of which reached the larger markets and thus were not recorded.

144. One member raised the point that while vegetables undoubtedly were important the amounts of calories and protein they supplied to the diet tended to be overestimated when calculated on a dry-matter basis and particularly keeping in mind the lower concentration of calories and protein compared with soybeans, for example, and the amounts of vegetables consumed by people. However, he wanted to emphasize the conclusion that vegetables contained vital nutrients other than energy and protein and particularly vitamins, not only vitamin A but vitamin C, and in some cases vitamin B2 which was usually less in rice and other grains. Vegetables thus provided a good supplement to the staple diet; they often provided a high acid content as well as a good balance of calcium and phosphorus together with some micro-elements.
145. Another member expressed the opinion that it was not so much a question of the nutritional value of vegetables, which he felt it was now well established, but more a problem of storage and transportation since with their high water content vegetables very rapidly decayed under tropical conditions. Unless these constraints were overcome, to a large extent by the advancement of dehydration techniques, vegetables would always remain a major item for rural populations but of much less importance to the dense and increasing populations of the cities.
146. The importance of having adequate dehydration facilities was stressed by other speakers who saw their value both for capitalizing on over production and for providing vegetables over a longer period in areas of marked seasonal supply and where production depended on availability of water, for example.
147. In direct response to the Chairman's question of why people don't eat more vegetables a plausible explanation was that very commonly a modest increase in production resulted in the disappearance of the market. This was particularly true of vegetables like garlic, onion, tomatoes and white potatoes. A logical conclusion was that although vegetables were cheap to produce they were expensive to consume by the time they reached the market. In this regard a member cited the rather sobering experience in the Philippines where as a result of the launching of a so-called "Green Revolution" programme there was a tremendous over-production of vegetables which almost wrecked the whole industry.
148. The Chairman raised the point that TAC was really not very interested in developing vegetable research for the sake of promoting exports. As it had been in earlier discussions on vegetables, TAC's concern was with the dietary needs of the poorer people. He felt, therefore, that a particular deficit of the data available and presented in the Report and addendum from the Secretariat was the lack of adequate separation of items of export from the domestically consumed items.
149. Dr. Munger added that the mission was aware of the problems of the over-production and marketing problems of vegetables and, in fact, part of the rationale for the team stressing the need for research on species grown and eaten in rural areas was that there was less danger of incurring a surplus production. In rural areas where people are producing vegetables only for themselves and/or for the local market they were more likely to grow those varieties they wanted and in quantities that could be consumed locally.
150. In addition he drew attention to the information from the nutritionists in countries visited which indicated that rural people generally had fewer vegetables than the urban peoples. Data from a survey of the Institute of Nutrition in Hyderabad, as well as from Thailand gave specific figures showing a marked difference in the amounts although the figures were perhaps suspect as they did not take into account home-grown vegetables. He recalled that many years ago a nutritionist in Egypt had told him there was too much emphasis on vegetables for commercial use and this had been re-echoed in every country during the mission's visits. Considering that in most developing countries the rural population makes up for 70 to 80 per cent of the total it seemed obvious that the emphasis should be on the vegetables of that sector. He thought that when the urban populations increased in proportion to the rural, the needs for good transport and storage facilities would become more important.

151. In replying to a comment that perhaps more attention should have been given in the report to the green vegetables, and particularly those more suited to the drier regions such as the Sahelian and Sudan zones and the Near East, Dr. Munger pointed out that this was a constant matter for consideration by the team but because they had heard about so many species which were important in various countries, it was difficult to determine how many should be stressed in the report. He referred to paragraphs 30 and 63 of the report where it was stated that there were a number of leafy greens which seemed to have considerable potential and therefore part of the international effort should involve exploratory work on these to determine their relative merits and potentials.

152. One member who had first-hand knowledge of the particular preferences of people in the diverse rural areas of India found it difficult to reconcile the aims of the mission at improving rural nutrition through availability of cheap vegetables with the stated priority given to tomatoes, peppers and related crops.

153. A number of speakers expressed the need for exploratory research to determine both the correct priorities among the many species of vegetables and the relative importance of the various constraints to production and consumption in different regions.

154. The view was expressed that it was necessary to examine the whole question of vegetables in terms of their present and potential contribution to nutrition as well as the economy in developing countries and in comparison with efforts being made in other crops such as the grain legumes. The dietary habits of the various peoples and possible future changes in these were also important considerations.

155. In respect of the specific constraints to consumption of vegetables in various countries it was considered necessary to determine the extent to which these could be surmounted before assessing the opportunity for productive research.

156. One member expressed the opinion that the availability of good seeds was a major problem facing increased production as was also identified by the mission. Another important constraint was that of pests and diseases which needed careful study in relation to the production of specific vegetables in both the humid tropics and the drier areas as well as to the expansion and intensification of production of some of the leafy vegetables at present grown on a very localized scale. Considering the emphasis given to tomatoes in all countries visited it was seen that the vulnerability to disease of this crop in the wet season was a major problem. It was reported that AVRDC was devoting attention to this as well as to the problem of inability to set fruit under high night temperatures.

157. In commenting on a number of the points raised by members, Dr. Marciano said that in effect the mission was recommending priorities for research on three crops, namely tomatoes, amaranths and the green legumes, the last two of which comprised a number of species. Having to deal with groups of crops like this made the question of determining final priorities very difficult. The team had given emphasis to amaranths and the green legumes for improving the food supplies of the rural populations, particularly in the humid tropics where these crops are normally grown. According to the results of investigations by the team and from the information given it, the amaranths were clearly the most important variety of indigenous vegetables eaten in tropical Asia and Africa. The tomato, on the other hand, was given priority because in every country there was considerable interest in it since it was a more diversified crop. As well as being eaten by both the rural and urban populations it was an important cash crop.

158. As regards the relative proportion of vegetables consumed by urban and rural populations he remarked that the latter appeared to be eating less and less vegetables which in some instances was due to the attraction of good prices at city markets. He concluded that this changing pattern of production and consumption warranted study particularly in relation to the needs for drying or any other process of preservation and principally on the amaranths and other leafy greens.

159. On the question of the most appropriate organizational form of an international effort in vegetable research there was no consensus in agreement with the mission's recommendation for establishing an international centre fully dedicated to vegetable research.

160. It was suggested that instead of having the very great expenditure and problems of setting up one single centre, it might be possible to use one of the existing international centres as the headquarters of a network of researchers at other centres where vegetables were part of the cropping systems being studied. In this way the overhead capital investment could be shared.

161. Mention was made of the fact that in many developing countries home gardens or market gardens have been developed as an integral part of the farming system and that, consequently, the work at IITA on improving vegetable production within a farming system was appropriate even though it formed a small element of the programme.

162. However, as pointed out by Dr. Marcano when reiterating the mission's case against use of one of the existing international centres, the efforts at IITA of one man working on tomatoes was not likely to solve any of the major problems of this crop in the tropics. This research would probably lead to better recognition of the tomato for a place in cropping systems but for greatest efficiency it was important to have good tomatoes which produced well under tropical conditions.

163. On the other hand it was argued that the integration of vegetable growing with the main cash crop of an area appeared to be a problem which would become universal and therefore it was timely to take the approach of incorporating research on vegetables with that on the main cash crops.

164. The point was raised that in view of the diversity of the vegetables, even taking into account the shorter priority list of the mission, and the often high location-specificity of some varieties in terms both of their importance and adaptation, it would be necessary to clearly identify the common base for research activity at a single international centre if this was to be established.

165. One speaker doubted if the suggested total staff of 15 senior scientists in the new international centre, as recommended in the report (para. 90), would be adequate in view of the very little work that has been done or is being done on a number of the vegetable crops.

166. The Chairman reminded members that TAC was not obliged to be disposed to solving the problem in the traditional way by recommending a new international centre. It was, in fact, quite proper for TAC to recommend a number of approaches to the problem, but if one approach seemed better than others, then it had the obligation to put this forward.

167. He remarked that he was troubled by the concept of a single centre proposing to deal with the enormous range of possibilities and problems outlined in the report. On the other hand the Report did nominate two or three other possibilities and he indicated his wish to have further discussion in the closed session on the idea of encouraging research in a network of national institutions under the control of some entity which would be responsible for supervising the quality of the work done. He believed that the proposal for setting up an International Vegetable Research Board which would have at its disposal grant funds to support vegetable research where required, might be a possible answer.

168. A member suggested that it might be helpful to establish good contacts with the International Society for Horticultural Science (ISHS), in the Netherlands. This body was involved in coordinating research work through several subcommittees dealing with specific topics, for example, the plant protection commission, and it was really effective in bringing people together from all over the world for special subjects. He referred to a paper (distributed to members) in the Society's journal, Chronica Horticulturae, by Dr. B. Chaudhury of the Indian Agricultural Research Institute calling for the ISHS to initiate some action towards increasing the production of vegetables in the tropics.

169. Replying to the question as to why the mission had restricted its study mainly to the humid tropical countries, and particularly to Asia, and not considered the extensive semi-arid tropical countries of Africa and the Near East, Dr. Marcano referred to the earlier discussions in TAC in which Asia was the main area of interest at least for the initial international effort in vegetable research, and that was where the present study had been concentrated. He believed that as in the case of the cereals and grain legumes, when the priorities for crop species and research in other areas were considered they would be found to be different from those determined as most important in the area covered by the present report.

170. It was pointed out by the Chairman that the relationship between any proposal for vegetable research that TAC recommended and the work of the Asian Vegetable Research and Development Centre (AVRDC) in Taiwan was a matter that had not been discussed to any significant extent in the report of the TAC mission. He understood that the Board and Director of AVRDC would welcome the development of a relationship with any new centre and would make all its knowledge, information and material available which would be beneficial to any effort which TAC initiated. However he was not prepared to speculate on what this might imply for the future of AVRDC.

171. In closed session the Chairman began by remarking that vegetable research was the most difficult question TAC had debated for some time. He referred to the division of opinion in TAC about the priority amongst the different vegetable species, although there was general agreement that it was not particularly interested in research on those vegetables designed for the high-quality, high-priced export market.

172. TAC was, however, interested in improving the food supply of the poorer peoples. In this respect, vegetables undoubtedly added to the quality of the diet and many species contributed significantly to the calorie intake as well. Since TAC had given highest priority to the provision of calories to offset the threat of starvation, it was important to recognize that vegetables were often playing the role of the calorie supplier when this could not be met adequately by meat or grain.

173. There was also the point of view that perhaps too much emphasis had been given to calories alone, and the nutritional benefits of a more diverse diet had to some extent been neglected.

174. One problem which added to the dilemma of determining the real importance of vegetables was the very inadequate amount of statistical data. For instance, although it was evident that there were very few people who did not have a significant intake of vegetables in their diet on an annual basis, it was a much more difficult matter to ascertain whether or not they had a regular, week by week, supply.

175. The Chairman pointed out that, although vegetables were recognized as important in the diet of most people and something more was needed in research on vegetables, there had been no consensus amongst TAC members as to the best approach to be taken. Earlier, some members had felt that whole-hearted support should have been given to the work begun in Taiwan (AVRDC) but this was confronted with political problems. The difficulty of overcoming this problem led TAC to conclude that, if there was a real need for encouraging vegetable research, it was necessary to look for a more suitable location for this purpose.

176. He referred to the initiative of the Rockefeller Foundation in offering to carry out a study for TAC. This resulted in the McClung report on a "Proposal for Formation of an International Vegetable Research Institute for the Tropics (IVRIT)", December 1974.

177. The Chairman recounted that, in order to more fully investigate the real needs of vegetable research in Africa as well as in Asia, the TAC had decided to send a mission. He expressed his disappointment at the shortcomings in the report of the appraisal mission as regards statistical data although this was no fault of theirs. He believed that, in general, most TAC members were surprised to read of the apparent preferences for this or that kind of vegetable.

178. While not professing to be an authority on vegetables, he had found on reading the report that his intuitive reaction was he could not accept it in its present form. He did not see the case for a single international research institute, particularly in view of the wide range of vegetables and the fact that many of the problems were markedly location-specific.

179. However, the report had now convinced him of the necessity for TAC to enter the field of vegetable research. Rather than recommend another centre in Asia working on some half a dozen vegetables and also serving Africa, he would prefer to develop the notion, somewhat along the lines proposed by an observer, of having a professional group, knowledgeable and competent in the needs of tropical vegetable research, which would make recommendations for significant support to be given for work on particular vegetables at appropriate institutions including both international and national centres. If, in time, the evidence indicated a need for a new research establishment to be built alongside or by way of supplementing an existing centre, then the group could recommend accordingly. In this way the work inevitably needed on tomatoes, for example, in two or three areas, or for that matter on any of the priority species of vegetables, could be done without pretending that TAC was recommending the erection of a single centre to serve the whole developing world on the vegetable front.

180. Responding to the Chairman's call for a full debate on the topic, one member felt there was a need to bring more expertise to bear on what were the specific constraints to increasing production of vegetables in some of the areas. He believed it was necessary to go beyond saying that one or another particular vegetable was important and to identify the specific problems which, when solved, had rather wide applicability. He cited as an example the physiological problem of fruit settling of tomatoes under high temperatures. This had to be solved before tomatoes could be grown in all seasons in the hot humid tropics but once it had been solved in one place it was applicable in all other situations where the problem existed. Similarly with disease problems, once a resistant variety has been developed in one place the technology could be tried in another area with the same problem or at least the methodology of dealing with the problem could be transferred. This approach could be attempted for the six or more important species of tropical vegetables.

181. While the majority of members agreed with the conclusion of the TAC appraisal mission that there was a definite need for additional internationally-supported research there was no similar degree of unanimity on the question of what form this should take.

182. Dr. Marcano pointed out that the mission had concluded there was a good case for establishing an international centre. They felt it was essential to have a basic nucleus of research workers to achieve results directly and to encourage research elsewhere. He cited the example of the impact of IRRI on rice research development. Initially there were few rice experiments in the developing countries but following the establishment of IRRI there were now many.

183. While stressing the need for a single centre he agreed it was necessary for TAC to examine the whole question in further detail. Two members who saw the need for an international centre to provide the impetus for research and to pass on information and to distribute seed, etc., suggested that it should not be a large expensive venture but of a size which could be allocated among existing centres. They felt it should at least be attached to one of the Centres to make use of the existing facilities of library, staff accommodation, and so on.

184. However, another member felt that none of the existing international centres would be greatly interested in taking on a vegetable research programme. On the other hand it was possible for a national institution to be supported and to undertake an expanded programme so long as it was prepared to work on a regional basis. There were four principal functions of such a centre: (i) germ plasm collection and distribution to interested workers; (ii) training in both production and the processing and preservation technologies; (iii) seed technology, which was considered to be one of the critical limiting factors; and (iv) a focal point for the meeting of research workers.

185. What one strong research centre could achieve in relation to the above was evidenced by the work of the AVRDC. As was pointed out, for the first time they had assembled within a space of about two years some 2,500 or 3,000 types of mungbeans which was a very important leguminous vegetable. This ability of a centre to collect, assemble and describe a number of valuable genotypes was seen to be very important in the production of improved varieties.

186. With respect to the future role of AVRDC in international vegetable research one member contended that there were no real reasons, either political or financial, why the work of this institute should not be included in any additional international effort. It should, at least, be incorporated into any proposed network in Asia and if direct financing from the CGIAR was not possible then some indirect means should be found.

187. Dr. Marciano mentioned that the TAC mission team had considered the work of the AVRDC and its future role in the international research effort. They had reached the conclusion it was better to have a new centre separate from AVRDC mainly for the reasons that there were differences in approach between AVRDC and what the mission was recommending on research needs, and particularly as AVRDC was more interested in the commercial varieties of vegetables.

188. The concept of establishing an International Vegetable Research Board or similar body, as suggested by Dr. Wortman and for which the Chairman had a similar notion, received strong support from four or five members. The International Society for Horticultural Science was mentioned as possibly able to assist and with several specialists in both the developed and developing countries, a small but august body could be easily constituted.

189. Such an International Board could coordinate the research activities in various countries and channel funds to support and strengthen existing national institutions as well as having appropriate International Centres undertake specialized projects. As regards the latter, one member felt it would not be too great a burden on an International Centre currently working on legumes to look at a specific problem on one of the beans, for example, the pods of which were utilized when green.

190. One of the reasons given in support of having an International Vegetable Research Board rather than establishing a new international centre, was that the latter could not deal with the many species of vegetables and the problems which were often location-specific. Some of the vegetable species and particularly the amaranths amongst the leafy greens, to which the TAC mission gave priority, had had very little work done on them and this magnified the problems. Furthermore, although there were good reasons why an international effort in vegetable research should be concentrated in Asia, at least initially, some members believed there were other areas which deserved attention. According to one member, at least three regions, viz, the humid tropics, the semi-arid tropics and the sub-tropics, which although overlapping to some extent in certain vegetable species, should all be considered in the suggested international research effort.



191. The fact that even in one country there were different kinds of vegetable or different species in different areas, with different methods of production and processing, pointed to the need to support and strengthen national institutions and where possible to identify those which could function on a regional basis. An International Board or similar overall body could then be charged with developing the fullest cooperation amongst the national institutions.

192. Some members felt this approach would not only serve to improve the areas of immediate application of existing knowledge and overall development in tropical vegetables but also identify the outstanding problems which could be further discussed and decisions made on how best they could be tackled.

193. In respect of the priorities among the vegetable species most members felt the need for more information especially statistical data on the consumption of different vegetables by the rural populations in particular and on the real nutritional value of vegetables in the diet of these people. However, as was pointed out by Dr. Marciano, the rapid increase in urban populations throughout the developing countries should not be overlooked in relation to determining priorities amongst vegetables. Also vegetables were an important export item in some countries and therefore their economic importance should not be disregarded.

194. Members agreed TAC should be mainly concerned with the species grown by the kitchen gardener and the home market gardener although it was appreciated that in certain countries consideration should be given to vegetables which were produced for export. Recognizing the very wide range of tropical vegetables and that many species were quite location-specific, TAC members complimented the mission team for its efforts in selecting the priority vegetables which either were representative of many tropical developing countries or appeared to provide a significant amount of nutrition to the low income group of people.

195. There was a consensus that tomatoes and some other solanaceous species had high priority in most countries but generally there was much less certainty about other vegetables although on the basis of the appraisal team's findings and supplementary information given at the meeting the amaranths were considered as very important particularly in rural areas.

196. Dr. Marciano reiterated that while the tomato was universal and amaranths were consumed in African and Latin American countries as well, the team had given preference to those vegetable species which were important in the humid tropics of Asia.

197. Some members brought attention to the fact that production of many vegetables and particularly the leafy greens was dependent on the rainy season, or the availability of water in drier areas, and therefore to provide these species out-of-season as well as coping with periods of oversupply and to reduce losses by spoilage, the provision of dehydration facilities was considered really important. One member referred to the many highly successful factories for dehydrated vegetables which were set up in East African countries during the last war but had since been closed down for lack of markets. Reference was made also to the abundance of expertise in vegetable processing which was now available.

198. With regard to the possibilities for transfer of technology on vegetable production in relation to the needs of research in tropical countries, one member believed the solutions were available for many of the problems, such as the setting of tomatoes under high temperatures, resistance to nematodes and some five diseases common to tomatoes. He regarded the principal constraint to increased vegetable production in tropical developing countries as being merely the difficulty of making the technology available to the people growing vegetables in the different regions.

199. In calling for a cooperative programme on vegetable research and particularly cooperation between research networks involving institutions not only in developing countries but also in developed countries, another member commented that the tomato grown for export in his country was the famous Moneymaker which variety had been bred initially in California. Similarly other vegetable species had been, and could be, transferred.

200. In response to the concern expressed by a member over the possible use of funds for research on vegetables to the detriment of the ongoing work on crops to which TAC gave higher priority, the Chairman stated that TAC would be unwilling to recommend the curtailment of existing programmes or those to be soon developed, such as ICARDA, in order to make significant room for vegetables. However, he believed the thinking amongst TAC members was to raise the status of vegetables in the priorities for research; possibly to the level of 1b as suggested by one member. And if in consultation with the CGIAR it was clear the World Food Council recommendations were to be taken seriously and in real terms with a consequential increase in the amount of support for international agricultural research, then it would be a more tolerable concept to channel a share of this growth to vegetable research.

201. The Chairman believed that one of the most interesting features of the report and the ensuing discussion was the enormous range of possibilities that existed. Vegetables could not be considered as a single homogeneous commodity in the marketable sense, like wheat for example, since there was a great number of varieties many of which were location-specific. Obviously it would be a very different process of selecting where where research activities could be strengthened, or if there was to be a single international centre what items would be chosen as most significant, which in turn would be influenced by the location of the centre itself.

202. He suggested that as a first step all the information from various sources, including the AVRDC in Taiwan, should be brought together and even though it was still inadequate for a thorough analysis, this would amount to a useful further contribution.

203. He asked the Secretariat to take up the various proposals and suggestions which had been made for supporting vegetable research in tropical developing countries and on the basis of this prepare a pros and cons paper for the next TAC meeting in May. Specific topics to be covered were more information on the kinds of vegetables which appeared to contribute most to the food problem of the poorer people and what form of organization should any additional international effort in vegetable research take.

204. As regards the latter, there had been several suggestions ranging from a traditional international centre over to some form of coordination process, or research network, which may or may not itself be based on a small international centre.

205. The Chairman felt it would be helpful if all these suggestions were brought out in the form of a pros and cons statement on each. In this way the problems as well as the possibilities would be clarified. He invited Dr. Marcano and his colleagues to make a further valuable contribution by making available to the Secretariat the outcome of any additional discussions which were likely to follow on the report of the appraisal mission.

206. In conclusion he reiterated that for TAC vegetable research was a difficult field and therefore it was unlikely that discussion on the subject would finish at the May meeting and if this was found to be the case it would certainly be on the agenda for the October meeting. He believed the step-by-step approach was the best to adopt.

207. The session concluded with agreement for TAC to proceed along the lines the Chairman had suggested.

Relations with Advanced Scientific Institutions and the Proposed International Agricultural Development Service (IADS) (Agenda Item 5)

208. In opening the discussion on this item, the Chairman pointed out that in effect this comprised two items — the relations of the IARC's with advanced scientific institutions and the proposal of the Rockefeller Foundation to set up an International Agricultural Development Service (IADS). He recalled TAC's brief discussion at its 11th meeting on this proposal associated with Dr. Wortman's name primarily because it seemed to promise some further means of strengthening national research capacity.

209. He then invited Dr. Wortman to give an account of the expected functions of the IADS and in particular how it was likely to assist countries strengthen their agricultural research capacity.

210. In explaining how the need for the IADS arose Dr. Wortman recalled the experience of the Rockefeller Foundation over the last 3-4 years during which a number of developing countries had requested help to increase the production of basic food crops towards self-sufficiency. Some governments also had expressed concern at the restlessness among the rural populations and wanted, therefore, to give more attention to agricultural development as a means of increasing rural prosperity and employment. There was also a greater awareness of the improved availability of technology through the efforts of the Consultative Group and other agencies as well as the improved availability of fertilizers and many nations were wanting to do something effective in agricultural development. But the main problem was how to implement development programmes in rural agriculture especially where a large number of farmers was involved. This required the efforts of a number of institutions working in concert.

211. Another factor was the lack of professional staff in the various foundations which had shown interest in assisting the so-called world food problem and this had to be considered in efforts to create a mechanism whereby the additional funds from these sources could be channelled to the poorer developing countries.

212. As an example of the need for the IADS Dr. Wortman cited the case in Nepal where a proposed integrated cereal programme to be funded by USAID could not get underway for lack of assistance to implement it. The programme included a maize and wheat component involving CIMMYT and a rice and multiple cropping component involving IRRI as well as a seed production improvement project, and possibly some potato work assisted by CIP. Originally it had been hoped that IRRI would take the responsibility as the principal contractor and subcontract to the other Centres but the IRRI Board decided that such a comprehensive programme was beyond the scope of the IRRI mandate. CIMMYT took a similar view. The IADS, however, was able to come to the assistance of the Government and find a solution to the problem.

213. He believed that the IADS had such a role to play in extending the outreach work of the International Centres. CIMMYT, for example, simply could not address the problem of increasing maize yields in all developing countries, for according to FAO data there were some 126 countries with significant areas under maize. Whereas yields in some developed countries averaged from 6 to more than 7 tonnes/hectare, some 106 countries had yields of 3 tonnes/hectare or less, and 78 countries  $1\frac{1}{2}$  tonnes/hectare or less.

214. There was a need for some mechanism to help governments create the national capabilities to make the most of the improved technology developed at International Centres. If necessary, they would pull in the appropriate expertise from wherever they could get it to achieve rapid and economical development in agriculture. A major constraint, however, was a poor availability of the right kind of expertise. People trained in the institutions of the developed countries often had little knowledge of the problems of the smaller developing countries and many advanced institutions were strongly oriented towards disciplinary research. On the other hand it was difficult to get the experienced people in the developing countries to become involved in the real problems and assist in development efforts. Also, often the research, training and education were not directly related

to the development efforts and remained aloof from them. This indicated the need for a tremendous effort in advanced management training in developing countries to achieve increased agricultural production and more rapid rural development.

215. A further constraint, revealed by an investigation on behalf of the IADS, was the lack of scientific and technical literature in a form which the development planners and policy makers could understand. Often these people were military men or professionals in disciplines other than agricultural science.

216. Dr. Wortman recounted that the IADS originated from the realization that something was needed to enable countries to draw information and materials to them in preference to waiting for this to be given through other means.

217. Rather than create a new, large institution, in the United States, which would take some 3 to 4 years to set up, and have to invest in development projects on its own behalf to meet overheads, it was decided to establish an independent organization to work out of the offices of the Rockefeller Foundation but have at its disposal any of the services of the Foundation which had been successfully used in the past in support of developing countries' programmes.

218. One of the main objectives of the IADS would be to use its rather extreme flexibility to obtain grant funds or contract funds from any source and use these in support of any developing country's agricultural development programme provided that the country first requests this assistance and provided the Board of IADS approved.

219. The Board of Trustees of the IADS, which at present had 10 members but could be expanded to 18, consists of the following: Dr. G. Harrar (Chairman), Dr. J. Hannah, Dr. G. Camus, Dr. C. Hardin, Mr. J. Drillon, Dr. V. Barco, Dr. D. Hopper, Prof. T. Schults, and Dr. R. Cummings.

220. Dr. Wortman pointed out that the Board had been composed in this way so as to cover all the possible interests which the IADS might encounter. Arrangements, identical to those used by the International Centres, had been made with the International Institute of Education to enable persons of any nationality to be employed by the IADS which was incorporated under the laws of the State of New York.

221. The IADS became operational in January 1976 and already had some people employed. Its proposed programme was still not finalized but basically it would take two main lines: (i) direct services to individual countries; and (ii) provision of supporting activities, particularly intensified training in specific fields.

222. As regards the former he mentioned that some twelve countries had already shown interest and there had been direct government invitations from Nepal and Botswana to which IADS has responded by sending missions.

223. IADS was particularly interested in assisting the smaller and poorer countries which did not have the extent of services in each professional field needed to develop their agricultural potentials. Many people appeared to be of the opinion that these smaller countries were being neglected by the assistance community. As pointed out by Dr. Wortman there were some 60 countries with populations of less than 5 million and of these 34 had populations of less than 1 million.

224. He added that in some cases IADS would provide the services of senior agricultural specialists to countries where the need arose.

225. In respect of the supporting activities in which IADS could become involved he singled out those of intensive training of production specialists, reorientation of agricultural education services within developing countries, and providing for more sophisticated short-term intensive training in agricultural systems management.

226. He commented that the term "production specialist" was intended to replace the term "extension worker" which was now out of favour and rather than demonstrate research findings they would be trained to go on to the farmers' fields and install experiments and thus help farmers identify the combination of practices which would provide the highest economic returns.

227. Some of the unique characteristics which IADS was considered as having included its ability to combine grant and contract funds in support of individual country programmes, to be able to respond quickly to requests, and to be in a position to refer particular activities of a programme to another organization or institution which was better able to undertake the work.

228. The point was stressed that the IADS would not develop its own programmes in any country but that it would simply provide services or personnel, the latter working with and on behalf of the responsible authorities in the developing country. The services would be production and action oriented and would include, where necessary, the strengthening of national research capabilities but only as part of the broader country development effort.

229. Dr. Wortman thought that it was better to consider IADS as a mechanism rather than an organization - a mechanism which both the developing countries and assistance agencies could use when the need arose. He added that IADS was still largely an experiment and although at present it was being operated out of the offices of the Rockefeller Foundation for reasons of speed, low overheads and to cover the risks involved, there was the intention, if it proved successful, to convert it to a fully international organization probably situated outside the United States.

230. In conclusion he reiterated that IADS was still very much an experiment and that it was bound to operate only in response to an invitation from a developing country government and not through any third party. It was also dependent for success on the funds made available to it and any proposals had to meet with the approval of the Board of IADS.

231. He believed that similar small organizations, or mechanisms, could be set up in the dominantly Arabic and Latin American sectors sensibly to overcome the language barrier. He felt that FAO could become much more vigorously involved in looking to the needs of individual countries and he hoped that the IADS and FAO could mutually benefit each other.

232. Finally Dr. Wortman gave an example of where the success of an international development should not be measured in terms of the number of staff with higher degrees, or the number of experiment stations, or the size of the budget, but rather by impact that it has on the overall development of the country concerned.

233. In opening the discussion, the Chairman asked if IADS, with its emphasis on production, would respond to requests from governments by dealing solely with those matters recognized by the government as needed for development, or was it intending to comment and advise on the policy structures necessary to achieve a desired objective. Would it be involved, for example, in the business of devising policies which would provide fertilizers to farmers or a better extension service.

234. Dr. Wortman replied that the main concern of IADS was to help governments raise farm incomes and if increasing the application of fertilizers was the only way then it would advise accordingly. In its work to date, however, IADS had not been involved in any detailed analysis of constraints and weaknesses but more in determining the extent and depth of interest amongst the administrators and policy makers. The most IADS would become involved in matters of policy would be to suggest options for consideration by the government.

235. In response to a member's conjecture that the need to make an analysis of a situation in the country would take six months or longer before any action or programme development could be attempted, Dr. Wortman commented that usually IADS would not wait particularly in cases where they knew development of a certain crop production programme was what was needed by the government concerned.

236. One TAC member from a developing country welcomed the proposals for the IADS and indicated there was a role for such services in his country particularly in providing the initiative to development by demonstrating the possible rewards from making better use of the available local expertise and facilities. Politicians in particular need these kind of examples to show them the way.

237. Services such as IADS could also provide a faster way of determining what development was needed to be carried out in an area. He foresaw no problem of it not doing what it was asked to do and he felt that it would be mainly involved in helping a government determine how to best go about things and less about what should be done. However, he had reservations about financing in that he felt the agencies would not be inclined to contract to a government through a third party.

238. When it was pointed out that the intended activities of the IADS in transforming knowledge into production were very similar to those of FAO, Dr. Wortman admitted he was not fully conversant with the services provided by FAO but felt that IADS had an advantage in being able to use grant funds with contract funds in whatever combination that might be available and in the interest of the country concerned. He believed that in being a private, professional organization, IADS would not be influenced by some of the political constraints which affected any official agency.

239. With regard to the provision of highly qualified long-term leaders to assist governments in development programmes, he believed there were a number of possibilities in which they might be employed. On the basis of the experiences of the Rockefeller Foundation a country might require a research director or merely a person to help with documentation. He again stressed that no long-term leader would be provided unless the government requested one.

240. One TAC member drew attention to the need for long-term leaders in developing countries pointing out that for many years the bilateral schemes and outreach programmes had been less effective than hoped for through the lack of local people with experience and training to trouble-shoot on the spot. He looked to an organization like IADS to provide a framework in which experienced persons of the kind required could make a career. A point raised by another member was the need to take care that these long-term leaders did not stay in one country too long so much so that the country came to depend on them and consequently restricted the opportunities for local expertise.

241. The FAO representative to the meeting said he welcomed any new initiative to assist the development of the poorer nations particularly in view of the tremendous task involved but found it difficult at the present stage to see how this additional development service differed from FAO, or for that matter, other agencies in the development field. As he pointed out FAO itself, as the largest development assistance organization in the field of agriculture, provided many different kinds of arrangements using a combination of funds from various sources and therefore the IADS was not unique in this respect.

242. On the question of the provision of long-term leaders he thought that one of the problems confronting IADS was the difficulty of obtaining the release of highly qualified staffs from universities and other research institutions for more than 2-3 years. He referred also to the intense world competition for the experience of the kind IADS would need. Even FAO was not always able to compete against some bilateral agencies and private companies.

243. The Chairman concluded discussion of Dr. Wortman's presentation by commenting that although it had now become clear to TAC that strengthening of national research capacity would not be a primary objective of the IADS it could be a component in an overall development programme in any one country. As he now understood the proposed activities of this new service he felt it important that a constructive approach be adopted in view of possible conflicts of interest between the different organizations involved in assisting developing countries. He cited the example of a problem of determining the limits of activities of an International Centre relative to the work of FAO. CIMMYT had been asked by a group of Central American countries for direct assistance in organizing their research and extension activities which was a function that properly belonged to FAO. While fully agreeing that there was a real need for this kind of assistance he expressed TAC's concern that Centres as part of their regional service activity should not be expected to virtually take over the development and management of national research systems since there was a limit to what the Centres could do. However, TAC and Centres' Directors agreed that if this problem was not attended to a good many of the fruits and legitimate expectations of international research would be denied. From its inception, TAC had recognized the need for national research and extension systems quite apart from the further requirements of development programmes and although dealing with them was acknowledged as an extremely delicate problem, without them one had to be skeptical about the returns on the research of the Centres. Many felt that the establishment of a proper relationship between FAO and the Centres should begin to meet this need.

244. The Chairman expressed pleasure at the welcome afforded by FAO to the IADS and believed much good could only result from further constructive discussion between the two.

245. Turning to the subject of relations with advanced scientific institutions, the Chairman indicated there were two aspects which he wished to table for discussion. One was the relation between the IARC's and advanced institutions, whether in developed or less-developed countries, and the other was the extent to which particular research such as nitrogen fixation, could best be carried out in one of the advanced institutes but with the work linked to that of the Centres concerned.

246. In respect of the first aspect he suggested that the type of relationship that could be established was well illustrated by the example of Dr. Brady, IRRI, visiting Canberra and establishing an understanding whereby the Australian Government would be prepared to support work on particular problems in which Australian scientists were known to be able to make a contribution including provision for these scientists to work at IRRI for either short periods or for six months or more. The important point was that the agreement had been reached between government officials and Dr. Brady on the procedure to be followed. There was a need for this approach rather than Centres making direct contact with individual scientists which could cause embarrassment.

247. Recent developments in the United States as a result of the National Academy of Science's response to President Ford would probably lead to a very marked increase in the work being done in the United States relevant to the research of the International Centres and aims of TAC, and therefore it would be a matter for careful discussion with the authorities there to determine how best to marshall this upsurge otherwise this could amount to a lot of investment without much point to it.

248. The Chairman thought that one of the research areas which was bound to be stimulated by this increased interest in agricultural research in the United States as well as to a lesser degree in Australia, England and elsewhere, was in the field of nitrogen fixation and the possibility of transferring this characteristic of legumes to cereal crops, for example. He added that this was a topic which TAC recognized as of long term importance and while TAC had always recommended to the CG that the majority of the research effort should be concentrated towards obtaining quick results it was necessary to look at some of the investigations of a more prolonged nature.

249. He reiterated that TAC had proposed a sum of \$300,000 be provided to enable workshops of an international character to be organized and thereby keep in touch with the progress in research. Also further to this TAC had agreed to recommend a significant investment in research whenever there appeared a good prospect of a breakthrough.

250. In this regard he suggested to Dr. Ruttan that he reconvene the TAC plant nutrition subcommittee to consider what might be the next appropriate course TAC might take in making recommendations on nitrogen fixation or another field related to fertilizers.

251. The Chairman then invited comments on any new measures that might be desirable concerning the relations of the Centres with advanced institutions and also on what steps TAC might take to recommend to the CG ways and means of ensuring the encouragement of scientific research in developed countries or elsewhere related to the longer-termed needs.

252. Dr. Ruttan pointed out that the plant nutrition subcommittee had been relatively inactive since it had brought out the recommendations that the CG make funds available to institutes to expand work in the field of nitrogen fixation on the basis of specific proposals from the institutes, and that the International Fertilizer Development Centre be brought into the CGIAR system and supported as an associate member. He added that it had been agreed to merge the plant nutrition and grain legumes subcommittees and the combined groups would be meeting to discuss the future course of action.

253. The Chairman asked for a report on further action that the new subcommittee thought desirable be ready for the May meeting so that any recommendations which arose could be included in the report to the CG in July.

254. With reference to the long-term fundamental research such as on nitrogen fixation which the United States as well as the OECD were interested in supporting, one member felt that this should be left to the advanced institutions until such time as the results of the work were of practical significance to the International Centres. On the other hand in the case of the bilaterally-assisted research projects on problems of direct concern to Centres and in which they were extremely active with approaches to as many as ten developed countries or funding agencies, he proposed the compilation of an inventory for the benefit of TAC so that it was better informed of these activities as well as the finances involved and thus could work towards a more rational distribution of these in a centre's programme overall. This was supported by other members, one of whom felt it was a function of TAC to have a very clear view of what the whole chain of International Centres was doing. It had become quite clear during the recent IRRI review, for example, that the total activities of this Centre were considerably larger and in some ways more effective than what the Centre's budget report to the CG might suggest.

255. Another member suggested it would be worthwhile if Centres could list in their annual reports, for example, the set of research problems in different areas with which they were confronted and which could be investigated in appropriate advanced institutions. He cited the case of a specific genetic problem on rice which a member of the IRRI review team felt could have been entrusted to one of his graduate students had he known before hand that the problem existed.



256. The point was raised, however, that the development of relations between Centres and advanced institutions should not depend on such a list. It was preferable to have them stem from the free flow of ideas between the scientists interested in a problem.

257. According to one speaker the International Centres did not have much difficulty in identifying institutes in developed countries which could assist on specific problems. This was exemplified by the number of contacts IITA had developed in the United Kingdom, for example. However, the organization of research on the more unusual problems such as pests and disease resistance in which several of the centres would be interested was a much more difficult matter and worthy of TAC's attention.

258. In response to the comment that one of the limitations of the study presently being conducted in the United States was many of the people in advanced institutions were really not aware of the major problems in the developing countries of the tropics and subtropics, a member suggested having a mechanism whereby the advanced institutions could be brought in contact with the problems and the environment where they existed. One possibility which had been successful in the case of universities in the United States assisting the Government of Brazil was for the advanced institutions to have their graduate students or younger research staff undertake studies on specific problems under the conditions of the developing countries.

259. An important consideration was the criteria used in delimiting the areas of research which might be profitably undertaken by advanced institutions on behalf of the International Centres, or national institutions. These should be determined more by the nature of the problems which arise during the course of development rather than by the interests of a particular scientist or group involved in elucidating a problem for the sake of scientific enquiry.

260. Another point raised was the need for a balanced attitude towards requirements of research on the major problems for there was a danger of an over-reaction to the universal appeal for increased food supplies and the desire for many research workers to get involved in nitrogen fixation, for example. One undesirable consequence was that research workers tend to become involved in a host of conferences and seminars all around the world and their scientific output diminishes.

261. In closed session the Chairman dealt firstly with the question of IADS and its possible relationship with TAC's business. As it turned out from Dr. Wortman's presentation IADS was a much wider concept than earlier understood and although it would be to some extent involved in assisting national research its main effort would go towards helping the smaller and less experienced governments frame a proper approach to the development of agriculture and particularly agricultural production.

262. TAC however welcomed the initiative of the IADS and members expressed their belief that this had an important complementary role to play particularly in relation to the FAO and the bilateral-aid agencies. The fact that IADS was placing emphasis first on development and second on a service was very important from the point of view of the poorer nations. If it operated along the lines described especially in assembling expertise and using the material generated as a result of the work of the International Centres it could help to bring about a faster rate of development in developing countries.

263. The Chairman then asked members for further comment on the way in which advanced institutes, either in developed or developing countries, should be encouraged to offer help to the International Agricultural Research Centres or whether they felt it right and proper that the Centres should turn to advanced institutions for assistance on some of their problems.

264. One member referred to the different trends that were developing with respect to the attitude of individual centres to seeking assistance on the more fundamental aspect of research. He stated a preference for the approach of CIP which organized small group meetings on very specialized subjects with invited scientists from various countries.

265. With regard to the encouragement of aid from developed countries it was pointed out that countries like the Netherlands were willing to finance work carried out in an advanced institute for the benefit of an International Centre. One beneficial consequence of this was that Centres would be constrained from developing into large research organizations doing work already being done elsewhere.

266. Another member while remarking on the well-established relations that had already been developed, particularly by the older Centres, IRRI and CIMMYT, expressed concern that with the present financial stringency affecting hundreds of research institutions and universities and in turn thousands of the staffs, there was a danger that these advanced institutions might go looking to the International Centres as a possible last resort to attract additional funds. He stressed the need for TAC and the Centres to make it absolutely clear that there was no point in any professor, university or institute approaching a Centre for funds to help their staff do overseas work. The correct procedure for them was to seek bilateral funds from the overseas aid ministries of the country concerned or from the foundation willing to support research in advanced institutions.

267. Concern was also expressed about the number of cases wherein advanced institutions had approached and obtained funds from aid agencies with proposals ostensibly to help the programmes of International Centres but which, in fact, had not been seen or approved by the Centre concerned.

268. There was also a danger of research effort becoming too concentrated on the specific problems of the international centres and stifling some of the national creativity of research overall.

269. According to a member, the problem of improving the relations between International Centres and advanced institutes could be regarded as enlarging the brain which was available to the world to solve the problems of the Centres. In view of the apparent willingness on the part of many countries to provide financial support to this effort there was a need to have liaison officers in the donor countries to make the necessary linkages between the scientists of the Centres and advanced institutes. This was important particularly where Centres were organizing meetings of specialists, to avoid errors in selection of the best research scientists to be invited.

270. There was agreement on the Chairman's suggestion that the best immediate step for TAC was to put the question of relations with advanced institutions high on the agenda for discussions with the Centres' Directors at the May meeting. The Chairman thought it would be useful to the CG if TAC could clarify with Centres' Directors as a whole the sort of principles and procedures which should be followed when they were looking for additional finance to deal with specific problems. TAC had earlier recommended that for certain types of problems a fund should be established to enable the necessary research to be supported but he felt now that TAC had perhaps been a little premature in view of the rapidly increasing tendency of Centres to call on individual scientists. TAC needed to assess how vigorously Centres were proposing to use this facility which should be generally available to them.

271. He expressed some anxiety at the possibility of everything being smothered by the expected large measure of support in terms of both financing and personnel which was imminent from the United States and to accommodate this it was necessary for TAC to seek clarification of procedures with the US Academy of Science and Centre Directors.

272. The Chairman reiterated that the procedures adopted by Dr. Brady in negotiating with the Australian Government for assistance on specific problems in IRRI's programme had established a pattern for Centres to follow in developing relations with advanced institutes. The purpose of having discussions on this topic with Centres' Directors at the May meeting was to reach some understanding with them on the best policies and principles that should be adopted. He foresaw that Centres would in future need a good deal of help of this kind.

Priorities for International Support to Agricultural Research in  
Developing Countries (Agenda Item 6)

273. Opening the discussion the Chairman referred to the terms of reference of the Committee, which state that an important part of the TAC's mandate is to advise the Consultative Group on research needs, with particular but not exclusive reference to world food problems, and to indicate how best to fill gaps identified as of high priority with institutions or other forms of collective activity.
274. In order to guide its own efforts the TAC had, in 1973, developed a priorities paper based on discussions at its early meetings, which was submitted to the Consultative Group. The latter had adopted this as the basic guideline for its own operations.
275. He had indicated to the TAC and the CGIAR in 1975 his feeling that this paper should be revised and amended periodically in the light of subsequent progress, and this had been given added point by the decision of the Consultative Group to review its entire operations, including those of TAC, to see whether and what changes might be needed in its methods of work, priorities, etc., although with the basic assumption that the Group and the TAC would continue. TAC was expected to make a major input to the work of this review committee, and not the least important part of that input would be its further views on priorities.
276. A first stage in this process had been their discussion on this subject at the 11th meeting in October 1975, and following his summary of this to the CGIAR the Executive Secretary had attempted to relate the conclusions to those in the earlier priority paper, reflecting the two kinds of decision made in October - reconfirmation of basic priorities, and any new thoughts and recommendations.
277. He congratulated the Secretariat on doing a very able job in this respect and asked Mr. Oram to summarize the main thrust of the revised paper.
278. Mr. Oram explained that in preparing the draft he had attempted both to update the previous paper by incorporating the results of the discussion of the 11th TAC meeting and eliminating references to gaps which had since been covered by actions of the CGIAR, and also to elaborate somewhat on the rationale underlying the TAC recommendations for the benefit of new members as well as for the CGIAR Review Committee. Some supporting statistical tables had also been added. Referring to the priorities he noted that the TAC continued to give first place to research on basic staple foods, in particular the cereals. Among other staples, emphasis was placed on the soya bean, the only major food legume not included in the programme of any international centre on a major scale, and which had been designated as an important gap at their last meeting; and on the edible plantain and possibly the sago palm among the starchy foods. As land availability became tighter it might be necessary to turn increasingly to crops such as this with a potential to produce a very high yield of energy per unit area.
279. The paper also reaffirmed the importance the TAC attached to ruminant livestock, including the water buffalo, and drew attention to the potential of the goat, which was largely neglected in national research programmes, and on which TAC wished to know the views of ILCA. In connection with the improvement of ruminant livestock, the vital role of feed supplies, and hence the closely related need for research on pasture and fodder crop improvement, had also been emphasized, since the TAC had not been very explicit on this and he felt that readers might gain the impression that it was something that they had failed to recognize.
280. Aquaculture had also been given a priority mention, since although the TAC had only made a modest recommendation to support research in this field, mainly as a vehicle for training more people, the potential appeared very large and the Chairman felt it was now time to look at it further. In the paper attention had been drawn to the possibilities of combining aquaculture with systems of small livestock production, involving particularly pigs and ducks.

281. Some interesting research was going on in this connection in Asia and it seemed to offer a means of intensifying animal production outside the normal intensive pig or poultry enterprises which the TAC had always viewed as something which did not involve major research problems.

282. Coming to the question of what had been described variously as "non-food crops", "other agricultural commodities" etc., the TAC had at its last meeting made the important decision to depart from its former procedure and include cotton among its high priorities. The reasons for this had been made clear in the paper, but the fact that the Cotton Research Corporation, which had until recently been an important element of strength in research on cotton, was now being closed down, opened a gap in cotton research which did not exist earlier in the TAC's history and was a major reason for more priority being recommended to this crop. The TAC had therefore informed the Consultative Group that it would consider specific research proposals for cotton if the Group so requested.

283. As a result of the last meeting intensification had also been raised as a first priority. This had always been an important concern of the TAC, but it had not specifically signalled it as first priority before. Attention had been drawn in the paper to some of the problems of work related to intensification, to the weaknesses of national programmes in respect of farming systems research, and to the difficulties of generalizing the results of such work. These problems had been noted because they had led the TAC to express some concern at its last meeting at the difficulties being encountered by some of the international centres in their farming systems research.

284. Under the category of second order priorities, Mr. Oram had included fruits and vegetables and the oilseeds. Until recently TAC had not given consideration to the latter except in the case of the leguminous species of groundnuts and soya beans, but following the Committee's perusal of the Tropical Products Institute Study, a feeling had emerged that both the annual and the perennial oilseeds, and in the latter case particularly coconuts, merited consideration for higher priority in research. In the case of the annual oilseeds, the paper reflected the TAC's opinion that these might best be approached (as they were being already to some extent) through the farming systems programmes of appropriate international centres. In the case of coconuts, however, the TAC saw the need for a special study of the research needs and the approaches which might be taken to filling gaps in these needs for this important crop as a means of helping it to decide whether additional action was needed in this respect.

285. In the case of vegetables and tropical fruits, the question of priority had not yet been adequately resolved, partly because of the statistical problems of defining their importance and partly because of the problems of choice of priorities for research among the very wide range of species. He hoped that progress in resolving this problem, at least for vegetables, would be made at the present meeting.

286. An area partly related to the problems with which the TAC had been wrestling in trying to define the importance of fruits and vegetables to the diet was applied nutrition. This had barely been mentioned in the paper because it was something the TAC had never dealt with explicitly; assuming it was implicit in the work of the international centres. However, this was perhaps a gap which needed to be looked at further. He drew this to the attention of the Committee since there was an important move to set up an inter-agency group to work on applied nutrition research in which FAO was active and with which the TAC might wish to develop some relationship.

287. Applied nutrition was also an element of socio-economic research, to which the TAC had always accorded great importance without actually giving it a first priority rating. Progress had been made in strengthening the international centres to undertake such work on an inter-disciplinary basis with their technical staffs, but the TAC had noted a gap to which attention had been drawn in the paper between this research at the micro-level on constraints and problems of the adoption of new technology and research related to policy-making at the national level.

288. Factor-oriented research had also been given rather more specific attention than in the earlier TAC priority paper since the Committee had gradually diverged from its initial viewpoint that this was something which ought to be done in relation to specific commodities and had recognized that there were some cases where factor-oriented research might have to be done by a specific institute. The new International Fertilizer Development Centre was a case in point. The paper had drawn attention to some other possible areas such as water use and management which still seemed to represent gaps to which the TAC had not been able to find a suitable approach. On the institutional side, the question of the relations between applied and basic sciences, and by implication between institutes of an advanced nature, international centres and centres in developing countries had been dealt with in more detail in order to reflect their lengthy discussion of this subject in Mexico. The strengthening of national institutions had also been dealt with at greater length in an attempt to reflect the TAC recommendations on this important subject at its October meeting and to indicate how it saw FAO and other organizations playing a more important role in this field to enable the international centres to concentrate on their primary research and training functions.

289. In conclusion he informed the Committee that the financial tables attached under Annex 1 "Global Estimates of Financial Support for International Research Activities" had been completely revised and up-dated with a base year of 1976 and projections of 1980 extrapolated to 1985.

290. Thanking the Secretary for his report, the Chairman stated that in his view it might be difficult to combine a priorities statement with judgements about the financial future, and while he felt that both were important, he proposed that the financial comments be separated completely from the priorities statement.

291. While the debate raised a number of clearcut issues on individual commodities and areas of priority, several speakers also raised more general questions and it may be useful to cover these first.

292. One important question related to how the TAC approaches the determination of its priorities, and what criteria and time-scale it adopted for this purpose. It was pointed out, for example, that the TAC had supported the establishment of a complete institute for potatoes, only 10 percent of which are grown in the developing countries, and that even the tropical starchy root crops, to which it had also given high priority, only provide about 10 percent of the total calorie intake, except in Brazil and the wetter areas of Africa. It was suggested that some means should be found for the TAC to give more detailed information on the factors which were taken into account in the allocation of its priorities.

293. The Chairman reminded members that the Committee had been formed at very short notice in 1971, and had been asked by the CGIAR to recommend as quickly as possible the matters it considered should be dealt with first. The fact that proposals were already being made by donors for support to certain ventures, e.g. the potato research centre, added to the urgency. The TAC had worked under immense pressure to indicate the major areas of research which it felt ought to be tackled as immediately as funds and skills could be brought to bear on them. This involved both assumptions as to their actual and potential importance to food production in the developing countries; potatoes - as one member pointed out - being selected because there appeared to be an important scientific opportunity for realising a potential, rather than on grounds of their present contribution to food supply; and assumptions as to the magnitude and nature of the human and financial resources likely to be available to support the research proposed within a predictable time horizon. Some of the reasons had been elaborated in its priorities paper, but the TAC had always been flexible in its criteria - recognizing that there was a need for a balanced view of regional needs. Poverty and malnutrition existed everywhere, and all resources could not be directed to one area even if the population served was very large, to the complete neglect of other research of vital importance to people elsewhere.

294. In his view there was no way of avoiding a process of selection; it was unrealistic to conceive of a funding level so vast that research on very subject that anyone thought important could be started simultaneously, and the TAC had always recognized that it must work to realistic assumptions about the levels and limits of funding likely to be available within a given time horizon. Giving preference to certain subjects against a background of time did not mean that others had no importance; for example, the TAC had always recognized the contribution of vegetables to the quality of the diet, but since their first preference had been to increase the sheer supply of calories it was decided that vegetables should not receive prior attention. Now that substantial progress had been made by the CGIAR towards this first objective the priority for vegetables was being re-assessed within an extended time-horizon on the assumption that funds would continue to expand in real terms, even if not as rapidly as in the past. This, of course, implied that donors accepted that there were important areas of research of substantial potential benefit to developing countries which had not yet been tackled.

295. Given this assumption, he felt that the TAC should not hesitate to recommend new activities provided these did not immediately place an unreasonable restriction on a first priority activity. This did not preclude TAC from recommending changes and shifts of emphasis within the programmes of existing institutes to make sure that priority results were achieved. However, if in the longer run there was to be some overall financial restriction on CGIAR funding imposed by economic forces it must be recognized that this would probably have to be applied across the whole system and not just to the latest additions to it. This must also be borne in mind by the Committee recommending support to new ventures.

296. In reply to a member's question he stressed that the TAC's view of priorities was in no way restricted to the establishment of international centres; its priorities related to fields of research and it was open to consideration of any approaches in order to determine the best way of getting the necessary research undertaken.

297. These things having been said, he recognized that it was the prerogative of the CGIAR to challenge the TAC's recommendations for priorities if it so desired and to ask for reasons for its preferences. He would explore means of setting out the TAC's procedures and criteria more systematically for the information of the CGIAR and other interested parties, perhaps in the form of a booklet, **as suggested by some members.**

298. Another speaker queried how the TAC obtained the feed-in of information on research needs and priorities in the developing countries essential to its decision.

299. The Chairman explained that the TAC drew on numerous sources of information for its purposes. These included the experience of its members; the Co-Sponsors of the CGIAR - in particular FAO, which had been conducting a series of regional and ecological zone meetings on research needs and priorities; the various other members of the CGIAR, which included two representatives from each of the developing regions; the IARCs, individual developing countries, and many reports and publications, e.g. the TPI study. The TAC missions, sub-committees, and working groups were a further valuable means of gathering and analyzing material related to priorities. **Nevertheless he agreed that feedback might be improved.**

300. In respect of specific questions of priority raised in the background document there was no disagreement among members that first priority should be given to food production, and to the cereals within the main groups of food commodities.

301. It was suggested, however, that more attention should be given not just to increasing production of cereals, but to ensuring that a higher proportion of harvested production was secured for consumption. This should involve not only research on various aspects of post-harvest technology, but also the screening of germplasm and the evaluation of breeding materials sent out by IARCs for storage qualities.

302. The high priority accorded to grain legumes and leguminous oilseeds was also confirmed, although it was decided to defer any recommendation to the CGIAR on soya beans in the light of the detailed discussion reported under Item 10 of this report. This discussion revealed a widely diverse range of basic and applied research needs in the developing countries, both in production and utilization, and the TAC wished to examine these needs and how best to tackle them more fully before reaching any decision.

303. Starchy roots and tubers, a further priority group, were felt to be adequately covered by internationally supported research programmes, with the exception of the edible plantains and bananas. These species within the genus Musa are very widely grown in almost every tropical environment, and in addition to being a commercial and export crop are a staple food in some areas - particularly for poorer people in densely populated parts of the humid tropics. It was suggested that they be treated as a priority to be considered along with other crops eaten largely as vegetables in the local diet.<sup>1/</sup>

304. In the livestock sector the TAC reiterated that priority should continue to be given to the ruminants.

305. Several voices were raised in support of the goat, confirming the attention drawn at the TAC's eleventh meeting to the neglect of this hardy animal by research workers. It was pointed out that goats were not only important in Africa and the Near East as had been indicated then, but were also of considerable significance in parts of Asia and Latin America, both for milk and meat. Work done in India had shown that crosses between local animals and various imported breeds (e.g. Alpine and Saana) could considerably increase meat and milk production, especially if nutritional management was improved. The potential therefore exists for a real pay-off to research, which would be particularly beneficial to the nutrition and income of poorer people, and for this reason (not just because the goat is neglected) the suggestion was made that the TAC should establish a working group to study the matter further. This might be funded by the CGIAR or bilaterally.

306. Referring to the importance of better nutrition in the improvement of ruminant livestock, some members urged that this should be made more explicit by the secretariat in the redrafted version of the priorities paper to be prepared for the May TAC meeting. This should stress that feed improvement, and in particular that of pastures and forage crops, was a research area of first priority within the overall problem.

307. While there was general support for according high priority to research aimed at the intensification of agricultural production it was recognized that this involved difficult and complex problems both in respect of research methodology and the application of the results which might impede the progress of any work undertaken by the IARCs in this field.

308. Several members felt that, in connection with the improvement of resource management, the Centres should be devoting more attention to studies of relationships between climate, soils and soil moisture status, and crop growth. Such studies, especially if linked to those in national programmes, would lead to a better understanding of the potential for intensification and the suitability of different ecozones to various types of agricultural use, thus helping to provide insights into their research needs and the transferability of results between areas with essentially similar problems and growing conditions. There was a consensus that consideration ought to be given to reinforcing the staffs in agro-meteorology and related lines of study at Centres such as ICRISAT, IRRI, IITA and CIAT whose programmes involved important elements of agricultural management.

<sup>1/</sup> It was also suggested that TAC should sponsor a small consultation on the scientific improvement of the banana; perhaps jointly with the New Guinea Biological Foundation, which the Chairman reported had recently been in touch with him on germplasm preservation for bananas and plantains.

309. Other fields of research having an important bearing on intensification to which attention was drawn, were mechanization and weed control. These again are inter-related. In respect of mechanization it became clear in discussion that there are substantial differences in the needs and approaches to research required in Asia, and those in Africa and Latin America. Nevertheless there was agreement that there have been too many small-scale and fragmented attempts at research on various aspects of mechanization, and that there is a real need for more work to develop appropriate mechanical equipment for developing countries. It was pointed out that mechanization is essential in many countries, particularly in areas with marked wet and dry seasons, to timely land preparation; certain tasks can only be done adequately with mechanized equipment, even in areas where labour is plentiful; certain weeds are not easily killed by herbicides and are difficult to control manually; and where water and temperature are not limiting, lack of power to supplement hand labour at critical points in the cropping cycle may be the main constraint to really intensive management on small farms. Mechanization does not, therefore, necessarily conflict with the need to create more employment.

310. Members recognized, however, that research on mechanization is often difficult and costly and that large-scale investment with a backing of mechanical engineering and industrial capacity is often essential. It was suggested that a regional or agro-climatic zone approach to problem definition was desirable, and that this was a field of research in which cooperation between developed countries, international centres, and national applied research and testing programmes could be particularly fruitful. Mechanization was felt to merit further careful study by the TAC in cooperation with appropriate International Centres, with a view to determining the key research problems and best approaches to their solution.

311. Considerable emphasis was placed in the discussion on the need to reinforce research on post-harvest technology for food crops. This was seen as of the utmost importance to increasing food availability, and the need to develop a total view of how to strengthen research and to put existing and new knowledge to use was stressed. It was pointed out that emphasis tended to be placed on attempting to quantify the magnitude of losses, whereas little attention seems to have been paid to estimating the size of the benefits which might accrue to research and where research might most effectively be directed in order to maximize the savings. It was not so much the size of the problem but the potential for doing something effective which needed study, particularly where the results would have to be applied to a multitude of small farms.

312. A number of important areas requiring more research was emphasized; in particular the improvement of drying facilities at the farm or village level, which had been accentuated by the development of short maturing photo-insensitive varieties suited to multiple-cropping; and on the control of fungus diseases and pests of stored products.

313. While agreeing with the urgency to do more research in respect of post-harvest technology the Chairman drew attention to the earlier recommendation of the TAC that the activities of the International Centres in this potentially very broad field should be limited to developing technology suited to application at the farm or village level. This might include working with farmers' cooperatives, the need for which had been stressed by some members, but the Centres should not be responsible for establishing such cooperatives. For them to attempt to do more than this would be to open a Pandora's Box. He had also noted from a remark of the Executive Secretary that FAO's directory of institutions working on various aspects of post-harvest technology in developed and developing countries showed that some 900 were in existence, which suggested a substantial reservoir of strength which might be tapped. For these reasons he did not consider it unlikely that the TAC would be submitting proposals to the CGIAR for support to such research, and he particularly welcomed the concerted action of an informal group of the donors in examining what more might need to be done. The TAC would appreciate being kept informed of their activities and the opportunity to offer comments or suggestions.



314. In respect of crops other than staple foods, there was considerable discussion on the exact rating which should be given to cotton, which some members felt had been left somewhat ambiguous at the Mexico TAC meeting, despite a consensus that it should be awarded higher priority.

315. Reminding members of the status given to non-food research in their first priorities statement the Chairman explained that while the Committee had never refused to consider proposals for cotton or anything else, it had stressed that it would not itself initiate such proposals. It had also emphasized that if it were to examine any proposals in this field it would only make a favourable recommendation if it were satisfied that this did not threaten funds for first-order priority research related to food production. As he recalled their discussion in Mexico members had felt that this position was no longer adequate for cotton, and that the TAC should now be invited by the CGIAR to consider or develop specific proposals for this crop.

316. In reporting to the CGIAR on this he had avoided the use of first or second priority, but the implication of his statement was that TAC thought that cotton was of such importance that, if the CGIAR concurred, it should now develop research proposals in this field.

317. One member indicated that he had had second thoughts on this since their last meeting, in the light of evidence collected by Dr. Evenson that cotton was one of the crops to which most research was not being devoted, expenditure being equivalent to about  $3\frac{1}{2}$  percent of the dollar value of output in developing countries. Compared to the meagre expenditures on sorghum, coconuts, or even oil palm it was hard to argue that cotton was being under-researched. While the quality of the research on cotton might be called in question, cotton seemed to be receiving the highest input of investment per dollar of output of any crop in the developing countries.

318. In this context Dr. Pereira informed the Committee that a main reason for closing down the Cotton Research Corporation - about which concern had been expressed at their last meeting, was that its scientific panel (of which he was a member) felt that it was giving an excessive concentration of research on one crop. Their opinion was that continuing research at its present level on cotton alone was not likely to be highly productive and that the emphasis should rather be on marrying cotton as a cash crop with other crops, and especially food crops, into more productive farming systems. He believed that this had also been a reason for the TAC wishing to accord cotton higher priority, and perhaps this had not come clearly enough out of the TAC discussion as reflected in the draft priorities paper.

319. While expressing some reservations about the quality of some of the figures from which Dr. Evenson's conclusions had been drawn (at least on the basis of his use of Australian data), the Chairman agreed that the Secretariat would have to pay careful attention to these comments in redrafting the priorities paper. However, he stressed that the present document did not do more than indicate that the TAC wished to look more closely at the research needs of cotton, whereas it had not done so in the past. There was no suggestion that they would be recommending an institute for cotton research and it must be clearly understood that in expressing a willingness to study the status of cotton research there was no commitment to the end result.

320. it was suggested that in approaching cotton research it should be recognized ab initio that this crop could not be dealt with by a single centre approach. The opportunities for improvement varied from place to place - for example, In India great progress was being made through the exploitation of hybrid vigour by hand pollination, but that this approach was too expensive where labour was scarce.

321. One almost universal problem, however, was pest control; cotton consumed around 50 percent of all pesticides used in LDCs at high cash costs, and this was an area where the development of an integrated approach was a high priority. It was pointed out that for this reason above all cotton was becoming unprofitable vis-à-vis alternative crops such as vegetables. One means of tackling cotton research, therefore, might be to isolate key problems

such as this which could be amenable to an international or regional approach, rather than trying to research the crop in its entirety at one centre. There was general support for devoting more attention to this aspect of cotton research, and some members felt that it might help to develop improved pest control methods for use on food crops, particularly those grown in rotations with cotton.

322. Reference was made to a recent discussion at the World Bank on the report prepared on cotton research needs by a team under Dr. Harrar on behalf of UNDP, the Bank and Rockefeller Foundation. This had also stressed the pest control problems with particular reference to the need for an integrated approach, since most research so far had been on chemical methods and through the aegis of pesticide manufacturers. The question had been raised as to whether an institutionally centralized international approach to breeding was feasible, and in general it had been felt that this was not the best approach. There had been a feeling that, as opposed to the earlier comments by TAC members, support for cotton research from metropolitan powers would be significantly weakened by the closure of the CRC in U.K. and by reduced dependence on cotton in textiles in most industrialized countries. While this would affect cotton production, there was also a need for reinforcement of end-use research, for which some new techniques were in sight which could make cotton more competitive with synthetics. There were also interesting possibilities for new food-uses.

323. Other members supported the view that cotton research should be given priority consideration, and that the TAC should therefore address itself to the main problems and approaches required. While the question as to whether current research was adequate, inadequate, or would be seriously weakened by reduced donor support in the near future was not fully resolved, it was felt that the crop merited such attention because of its multiple uses, its key role in cropping systems - particularly in providing a cash income to small farmers, its high employment component both on and off the farm, and its critical importance to foreign exchange earnings in many developing countries.

324. Summing up, the Chairman felt that the discussion largely confirmed the Committee's conclusion in Mexico that it should revise its earlier statement to the CGIAR that TAC should limit its activity to direct food questions, and that in this light cotton should be given first consideration. However, in view of some doubts raised at this meeting concerning the magnitude of ongoing work on this crop, he proposed that they examine the state and strengths of ongoing and planned research and advise the CGIAR on their conclusions. If this was acceptable to members, he would ask the Secretariat to proceed with the collection and analysis of the necessary data.

325. On vegetables it was agreed that while the Committee was moving to a position where it might want to recommend support for research, no precise category of priority should be allocated until it had completed its technical enquiries and been able to devote more time to studying the best form of organizational approach to getting any necessary research done. The Chairman was authorized to report this position to the Consultative Group with the rider that the Committee was giving serious consideration to raising the importance of vegetables in its priorities.

326. Among the oilseeds discussion centred primarily on the coconut, the importance of which was stressed by several speakers. The Executive Secretary reminded members that this crop had been singled out in the TPI Study as meriting strong international support, because of its economic and nutritional significance in the tropics, the fact that it had a number of difficult and so far unresolved research problems, and because current research effort was weak and fragmented. It had hoped to be able to arrange an expert consultation on coconut research from his FAO Regular Programme resources, which would inter alia provide information to assist the TAC on reaching a recommendation to the Consultative Group. Unfortunately it now seemed unlikely that funds would be available for this meeting.

327. Members therefore proposed that the TAC finance an international coconut research workshop to determine the state of coconut research in the various regions of the world and to advise the Committee on how best to organize a cooperative research programme or network.

328. Referring to the crucial importance of the coconut in the Pacific, the Chairman agreed that such a meeting was desirable. He wished, however, to be in a better position to review the TAC resources before reaching a decision, and felt that by their May meeting the availability of funds should be clearer. It was therefore agreed to discuss the proposal again then, recognizing that this was a matter in which the Committee had expressed a clear interest.

329. Another area of research which aroused much debate was forestry, which several speakers felt merited at least greater attention by TAC than hitherto, even if only as a second order priority. It was pointed out that tropical silviculture has been neglected; that "agro-forestry" (the integration of tree crops, including coconuts, or industrial tree plantations with agricultural crops) is a commercially attractive alternative to shifting cultivation, particularly in the humid tropics, on which research could prove very productive; and that rapid removal of natural forest cover is threatening agricultural productivity and investments in many developing countries. Existing forest technology, even for the tropical rain forests, and particularly in respect of timber utilization, has been developed largely in the light of the standards of industrialized countries, and thus is not well adapted to the needs or ecology of non-temperate areas. Attempts to introduce exotic species and technology had often failed, but not enough was known about the correct management and use of native species for lack of research. This is a gap to which attention was drawn by the FAO general Conference, which had endorsed a specific resolution for more internationally supported work in this field.

330. Others disagreed in varying degree with the view that research on forestry in the tropics had been, and remains, very weak. It was argued that the International Union of Forestry Research Organizations (IUFRO) already provides a highly organized world network, and a great deal of silvicultural work has been done in tropical rain forests, though its output ~~has~~ been somewhat discouraging in the sense that the total productivity of hard, useable, and particularly exportable timber has always been much less than was expected. In the case of forest genetic resources a very well thought out proposal had been put forward to IBPGR, which indicated that substantial progress could be made at relatively low cost, using the existing machinery of IUFRO. In several respects therefore it was argued that the total forest community is better organized for research than the agricultural community, and that there is a fairly clear idea of what needs to be done in the whole forest sector.

331. The problem of the misuse and rapid disappearance of the forest resource and consequent degradation of the environment was felt by these members to be the result of the difficulty faced by governments in developing countries in keeping subsistence farmers from constantly eroding the boundaries of forest reserves. It was suggested that this is very largely a matter of local organization and political control and not a problem which can be solved by more science.

332. However, in addition to the problems of managing tropical rain forests attention was drawn by members from developing countries to several other aspects of tree production in which it was felt that more research would be useful. These included what was described as "social forestry", based on the introduction of a silvi-pastoral system combining trees or leguminous shrubs with improved pastures and grazing practices to provide additional income and fuelwood to graziers and help to improve soil fertility. This is especially appropriate for the drier areas where erosion control is vital and trees and shrubs and grasses are essential to prevent the encroachment of sand dunes on cultivated land. Increasing population pressures make the maintenance of pure forest reserves increasingly difficult and it is considered urgent to find productive alternative forms of land use to prevent shifting cultivation. A valuable species in these areas is Acacia senegal, from which gum arabic is produced. It was pointed out that several countries are anxious to expand their cultivation, but that yields varied enormously, and a selection and breeding programme

could be very valuable. Research on irrigated forestry involving the cultivation of quick-growing species for pulp and paper could help many developing countries save foreign exchange.

333. The Chairman pointed out that the Committee had earlier taken a quite explicit decision that forestry would NOT be accorded priority. Its relevance to land use, soil erosion and conservation, and thus indirectly to food production had not been overlooked, but in the light of the dominant importance it had given to food production ~~research~~ the TAC was not prepared to consider forestry proposals.

334. Where forestry was or could become an important component in a farming system, he did not see that any objections would be made to an institute including this in its studies, but the proposals that came to him were for straight-out research related to the development of forestry and its management for timber production, and it was in this area that the TAC's judgement as to its mandate had so far been negative.

335. In reply to a member's question, he agreed that in its overall approach to any question before it, the TAC was not looking only at what might be funded by the Consultative Group. It could reject a proposal, recommend it to the CGIAR, or commend it to the attention of bilateral or other potential donors or foundations. There were practical examples of this, for example CATIE, which TAC had recommended should be supported from regional funding by bilateral donors. This in fact had a major forestry component. But he did not believe that in following this approach TAC should necessarily try to cover every aspect of the rural economy. If, in the specific case of forestry, there was a strong wish of members to examine research needs in greater depth and the Consultative Group concurred, this would have to be governed by their understanding that any support recommended should not be at the expense of research on priority matters related to food production. Furthermore, additional expertise would have to be co-opted to enable TAC to look at the problems of forestry. He would like a firm decision from members as to how to proceed in this area.

336. Because of the uncertainties expressed as to the adequacy of current research on forest management and utilization to the needs of the developing countries, and the different approaches indicated by members to the use of trees in pure stands and in mixed agricultural systems in different ecological regions, it was suggested by members that a paper be prepared for consideration by the Committee which would spell out the problems requiring research related to forest cultures in these main zones.

337. In view of the fact that IDRC is at present undertaking a study of forestry research needs in the various regions of the world, it was agreed that, apart from drawing the salient features of their discussion to the attention of the CGIAR, TAC would take no further action in respect of forestry until the IDRC study is completed. IDRC would then be invited to make their report available to TAC as the basis for an informed discussion before any firm advice was given to the CGIAR as to its possible role in support of forestry research.

338. A number of fields of research which the TAC has always recognized as important were nevertheless not assigned a specific priority in the draft priorities paper, mainly because they are so broad and cut across commodities, disciplines, and even ecological regions. Among these are socio-economic and factor-oriented research.

339. In the case of socio-economic research, the TAC was unanimous in reaffirming the importance it attaches to this as a means of throwing new light on problems of increasing production, and indicating to scientists and technologists where their efforts need to be focussed to achieve maximum impact on and acceptance by the farmers. It was suggested, however, that the TAC had perhaps been too food production-oriented in its criteria for support to research in the past; and since there are now few true subsistence farmers left in the world it is important for TAC to pay more attention to the potential of research to increase small farm incomes. Socio-economic research would provide valuable insights in the use of this criterion also.

340. Attention was drawn to the value of the research network being developed among social scientists in Asia, with the help of IRRI, ADC, IDRC, and other organizations. It was felt that this is proving extremely useful as a means of enabling economists and sociologists to exchange ideas, develop closer working relationships and compare their approaches; and the countries of this region are already feeling the benefits. It was suggested that an attempt should be made to encourage similar linkages in socio-economic research in Africa and Latin America, with the ultimate aim of institutionalizing a system of communication among social scientists working in developing countries. This is important because much of the research is quite country or location specific and is often better if done by nationals of the countries, as well as more effective in its impact on national policy-makers. A centralized effort is therefore unlikely to be a practical approach, but some outside assistance, whether provided through the CGIAR or other means, could be valuable in facilitating communication, developing common research designs, and helping work in one country to build on work in another.

341. The Chairman supported this view, although he felt that perhaps rather more progress had been made in Latin America than the last speaker realized. Speaking as a governor of IDRC and of IFPRI, he assured members that promoting the kind of approach just indicated is very much a matter of priority in their programmes. In relation to socio-economic research, members welcomed the reference to nutrition in the priorities paper. It was suggested that this be highlighted as a subject deserving more attention but one in which research was complementary to the efforts of the CGIAR system, and on which it needed to be kept informed by FAO and others.

342. In respect of factor-oriented research, members stressed the need for a better understanding of the management of tropical soils. This is vital to the improvement of agriculture in many developing countries, and particularly where there are large areas of land which are under-utilized due to special problems of soil fertility. There are also areas where natural phosphate or other potential sources of plant nutrients could be utilized to save fertilizers if their management is better understood. It was felt that these problems deserved greater emphasis in the priorities paper.

343. Attention was also drawn by the Chairman to the previous discussions by TAC of the need to improve water management techniques. He felt that the survey carried out by IDRC on the Committee's behalf had concentrated mainly on the engineering aspects, and asked members whether they were content that this important subject was receiving enough attention.

344. One member described the subject as well researched in principle but location-specific in practice and needing skilled adaptation of techniques. He considered that the centres were not yet making enough effort in soil and water management as a component of cropping systems. Multiple cropping and sequential planting of upland rainfed crops requires quantitative soil moisture study and there is no soil conservation planning infrastructure for a specialized central institute, but centres should be as strongly staffed in this field as in other critical aspects of crop production.

345. Members endorsed the emphasis placed on finding new institutional approaches to strengthening research in, and in the interests of, developing countries, particularly where these could involve strengthening and drawing on linkages between national institutions and between these and international centres.

346. In this context, a member suggested that an early effort should be made to compare and evaluate the various institutional models that countries were adopting, for the benefit of all. He believed that cooperation between national and international centres could be greatly facilitated if nations had an appropriate institutional set-up. One objective of this should be to enable national and international centres to follow up the results of their joint research efforts right down to the farm level. By this, he did not mean to imply that international centres should become involved in extension work, but it was essential for them to be able to work with the national institutions to check the fitness of their technology for use by farmers.

347. Referring to these comments, the Chairman recalled the previous TAC debates on the subject of transfer of research results to farmers and the respective roles of the international centres and national institutions in this. While trying to determine the limits of responsibility of the centres, TAC had never disputed the high desirability of their having strong research links with national systems and being in a position to follow the results of the adaptation and implementation of their new technologies through national programmes.

348. On the other hand, TAC had not wished the centres to have to take on the task of developing the national research systems, and had recommended that they should certainly not become involved in developing the extension system.

349. This advice, of course, did not dispose of the problem, and in his view this was an issue which had to be grappled with in the review of the CGIAR system. The TAC's terms of reference contained a clear invitation to check on the progress of national research systems, and he felt that they had done more than anyone else in trying to assess what the position really was.

350. From this, he doubted if any single institutional model would serve all purposes for national research or providing linkages to international centres, but he would welcome any other comments on this.

351. His real concern, however, was how to proceed further with strengthening national research, on which he did not feel the TAC could do much more. In his judgement, the whole subject would collapse for lack of proper attention if the present CG system did not develop a more careful policy on support for national research; and if FAO - which was the major international agency with a mandate in this field - was not encouraged to devote more resources to helping national systems. If the CG took a negative attitude, this would certainly endanger the validity and value of the international research. On the other hand, if it were to agree to take on the financing of national research, it would probably involve difficult and complex management problems.

352. Commenting on the reference to the possibility of the Consultative Group on Food Production and Investment (CG'FPI) financing support to national research programmes in paragraph 121 of the draft priorities paper, a member noted that throughout TAC's experience with the international centres it had repeatedly come to the point where research results had not been taken up because of other restraints. Even with highly developed research systems, as in Europe, this was often the case. His hope (and he felt that of TAC, at its previous meeting) was that CG'FPI would address itself to alleviating such constraints, of which the supply of fertilizers was probably top priority, but transport, marketing and many others could be identified. He did not, however, agree with the suggestion that this newly created body should start zeroing in on research in which the CGIAR and TAC had been deeply involved for several years. Apart from the time involved, the risks of duplication and confusion would be considerable, and he felt that national research programmes would be far better, and more directly helped by bilateral aid or by FAO, UNESCO and other international agencies and foundations already playing an important part in this respect.

353. In order to avoid competition between bilateral donors in aid to national research systems, and to ensure that the overall resources are more efficiently utilized for this purpose, it was suggested that advantage might be taken of the existing Centres Week mechanism when all donors are present at the CGIAR for getting them together on this subject also. This meeting could be organized by FAO, and one of its objectives could be to draw to the attention of the TAC and CGIAR projects which it was considered profitable to support, including regional networks as well as national proposals, but which no single donor was able to take up. This could do much to reduce the magnitudes of the volume of work which the CGIAR system would have to cope with if it undertook to support appropriate national or regional projects, whereas if another Consultative Group were also to take a hand it would only create more paper. There was plenty for the CGFPI to do on removing constraints to the successful application on research. Therefore, if any reference were to be made in the priorities paper to the CGFPI this division of labour should be made clear.

354. While the Chairman felt that questions related to the CGFPI fell outside the TAC's mandate and he was not sure that TAC had full authority to debate the subject, he agreed that the two groups ought to be complementary and shared members concern that they might overlap if the CGIAR and CGFPI both became involved with questions of support to national research. He would discuss this concern with the Chairman of the CGIAR. He felt that the question of how the CGFPI might complement the CGIAR could be handled simply by referring in the part of the redrafted paper concerned with socio-economic question to the need for investment in a number of institutions and services if research is to be translated into action, and that the TAC understood that the CGFPI would be devoting serious attention to those matters, as was the World Bank and regional banks. He did not feel that TAC could go much further on this issue, although it was a proper question to which serious thought should be given.

355. The Chairman recalled that in its first priorities statement the TAC had requested FAO, UNDP and the World Bank to take note of the key role of national systems in this whole effort, and he felt that this should be re-emphasized in the final draft of the revised statement. TAC should keep this crucial subject on its agenda, try to clarify its thinking on what ought to be done as a means of helping the CGIAR review panel, and in no way appear to relegate it to a lower level of importance in its priorities statement.

356. One member expressed the view that even if a commodity or an area of research did prove to be neglected this did not necessarily mean that TAC should support it. In most of the research systems with which he had been involved there was a tendency to try and cover every base, whereas he felt that the perspective which had made sense in the TAC/CGIAR system was that resources should be amassed at those critical points where there was reason to believe that accelerated research would pay off in terms of production in a five to ten year period. When making this assessment the possibility that other problems could be dealt with by inputs from outside the system must be looked into. This seemed to him the only way in which the number of institutes and factors dealt with by the system could be maintained at manageable level.

357. Following support from other members the Chairman agreed that it was essential that TAC should have the courage to draw a limit. He was well aware of the tendency of any concerned body of people to identify everything that was critical to some facet of society and he felt that forestry was one case in point. The TAC's position had always been that it would name the priorities as it saw them. If the Consultative Group wanted to amend the priorities or turn itself into a wider instrument that was in their hands and they were obviously free to ask the TAC to investigate felt needs for research even in commodities to which the TAC had not given priority. So far, however, the CG had conscientiously adopted TAC's stance and agreed with its priorities; for this reason when the revised statement came back for discussion at the May meeting he was really going to insist on being clear as to what TAC's order of priorities should be.

358. In this respect he wanted to know whether members wished for more to be said on nutrition in the re-drafted Priorities Paper. He recalled that the TAC had had one discussion on this matter, somewhat inconclusively, and suggested that perhaps it might be further explored at their October meeting.

359. In response to his question several members felt that the importance of applied nutrition research should be explicitly recognized in the paper since even in the developed countries it was an undeveloped discipline. Given that the TAC was concerned with the overall improvement of food production questions of nutrition and health in relation to food supply were highly relevant to the development of research strategy for production. It was pointed out that if the TAC were to make an effort in this direction it would be wise to contact the international centres to see what resources there were and the relationships they were developing with nutrition centres. Some of them had linkages with work going on at universities which helped to guide the thinking of their commodity research.

360. The Executive Secretary informed the Committee that two meetings had been held late in 1975 at FAO on applied nutrition research; one being an inter-agency meeting and the other a meeting of agency representatives and a number of outside donors and institutions. He could circulate the proceedings of these meetings to the TAC and felt that they would be useful since they contained an evaluation of the fields where applied nutrition research needed to be strengthened and suggestions for priorities. The Chairman welcomed this as an input to a further discussion by TAC on this subject in October.

360. In concluding the discussion the Chairman thanked the Secretariat for the draft paper but asked that in revising it a single integrated paper should be developed, not just a document referring to changes in the TAC's position. In other words this would be a complete and up-to-date replacement of the 1973 TAC Priorities Paper. Although he welcomed the financial tables provided by the Secretariat in Annex I of the present draft he did not wish these to be incorporated into the revised document but to be provided to the TAC as a separate input at the May meeting. It might be necessary to revise the financial projections somewhat in the light of the modification coming out of their present discussion.

361. In response to a member's question he agreed that it would be desirable to get a more systematic feedback from the centres directors and the CGIAR indicating their reactions to the revised paper. The suggestion that this might be discussed with the directors at the May meeting merited some consideration if the timetable allowed it. Once the CGIAR had made its own judgment about the priorities, particularly if it adopted them as it had the earlier TAC statement, he felt that it should be given wider publicity so that people could be encouraged to react to TAC's work and provide it with an input of fresh ideas.



Evaluation of Agricultural Research Programmes (Agenda Item 7)

362. Dr. Ruttan explained that the paper he had prepared for TAC on this subject arose from his examination of the conclusions on an in-house conference at IRRI on research allocation and agricultural research. He thought that it would be worthwhile for the review mission teams that TAC mounted to have a background document on the more fundamental aspects of evaluating an agricultural research programme.

363. Now that the IRRI Review had been accomplished he was keen to learn what change in emphasis or in content in his paper was indicated and he asked Dr. Swaminathan to provide some ex-post impressions in this respect.

364. Covering the main points of his paper Dr. Ruttan laid stress on the fact that in his opinion any attempt to evaluate a research programme, and the same applied to research planning, had to supply answers to two leading questions; firstly, what it was feasible to accomplish, or in other words, what the best scientists in the field considered could possibly be achieved, and secondly, what among the possibilities for research that was worth doing. He felt that these two main questions and the sub-questions they led to, helped to define the issues that had to be dealt with.

365. Turning to the matter of the objectives of reviewing a research institute he thought that this should entail principally a dialogue with management and the staff that would lead to a refinement of the research aims and to the efficiency of the system. However he believed that such a dialogue could only be effective if the institute itself and its management had clarified its own objectives. His experiences of being either reviewed or in a review team were that the greatest extent of misunderstanding arose in cases where the organization under review had not adequately clarified its objectives.

366. In the case of the IRRI review he felt that in the GEU programme, for example, the objectives had been clearly stated, whether one looked at it in terms of either doubling the yield potential or of doubling the yield in the farmers' fields, so much so that after a decade or more it would be possible to say how much of the objective had been achieved. However, in other areas of its programme IRRI had been less precise in indicating what were the objectives and this had led to some difficulty in the dialogue between the review team and the institute. It was necessary to air any differences of opinion as soon as possible and as much as the institute needed to clarify its objectives the review team should also be explicit on the points of disagreement. This, of course, was not always easy when the review team was working to a tight schedule as would often be necessary, but the desired aim was to have the review and the dialogue focussed around a common understanding as soon as possible.

367. Dr. Ruttan pointed out that in most of the institutes that would come under review by TAC there were three areas of evaluation; the research activity, the training activity, and the outreach or communication activity. He commented that those areas of research in which the output of the research was expected to become a direct input into production such as the GEU activities and pest control activities, were the easiest to evaluate. Other activities such as the statistics unit, the library and communications, or the constraints project, could be reviewed in terms of their contributions to the output producing activities and thus could be reasonably well evaluated. But some of the remaining areas were difficult to assess particularly in relation to determining what proportion of the resources should be directed to them. The training activity was particularly difficult to evaluate. As he saw it this had three dimensions; one related to the method of diffusing the knowledge developed by the institute, a second was the training activity as a method of developing the knowledge, and in this the importance of graduate students was often being stressed, and the third was that related to the feedback of knowledge into the system. The evaluation task was much more difficult if it was necessary to determine to what extent each of these activities were complementary to the research and to what extent they became competitive. He thought that the third aspect of training, a method of the regeneration of institutes was often given the least attention.

368. With respect to the outreach activities he was not sure that a final terminology had been agreed upon but as far as he understood it was usual to talk of two types of off-campus activities. One involved simply the testing of materials and the checking of constraints under a wider range of environments but from the resource allocation standpoint it was necessary to know how many of these extensions of the research programme itself were needed. The other outreach activity comprised the diffusion of the technology and knowledge generated from the programme. The problem was to determine the best mix of these outreach activities and whether they could be developed together in a particular situation or needed to be kept relatively separate.

369. In conclusion Dr. Ruttan raised the point that in his opinion the quantification of the effectiveness of research was not as difficult a matter as many often thought since it was not necessary to go to the extent of involving complex calculations of internal rates of return, and so on. Information on the area of land affected and the change in the cost of the increase in yields anticipated from the application of the research results was adequate. If the scientific steps required to produce the knowledge and technology could be visualized then it was possible to go the further step and indicate what was to be expected in terms of straightforward quantities like increased output per hectare or reduction in cost per unit and from this obtain an idea of the relative magnitude of the outputs or changes involved. This at least allowed for a rough judgement to be made on the anticipated impact of the research programme which when made known to an institute could assist in judging its own effectiveness and provide the basis for a productive dialogue between the institute and the review team.

370. Dr. Swaminathan remarked on how useful he had found the paper for the IRRI review and complimented Dr. Ruttan on his effort. However, there had been some difficulties in certain areas of the evaluation and particularly with regard to quantification. As he pointed out, it was possible to quantify certain accomplishments in terms of a particular variety occupying a certain area at a particular point in time but beyond that it was no easy matter to quantify an institute in measurable terms. In agriculture it was difficult to apportion the credit for a quantity of output to the different components because often the effect of one component was to a greater or lesser extent dependent on the effect of another. For example, any evaluation of the exploitation of groundwater for agriculture in terms of yield increases was confounded by the extent of fertilizer application.

371. In the review of IRRI the team had attempted to quantify wherever possible and he gave as an example the extent to which IRRI research had led to the achievement, on experimental farm fields, of up to 75% of what appeared to be the maximum possible potential yield of rice. However, this was not reflected in farmers' fields although he reminded the Committee of an earlier statement which indicated that even a 1% increase overall in rice yield in Asia led to some \$300 million increased income; thus even a small movement towards the potential could have tremendous consequences.

372. It had been agreed, in an earlier meeting of the Committee, that production increases stemmed from three major groups of factors which interacted very closely; a reliable package of technologies; a complex of appropriate services and finally appropriate public policies. The Mission had been satisfied that IRRI's package of technologies was scale neutral and non-discriminatory and the institute had been warned to avoid in future any reference to low - medium - or high level input technologies as creating an impression that something could be got for nothing! Thus one of the criteria used by Dr. Ruttan had at least been satisfied at IRRI.

373. The service and public policies inputs could only be stimulated by the advent of a new technology, but as they were both in the hands of national administrations the centres could only, through its 'constraints' and 'consequences' programmes point out to the policy makers where gaps existed which delayed the full realisation of potential production increases.

374. He suggested that in recasting the paper Dr. Ruttan might include, under the three headings suggested, an examination of what the centre has been able to achieve in developing an economically reliable technology, stimulating inputs and affecting public policy.

375. In this connection he expressed the hope, warmly supported by the Chairman that the economics programmes of the centres would not become attenuated in any way as a result of the establishment of new specialised policy research bodies such as IFPRI.

376. The Chairman also suggested adding another sub-division to the three input areas outlined, that of choice of priority within centres. He took as an example the work of IRRI on irrigated and rain-fed rice. TAC had felt that IRRI might be over-concentrating on the irrigation approach and had welcomed a divergence from this. Now the question which might be framed was, taking the argument that a viable technology able to raise yields in irrigated areas had been established, would it not be advisable to concentrate even further on the less favoured environments? The team had however faced this question and it was implicit in Dr. Ruttan's paper. Nevertheless he felt that TAC reviews should, in future be requested to be quite explicit with regard to priorities within a centre.

377. He wondered also whether Dr. Ruttan would give some thought to the question of the criteria to be considered when recommending a research effort with specific reference to those crops which, whilst not of considerable magnitude on the global scale, were very important to sizeable groups of people.

378. Dr. Ruttan replied that, in his opinion, the total size of the crop, in terms of some combination of area, yield and value was an important criteria but not the only one. Others were the amount of effort which needed to be put into it and the size of the impact. A large impact on a small area could be more significant than a small impact on a large area.

379. Referring to the earlier comments on quantification he believed that the review team should not be asked to engage in it in detail. The centres own staff should be warned what is expected of them, as part of their own decision making, leaving the review team to evaluate these decisions. He would also agree with the suggestion to include in the paper some reference to the desirability of the review teams occupying themselves more with the question of what a centre should be doing rather than how well they were doing it. Only in rare cases could the members of a team treat with a subject in more depth than the institute's own specialist staff, and such review might be better conducted at seminars and workshops with outside participation.

380. This suggestion was contested by another member who felt it was essential that this task be undertaken by members of the review team and that teams should be carefully selected to ensure such essential scientific capacity. Failing this he thought that team members would not receive the necessary respect and confidence of the staff whose work was under review. The continuing biological changes, which meant constant alertness in the assigning of priorities within centres, also called for persons of the highest calibre on review missions.

381. Referring to the need for an attempt at quantification he felt nevertheless that this could be no better than an informed guess in most cases, where a standard error of 50% or more could be envisaged! This could also lead to considerable difficulties if erroneous figures were obtained by policy makers concerned with rapid increases.

382. On the basis of experience at IRRI Dr. Swaminathan suggested that, prior to the advent of a mission, the centre director concerned should be requested to specify what he felt to be acceptable as the minimum programme performance for the ensuing five years as a management tool. In some members' opinion this might, although very desirable, prove difficult however in view of the practical problems concerned with funding, especially that of special projects and outreach in general. Clearly flexibility was essential to the management, provided it did not go too far, in the fact of not necessarily assured financing.

383. Considerable discussion then ensued on the advisability and feasibility of forward planning and programming to the extent of five years. The value of ex-post evaluation to forward planning and decision making for the future was inescapable. For this reason several speakers agreed with Dr. Ruttan that the centres should undertake this themselves, rather than make it as a task for review missions. Ex-ante evaluation was infinitely more difficult, not to say speculative and needed to be considered by review missions when evaluating proposed new programme trends.

384. Requested to clarify whether the main reason why the director of IRRI had found 5 year programming difficult was in reality that of financing constraints, Dr. Swaminathan assured members that this was his statement, not Dr. Brady's. It was relevant he felt especially to the evaluation of performance; if this is to be increased in terms of production then the outreach programmes are most significant; but if used in a strict sense it need relate only to the achievement of programme targets measured in terms of number of crosses made, screening targets reached, etc. Thus the achievement of targets could be one definition - however overall preference was, he reiterated, extremely difficult to quantify. Several members remarked that it became more difficult when associated with rigid targets over a fixed time period.

385. Some members made reference to the effective of the former system of forward planning and review utilized in the U.K. and some other countries. Five year projections were made by the Institute concerned, giving not indications of possible production increases but the scientists' view of what technologies might emerge which could be expected to affect production increases, subject to the provision of appropriate services and policies as the other packages of inputs. These proposals of the scientists were then examined by a review panel, which at the same time evaluated past performance. The recommendations of the review panels were taken very seriously by the research councils concerned.

386. There was general agreement that the IARC's should follow something along these lines, with forward programmes agreed by the governing bodies prior to the visit of the review missions, always of course basing their approval of programmes on what might reasonably be expected to be forthcoming in the way of financial support from the system and service support from interested governments.

387. The Chairman agreed therefore that it would be fair to ask the centres whether they felt they had provided a technology for a given system and/or region, and if so, to regard this as an accomplishment. It might still, however, be necessary to provide an appropriate policy before full results could be achieved and felt. If such a question be answered negatively, however, it would clearly be very relevant to judgement and future work.

388. One member referred to a recent research conference which had closed with the statement that much had been achieved in research but little in production increases. It provoked a reaction that suggested that maybe research should be stopped for a while and more effort given to the concentrated application of known technologies! Whilst not concurring he did feel that the ultimate objective of the IARC's should not be to stop at the development of a package of technologies. Quantification and cost budget analyses could only be made, in the long run, at the level of farmers' fields. This was particularly true of the view which must be taken of the IARC system from outside.

389. He fully supported the contention that institutes should plan on a quinquennial basis, to coincide with the review system, with very clear objectives, and the methods to be employed to reach them carefully set out and giving a reasoned account of the expected results. Clearly sufficient flexibility would be needed, but he agreed with earlier speakers that this should not be excessive. An objective quinquennial evaluation could only be carried out on the basis of the measurement of achievements against those anticipated.

390. The Chairman drew attention, in the light of the foregoing comment on results in the field, to the supreme importance he attached to the economic work at the IARCs particularly that related to the constraints to, and consequences of, the adoption of new technology. This work cannot and should not be conducted out of the context of the rest of the work of the centre, although it could be usefully complemented by other bodies. He reiterated, however, the Committee concern that IARC's should not become involved in, or made responsible for, national level policy planning.

391. He also drew attention to another point implicit in Dr. Ruttan's paper, which arose from the fact that TAC was not fully conversant with the total programme of the centres, especially with respect to bilaterally funded outreach work. He would wish the Committee to push hard for full information on the total activities which, it was becoming quite clear, were of fundamental importance in the review process.

392. Responding to comments Dr. Ruttan observed that all recognized clearly that research was only one of three factors he had outlined. It was engaged in because lack of knowledge or technology appeared a fundamental constraint to increase in given circumstances and at a particular time. It was not, in his opinion, difficult to justify research or to sort out its effects.

393. Secondly, he felt it was essential to go beyond the simple measure of research work based on a number of crosses, etc. and to regard these as measures of input, not output. The output was what happened as a result of those activities and there were several levels at which it could be measured. In his opinion reviews should go at least as far as the potential impact on production.

394. He contested the suggestion that the criterion of total yield was the best and only measure of return on research investment but he did feel that the director of a research station had some responsibilities off the station even if these did not quite stretch to attempts to affect national policy. Advice could be and is, given as to how best the results of the station should best be applied in a given situation.

395. Agreeing that it was natural for a director to make comments on the type of policy decision needed to fully effect the mandate of his centre the Chairman remained adamant that it was not the responsibility of a centre to develop the policies and run the extension services of any country whether the host country or otherwise. Observations made by experienced men were reasonable to expect but no centre should expect to be able to take on the task of devising appropriate extension systems for every country in which it had programmes. This could only lead to attenuation and ultimate breakdown of the research centre. A new type of assistance was needed for that sort of task.

396. Summing up the discussion in closed session the Chairman warmly thanked Dr. Ruttan for his valuable contribution. A number of points had been raised in discussion that would be recorded and he asked Dr. Ruttan if he would then undertake a revision of his paper. It would serve as an important adjunct to the work of the Committee and an invaluable part of the briefing materials for future review missions.

397. Dr. Ruttan willingly accepted the assignment and invited members to communicate with him directly on any further thoughts they might have for improvement of the paper.

Arrangements for the Water Buffalo Research Consultation (Agenda Item 8 (a))

398. At the request of the Chairman, the Deputy Executive Secretary explained the arrangements for the consultation. He recalled that TAC had proposed it should mount a field mission to study the research needs of the water buffalo in order to assist in resolving the question as to what were the needs, or were there needs, for international support for research on the water buffalo. As a result of a report from the UNDP/FAO mission which was in the field for some 3 months, which was shared with members at the last meeting, it was resolved that a working group of experts should be convened by the TAC at a suitable location in the Far East region, to discuss the possibilities of international support for water buffalo research. The Secretariat had consequently arranged an expert consultation which was to be held in Singapore from the 10th to the 13th of March, 1976. This was being convened with FAO's assistance. Documents relating to the consultation which had been issued included a provisional agenda, a list of the proposed attendance of experts, and a brief paper headed "United Nations Development Programme - Proposal for an Inter-Regional Project", which gave the background and supporting information for the consultation. This had been prepared for purposes of discussion with UNDP with a view to possible UNDP support.

399. Before calling on Dr. Rendel, Chief of the Plant Production Service in FAO's Division of Animal Reproduction and Health, to address the meeting, the Chairman brought to the notice of new TAC members in particular that the Government of Pakistan had put a serious proposal to TAC for research on water buffalo but TAC had been very slow in dealing with this matter and reaching a conclusion. He recalled that the earlier TAC discussion had been fairly decisive. The Committee had not seen a case for establishing a single international centre for water buffalo research but it had seen the need for strengthening collaboration among the nations concerned and particularly in South and South-East Asia. In view of the fact that TAC had acted much slower than apparently necessary and to its possible discredit, he was anxious for the proposed consultation to produce some viable proposals of the kind which interested bilateral donors would be willing to support.

400. Dr. Rendel recounted that the countries which had been invited included the Philippines, Indonesia, Thailand, India, Sri Lanka, Pakistan and Egypt. He mentioned that the meeting had been planned so that each country would be represented by the senior scientist involved in buffalo research as well as by one senior person in governmental service who would have some kind of administrative authority so that any decisions taken would have some assurance of governmental backing which was essential.

401. In order to obtain a clear opinion of what the governments and the scientists in the area wanted from a buffalo research network all the governments concerned had been asked to indicate the kind of buffalo research they had on-going, the kind of facilities they had in their country, the kind of budget they had for buffalo research, and their intentions and priorities for future research. Practically all of the countries invited had answered and it was very interesting to see that they had in most cases listed the same items. He added that it was also interesting for the organizers to note that the items put down as priorities in discussions within FAO had been repeated by the countries of the region. One item in which they were particularly interested to cooperate was reproductive problems with the buffalo, including artificial insemination and deep freezing of semen. Another was animal nutrition and particularly the buffalo's ability to utilize waste from agriculture. Other items listed included animal breeding and studies of genetic parameters, and milk draft production and/or meat draft production. The enquiry revealed that there were several countries which stressed the importance of buffalo as a meat animal but only one country listed the economics of buffalo production. As a priority item several countries cited specific buffalo diseases. It was apparent that several of the institutions particularly in India, Pakistan, the Philippines, and Egypt had a very impressive set of research activities on buffalo nutrition and breeding. Obviously other countries had not the same research capability but still there was some research going on.

402. Dr. Rendel then turned to the question of how should a network be organized and how could it be supported. The conclusions reached in preliminary discussions within FAO were that an attempt should be made to establish networks in, say, five priority fields and that these networks should then be established between institutions in each country participating in the network. As well, scientists responsible for contact with the other institutions should be designated and coordinators for each network appointed. However, as the research was being made in national institutions it was very important to involve the institution directors in some way. Therefore it would be necessary to have some kind of mechanism whereby the directors for all cooperating institutions, and the organizers or coordinators of the networks could come together, for instance, once a year and discuss the programme of work for the forthcoming year.

403. He added that the FAO ad hoc study group believed that workshops on specific topics such as water buffalo as a utilizer of roughages or the freezing of semen, would be a very useful way of sensing the degree of cooperation between the participating countries.

404. In addition to the workshops they felt that there should be provision for fellowships to enable students to study at one of the institutes in buffalo research and also provision for short-term consultancies particularly for scientists within the Asian region where the greatest expertise resided.

405. Dr. Rendel felt that the expert consultation would welcome any advice from TAC particularly in respect of the machinery by which support could be administered to national institutes assuming, of course, that the CGIAR would support the setting up of the cooperative research networks. He thought that this and the funding operation involved some difficult problems and called for some coordinating body to organize and channel funds. One possibility was to have an annual meeting between the institution directors and the network coordinators who had authority to distribute funds. He expressed the opinion that as much as possible of the workings of the programme should be handled by the scientists actively engaged in the research.

406. The Chairman pointed out, however, that while appreciating the various points made by Dr. Rendel, it was the job of TAC to report to the CGIAR in response to matters which had been properly placed before it by the co-sponsors, and in the matter of research on water buffalo TAC had not formally responded to a proposal from Pakistan. The procedure would be that TAC examined the report of the expert consultation and made recommendations of its own on the basis of this. It was possible that TAC might just endorse what emerged from the consultation, or it might find it necessary to make suggestions or amendments, or even reject the ideas. He indicated that there were a number of possibilities such as assisting the further development of the good work at present being done in the Philippines and India, and the building up of a collaborative programme with other members. Another possibility was that bilateral donors support the work in each country and the CGIAR sponsor through TAC frequent consultations. However, he did not wish to see any of the options preempted although any ideas fed in to the consultation from FAO or elsewhere were welcomed. The assistance of FAO in arranging the consultation was also appreciated.

407. The Executive Secretary informed the meeting that Dr. Madamba would be representing TAC at the consultation. He added that TAC had engaged Dr. Ross Cockrill as consultant and had specifically charged him with writing of the report.

408. After discussion on a number of suggestions for inclusion of other country participants in the expert consultation, the Chairman invited the Secretariat to confer with FAO for finalization of the arrangements.

Animal Genetic Resources Board (Agenda Item 8 (unscheduled sub-item))

409. To take advantage of Dr. Rendel's presence the Chairman raised the matter of the proposal for an animal genetic resources board which he had learned of by way of a letter from a professor of genetics at the Australian National University. He had not yet received a copy of the proposal but had been given a document from a working group for cooperative research on breed comparison and cross-breeding held in Warsaw last June, which he felt was germane to the proposal.

410. He informed new members that when TAC had previously discussed the gene conservation of crops it had explicitly decided not to recommend any activity in respect of animal genetics. This, however, did not preclude TAC from considering the matter again but would do so only after it had been placed on the agenda at the request of a sponsor or by himself, and the latter alternative was only possible after he had received a formal proposal.

411. In the meantime he would inform the one correspondent of the previous TAC decision and that the proposal for an animal genetic resources board would not be a matter for early consideration by TAC. He added that if any of the sponsors wanted TAC to examine a proposal then they were entitled to ask this of TAC.

412. It was made known to the meeting that the reason why the proposal had not been tabled at this TAC meeting was that the proposer had seen that it was not included on the agenda and therefore had decided there was no urgency to present it.

Arrangements for CIMMYT Review Mission, March-April, 1976 (Agenda Item 8 (b))

413. The Executive Secretary reported that everything was in hand for the CIMMYT review mission and that the team members as well as CIMMYT had been provided with the necessary documents. Dr. Hanson had suggested some minor changes to the terms of reference but basically they were the same as used in the IRRI review.

414. He commented that the itinerary of the mission had been changed at the request of Dr. Hanson from that which had been tentatively planned during the 11th TAC meeting held at CIMMYT in October last. Instead of the mission team splitting and some visiting the winter wheat programme in the United States while others visited the maize programme in Guatemala, Dr. Hanson had decided it would be better to bring the people from Oregon as well as from Turkey, where CIMMYT had a major wheat breeding programme underway, to Obregon where CIMMYT's winter wheat programme was essentially based. And further, in place of the visit to Guatemala it was suggested that the research directors of several of the Central and South American countries be brought to CIMMYT to have discussions with the mission. By coincidence this was the same arrangement as had been suggested by the teamleader, Dr. Riley.

415. On the point mentioned by the Executive Secretary that Dr. Hanson was keen to have the team leader and, if possible, other members of the mission meet with the CIMMYT Board of Trustees to discuss the main conclusions of the review, the Chairman intervened to point out that such discussion should be limited to an oral statement of the tentative views formed. As in the case of the IRRI review the team leader of these TAC missions could only be committed to having frank discussions with the Boards of the problems emerging and the nature of the mission's tentative thinking but in no way should be committed to stating firm conclusions.

416. The Executive Secretary commented on the problem of deciding on the duration of these quinquennial review missions. Dr. Hanson had indicated that he thought the two weeks allotted was not sufficient time. With the IRRI review the 3-week itinerary was first considered to be too much but after their experience most of the IRRI mission team had decided it was not too much. The IRRI itinerary, however, included a full week in the field whereas the CIMMYT mission, as presently planned, would not be spending any time in the fields outside Mexico.



417. The Chairman then raised the issue of the proper procedure in reporting since it had become known to him that a member of the CIMMYT review mission had requested a copy of the report of the IRRI review. This did not seem an unreasonable request but he wished to express his firmness about the need to limit the distribution of a TAC document before it had been finalized and cleared by TAC. It was TAC's obligation to report to the CGIAR and although the report was that of the review mission TAC would endorse it, or if necessary, suggest modifications of viewpoints.

418. On being informed that the IRRI review report would be in final draft form before the CIMMYT review he thought it would be helpful for Dr. Riley and his colleagues on the team to have copies so that they could see the kind of report which would evolve. The meeting agreed to this proposal.

419. The Chairman concurred with a member's contention that two weeks was inadequate for the CIMMYT review and that the review mission should as far as was possible visit all the countries where major outreach programmes were being carried out. He recalled that unfortunately there had been no real cooperation on this matter from the start of discussions in mid-1975 and although there had been an improvement in CIMMYT's understanding of the mandate of the review and some promise of an enlargement of the mission's itinerary, the letter from Dr. Hanson which had only just arrived now stated that for reasons of cost, time and government sensitivities the original proposals were not feasible. The Chairman felt that the original idea of the mission visiting other countries where CIMMYT had on-going work, should not be abandoned unless TAC could be satisfied that the review mission had the means available to make some assessment of the outreach programmes. Otherwise TAC would be failing in a very important matter which had already been the subject of a controversial debate in the CG. He felt reluctant to go along with the notion of bringing people from Turkey to CIMMYT. Rather he wished to explore the feasibility of the mission visiting other countries. Was this impossible, he asked?

420. The Executive Secretary pointed out that it would be difficult because Dr. Riley would not be able to spend more time travelling to other countries. In fact one of the main constraints on time was the availability of Dr. Riley as team leader. He added that one advantage of having Professor McCalla in the mission was his wide experience of the outreach programmes of all the Centres - he had recently carried out an evaluation of these for IFPRI, or was in the process of doing so - and it was hoped that the team would get some first-hand information from him. Also it could be anticipated that Dr. Blumenschein, who was a member of the mission, would provide information on CIMMYT's work in Latin America.

421. He understood that CIMMYT was proposing to bring to the Centre not only a member of their own staff in Turkey but also a Turkish wheat scientist. Likewise a scientist from the Oregon programme would be invited and in the case of the Central American countries it was planned to have several national research directors as well as CIMMYT's own regional maize scientists discuss their programmes with the mission.

422. At one stage visits to Pakistan, Lebanon and Algeria had been mooted but due to the civil strife in Lebanon and the problem of logistics with a visit to Pakistan, as well as the difficulty of resolving the dilemma of whether it was wheat or maize that should be looked at in this country and also in neighbouring India, the compromise solution of having everything focussed in Central America was accepted.

423. The Executive Secretary mentioned that he was bothered by the fact that he had not seen any reference to the suggestion that people from either CIAT or IITA should also be invited to CIMMYT to join in discussions with the mission. He thought this was an important omission which should be raised.

424. The observer from the CG Secretariat pointed out that the maize programme at CIAT had been taken over by CIMMYT and the former maize breeder there was now working on beans. He felt that the programme at IITA, however, was very important for the mission to know more about and there was a need to consider a representative from IITA.

425. One member was of the opinion that it was perhaps necessary for TAC to take a special look into the problem of mission's making an effective evaluation of outreach activities of the Centres. He suggested that one approach would be to select four or five countries in which a number of the Centres had outreach programmes and then try to obtain some assessment of outreach per se and not in connection with a specific Centre's activities.

426. Another matter he raised relevant to mission procedure overall was the need to have some carry-over of experience from one mission to the next. He expressed regret that there was no one in the CIMMYT review team who had worked on the IRRI review mission.

427. A TAC member who was on the IRRI mission mentioned that he had found the visits to the three different rice growing areas prior to the detailed discussions at IRRI absolutely essential to his complete understanding of both the objectives of some of the programmes in the laboratories and the problems and constraints under which the staff were working. He stressed that this was too vital a part of the review to dispense with lightly. He added that he fully realized the problems of getting an expert panel together and the chances of mounting the sort of team which TAC would like decreased exponentially with every two to three days added to the duration of a mission of two weeks. He did not see the need to have the mission visit the appropriate countries in the one spell and suggested having a field trip organized in one area for three or four days followed by a couple of weeks later by a similar field trip to another area followed say, a month later by the review proper at the Centre concerned. He believed that it was easier to fit a number of busy people into two or three short absences that attempt to get them all together for three to four weeks in one stretch.

428. Another member thought it was apparent that the outreach programmes in different areas required different approaches and he supported the suggestion that perhaps TAC should treat this aspect of Centres' work in a special way.

429. Bringing the discussion to a conclusion, the Chairman thought that all the important issues had been raised and since there was little time before the CIMMYT review took place it was hard to make substantive changes to the itinerary. In order to resolve some of the more apparent problems he requested a number of members to meet with him and the Secretary next morning.

#### Arrangements for the CIP Review Mission, Autumn 1976 (Agenda Item 8(d))

430. The Executive Secretary stated that there was nothing to report. He had distributed a letter from CIP to the new TAC members so that they were in the picture. This was the same letter distributed at the 11th TAC meeting in October and there had been no change since then. He indicated that he was hoping to visit CIP before the May meeting of TAC and would discuss the terms of reference, composition and itinerary of the CIP mission with Dr. Sawyer and his staff.

Research on Water Use and Management (Agenda Item 8 (unscheduled sub-item))

431. The Chairman intimated that this was a matter which Dr. Hopper had wanted to have brought back into TAC discussions. There had been previous discussion on the subject and relying entirely on memory and one or two recent experiences with regard to restating the nature of this subject, he recounted that TAC had ranged in ideas from having mobile teams studying engineering systems to an attempted integrated approach where all the water problems could be studied at one place. He felt that TAC had retreated from both extremes and more or less had left it to the Centres to deal with this subject alone. TAC expected, and rightly so, that as water was an important factor in crop production the Centres, although essentially crop-oriented or systems-oriented should in dealing with water either under rainfed or irrigated conditions give attention to the moisture-crop relations.

432. Because of the environment they worked in, some Centres had to give more attention to research on water use and management than did others. At ICRISAT, for example, the work on farming systems under semi-arid conditions was aimed at making the most efficient use possible of the available water. Likewise in the programme of ICARDA it was anticipated that research on different ways of water storage and utilization would be an important component.

433. The Chairman remarked that he was troubled by the fact that TAC had not had further discussions on this topic. He referred to a document which had been produced under the auspices of IDRC but unfortunately this study which was mainly oriented toward engineering and large-scale reservoirs, and so on, was not very relevant to the specific problems of the Centres. Therefore, he thought it was time that TAC had a fresh look at the state of the art and he had asked FAO's assistance in providing an up-to-date survey of the research in this field particularly to reveal if there had been any significant developments in water use and management under conditions of scarce water supply. He suggested that this topic be discussed at the October meeting.

434. A member pointed out that the last time TAC had discussed this subject it had concluded that because it was climate- and location-specific it was necessary to develop and test methodologies for individual cropping regions. It was not possible to rely on general engineering and physical concepts. For this reason TAC had considered that this was one of the sciences that each Centre should develop according to its specific needs. However, he thought that TAC had not sufficiently emphasized that Centres should be really developing research in this field and he expressed astonishment at how little work was being carried out in water use and management at IRRI. Admittedly the Centre was primarily in a situation where there was no shortage of water but he felt that as they were dealing with irrigation and were developing more research on dryland rice growing there was a need for information on such aspects as water budgeting, depth penetration, water storage, and so on.

435. He doubted if there was a need for an overall review of research on the subject since from his own knowledge there had been no outstanding advance made. He felt, however, that there was a need to know what the Centres were doing. He believed that a survey of the Centres would show that throughout the whole IARC system the total number of people working in this field was quite inadequate.

436. Another member mentioned he understood that China had developed significantly in such aspects as use of water, water conservation and management and he hoped that some information on this could be included in reports to the October meeting.

437. Other members supported the call for more work in water use and management particularly in relation to the problems in the Sahelian zone as well as other areas receiving higher rainfalls but where better water management could lead to increased crop production.

438. The FAO representative said that he would be pleased to pass on the request of TAC to the Director General.

Aquaculture (Agenda Item 8 (unscheduled sub-item))

439. The Chairman informed the meeting that the position TAC had reached as regards aquaculture research was that it recognized the importance of fish, but particularly the cultivation of fish in inland waters, as a part of the total food supply hopefully available to the masses of people in the world. From the beginning TAC had declared a non-interest in the cultivation of products such as shrimps, designed purely for the more affluent markets. TAC had made a thorough investigation of aquaculture which revealed a peculiar situation. It appeared that there was a good deal more capital equipment available for research and development than there was the actual skill to undertake research. Also there were very clear indications of difficult problems but nonetheless some signs of significant breakthroughs being made. In addition it was seen that the development of aquaculture in relation to the inland waters of Asia was quite considerable.
440. He recalled that TAC had reported to the CGIAR that they considered this field of research very important and that the major immediate priority was in training more people to undertake research. At the same time TAC wanted to indicate the importance of research by encouraging one or two particular efforts. The matter was then both relieved and in some ways made more difficult by IDRC picking up the recommendations of TAC and very helpfully giving effect to them.
441. As far as TAC was concerned, however, the Chairman did not want the impression formed that this was all that needed to be done. He thought that there had been considerable further progress over the last two years judging by what he had seen in India. He proposed that TAC make another examination of the state of aquaculture and discuss it at the October meeting to see if a further recommendation could be made to the CG. He looked to the countries concerned, IDRC, and the strong element in FAO to provide the necessary background documentation.
442. In response to the Chairman's invitation for comments one member said he was rather unhappy in that after having stimulated so much thinking as well as the work by some groups TAC was seeing very little in the way of results except for the fact that some bilateral donors and IDRC had picked it up. He viewed aquaculture as having considerable potential in relation to the nutritional needs of people. He stressed the importance of having information from all the various sources available for the October meeting.
443. The Deputy Executive Secretary informed members that recently he had met the leader of the IDRC team which had just completed a mission in the Far East and which was making some fairly firm recommendations to IDRC for the establishment of an advanced training centre for aquaculture research. The proposal was that this should be centred at Ilo-Ilo in the Philippines. He added that IDRC would, in due course, be releasing the report to TAC and other interested parties.
444. Information on other activities which members provided included the setting up of an aquaculture centre in Hawaii supported by the Rockefeller Foundation, an ADC workshop on the social science needs in the Southeast Asian area, the extent of research in the U.K., the large scale study of the Battel Memorial Institute in Switzerland, and a recent symposium on aquaculture in the Philippines.

Banana Collection in New Guinea (Agenda Item 8 (unscheduled sub-item))

445. The Chairman mentioned that he had received a letter from a research committee associated with the Foundation for Biological Research in New Guinea informing him that it had quite valuable collections of banana germ plasm, and being concerned that this collection was more difficult to maintain under conditions in New Guinea, had asked if it could be taken over by the IBPGR or linked with other collections. He reported that he had passed the matter on to the Chairman of the IBPGR for comment.

Weather and Climate (Agenda Item 8 (unscheduled sub-item))

446. The Chairman referred to the letter he had received on this subject and which had been circulated to TAC members. He said that he was hesitant to place this matter on the agenda since it was one receiving attention from scientific academies around the world, and was regretfully in his opinion lending itself to too much sensationalism and statements about what had happened to the climates in the world, which when examined did not stand up to scientific tests. Also as this was a long term problem it was of less concern to TAC although in the future, as in the case of nitrogenous fertilizers, TAC might have to modify its terms of reference and consider such items.

447. A member informed the meeting that with the advent of satellite photographs it was possible to explore if there was a real effect of change in climate and weather on a global basis. However, he did not see any likelihood that these efforts needed the support of the CGIAR.

448. The Chairman concluded that he would consult the sponsors of the letter and the co-sponsors in the CG system and draw attention to the fact that this particular problem was held in the ambit of certain institutions.

Merger of the TAC Grain Legumes and Plant Nutrition Subcommittees (Agenda Item 8 (unscheduled sub-item))

449. As a result in the large change in the membership of TAC, the Chairman suggested combining the legumes and plant nutrition subcommittees into a new committee with membership as follows: Drs. Swaminathan and Ruttan as co-chairmen, and Drs. Blumenschein, Ajibola-Taylor and Madamba.

450. He saw the immediate need in connection with plant nutrition was to sort out what could be done in the field of organic sources of nutrients.

451. Dr. Ruttan mentioned that they had not got very far in earlier discussions but planned to deal with items such as organic matter preservation and use, village-level nitrogen, kinds of production and systems of conservation, and the potential of biological assimilation, at the subcommittee meeting to be held immediately prior to the 13th TAC at Los Baños.

452. Dr. Swaminathan, for the benefit of the two new members to the legumes/nutrition committee mentioned that right from the beginning TAC had been concerned about the whole question of plant nutrition and had tackled the matter from three angles. One was purely from the use of chemical fertilizers and an outcome of this was the IFDC and its concern in various aspects of leaching losses. Another was biological nitrogen fixation which TAC had looked at in its totality, and the third was organic matter conservation and utilization.

453. The Chairman concluded discussion on this item asking the Secretariat to ensure new members had all the relevant documents covering previous discussions.

CATIE (Agenda Item 8(e))

454. The Chairman remarked that the matter of CATIE was one of considerable debate and discussion previously and he thought he had delivered a very clear verdict from TAC to the CGIAR, a verdict which he knew to be entirely satisfactory to the Inter-American Development Bank, USAID and other donors involved. He recounted that TAC had brought notice to three major deficiencies in the proposals and the experience of the centre. One was that TAC was not happy with the apparent absence of close relations between CATIE and the national research system. There was also an understandable absence of a link between CATIE and CIAT but which needed to be established. Thirdly, TAC felt that the management capacity of the centre would have to be improved if the ambitious programme was to be successfully launched. TAC had therefore stipulated three important conditions that were understood and were accepted.

455. Although CATIE had made apparently considerable progress towards meeting these conditions the matter had unfortunately been referred back to TAC as a result of unscheduled visit to CATIE by the President of the World Bank. It seemed that one of the problems arose from the Director of CATIE wishing to be treated in the same way as the director of an International Centre and wanting CATIE recognized as an international body working within the CG system. But as the Chairman pointed out CATIE was mainly financed through bilateral donors and not by the CG as were the International Centres.

456. In response to the Chairman's request for some clarification of the letter from Dr. Elgueta in which he had indicated that CATIE was keenly interested to be recognized by TAC as an international centre with all the requisites of such but with regional objectives and with a programme that was not oriented to commodities, and so on, Dr. Marcano said he could not shed much light on the matter except to report that Dr. Wellhausen had been appointed Chairman of the Board of CATIE and had considered all of TAC's comments, that the review of the research programme was anticipated in June, and that Jorge Soria was currently acting as director of the centre while Dr. Elgueta was convalescing after a serious automobile accident.

457. With this additional information to hand it appeared that things were proceeding in the right direction. It would be a matter for the CG to decide if CATIE should appear at Centres Week. As far as TAC's support was concerned this would be limited very precisely to certain activities it hoped would be carried on.

458. It was agreed by the Committee that the matter of CATIE's status should be discussed with the Chairman of the CG and if necessary brought back on to the agenda of the May or October meeting of TAC.

459. The Chairman said that on behalf of TAC members he would convey to Dr. Elgueta that they were sorry to hear of his accident and best wishes for a speedy recovery.

Report of discussion and recommendations on research of the FAO Conference  
(Agenda Item 9)

460. The Executive Secretary referred to that section of the FAO Conference Report dealing with research which had been circulated to members. The basic working document, also circulated at the last meeting of TAC, had been very well received by the Conference and had recalled in a constructive discussion from which three resolutions had resulted.
461. Both developed and developing countries supported the general content and basic recommendations of the working document, supporting particularly the need for additional work to strengthen national research and to support extension and development activities related to the application of the results of research. The latter need was given especial stress by a number of delegations.
462. The three resolutions consisted of a general nature, one related to biological nitrogen fixation and one to the establishment of an international hardwood pulp and paper research centre. The latter had some relevance to TAC's earlier discussions on forestry, and the Committee had also given high priority to work on biological nitrogen fixation.
463. Areas of research requiring more emphasis were listed in the document and he would not repeat them. Some were also reiterated in the general resolution.
464. The activities of the CGIAR, and, by implication, of TAC were welcomed and the support given by the CGIAR to both international centres and national programmes through networks was emphasized as of importance.
465. He was not in a position to comment on follow-up action to be taken by the Organization as programmes were currently being reviewed in the light of the Conference's recommendations.

Proposals for further action to establish an International Soya Bean Research Programme (Agenda Item 10)

466. The Chairman opened discussion on this item briefly re-stating for the benefit of new members the proposal made earlier by TAC for recognition of the INTSOY programme of the University of Illinois as an international effort worthy of additional international financial support. Difficulties had been encountered by the CGIAR however in implementing the proposal which, unfortunately still remained in abeyance. However soyabean was a crop of major importance and he, in common with other members of the Committee and of the CGIAR, felt that TAC should reopen the question of how to deal with the problems encountered and how best to encourage the development of research on the production and use of soyabeans.
467. The problems met were of two kinds, stemming from the possible threat to university sovereignty by loss of control over a major university activity (not insurmountable with adequate good-will on both sides), and the more serious difficulty met by some donors in contemplating financial support to an institution based in a developed country. Proposals had been worked out to avoid this latter difficulty also, by suggesting support only for outreach activities in the developing countries, but to no avail. A development of this proposal might form the basis for the Committee's discussion.
468. This suggested development was based on the proposition that a strong tropical soya research effort should be established in an appropriate country and environment, which could draw on INTSOY as a resource base but which would be itself CGIAR supported. Both Brazil and IITA had been suggested as suitable country sites for such an operation. Without further up-dated documentation the Chairman did not seek a full discussion, this could be at a later meeting, but he would appreciate members views on how the Committee should proceed further.
469. At the Chairman's request Dr. Blumenschein indicated Brazil's firm interest in the proposal. Brazil was the second largest producer of soyabeans and had developed a very active national soyabean research centre which was already in very close contact with the INTSOY programme. Some very interesting research results had already been obtained, especially in biological control of pests and systems which, utilizing two different regions of the country, permitted breeders to achieve three generations in a year. He would not anticipate the official reaction to a proposal to host an international centre or sub-centre but anticipated the fullest cooperation being offered at the technical level. Already other centres in Latin America were making use of results from Brazil.
470. Pointing out that both Illinois and the Brazil soya work was in agro-climatic zones more temperate than tropical, several members agreed that a sub-centre in the tropics was the real need, in order to hasten the development of soya in the tropics. This could certainly be achieved in Brazil, if that country was willing, and CIAT had shown an interest in cooperating with soya work in tropical areas of Latin America and might be considered as a participant in any proposed regional work.
471. The need for work on soya in the tropics, rather than continuing attempts to transfer temperate technology was confirmed by all subsequent speakers. Many attempts to introduce soya successfully in the tropics had failed, and many different reasons had been advanced, ranging from photo-period sensitivity of temperate varieties (which had now been overcome to some extent in INTSOY varieties) to pest and disease attack and inadequate modulation.
472. Referring specifically to the programme of IITA, where a cooperative programme with INTSOY was already under consideration, and the great potential for soya in Africa (except in the really wet tropics where light intensity might be insufficient), several speakers referred to the need for an examination of not just research needs in soya production but to other aspects of production development and utilization. In other words a strong outreach effort would be needed to improve the very limited success which had so far been achieved in those African countries which had entered soya production not only for internal consumption but for trade also.



473. Therefore a comparison of the two proposals would be of great value to the Committee in its further deliberations and it was mooted that the Secretariat should make contact with INTSOY, with the Brazilian authorities and with CIAT and IITA in order to obtain comparative views on research potential of the two regions considered. Emphasis should be on the possible advantages to be gained by strengthening the national research capacity, from the point of view of its contributing to increased production, rather than on strengthening of the INTSOY programme.

474. The Committee was informed that the programme of INTSOY was to receive continued and probably increased support from the USAID, following a recent review of its activities which had pointed up, inter alia, the need for additional outreach support. Some research was being supported on the utilization of soyabean as a food, in addition to the basic research on its improvement as a crop. The stationing of an INTSOY team at IITA was also confirmed, and encouragement was being given to research on nitrogen fixation (nodulation) and seed-storage, both problems of express interest in the tropics. A summary of progress at INTSOY was provided for members.

475. Reporting on work in the tropics with soyabean two members referred to the excellent results which had been obtained, with yields of 4 - 5 ton/ha from crosses of local and introduced germplasm. Whilst other grain legumes such as cowpea, chick-pea, and pigeon-pea remained the most important species there was undoubtedly scope for enhanced work in soya, probably best approached through inter-country collaboration in a network. The problems appeared not to be in the area of yield, but rather in its acceptance as a food crop.

476. In the latter connection it was pointed out that soya had multiple uses - as an animal feed, as a source of oil, as a green vegetable and as a dry bean with varying food uses. There was therefore some need to discuss what soya was really wanted for, and to ensure that any research was properly oriented towards the appropriate end use. This would certainly entail the sort of local specific research which could be best done at the national level in a network approach, following the pattern already established by INTSOY.

477. It was suggested therefore that the TAC should examine the consumption and nutrition aspects of soyabean, particularly in view of the very considerable contribution it had made to the problems of protein malnutrition, especially in infant feeding. A complete literature survey would, it was agreed, assist the Committee to reach some conclusions on the question of utilization and the type of research which needed to be undertaken in respect of the various uses.

478. It might even prove advantageous some members thought, for the Committee to convene a small working group on soyabean.

479. Several members gave further information to the Committee on the very diverse utilization of the crop, and it was remarked that at least two of the international centres were already using it in cropping systems programmes. It was not however suggested that other centres than IITA should interest themselves in soya except as part of their systems work and as participants in any network which might be established.

480. In opening the discussion in closed session the Chairman remarked on the very wide ranging discussion which had ensued, which had proved very useful in highlighting the problems to which TAC needed to give its attention. In the light of this discussion he felt that the issue facing the Committee was no longer a question of how to circumvent the difficulties experienced over the earlier recommendation but rather the need for a restatement of where soyabean work was being done, the range of total interest in the crop, the rather critical question of utilization, which was felt to have been underestimated, and the need for a fresh look at the organizational approach to the problem. This would require a considerable input from the Secretariat and other collaborations. This should start, he felt, with updating of the knowledge of what INTSOY is doing, and where and what national and international centres are undertaking. It would not be reasonable therefore to undertake all of this in time for the May meeting and it would probably prove necessary to postpone further full discussion until October.

481. A question was raised by the Executive Secretary as to what priority the TAC now wished to assign to soyabean research as at its last meeting the Committee had assigned a top priority to the crop.

482. One member felt that in view of the rather diverse opinions expressed about the potential for soyabeans in the tropics the allocation of a priority rating would depend on a potential for the crop in the true tropics as distinct from the sub-tropics.

483. The Chairman, supported by several members, believed that a consensus had been reached with regard to this critical question, to the effect that it was a high priority matter. However, in view of the expressed wish for the soundest scientific judgment he would like to invite a representative from INTSOY to assist the further deliberations of the Committee, whether in May or October. In the meantime he would request the Secretariat to begin preparations for an updated statement on soyabean research, including that of INTSOY.

The CGIAR Review (Agenda Item 18)

484. The Chairman explained to members that the general purpose of the current review of the CGIAR was to examine what had to be done and whether it was proceeding along the right lines as well as to determine what were the likely needs for the future and consequently the financial projections over the next decade. As regards the likely future needs, TAC's advice as an input to the review would be of tremendous importance. It was clear that the question of priorities would be re-examined and in this respect TAC may even have the task of being much harsher than in the past about priorities within the existing Centres.
485. The Chairman commented that a review committee had been formed headed by a chairman and two or three other members who would serve in their personal capacity rather than representatives of this or that national or international organization. He informed members that there was to be a meeting of the review committee during the present TAC meeting and another in March, and he hoped to report on the review at the TAC meeting in May.
486. With respect to the review's consideration of what sort of further developments were in mind he stated that TAC had not given many illustrations but what it had given were important ones such as support of TAC's view that it would be wrong to think always of an answer in terms of an institute.
487. He referred to the fact that the appointed director of the study, Dr. C. C. Webster, unfortunately had to withdraw through illness and that it was proving difficult to find a replacement. Dr. Webster had made a useful contribution in reshaping the terms of reference of the review.
488. The Executive Secretary informed members that Dr. Webster had visited him and made a careful appraisal of the contribution which TAC made to the system. He found that one aspect Dr. Webster was keen to get a good grasp of was an overall view of the system. He was concerned that the system had always been additive and there wasn't a mechanism, as far as he could see, for reviewing it in its entirety.
489. Another problem that concerned the review study director was the request in the original terms of reference for quantification, like trying to indicate what the success of research would be in the future in increasing yields. This was a very difficult, if not impossible, task and the director's concern was well expressed in the amendments he had proposed to the terms of reference.
490. The Chairman agreed with the suggestion that in addition to the priority statement a useful input from TAC would be to indicate to the review panel the mechanisms by which TAC felt that international agricultural research could be advanced and give a description of the mechanisms TAC used or advocated. As pointed out it was better to have TAC prepare one document from its detailed knowledge of the subject rather than have someone from outside come in and pick it up from diverse documents.
491. The Chairman reiterated that as far as priorities for research were concerned the TAC document would be the major contribution. He remarked, however, that even in present structural relationship of TAC with the CG, the CG was free to accept or amend any recommendation that TAC put in.

CHAIRMAN'S SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS (on Further Action on  
Items 3, 4, 5, 6, 7, 8 and 10)

Agenda Item 3 - Report of the IRRI Quinquennial Review Mission

492. The Chairman explained that the purpose of the quinquennial review of Centres, of which IRRI was the first, was an examination of their accomplishments and future programmes by a TAC team based on close discussion with the particular Centre's Director and staff. He emphasized that these reviews were not inspections in which, for example, staff were assessed on past performances.

493. Because of the importance of these reports in determining the future of the CGIAR system overall it was necessary that the missions be well constructed. The procedure adopted for this first and critical IRRI mission, whereby the team was made up of two or three TAC members augmented with the best scientists that could be recruited from outside with experience in the fields related to the Centre, appeared to be satisfactory judging from the excellent reception of the Report by the members of TAC.

494. The Chairman pointed out that TAC in its deliberations on the Report had made a number of suggestions for alteration in wording and style but not of the substance of the Report.

495. He asked that it be clearly understood that as a matter of principle any changes in the substance of a Report as submitted by a mission team would remain the prerogative of the mission team leader and members and any comments or additions that TAC wished to make or suggest would be stated separately but in the same final report for submission to the CG.

496. In the case of the IRRI Review Report it was fortunate that Dr. Swaminathan, the team leader, and three other members of the mission had been able to meet during the present TAC meeting to discuss and reach agreement on the amendments suggested.

497. The TAC Secretariat was requested to prepare the revised Draft Report of the IRRI Quinquennial Review in good time to enable TAC members to become fully conversant before discussing it further at the May meeting. It was intended that the final position of TAC itself with respect to the Report would be expressed at the next meeting and that this be incorporated in TAC's report to the CG at their July meeting. The preliminary reactions of the present meeting indicated, however, a very high level of agreement with the substance of the Report and on the basis of this the Chairman believed that there was a good likelihood of its unanimous acceptance by the CG.

498. The TAC had agreed that the quality of the Report had set a high standard and thus had very satisfactorily initiated the sequence of the TAC quinquennial reviews.

499. Of the specific issues raised during the discussion, that of the need for the review team to reach agreement on priorities within its own list of recommendations, particularly with respect to new senior positions to strengthen the research staff, had already been taken care of by the subcommittee meeting in Rome.

500. Another issue which likewise had already been rectified was the need for clarification of the recommendations with respect to allocation of resources to upland non-bunded rice research.

501. Further to these pointed, TAC had found that there was a need to clarify the proposals for capital installations, particularly those for storage of the germ plasm collections and the associated routine work of the genetic evolution and utilization team.

502. Another point raised and which the Chairman thought could perhaps be incorporated as part of the TAC report on the IRRI review, was the need to emphasize the recommendations of the Team on agricultural engineering research and post-harvest technology. It was felt desirable to stress that the ideas expressed by the Team in support of agricultural engineering research were in full accord with the views expressed by the TAC in response to an earlier report on the machinery programme. TAC had agreed that mechanization in rice cultivation in countries where there were very intensive labour systems and small holdings should not be of a character such as to lead to the displacement of labour but rather to enable the abundant manpower resource to produce more rice. With regard to the work on post-harvest technology TAC had indicated that as far as IRRI was concerned it should be limited to the village level although covering all phases from planting right through to the delivery and threshing of the grain.

503. In respect of the IRRI cropping systems programme, to which the review team had given much attention, TAC felt that a clearer rationale could be spelt out particularly in terms of a proposal for the Centre to initiate coordinated activity in systems work involving rice. In other words TAC was suggesting that IRRI should participate in the oversight of all the work in the CG system that had rice as a major component in the cropping system.

504. In conclusion the Chairman reiterated his own personal satisfaction with the report of the IRRI Review Mission especially as it had splendidly initiated TAC's review activities.

#### Agenda Item 4 — Report of the Vegetable Research Appraisal Mission

505. Before giving a summary of the conclusions reached by TAC, the Chairman reminded the meeting that vegetable research had not been placed in the first category of TAC's priorities and although moral support had been given to programmes in Thailand and the Asian Vegetable Research and Development Centre (AVRDC), TAC had not been disposed to recommend any international effort within the CG system. In the absence of substantive data about research on vegetables or about the usage of vegetables and their importance in the diets of people in different regions, TAC had been reluctant to accept the recommendations of a Rockefeller-supported mission for an international centre. In order to try and resolve the issue TAC mounted its own mission to appraise the need for additional internationally-supported research.

506. The report of the mission lead by Dr. Marcano had now crystallized TAC's thinking and although there was still a scarcity of substantive data, a problem which beset the mission members, there appeared to be little doubt of the need for some form of internationally supported effort to strengthen vegetable research. However, the majority of TAC members remained unclear as to how best it should be effected. While TAC members appreciated the strength of the reasons given in the report supporting the establishment of a new international centre of limited size in combination with a network approach, they were not prepared at this stage to endorse that approach and had put forward other alternatives for consideration. These included utilizing one of the existing International Centres as the main coordinating research location in a network of national institutions or merely developing and strengthening a network of national research institutions with one as the main coordinator and principal seat of the research effort. A third possibility was the creation of an international vegetable research board for tropical developing countries which would identify research needed to remove the major constraints to increasing vegetable production in selected species, channel funds to its support at appropriate institutions, monitor the utilization and report to the CG.

507. Apart from this problem of determining the most appropriate organizational form of an internationally supported research effort, there were other unresolved but important points upon which valuable comment had been made in the review mission's report. One was the need to determine the correct order of priorities among the many plant species used as vegetables in the tropics.

508. Another was the need for more information on the real significance of the various kinds of vegetables in the diet and nutrition of both rural and urban populations.

509. A third important matter was to know more about the extent of research on vegetables and if, in fact, research of any kind was being carried out on the "native" species widely consumed in the traditional diet.

510. The Chairman also pointed out the need to recognize that there were many problems facing the researchers particularly with regard to determining the real constraints in increasing vegetable production in tropical developing countries. For example, were they mainly pest and disease problems; or was it simply a question of breeding higher yielding varieties; or was it a matter of storage and dehydration processing? He believed that all of these aspects were bound to be important to varying degrees according to the type of vegetable and the location.

511. Although the review mission's attention had been directed to vegetables for the tropical lowlands and the report, therefore, had given emphasis to the problems and needs of this ecological region, there were others such as the semi-arid and sub-tropical regions in which strengthening vegetable research warranted consideration.

512. In order to have a further full discussion on vegetable research at the next meeting in May the Chairman had asked the Secretariat to prepare a paper on the issues raised in the mission report and in the debate, and adding further pertinent information where possible to provide a series of options as to the relative importance of the different vegetables. TAC needed a pro-and-con statement about each of the possibilities and about selection of priorities in the vegetable list.

513. He also added that in TAC's further and final deliberations, full account would be taken of the experience gained by the Asian Vegetable Research and Development Centre in Taiwan.

514. He concluded by stating his conviction that TAC was moving in the right direction of recognizing vegetable research as of a higher order of importance than was given in the priorities statement which had hitherto bound TAC's judgement.

Agenda Item 5 — Relations with Advanced Scientific Institutes Including the Proposed International Agricultural Development Service

515. The Chairman first referred to the contribution of Dr. Wortman in presenting TAC with the details of the proposed functions of the International Agricultural Development Service (IADS) being sponsored by the Rockefeller Foundation.

516. He recalled the previous meeting in Mexico at which, with the limited information TAC had received, it was thought that IADS might be concerned principally in strengthening national research. However, it was now evident from Dr. Wortman's paper and his oral presentation that the main objective of IADS was to assist national governments prepare alternative strategies for production and development although it would, as a matter of course, concern itself in national research and its application to increased production.

517. The Chairman affirmed that TAC welcomed this initiative, apparently being followed also by other countries, as a valuable means of supplementing the wide range of project and technical assistance given by several international agencies, especially FAO, and bilateral donors in support of enhanced farm production.

518. In his judgement the services of IADS were most likely to be prevailed of by, and most valuable to, governments lacking sufficient technical skill in their own civil service structures to formulate development policies and to determine the essential elements involved. There was reason to believe, and the charter provides the possibility for it, that the work of IADS could go beyond that level in which case it could involve support from the World Bank, FAO and the larger bilateral donors.

519. It was clear that the work of IADS would help complement the research programmes of the International Centres particularly in their outreach activities.

520. With regard to relations with advanced scientific institutions, the Chairman pointed out that TAC had already suggested that the International Centres should develop contacts with advanced institutes for work on fundamental constraints which limit yields and on factors of production. Many of the Centres had already established these links and it was opportune for TAC to discuss with Centre Directors the best ways in which these relationships could be further developed. There were two aspects to be considered. Either a Centre would be seeking assistance on a particular problem, or universities and institutions were looking to work collaboratively with the Centres. In the latter aspect there was a need to safeguard Centres from an avalanche of requests to collaborate in well-meaning but perhaps not completely relevant scientific work. Thus while TAC and the Centres very much welcome the developing programme of the National Academy of Science in the United States to assist both the International Centres and national research programmes in developing countries, they believed that there should be a proper mechanism of establishing these relations.

521. The Chairman had noted with great interest the approach of the United Kingdom Government, for example, in meeting Centres' requests for help on particular problems. He referred also to the procedure that Australia had adopted in screening requests for collaboration and for assistance in research on particular problems.

522. TAC felt that procedures of this sort were needed to protect both the interests of the Centres and would-be donors and this was a matter for discussion with the Centres' Directors at the next meeting.

523. An incidental point to the present discussion but which had arisen before and would be emphasized by the Chairman in his report to the CG in July, was that as a consequence of the increase in linkages between Centres and advanced scientific institutes there was a danger that where bilateral donors picked up some of the programmes of Centres, TAC might find itself advising the CG without full information as to the on-going activities. It was essential that when TAC was asked to pass judgement on the work of a Centre it had a complete account of the activities of the Centre in question.

#### Agenda Item 6 — Priorities for Research

524. The Chairman recalled that the present revision and updating of the TAC priorities for research began at the Eleventh Meeting in Mexico. This led to the paper, tables at the present meeting, which all agreed was an excellent piece of work on the part of the Executive Secretary, and which was a revision of the 1973 priorities statement done in the form of commenting on particular matters in the original paper which called for revision in the light of the Mexico discussions.

525. He then referred to the various points which had arisen from the discussion of the paper. The first related to the need for an elaboration of the section on post-harvest technology, specifically to reiterate TAC's point of view that the work of a Centre should be confined to the farm and village level, and further to emphasize TAC's general interest in the wider aspects of this field of research. As a follow-up he indicated that TAC proposed to invite the Chairman of the CG coordinating group for an exchange of ideas on the nature of the work required beyond the village level.

526. The next point raised concerned the position of forestry among TAC's priorities. The Chairman made it clear that although TAC recognized that forestry was related to land use patterns and that the denudation of forests could have a bearing on productivity of food, it was not prepared to give forestry research per se a priority placing. As a result of strong arguments put forward by some members it was agreed that research on forest-farm systems development might be appropriate at certain of the Centres, for example IITA, and that there were a number of other problems related to forestry which required further study. But while agreeing to the need for some interrelated forest studies, TAC was not

disposed to give forestry research, as a whole, a much higher priority without knowing more about existing facilities and the need for research. TAC therefore welcomed the current study sponsored by IDRC to review the present state of forestry research in developing countries, and would wish to examine the report of this work before proceeding any further in this matter.

527. Turning to the question of priorities of the "non-food crops", the Chairman reported that he had made a fairly definite statement to the CG meeting (July 1975) that TAC was willing to reconsider the position as regards cotton. TAC had in mind making a significant change in the priority allocation to some crops not grown primarily for food and cotton was a special case. However there were still some doubts expressed at the present meeting as to whether this judgement should be confirmed and in the light of this and the fact that one or two members had felt that cotton may already be receiving adequate research support in developing countries, it was proposed that TAC seek a further evaluation of the matter before making a final recommendation as to the degree of priority to be accorded this crop.

528. TAC had also proposed to look more closely at coconuts which although it had only modest food importance it was a very important industrial crop particularly in the many islands of the Pacific Ocean where it, in fact, was of major socio-economic importance. There were, however, a number of different research problems and TAC wished to know more about these and the overall research situation before proceeding further.

529. The Chairman then referred to the question of climate, water and crop growth which had been discussed both under the TAC priorities head and independently. TAC generally felt that the Centres should be devoting more attention to relations between weather, soil, moisture availability and crop growth although it was recognized that ICRISAT was already giving emphasis to work in this field. TAC proposed to draw the attention of Centres to this matter in future discussions with them.

530. On the question of vegetable research which had been dealt with earlier, TAC felt that this was likely to be moved to a higher priority following the results of a further examination of the needs for international support.

531. In addition to these proposals for shifts in priorities several members felt that the subject of nutrition research should be given more recognition. It was agreed that TAC should be better informed on any linkages Centres had with other institutes in this field and what their attitudes were as well as about the proposal to set up an international programme of applied nutrition research outside the CG system. Although TAC had given emphasis in its first priority statement to the provision of calories this did not preclude an interest in efforts to raise the protein content of cereals.

532. Other matters to which TAC members had suggested more attention should be paid were the improvement of plantains, bananas, and of the neglected goat.

533. With respect to these possible shifts in priorities, the Chairman stressed the importance of understanding the concept that the priorities had to be determined in relation to a fixed level of funds and consequently it was not possible to add new priorities without withdrawing somewhere else. He wished it understood that notwithstanding the fact that TAC would seriously put forth proposals for research in new areas or for expanded research in existing institutions, it was not going to be wild-eyed; it hadn't been wild-eyed in the past and it wouldn't be in the future. TAC had to base its proposals on the assumption that there would be at least a modest steady expansion of financial support in real terms. He regarded this concept as vitally important for the CG's view of its own future since if they were to decide that there could be no expansion of funds then TAC would have to immediately revise the whole priorities statement.



534. Attention was drawn to the need to distinguish between a neglected field of research and a priority justifying the recommendation for support from the CG. It was felt that resources should be concentrated on critical fields where reinforced efforts seemed likely to give a relatively rapid payoff. Whereas some members saw a danger of pressures on TAC to widen its priorities too far, it was pointed out by the Chairman that TAC was in a position to recommend a proposal for research which, while not having a priority justifying CG support, might justify the attention of the additional source of funds coming from bilateral donors. This, in fact, had been done on occasions and TAC would not hesitate to assist worthwhile proposals in this way.

535. In this respect there was a general feeling that TAC's activities, its criteria, its methodologies and approach to defining priorities should be more widely known. The Chairman felt that this information together with TAC's views on the feasible financial magnitude of the CG system should be contained in a document separate from that of the priorities statement. He thought that this would be of value to the CG's review panel.

536. With regard to the statement of TAC priorities the Secretariat had been asked to prepare a revised paper, taking note of the full debate at this meeting, to provide TAC with a new overall priorities document. TAC wished to finalize this at the May meeting so that it could be of maximum value to the CG review committee. The Chairman believed that it would offer significant help to them.

537. He then referred to a matter which although not strictly within TAC's Terms of Reference was nevertheless of considerable importance. This related to his concern with the possibility of overlaps between CGIAR and CGFPI with respect to support for national research and his belief that this was a proper matter for consideration by the CG review committee as established by the Chairman of the CG. Likewise, TAC's strong support for socio-economic research inevitably emphasized the need for investment and pre-investment to translate the results of research into action. He felt that this fact might be highly relevant to the proper role of the CGFPI and although these matters were not appropriate for TAC to pass judgement on it was, however, appropriate for TAC to suggest that the CG review committee consider the future role of the Consultative Group system as a whole.

#### Agenda Item 8 (a) -- Water Buffalo Research Consultation

538. The Chairman commented that the delays in dealing with the question of water buffalo research was a matter that had been very much on his conscience at two meetings of TAC. There had been a slow response to the requests from Pakistan and the Philippines that TAC recommend the establishment of an international centre on water buffalo research.

539. He referred to the fact that the earlier considerations had led TAC to conclude that although there was no clear case for a single centre, everything pointed to the need for strengthening regional and national efforts and it was to this end that TAC had decided to devote its efforts.

540. He was pleased to report that recent progress had been such as to allow him to promise a conclusion to the matter in the May meeting and that arising from this TAC would make some recommendation to the CG meeting in July.

541. The most important aspect of the progress made was the organization of the TAC-sponsored expert consultation in Singapore from 10-13 March. All Asian countries that had buffalo research programmes would attend together with participants from Egypt and Brazil. The purpose of the meeting was to indicate the present status of buffalo research in the various developing countries, discuss suitable mechanisms for the coordination of such research including, specifically, mechanisms which might lend themselves to international support. Various options would be presented, including those proposals already submitted by TAC, which would be reported back to TAC in order that a definite conclusion could be reached at the May meeting.

Agenda Item 8 (e) — Research on Water Use and Management

542. The Chairman explained that he had placed this item on the agenda again mainly because of the recognition that Centres would naturally be tending towards certain aspects of water usage in relation to their crop-oriented research or their farming systems-oriented research. However, although everyone recognized that water research was important the Centres did not seem to be doing anything specific about it which had led to some members expressing their concern.

543. It was realized that part of the difficulty lay in the fact that there could be entirely different points of view, for example, that of the engineers who recognized the need for more dams and better reticulation systems or that of the plant physiologists who wished to study the uptake of water by plants and determine the optimum watering schedule.

544. The Chairman stressed that he was not advocating a research centre, or for that matter, any particular solution, but merely to bring notice to the previous discussion by TAC and the need to bring the subject back on the agenda for further serious thought.

545. He informed the meeting that he had asked FAO to assist in updating the information on the worldwide development in the use of water but more specifically in relation to its use in those farming systems where water represents a severe constraint, that is, in the semi-arid areas.

Agenda Item 8 (unscheduled) — Weather-Food Interaction

546. Although the subject of weather-food interactions had been debated under the TAC priorities head it had been tabled as a separate item on the agenda primarily in response to a letter received from Dr. Dahl of the Massachusetts Institute of Technology drawing attention to the research work being done in the field of computer modelling of weather in relation to agriculture. In particular the letter had drawn attention to the consequences of over-grazing on weather and the weather changes which could accompany major afforestation projects.

547. The Chairman believed that TAC was well aware of these weather interactions but pondered on the question of the extent to which TAC should enter this field of research in any way by recommending some CG support for it. He thought that in general most TAC members felt that the subject was adequately covered by research institutions outside the CG system. However, it was his intention to inform the co-sponsors of the approach and report the present feelings of TAC. If the co-sponsors wished TAC to examine more closely this whole field of research then it would do so.

548. He stressed that this position which TAC had assumed did not retract in any way his previous statement that the weather/climate/crop relationship was highly important for the research of the Centres.

Agenda Item (unscheduled) — Formation of TAC Subcommittee on Grain Legumes and Plant Nutrients

549. The Chairman commented on the fact, as known to CG members, that TAC had active subcommittees — one on grain legumes and another on plant nutrients. It had been decided to combine these two into one and the new subcommittee, consisting of Drs. Ruttan and Swaminathan as co-chairmen, with Drs. Blumenschein, Madamba and Ajibola-Taylor as TAC members, with authority to co-opt outside specialists, including Dr. Witten, Director of the International Fertilizer Centre, as required, was asked to meet again and report further to TAC on the fields of work which had not been adequately considered, particularly aspects of biological nitrogen fixation and organic fertilizers.

Agenda Item 8 (unscheduled) — Aquaculture

550. TAC had reported that it considered aquaculture to be an important part of the total food supply and as such had proposed certain modest steps which had been picked up by the IDRC of Canada. TAC believed that the lack of skilled workers was a major constraint and consequently that training was a principal need.

551. Because of the fact that aquaculture was rapidly assuming greater importance in many areas it had been decided to put it back on the agenda for further examination.

Agenda Item 10 — Proposals for Soya Bean Research

552. The Chairman called attention to the fact that soya bean research was one of the few matters of high priority that had defied the ingenuity of TAC and the CG to resolve the attendant difficulties. TAC had proposed the development of a research network with INTSOY as the base institute but this had proved unacceptable to the CG. The CG had therefore expected TAC to re-examine the question and submit new proposals.

553. Discussion at the present TAC meeting had at first centred on alternative organizational approaches, such as developing a centre in Brazil or at IITA with strong support from INTSOY.

554. Because five members of the present TAC had not participated in the earlier examination of the subject, the debate to a large part had been wide-ranging covering aspects such as the utilization of soya beans as human food, both directly and indirectly, the adaptability of the crop to tropical conditions, both humid and semi-arid, as well as the most appropriate method of developing necessary research. Although it was decided that a final comment on the true position of soya beans among the priorities must await further discussion there was a consensus in support of the earlier high priority view of TAC.

555. It was agreed that the earlier documentation should be upgraded, especially to restate the present range of research activity and the extent of the linkages already established by INTSOY. The TAC Secretariat was requested to initiate and coordinate this further work and provide the necessary papers for the next round of discussion which the Chairman felt should be definitive. At this next discussion on soya bean research, which might be either at the May or October meeting, TAC would invite an INTSOY scientist to participate.

556. The Chairman reiterated that it was TAC's aim to re-check its views on the research needs. He believed that the outcome would be a confirmation of TAC's earlier views on the high priority to be accorded soya beans and that they would arrive at a solution to the organizational problem.

Agenda Item 7 — Procedures for the Evaluation of Agricultural Research Programmes

557. This matter arose out of a request from Dr. Swaminathan, leader of the IRRI Review Team, for a paper on the evaluation of agricultural programmes for the guidance of the mission. The paper, prepared by Dr. Ruttan, a TAC member, set out the principal issues which the team should deal with; what was possible to accomplish by research; what kind of research was worth doing; and what inputs were necessary to produce research results and to enable a research institute to function in the socio-economic and political environment in which it works? The paper also posed the problem of how far an institute should be expected to go in quantifying its objectives.

558. TAC had recognized the value of this paper both to the IRRI Review Mission and the forthcoming CGIAR review.

559. Following a revision of the paper, which Dr. Ruttan had agreed to do both in the light of comments made at the meeting and the experience of the IRRI review team, it will be further discussed at the May meeting.

560. The Chairman expressed the belief that the paper would undoubtedly create widespread interest and for this reason he hoped it would be made generally available. It would amount to a very important input for the work of the CGIAR review committee.

#### Agenda Item 15 — CATIE

561. The decision to have further discussion on the CATIE request for CG assistance was in response to a request from the World Bank which arose from an apparently fortuitous visit to the institute by the President, Mr. McNamara. Unfortunately he had not been fully briefed as regards TAC's earlier deliberations on the CATIE proposal.

562. There was a full account of TAC's discussions in the report of the 11th meeting in October, 1975.

563. The Chairman pointed out that TAC had given, in his opinion, a very thorough and complete consideration to the CATIE proposal. TAC had quite firmly endorsed the institute's programme although it did indicate the need for linkages, which did not appear to exist at the time, with national institutes in member countries as well as with CIAT. These were essential if the programme of CATIE was to have real significance.

564. He expressed his pleasure at the response from CATIE in the light of TAC's earlier suggestions regarding the development of these linkages. Good progress had been made and TAC now held the strong belief that CATIE's status would be quickly and significantly enhanced by these linkages by rendering its research programme more effective and much more worthy of recognition in the international scene.

565. He stressed the fact that TAC had originally endorsed CATIE's programme with the proviso that it wouldn't be successful unless the matter of linkages was attended to.

566. The Chairman paid tribute to Dr. Elgueta, President of CATIE and a former TAC member, who had been very seriously injured in an automobile accident. On behalf of TAC he would send good wishes for a speedy recovery to Dr. Elgueta and his wife who was also injured, but less seriously.

#### Agenda Item 18 — CGIAR Review Committee

567. The Chairman referred to the fact that the CGIAR Review Committee was now established although, unfortunately, a start to its work had been hampered by the illness of the appointed Director.

568. He mentioned that he had offered the full cooperation of TAC and its Secretariat which offer had been endorsed at this meeting.

569. He believed that TAC would be providing a significant input to the work of the Review Committee especially in respect of the determination of priorities for the future activities of the CG over the next five to ten years, and as a consequence he considered that the TAC would also be able to contribute usefully to the projection of financial horizons.

570. Several TAC members had emphasized the need for the Review Committee to draw as fully as possible on the accumulated experience of TAC and while there was no wish to foreclose the right of the review committee to express its own opinions on priorities there was naturally a strong feeling that the main input to the work of the review, in respect of priorities, should come from TAC. The Chairman assured TAC members that this was fully understood by Mr. Baum and his colleagues undertaking the review.

571. As he had earlier intimated he believed that a paper prepared by the Secretariat on TAC's method of work and its approach to, and the criteria for the choice of priorities would be a useful contribution. It was agreed that the TAC and CG Secretariats would maintain close contact on these matters and that the final drafts of the new TAC priorities paper as well as that on its methodologies would be transmitted to the CG Review Committee as soon as possible after they had been cleared by TAC in May.

Time and Place of Next Meeting (Agenda Item 20)

572. The next meeting of TAC would be in May starting on Sunday, 9 May, with TAC's own discussion to complete the work on the IRRI Review Mission, the Priorities Paper, vegetable research, water buffalo research, and if possible further discussion on soya beans. It was also agreed that there would be a general visit to IRRI activities and facilities in Saturday, 8 May.

573. From Monday 10th through Wednesday 12th, TAC would meet with Centre Directors, collectively on the first day to discuss matters of concern to all of them and to TAC, and then individually on the Tuesday and Thursday (if required) to review each Centres' programme for 1977.

574. If there was a need for extension of the meeting into Thursday the Chairman indicated he would be asking Dr. Swaminathan to take the Chair as he would have to leave Manila on the night of the 12th.

Role of the TAC Secretariat (unscheduled item)

575. The Chairman remarked on the importance of the Secretariat in the work of TAC which would be impossible without a good deal of background work. This involved not merely organizing meetings and missions, organization of a kind not necessarily difficult, but also handling a diverse group like TAC and providing it with the material necessary for its meeting, which was a more difficult task. In this respect it was agreed that the Secretariat was superb in doing this.

576. The Chairman stated very sincerely that the TAC Secretariat was a good part of the FAO total machinery and the agenda for TAC meetings would be impossible of proper handling and resolution without the significant input from the FAO Divisions. It was well recognized that FAO was the organization with worldwide experience both in development and in research, and as he had already indicated from time to time, TAC simply could not make progress without calling on the various Divisions of FAO for help. He expressed an appreciation of that help in the past and really looked forward to a continuation of it.

577. The Chairman in closing the meeting and remarking on how useful it had been, expressed his pleasure at how quickly the new members had fitted into the style of TAC and how ably they had made contributions in their own right. This augured very well indeed for the future of TAC.

TWELTH MEETING OF THE TECHNICAL ADVISORY COMMITTEE

TO THE CONSULTATIVE GROUP ON  
INTERNATIONAL AGRICULTURAL RESEARCH

Rome, 2-6 February, 1976

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REVISED AGENDA

- Item 1      Adoption of Agenda
- Item 2      Adoption of Report of 10th Meeting
- Item 3      Report of TAC Quinquennial Review Mission to IRRI
- Item 4      Report of TAC Vegetable Research Appraisal Mission
- Item 5      Relations with Advanced Scientific Institutions and the Proposed International Agricultural Development Service (IADS)
- Item 6      Priorities for International Support to Agricultural Research in Developing Countries
- Item 7      Evaluation of Agricultural Research Programmes
- Item 8      Other Business
  - (a) Arrangements for the Water Buffalo Consultation  
(unscheduled sub-item)    Animal Genetic Research Board
  - (b) Arrangements for CIMMYT Review Mission
  - (d) Arrangements for CIP Review Mission  
(unscheduled sub-item)    Research on Water Use and Management
  - (unscheduled sub-item)    Aquaculture
  - (unscheduled sub-item)    Banana Collection in New Guinea
  - (unscheduled sub-item)    Weather and Climate
  - (unscheduled sub-item)    Merger of the TAC Grain Legumes and Plant Nutrition Subcommittees
  - (e) CATIE
- Item 9      Report of Discussion and Recommendations on Research of the FAO Conference
- Item 10     Proposals for Further Action to Establish an International Soya Bean Research Programme
- Item 18     The CGIAR Review
- Item 19     Chairman's Summing-Up

LIST OF DOCUMENTS

ANNEX III

Agenda Item

- List of Documents
- Item 1                    Provisional Agenda
- Item 2                    Report of 10th TAC Meeting  
                         DDDR:IAR/75 RESTRICTED
- Report of 11th TAC Meeting  
                         DDDR:IAR/75/26 RESTRICTED
- Item 3                    Draft Report of the TAC Quinquennial Review Mission to the  
                         International Rice Research Institute  
                         DDDR:IAR/76/3 RESTRICTED
- Item 4                    Report of the TAC Vegetable Research Appraisal Mission  
                         DDDR:IAR/76/1 RESTRICTED
- Supplementary Data Related to Vegetable Production & Consumption
- Item 5                    Proposal for an International Agricultural Development Service
- Item 6                    Priorities for International Support to Agricultural Research in  
                         Developing Countries  
                         DDDR:IAR/76/2 RESTRICTED
- Annex 1 to Priorities Paper — Global Estimates of Financial Support  
                         Required for International Research Activities 1976-80, with  
                         Extrapolation to 1985.
- Regional Distribution of Major Crops and Livestock
- Item 7                    Evaluating Agricultural Research Programs by V. W. Ruttan
- Item 8 (a)                i) Workshop on Buffalo Research Needs - Proposal from UNDP for an  
                         Inter-Regional Project for the Governments of Brazil, China,  
                         Egypt, India, Indonesia, Pakistan, Philippines, Sri Lanka & Thailand
- ii) Provisional Agenda for the Expert Consultation on International  
                         Buffalo Research Needs
- iii) Proposed Attendance of Experts at The Expert Consultation on Inter-  
                         national Buffalo Research Needs
- iv) Proposed Attendance of Observers at The Expert Consultation on  
                         International Buffalo Research Needs
- (b)    i) TAC/CGIAR Review Mission to CIMMYT - 1976: Terms of Reference
- ii) CIMMYT Review Mission - Participants
- iii) Tentative Programme of the TAC Review Mission to CIMMYT, 1976

- (e)
  - i) FOR MEMBERS ONLY: Letter to Daniel Ritchie from Jorge Soria, Acting Director, CATIE - January 6, 1976
  - ii) FOR MEMBERS ONLY: Letter to P. A. Oram from Daniel Ritchie, December 16, 1975
  - iii) Visit to CATIE by Executive Secretary and CATIE's Submission to the TAC, by P. A. Oram
  - iv) Letter to Peter Oram from Manuel Elgueta, Director, CATIE - December 15, 1975, with enclosure "Tropical Agricultural Research and Training Center"
  - v) CATIE - Proposal of 1975 (Available in Meeting Room)
- Item 9 Report of FAO Conference, 1975 (Available in Meeting Room)
- Item 10
  - i) Letter to Sir John Crawford from W. D. Buddemeir, Director, INTSOY - November 24, 1975
  - ii) INTSOY Proposal - Original Document dated September 28, 1973.

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ANNEX IV

Corrigenda to Report of 11th TAC Meeting

The following corrigenda have been brought to the notice of the Secretariat:

- i. Pg. 41, para. 256, 2nd line;  
For ".... CAB Bureau of Integrated Pest Control ....",  
Read: ".... Commonwealth Institute for Biological Control ....".
  
- ii. Pg. 48, para. 304, 8th line and para. 305, 8th line;  
For ".... Hurst ....",  
Read: ".... Hirst ....".