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DEC 20 1974

Mr. H. Adler	A1042	Mr. Knox	A813
Mr. J. Adler	E624	Mr. Krieger	B906
Mr. Alter	A907	Mr. Lari	D1032
Mr. Bart	F718	Mr. Lejeune	E1039
Mr. Baum	E1023	Mr. McNamara	E1227
Mr. Bell	A613	Mr. Muller	N935
Mr. Benjenk	E723	Mr. North	D1032
Mr. Broches	E923	Mr. Nurick	E915
Mr. Cargill	E1236	Mr. Paijmans	C702
Mr. Chadenet	E1204	Mr. Please	A1013
Mr. V. C. Chang	E516	Mr. Rayfield	N935
Mr. Chaufournier	A313	Mr. de la Renaudiere	C302
Mr. Chenery	E1239	Mr. Rotberg	E427
Mr. Wm. Clark	E823	Mr. Thalwitz	A210
Mr. Clarke	D1029	Mr. Tims	D428
Mr. Damry	A1219	Mr. Twining	N635
Mr. D. A. de Silva	N635	Mr. Van der Meer	A507
Mr. Diamond	C502	Mr. Van der Tak	E1023
Mr. Fowler	A1219	Mr. Votaw	C602
Mr. Gabriel	E516	Mr. Wapenhans	A712
		Mr. Weiner	A513
Mr. Graves	E1039	Mr. Wiehen	C1001
Mr. Gulhati	D530	Mr. Wiese	A837
Mr. Hittmair	E427	Mr. Willoughby	G1050
Mr. Hoffman	E823	Mr. Wright	A307
Mrs. Hughes	D529	Mr. Wright	
Mr. Husain	A1136	Mr. Duloy	
Mr. Kirmani	A610	Mr. Duloy	N234
Mr. Knapp	E1227	Mr. Merriam	E826

FROM: Incoming Mail Unit, Room F-126, Extension 2023



PROTEIN-CALORIE ADVISORY GROUP (PAG) OF THE UNITED NATIONS SYSTEM

18 December 1974

Mr. Michael L. Lejeune
Executive Secretary
Consultative Group on International
Agricultural Research
World Bank
1818 H Street, N.W.
Washington, D.C. 20433

Mr. Coulter for info
Jee

Dear Mr. Lejeune:

I appreciated your kindness in finding time on 12 December for my informal visit. I came away with the impression that we did indeed have a number of common interests in technical matters relating to the work of CGIAR and TAC and that further discussions might be mutually helpful.

Copies of a few recent issues of the PAG Bulletin are being supplied. You will certainly receive all future numbers. Bruce Cheek had an extra copy of the recent PAG book "Nutritional Improvement of Food Legume by Breeding" which I asked that he present to you. *done*

I hope you will agree that following my retirement here we should continue to explore ways in which I might be of assistance to CGIAR in furthering its efforts relating to food science, processing, post harvest technology, and nutrition. The attached sheet of biographic data may be helpful in this regard.

With kind regards.

Yours sincerely,

Max Milner, Director
PAG Secretariat

P.S. I am also supplying a spare copy of recent issue of Cereal Science Today in which is reproduced a lecture I gave to the Canadian International Grains Institute.



17 December 1974

Mr. Michael D. Jensen
Executive Secretary
Consultative Group on International
Agricultural Research
World Bank
1818 H Street, N.W.
Washington, D.C. 20037

Dear Mr. Jensen:

I appreciated your kindness in finding time on 12 December for my informal visit. I came away with the impression that we did indeed have a number of common interests in technical matters relating to the work of CGIA and that further discussions might be mutually helpful.

Copies of a few recent issues of the PAC Bulletin are being supplied. You will certainly receive all future numbers. Since Christ had an extra copy of the recent PAC book "Nutritional Improvement of Food Systems by Genetic" which I asked that he present to you.

I hope you will agree that following my retirement here we should continue to explore ways in which I might be of assistance to CGIA in furthering its efforts relating to food science, processing, post harvest technology and nutrition. The attached sheet of biographic data may be helpful in this regard.

With kind regards,

Yours sincerely,
John R. ...

John R. ...
Executive Secretary

I am also enclosing a spare copy of recent issue of ...
in which is reproduced a lecture I gave to the ...
... ..

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Document Date September 1974	Document Type CV / Resumé			
Correspondents / Participants				
Subject / Title Biographic Data - Max Milner				
Exception(s) Personal Information				
Additional Comments		The item(s) identified above has/have been removed in accordance with The World Bank Policy on Access to Information or other disclosure policies of the World Bank Group.		
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CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

1818 H St., N.W. Washington, D.C. 20433 U.S.A.
Telephone (Area Code 202) 477-3592
Cable Address - INTBAFRAD

October 1, 1974

TO: Members of the Consultative Group
FROM: Executive Secretariat
SUBJECT: Communication to the World Food Conference:
Plant Nutrients

1. Members will recall that at the meeting of the Group on August 1-2, they discussed various measures being undertaken to carry forward and to stimulate research on plant nutrients.

2. It was agreed at that time that steps would be taken to inform the World Food Conference of these measures. Attached to this memorandum, for the information of members, is a copy of a letter on this subject to the Secretary-General of the World Food Conference from the Chairman of the Consultative Group.

Attachment

September 27, 1974

Mr. Sayed Marei
Secretary-General
World Food Conference
Food and Agriculture Organization
Via delle Terme di Caracalla
Roma 00100, Italy

Dear Mr. Marei:

The forthcoming World Food Conference promises to be an important step towards the improvement of food supplies and food production in the developing countries. The documents of the Preparatory Committee make it quite clear that fertilizers play a key role in any strategy to help developing countries feed their people. Moreover, the attention of the Conference has been called to the need for research which could lead to improved types of plant nutrients and non-energy alternatives for stimulating plant growth. It therefore seems opportune to write to you about the work of the Consultative Group on International Agricultural Research with respect to plant nutrients, including the proposals which the Group and its Technical Advisory Committee (TAC) have under consideration.

At the August 1-2, 1974, meeting of the Consultative Group in Washington, special attention was given to a report from the TAC on its consideration of how to approach the question of stimulating research on the application of chemical fertilizers to developing country conditions, biological fixation of nitrogen, and organic fertilizers, and to a proposal by the United States to help develop research on the chemical fertilizer part of this problem. The latter proposal was intended to fall within the context of any overall Consultative Group effort on plant nutrition; it would be based on the extensive facilities of the Tennessee Valley Authority (TVA).

The existing international agricultural research centers have a substantial interest in plant nutrition: the International Rice Research Institute (IRRI), the International Institute of Tropical Agriculture (IITA) and the Centro Internacional de Agricultura Tropical (CIAT) have programs on the biological fixation of nitrogen by leguminous and non-leguminous plants. Moreover, work on conventional chemical fertilizers is under way at all the centers, including research into improving efficiency in the use of fertilizers in tropical conditions. An important aspect of this work, in view of the fertilizer shortage, is that the new varieties of wheat and rice, while responding best under controlled fertilizer use, are not dependent exclusively on fertilizers to be superior in yield to traditional local strains. At the same time, the need is recognized to strengthen these programs so as to increase the efficiency of presently available conventional fertilizers and to help define needs for new types of fertilizers.

Accordingly, the Consultative Group's Technical Advisory Committee has recently established a subcommittee to examine the best ways and means of giving effect to the need to mobilize the experience of TVA and other bodies; how best to monitor work at the centers and elsewhere in all relevant fields, and to stimulate further research in each of the three main elements of chemical, microbiological and organic aspects of plant nutrition. The subcommittee will report to TAC at its next meeting in Rome in February 1975. The Consultative Group and TAC have also welcomed the U.S. proposal to establish a non-profit corporation with a multi-national board and staff which would have access to the staff and facilities of the Tennessee Valley Authority and would help develop chemical fertilizer research for tropical conditions. Further plans are awaited by the Group and will be examined by TAC.

In sum, the Consultative Group is seized with the problem of promoting research on more effective means of nourishing the major crops that are practical for small as well as large farmers in developing countries. We hope and expect that this will make an important contribution to the solution of world food problems.

More generally, it is good to note the emphasis which the documents of the Preparatory Committee for the World Food Conference have given to increased agricultural research, including that sponsored by the Consultative Group. It is the hope of the members of the Group that this matter of strengthening international and national agricultural research will receive strong support at the Conference when it meets in Rome in November.

Sincerely yours,

Warren C. Baum
Chairman

Mr George F. Darnell

August 23, 1974

Anthony Neylan

TAC Sub-Committee on Plant Nutrition

I attach a copy of draft terms of reference for my attendance next week at the TVA seminar on the proposed International Fertiliser Research Centre.

I also attach a copy of a letter from Dr Ruttan in his capacity as Chairman of the TAC Sub-Committee on Plant Nutrition which foreshadows the meeting in Frankfurt on September 28 which I discussed with you per phone. The cable from Oram (also attached) indicates that TAC will cover expenses.

Attachments

ANeylan:jf

INCOMING TELEX

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Distribution
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Development

From: Rome

August 21, 1974

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Aug 21 3 00 PM 1974
COMMUNICATIONS
SECTION

MR ANTHONY NEYLAN
CHAIRMAN RUTTAN WISHES CONVENE FIRST MEETING
TAC SUB COMMITTEE PLANT NUTRITION FRANKFURT
GERMANY TWENTY EIGHT SEPTEMBER STOP OBJECTIVE AGREEMENT
WORKPLAN ALLOCATION RESPONSIBILITIES PARTS PLAN TO MEMBERS
SUB-COMMITTEE ARRANGEMENTS CONTACT MAIN WORKERS ON
CHEMICAL BIOLOGICAL ORGANIC SOURCES PLANT
NUTRIENTS AND APPROPRIATE INDUSTRIAL
ORGANIZATIONS STOP WEBSTER WILL ATTEND AS SECRETARY STOP MEETING
TO BE HELD CONFERENCE ROOM 7 HOTEL FRANKFURTER HOF KAISER PLATZ
FRANKFURT 9 AM TO 5 PM TWENTY EIGHT STOP PLEASE CABLE ME
SOONEST FOODAGRI ROME YOUR AVAILABILITY SO THAT TICKETS TRAVEL
AUTHORIZATIONS CAN BE SENT YOU REGARDS
DRAM

B40098 IBRD UI

61181 FOODAGRI.....

Files

August 21, 1974

Harold Graves *HG*

International Plant Nutrient Institute

In a telephone conversation on August 16, Dr. Hopper of IDRC said that the Dutch had indicated an interest in joining the Subcommittee on the Middle East center, and asked me whom he should write to about this matter. I gave him the name of Mr. Albers in the Foreign Ministry at The Hague.

Dr. Hopper stressed that the meeting to be held in London on October 1-2 would be styled a preparatory meeting, not a meeting of the Subcommittee as such. The Subcommittee would not meet as such until it contained some representation from the countries of the Middle East and North Africa. It was expected that such a meeting could be held in Beirut in January.


I raised with Dr. Hopper a question about the mode of participation of Dr. Camus of TAC in the Subcommittee. It had been reported that Dr. Camus would participate as a member of the Subcommittee. I said I was uncomfortable about this and would like an opportunity to talk to Warren Baum about it. What troubled me was (1) that TAC was not included in the Chairman's invitation to the Subcommittee, which was addressed to the members of the Consultative Group, (2) there would be a certain anomaly in having all three co-sponsors of the Group and TAC on the Subcommittee, and (3) putting Camus on the Subcommittee seemed to take TAC across a line the Chairman had said it would not cross, from being an advisory body to assuming executive functions.

On the other hand, I quite appreciated that the participation of Dr. Camus in some form or other would be beneficial. After discussion, we agreed that Dr. Camus would not participate as a member but as an observer.

HGraves : apm

Sir John Crawford

July 19, 1974

Bruce M. Cheek 

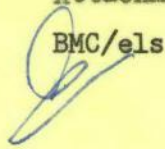
Proposed research function for PAG

Attached is a memo of May 6 which Alan Berg wrote on the above subject as a basis for a meeting in late June.

I have now spoken to Berg who says that the proposal has been accepted. They are trying to raise the \$300,000 three-year total from USAID and SIDA.

In effect this would be a brokerage service to direct resources, avoid duplication, assist in resolving major research issues, and develop research opportunities.

Attachment

BMC/els 

COPY

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT
Cable Address: INTBAFRAD

JHC
HC

INTERNATIONAL DEVELOPMENT ASSOCIATION
Cable Address: INDUAS

1818 H Street, N.W., Washington, D.C. 20433, U.S.A.
Area Code 202 • Telephone: EXecutive 16 600

May 6, 1974

TO: Representatives of Sponsoring Agencies of PAG

- Dr. Marcel Gazin, FAO
- Dr. J. M. Bengoa/Dr. E. DeMaeyer, WHO
- Dr. Lester Tepley, UNICEF
- Mr. R. C. Desai, UN

FROM: Alan Berg, IBRD

SUBJECT: Proposed PAG Research Function

The importance of policy or program-oriented nutrition research to support the development of nutrition programs in low-income countries has long been recognized by the international agencies and the Protein Advisory Group. The PAG devoted attention to such research in its compendium of nutrition research needs. Similarly UNDP, FAO, WHO and other agencies have been giving explicit attention to the review and support of such research.

In November 1973 the World Bank, in conjunction with the Agricultural Development Council, sponsored an international meeting on Nutrition Policy and Programming Research in Princeton, New Jersey to begin identifying priority research needs. Although the meeting did not produce a definitive ordering of research priorities it did produce a set of proposals which could be useful as the first approximation of an agenda. (Report attached.)

The meeting also identified a set of basic problems presently inhibiting such research, several of which may lend themselves to inter-agency cooperation. Among them:

- 1) There is today no logical mechanism to match up research needs with potentially available funds. Major research requiring multiple funding sources is rare, given the considerable difficulty involved in arranging it. At the same time, research institutes spend a vastly disproportionate amount of time simply hunting for money.
- 2) Information flow and communication pertaining to such research is poor. Research entities often are unaware of similar or complementary work being done or already completed elsewhere.

Funding agencies asked to consider specific proposals often are hampered by the lack of more general information on the area of inquiry, and themselves are often unaware of similar projects under way.

- 3) There is presently no means of defining and regularly updating program-oriented research priorities. Research institutes, sometimes unfamiliar with program and policy needs, often embark, with the best of intentions, on research that from a broader perspective may seem of questionable value. Many funding agencies similarly have no adequate way of assessing the potential value of the research they sponsor.

Recognizing these problems and, at the same time, the vital importance of such research, the Bank is proposing, in consultation with the other member agencies, a new research advisory and coordination function for the PAC. The function would be performed by a permanent research advisory committee with representatives of (a) the PAC, (b) selected international and bilateral assistance agencies with distinguishable research budgets, and (c) the research community; it would be supported by a secretariat consisting of (a) a full-time professional, (b) a research/administrative assistant and (c) a secretary.

The advisory committee and its secretariat would attempt to perform the following functions.

- 1) establish and regularly update policy-oriented nutrition research priorities;
- 2) facilitate the flow of information among the research institutions regarding research undertaken and the results of research completed;
- 2) serve as a broker between research institutions and funding agencies, particularly in the case of major research needs which transcend national boundaries.

Anticipated annual costs of this research function (staff salaries, international meetings and operating expenses) are estimated at roughly \$100,000, assuming office and meeting space would be provided and committee travel would be met by member agencies. Our impression is that financing on the order of magnitude indicated can be obtained for this purpose from sources external to the PAC-sponsoring agencies, should we agree for PAC to take on this new function.

Subject to the agreement of all concerned, I am requesting that this proposal be placed on the agenda of the June 23 inter-agency consultation meeting at FAO Headquarters in Rome.

cc. Dr. Max Hilner, PAC
Mr. Heyward, UNICEF

Mr. H. Vergin

July 16, 1974

Frank Lowenstein *T.L.*

International Institute for Plant Nutrition
Transmitted by Mr. Yudelman on July 3, 1974

1. This proposal appears to me to be quite grandiose. The request for funds is for about \$19 million for capital evaluation and \$8 to \$9 million for operating expenditures.

2. The proposed Institute would cut across many international, agricultural research institutions, such as IRRI and CIMATT, which are already in existence. The task proposed for the Institute is quite tremendous. For example, the improvement in yields cannot be separated into nutrition and development of HYV's as separate research efforts. Varieties should be developed which would respond to specific nutritional treatment. Thus, the proposed Institute would have to duplicate facilities and personnel already organized elsewhere. Furthermore, research would be required at numerous locations. Specific investigations would be needed for each location for which results were desired. The proposed objectives could probably best be accomplished by utilizing research facilities now available in many locations. Furthermore, much of the proposed work is already being undertaken.

3. I recommend that IBRD not participate in financing this proposal.

cc: Mr. Smith
Mr. Giglioli

Flowenstein:sam

June 28, 1974

Dr P.J. Dart
Rothamsted Research Institute
Harpenden
Herts
England

Dear Dr Dart,

The Technical Advisory Committee (TAC) of the Consultative Group on International Agricultural Research will hold its eighth meeting in Washington, DC, from July 24 to August 2, 1974. "Plant Nutrition" has been proposed as Item 11 on the meeting's agenda and is scheduled for discussion on the morning of July 26, 1974.

At the request of the Chairman of the Technical Advisory Committee, I wish to invite you to prepare a paper for the Committee's consideration on non-chemical aspects of plant nutrition.

The Committee would indeed be pleased if you were able to present your paper in person at the meeting. Should you be available to attend the meeting in Washington, I wonder would you be kind enough to cable me to that effect so that I can make the necessary arrangements.

With kind regards,

Yours sincerely,

Anthony Neylan
Assistant to
Sir John Crawford, CBE

ANeylan:jf

AN

Yellow
0.

OFFICE MEMORANDUM

TO: Mr. Warren C. Baum
(through Mr. Graves)
FROM: Bruce M. Cheek
SUBJECT: Plant Nutrient Institute

DATE: May 14, 1974

On April 19, Mr. Yudelman sent you a memorandum on the above subject, referring to a U.S. proposal to examine the case for establishing such an institute as suggested by Henry Kissinger. A copy of the U.S. memo of April 29 detailing the proposal is attached. Messrs. Yudelman, Wortman and Hopper and Sir John Crawford discussed the proposal with Joel Bernstein of USAID on April 30. Bernstein reiterated his wish that the possibility of relating any such institute to the TAC/CGIAR set-up should be explored.

The Secretariat took up the matter with Sir John in reviewing the status of TAC business with him and Peter Oram last week. At its February 1974 meeting in Rome, TAC had already discussed both the world fertilizer shortage and the question of non-chemical approaches to fertilizers and had put the matter of inorganic nutrient supplies on its July agenda. As summarized in the draft TAC minutes:

"In view of the scarcity and high price of fertilizers, the Committee had stressed the need to draw on all possible sources of nutrient supply, both organic and inorganic, for crops in the developing countries. It had been decided to discuss this important problem at greater length at its next meeting, and Dr. Swaminathan had been asked to prepare a paper outlining the scope for developing quick-yielding shrubs and trees for fuel, to substitute the current widespread use of organic manures for this purpose. The Committee would, at the July meeting, examine in more depth the question of canalizing all sources of nutrient supply to crops in the developing countries. The Center Directors had also been requested to indicate at Centers Week the extent to which shortage and high costs of fertilizer and other inputs based on fossil fuels, would limit the effectiveness and the spread of the technologies being developed and recommended by their respective institutes."

It is therefore my understanding that, on the basis of further investigations to be made by TAC in the coming weeks, the July 24-26 meeting of TAC will consider the case for a proposal such as the U.S. one, and will present its findings to the CG meeting on August 2 when Sir John reviews TAC's work.

Mr. Baum

- 2 -

May 14, 1974

We are aware that the U.S. wants to report progress on the matter at the World Food Conference in November, but at this stage there is no way of telling what this may mean for the CG at either its August or October sessions. In any event, TAC is not confined in its considerations to any particular machinery or proposal. It might, for example, prefer a less capitalized network arrangement, particularly since a fertilizer institute would be contrary to its approach to date which has been to organize on the basis of product research rather than input research.

The draft U.S. proposal indicates a capital cost of some \$20 million and an annual operating cost of some \$10 million. A major point outstanding is the role of TVA. There would have to be more consultation and consideration of the nature of the TVA's role which would affect both the scientific aspects of the proposal and the estimated costs of any institute or network.

Attachment

cc: Sir John Crawford
BMC/AAN:mcj

Sir John Crawford, Chairman, TAC, CGIAR

January 18, 1974

Montague Yudelman, Dir., Agriculture & Rural Dev. Dept. and
Alan Berg, Deputy Director for Nutrition, PNPD
AD by EBB
Comments on Note on "Strengthening Nutrition via Agriculture
Research Center Activities" Prepared by USAID

1. The interest of the Technical Advisory Committee (TAC) in considering additional possible nutritional contributions by the International Agricultural Research Centers is welcomed by the Bank and is in close accord with the spirit of the recent IBRD Board discussion on nutrition policy. The attached note, prepared for TAC consideration by the U.S. representative to the Consultative Group, is a useful introduction to discussing your suggestion that TAC and the institute directors give thought to means of strengthening the nutritional impact of their programs. Consideration, however, might be given to broadening the scope of the note. The preamble states that "the problem of the world food supply involves both quantity and quality..." To this might be added "and availability (at a low enough price or other distributional means) to satisfy the nutritional needs of all portions of the population."

Supply Policy

2. For most countries -- and institutes -- concentration of agricultural research is on increased supply. Clearly the magnitude of the food supply plays a major role in determination of nutritional status and nothing here is intended to suggest diminishing the supply emphasis. Also clear, however, is that even with substantial food increases, a supply-oriented policy alone cannot meet the nutritional needs of certain deprived groups of consumers. In some cases the nutritional effect of agricultural progress on these groups may be negative.

3. In the formulation of many current supply policies and related agricultural research strategies, it is implied that increased production will lead to improved nutrition, but the relation between food supply increases and the circumstances of the malnourished is seldom explicitly taken into account. (Calculation of aggregate -- and potentially misleading -- national per capita availability of specific foods or nutrients is ordinarily the closest attempt at consideration of nutritional need.) To satisfy nutritional need, deliberate agricultural policy and research measures must be taken concerning the nutritional content of the foods and their distribution.

Nutritional Content

4. A major contribution to nutrition betterment -- especially for the rural poor who are not easily reached through other means -- would be the genetic improvement of seed varieties to obtain higher nutrient content. If plant geneticists can succeed in producing seeds of traditionally preferred foods that differ from existing high-yielding strains only in their nutrient content (if the strains have the same yield, respond in the same way to fertilizer, have the same keeping properties, produce the same income for the farmer

as lower-protein strains and have the same taste and cooking qualities as existing strains) the effect would be a potential mass improvement of nutrition at a small cost.

5. The efforts now being directed to improve the protein quantity and quality of certain cereal and root/tuber staples (as well as recent emphasis on legumes and beef) reflect a growing awareness at certain Centers about the quality of the foods produced. Item 5 in the attached note calls for greater weight being assigned "to the nutritional value of new varieties, balanced against yield and other desired characteristics, in deciding which varieties to release." Because of the potential importance of this approach to nutrition, consideration might be given to taking this a step further and suggesting that new varieties be developed, based on nutritional considerations.

6. Although, of course, there are several relevant criteria for establishing research priorities at the Centers, it would seem appropriate that nutritional impact be considered along with other goals when choices are made among alternative research possibilities. In cases where conflicts exist between the nutrition goal and other development goals, e.g., if an improvement of protein of a certain crop may be associated with a decline of yield or poor storage properties, it is not likely that a universal trade-off rule can be established. Such decisions depend on the needs of specific countries and the priorities of individual governments. In other instances, nutritional considerations can be included without reducing the potential contribution to other goals.

Availability

7. Whether or not an increased quantity of food (particularly in instances where caloric deficiency is the major nutrition problem) or a genetic improvement of the quality of the food will have nutritional impact depends, of course, on whether the food reaches those in nutritional need. Insufficient attention has been directed to this problem. To make sound decisions concerning the impact of alternative policies and research efforts on human nutrition, additional information is needed on consumer behavior and the expected distribution of additional supplies of different foods among various consumer groups. Although numerous food consumption surveys have been conducted, surprisingly little research has been undertaken to estimate and predict the relationship between changes in food supply and resulting changes in human nutrition. One could argue that the purpose of agricultural research institutes is to facilitate an expansion of food production, leaving it to individual countries to assure that the increased food supply is used in ways to satisfy their people's need. However, it would seem that by the way in which their research priorities are established, agricultural institutes are in a good position to reduce the needs for later corrective public measures.

Recommendations

8. If TAC wishes to pursue means for further improving nutrition via agricultural research center activities, the following may be appropriate next steps:

- a) Organize a 2-3 day meeting designed to examine in depth and make appropriate recommendations concerning the desirability and the possible means of adding a nutrition dimension to the work of research centers.^{1/} The agenda of the meeting might include the following issues:
- (i) The relative importance of "improving human nutrition" within the Centers' set objectives;
 - (ii) The kinds of human nutrition information (e.g., dietary standards, food quality guidelines, methods of evaluation) needed by plant breeders to incorporate nutritional considerations in their work, and the research facilities and manpower needed to provide the additional information;
 - (iii) Definition and establishment of priorities of needed studies providing linkages among agricultural research, public policy and health/nutrition research and field programs both with respect to information flows and program execution;
 - (iv) The need to include work on processing and other post-harvest uses of the food produced, where these have nutritional implications; and
 - (v) The need to increase the understanding among Center staff and trainees of the relationships between agricultural research activities and human nutrition.
- b) Invite an expert on applied human nutrition to become a member of TAC.
- c) Promote research defined in (a)(iii) above aimed at providing information on the linkages between agricultural research, public policy and human nutrition. Such research might be

^{1/} Participants for such a meeting might include Center research directors, an economist from each Center, three or four plant breeders working on protein improvement, two experts in human nutrition, two or three people working in applied nutrition programs, three or four people working on research related to nutrition policy and programming, and interested appropriate members of the Consultative Group, TAC and the U.N. Protein Advisory Group (PAG).

January 18, 1974

carried out by the Center economists in collaboration with agriculturalists and nutritionists. 1/

Attachment

Cleared w/and cc: Dr. Kanagaratnam, Dir., PNP
Messrs. Cheek, Agr. & Rural Dev.
Zaidan, PNP

cc: Messrs. Baum, Vice-Pres., Central Projects
Baldwin, PNP
Graves, Agri. & Rural Dev.
Reutlinger, Dev. Economics

cc: Dr. J. Bernstein, USAID, Tech. Assistance Bu.
Mr. Peter Oram, Secretary, TAC (Rome)

ABerg:cj

Bme

1/ One such effort, currently being carried out in Cali as part of CIAT's Agricultural Economics Program, attempts to predict the distribution of increasing supplies of each of a number of foods among consumer groups. Emphasis is on predicting the proportion of the additional nutrients being consumed by those groups in nutritional need. Also predicted are the impact of government price policies, income distribution and increased employment on the nutrient intake of the nutritionally deficient consumer groups.

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

ASSISTANT
ADMINISTRATOR



August 14, 1973

Sir John Crawford
32 Melbourne Avenue
Deakin
Canberra, A.C.T. 2600
Australia

Dear Sir John:

Thanks again for your assistance with the recent Seminar. Your handling of the last half day, on which I received many favorable comments, certainly strengthened the overall impact.

I'm enclosing a copy of the AID comments on strengthening the nutritional dimension of center activities that I said I would turn in for the record in lieu of taking more CG time late in the discussion of your priorities paper. I gave a copy to the CG Secretariat afterwards and will also send one to Peter Oram.

Best regards.

Sincerely yours,



Joel Bernstein

Enclosure

Strengthening Nutrition Via Agricultural Research Center Activities

The problem of world food supply involves both quantity and quality -- calories and nutrients. The priorities paper of the Chairman of TAC questions whether enough emphasis is being placed on the quality aspect, particularly protein. The international centers and other research organizations are already doing much important work to breed better protein content into basic grains, and more recently to increase yields of the most nutritious and widely used legumes. However, it is desirable, as the TAC Chairman implies, that TAC and the Institute Directors consider development of a more systematic effort or strategy to strengthen the nutritional impact of their programs.

Measures that might be considered include:
further

- (1) /rationalization of the pattern of the centers' research to give appropriate stress to nutritional objectives;
- (2) strengthened lab and field research capabilities to test for varietal characteristics that will increase consumer acceptance of high protein crops and also for bodily absorption of nutrients from the various varieties; rather than duplicating this capability at all of the centers, it might prove feasible to use a common facility somewhere, particularly for the more sophisticated and expensive parts of the work -- possibly by contracting with existing food technology or biological laboratories;
- (3) professional nutritional representation on TAC;
- (4) inclusion of appropriate nutrition awareness, strategy and technical training in Center training activities, particularly as this is relevant to agricultural research activities;
- (5) assignment of greater weight to the nutritional value of new varieties, balanced against yield and other desired characteristics, in deciding which varieties to release.

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Population Projects
Mr. Graves

COMMUNICATIONS
SECTION

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--- TELEX NUMBER.
BERG WPPD THATS GREAT NEWS YOUR PAG REPORT JUST RECEIV

GLAD FAO RELAXED ON SECRETARY PRESUME FROM NO MENTION THEY ALSO
DROPPED ROME CAMPAIGN STOP BELIEVE THESE RESULTS SHOULD BE
PROMPTLY REPORTED MC NAMARA WITH RECOMMENDATION WHICH EYE JOIN
THAT WE SHOULD INCREASE BANK CONTRIVEEE CONTRIBUTION FY 75 TO
FULL PARITY OTHER SPONSORS STOP ALSO SOME REPORT ON PLANS FOR
PAG SHOULD BE MADE JULY MEETINGS PROBABLY TO TAC IF GRAVES
AGREES STOP PRESUME EYE SHOULD EXPRESS TO BOERMA IF OCCASION
ARISES FULL BANK SATISFACTION WITH RESULTS OF AGENCIES MEETING
CONGRATULATIONS

HOFFMAN

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Mr. Berg

May 29, 1973

Harold Graves

Draft Nutrition Sector Paper

Many thanks for letting me see the interesting April 20 draft of Policy Guidelines for Bank Nutrition Activities. Since this has been superseded by a subsequent draft, I'll keep my comments brief:

1. In this draft, the point of departure seems rather too much oriented to consumption and welfare (rather like the customary approach which is criticized in The Nutrition Factor). The argument appears to be made, first, on humanitarian grounds (Section I) and then (Section II) on "several indirect relationships" between nutrition and development.

Another and stronger point of departure might be found in the fact that the Bank has, literally from the first day of its lending in developing countries (when it made a farm machinery loan to Chile) been concerned with the production of food in developing countries. Food production (as well as other kinds of agricultural production) has become a larger and larger part of the Bank's lending activity; and it is now modestly supplemented by a special program of grants for international agricultural research intended to increase the production of food crops in developing countries.

It isn't enough, however, simply to produce more food. A national nutrition program, concerned with the distribution and quality of what is produced, is a necessity if investments in additional food production, by the Bank and others, are to be effective. And a nutrition program is not simply concerned with distributing what already is produced; ultimately, it weighs the question of what should be produced, and it therefore becomes a necessary element in the determination of production policy. Et cetera. A lot of this already is in the draft, but would count more heavily if it were brought forward and compactly presented.

2. Although it has been hallowed by repetition, the statement that "the initial pronouncements about the relationship of PCM and mental development were made in the mid-1960s" seems to me to give a misleading impression. Experiments showing a relationship between levels of nutrition and levels of intelligence in children go back at least as far as the late 1930s: for instance, the experiments reported by F. S. Freeman of Cornell University at the AAAS summer meeting in 1938.

3. Care needs to be taken in statements about the effect on protein availability of the substitution of cereal grain production for legume production (page 18). The position seems to be generally accepted that an individual meeting his calorie needs adequately from cereal grains of reasonable quality will at the same time be getting an adequate supply of protein. And in any case, the substitution of cereal for legumes does not mean less availability of protein, since, per unit of growing space, cereals can produce about four times as much foodstuff as legumes.

HGraves:apm

①

March 15, 1973

Dear Ben:

Thank you for your invitation to provide a factual statement on protein-related activities of the Consultative Group on International Agricultural Research, for use in the eighteenth session of the Advisory Committee on the Application of Science and Technology to Development. I attach to this letter a copy of such a statement, and I hope that by now you have received the 100 copies which I dispatched to you this morning.

I trust that you understand that the statement is not from the Consultative Group as such, but from the Group's Secretariat.

With best regards,

Sincerely yours,

Harold Graves
Executive Secretary

Enclosure

Tomson
Mr. Benjamin Barg
Chief
New Technologies Section
Office for Science and Technology (Room No. 3146)
United Nations
New York 10017

cc: and attachment to
Mr. Hoffman
Mr. William Clark
Mr. Franco/Mr. Chatenay
Mr. Weiss

HGraves:apm

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

Protein-related Activities of the Consultative Group on International Agricultural Research

The Consultative Group on International Agricultural Research is an informal association of organizations of the U. N. System, governments and other entities, public and private. The principal objective of the Group is to improve the quantity and quality of food production in the developing areas of the world.

The Group was established in 1971 under the joint sponsorship of the United Nations Food and Agriculture Organization, the United Nations Development Programme, and the World Bank. It now consists of 24 permanent members: FAO, UNDP and the Bank; the Ford, Rockefeller and Kellogg Foundations; 13 donor governments (Australia, Belgium, Canada, Denmark, France, Germany, Japan, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom, the United States); three regional development banks (the African Development Bank, the Asian Development Bank and the Inter-American Development Bank); the Commission of the European Communities; and the International Development Research Centre, an autonomous organization financed by the Government of Canada. In addition, the five major developing regions of the world participate in the Consultative Group through representative countries designated for a two-year term by the membership of FAO.

The Group is served by a Technical Advisory Committee (TAC) consisting of a chairman and 12 other experts, of whom six are from developing countries. Liaison between the Group and the Protein Advisory Group of the United Nations System is conducted ad hoc; TAC has had the benefit of advice from the Protein Advisory Group of the United Nations System on desirable nutritional improvements to be sought through plant breeding. A secretariat for the Group is maintained by the Bank; FAO provides the secretariat for TAC.

The members of the Consultative Group are giving support, in the form of grants, to research intended to improve the output of most of the world's important food crops, including crops which, used either directly in the human diet or as livestock feed, account for most of the protein available in developing countries. For 1973, members of the Group are making grants of \$24 million to six international centers carrying out work on these crops.

The two oldest and best known centers deal with the most important cereals; they are the Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT), working on maize and wheat, and the International Rice Research Institute (IRRI). Adaptive work on maize and rice is done by other centers being supported by the Consultative Group -- by the Centro Internacional de Agricultura Tropical (CIAT), based in Colombia, for the humid lowland tropics of the Western Hemisphere, and by the International Institute for Tropical Agriculture (IITA), based in Nigeria, for the corresponding ecological zones in Africa.

The work done by CIMMYT and IRRI, as further adapted by both international and national research and as applied by national systems of extension, has generated dramatic increases of recent years in the yields of wheat and rice. In 1971, about 10 million hectares of land throughout the world were planted to new rice varieties yielding about 1 ton per hectare more than before. In 1972, about 20 million hectares were estimated to have been planted to the new wheats in developing countries, or about 40 per cent of the total area planted in wheat in these countries.

The two senior centers are engaged in specific efforts to improve the protein content of their respective cereals. With support from the United Nations Development Programme, notable progress has been made by CIMMYT in the development of a high-lysine maize. In the past two years, that Center has distributed, for field trials in 15 less developed countries, the latest and most promising of its corn lines: a high-lysine maize resistant to many common maize diseases and insect pests, with good yield potential under tropical conditions and better nutritional quality than any variety previously known. One of the major research objectives of IRRI is the development of a high yielding rice with high protein content and with a short growing season, a broad spectrum of resistance to pests and disease, and attractive grain appearance. The prospects for a breakthrough in this respect are thought to be good.

Work on other cereals is in prospect. The newly established International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), based in India, will undertake research aimed at improving yields and nutritional quality of sorghum and millet, crops which can be grown as alternatives when conditions are not suitable for wheat and rice.

A second class of plants important to protein availability are the food legumes, whether used directly in the diet or as livestock feed. They have higher protein content than the cereals, but produce considerably lower yields of foodstuff per hectare of area planted. The research programs of the international centers on legumes are much newer than the programs on cereals, none being as much as four years old; and while significant progress in the development of high-yielding varieties can be expected, it has not yet occurred on a notable scale. The principal assignments of the centers with respect to legumes are as follows: CIAT -- field beans (*Phaseolus Vulgaris*); IITA -- cowpeas, yam beans, winged beans and lima beans; ICRISAT -- pigeon peas and chickpeas. TAC is considering what additional steps need to be taken to extend legume research.

The sixth center in the network of international research institutes being supported by members of the Consultative Group is the International Potato Center (Centro Internacional de la Papa - CIP). Among its objectives are to develop varieties of potato which will offer improved yields and higher protein content. The potato already is a staple item of diet in Andean countries, and is becoming an increasingly important crop on the Indian subcontinent and in parts of Africa. Greater availability of the potato in the humid tropics and the existence of a potato with higher protein content would offer significant improvements in diet, in the first case by making feasible the substitution

of potato for less nutritious starchy products such as cassava, and in the second by raising protein intakes in existing centers of potato consumption.

Only one center, up to now, is concerned with increasing the availability of meat, a superior source of high-quality protein. This center is CIAT, which has a major research program, still in its early stages, devoted to improving the production of cattle and swine in the lowland tropics. TAC and the Consultative Group, however, have agreed in principle on major initiatives for improving animal production, particularly of cattle, in Africa.

On behalf of interested members of the Consultative Group, steps are now being taken toward the establishment of an international center to improve animal production and health in the developing countries of tropical Africa. One of the objectives of the center would be to study systems of animal production and to offer expert assistance to national institutes devoted to improving these systems in specific localities. Steps also are being taken toward the establishment, as a sub-unit of the international production center, of an international laboratory for the study of two killer diseases of cattle: Trypanosomiasis and East Coast Fever. It is possible that sites may be chosen and work may be started on the production center and the laboratory before the end of 1973.

TAC also is considering whether recommendations might be made to the Consultative Group on research into fish, another food with high protein content, and in this connection will sponsor a scientific symposium on aquaculture in 1973.

March 14, 1973

UNITED NATIONS



NATIONS UNIES

POSTAL ADDRESS—ADRESSE POSTALE: UNITED NATIONS, N.Y. 10017
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REFERENCE:

12 January 1973

Dear Harold,

At its seventeenth session, the Advisory Committee on the Application of Science and Technology to Development discussed the problem of protein malnutrition confronting the developing countries. In the light of the important activities of the Consultative Group for International Agricultural Research, the Advisory Committee decided that it would like to invite the Consultative Group to provide a factual statement on its work relevant to the protein problem for the next session of the Committee. Accordingly, we would be most grateful if it would be possible for you to arrange for such a factual statement to be sent to us so that we could place this before the eighteenth session of the Advisory Committee.

May I take this opportunity to extend my best wishes to you and your family.

Yours sincerely,

A handwritten signature in black ink, appearing to read "Ben", with a horizontal line extending to the right.

Benjamin Barg
Chief
New Technologies Section
Office for Science and Technology

Mr. Harold Graves
International Bank for Reconstruction
and Development
1818 H Street, N.W.
Washington, D.C. 20433

Encl: Record of ACAST 17th session (E/AC.52/L.141)
see page 21, paras. 53-55

cc: Mr. C. Weiss

UNITED NATIONS



CALL ADDRESS - ADDRESS TO BE USED FOR TELEPHONING THE SECRETARY GENERAL
TELETYPE ADDRESS - ADDRESS TO BE USED FOR TELETYPE COMMUNICATIONS

12 January 1973

Dear Harold,

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May I take this opportunity to extend my best wishes to you and your family.

Yours sincerely,

Partha Sarathi Ray
Chief
New Technology Section
Office for Science and Technology

Mr. Harold Graves
International Bank for Reconstruction
and Development
1818 H Street, N.W.
Washington, D.C. 20543

JAN 12 1973

Enc: Record of AGST 17th session (ENC. 17.11)
see para 21, paras. 23-25

cc: Mr. C. Weiss

ADVISORY COMMITTEE ON THE APPLICATION OF
SCIENCE AND TECHNOLOGY TO DEVELOPMENT

RECORD OF THE SEVENTEENTH SESSION

23 October to 1 November 1972

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1. The Advisory Committee on the Application of Science and Technology to Development held its seventeenth session at Geneva, from 23 October to 1 November 1972.

2. The list of members of the Advisory Committee is contained in annex I. Representatives from the Department of Economic and Social Affairs, the United Nations Conference on the Human Environment, Office for Inter-Agency Affairs of the United Nations Secretariat, the regional economic commissions, the United Nations Economic and Social Office in Beirut, United Nations Conference on Trade and Development (UNCTAD), United Nations Children's Fund (UNICEF), United Nations Development Programme (UNDP), United Nations Institute for Training and Research (UNITAR) and the Protein Advisory Group (PAG) participated in the session. The following specialized agencies were represented: the International Labour Organisation (ILO), Food and Agriculture Organization of the United Nations (FAO), United Nations Educational, Scientific and Cultural Organization (UNESCO), World Health Organization (WHO), International Bank for Reconstruction and Development (IBRD), International Telecommunication Union (ITU) and the World Meteorological Organization (WMO). The International Atomic Energy Agency (IAEA) also was represented.

3. Also attending were observers from the following intergovernmental organizations: the Arab League Educational, Cultural and Scientific Organization, Council of Europe, Organisation for Economic Co-operation and Development (OECD) and the World Intellectual Property Organization (WIPO). The non-governmental International Council of Scientific Unions (ICSU) and World Federation of Scientific Workers (WFSW) also sent observers.

4. At its opening session, the Advisory Committee unanimously elected Sir Ronald Walker chairman, and M.G.K. Menon and T. Sai as vice-chairmen for the seventeenth session. The membership of the ad hoc working groups and regional groups is shown in annex II. At its first meeting, the Advisory Committee adopted its agenda (E/AC.52/L.139/Rev.1) as listed in annex III. Documents which were before the Advisory Committee at its seventeenth session are listed in annex IV.

II. THE ADVISORY COMMITTEE AND THE COMMITTEE ON SCIENCE
AND TECHNOLOGY FOR DEVELOPMENT

5. The Advisory Committee had before it copies of Economic and Social Council resolutions 1715 (LIII), entitled "Terms of Reference of the Committee on Science and Technology for Development," and 1718 (LIII), entitled, "Programme of Work of the Committee on Science and Technology for Development". The Advisory Committee agreed that it should submit to the Committee for Science and Technology for Development at its first session a statement relating to the Advisory Committee's work and its expected relationship with the Committee. It reiterated its readiness, already expressed in its ninth report to the Economic and Social Council ^{1/} (E/5131), to cooperate closely with the Committee on Science and Technology and to hold itself in readiness to provide any advice which the Committee for Science and Technology might request of it. In that connexion it adopted a statement for submission to the first session of the Committee on Science and Technology (ACAST/XVII/CRP.18) as amended by ACAST/XVII/CRP.18/Corr.1. It also requested that its ninth report to the Economic and Social Council be made available as a paper for the first meeting of the Committee on Science and Technology.

6. The Advisory Committee noted that in resolution 1718 (LIII), the Council had requested the Committee on Science and Technology at its first session to recommend goals and targets for the achievement of the proposed policy measures relating to science and technology ^{2/}. Some discussion was held as to whether the Advisory Committee would wish to place any additional statement before the Committee on Science and Technology, on the Advisory Committee's recommended targets for science and technology. ^{3/} The Advisory Committee wished to place on record its disappointment that, in the International Development Strategy, while specific commitments had been undertaken by some developing countries, the advanced countries had refrained from accepting such commitments. However, it decided it did not wish at this stage to provide any additional statement on targets for science and technology, but suggested that it would be valuable if the Committee on Science and Technology could be provided with independent advice on this matter from a group of experts who might be asked to

^{1/} Official Records of the Economic and Social Council, Fifty-third Session, Supplement No. 8.

^{2/} International Development Strategy for the Second United Nations Development Decade (United Nations publication, Sales No. E.71.II.A.2), paras. 60-64.

^{3/} World Plan of Action for the Application of Science and Technology to Development (United Nations publication, Sales No. E.71.II.A.18), pp. 32-33.

examine the Advisory Committee's recommendations and to review the discussions in the Council and in various other meetings which had been held on the matter, and tender its own views. If such an expert group were set up, the Advisory Committee agreed that two of its members should be available to co-operate with the group in making the proposed review and recommendations.

III. SUBJECTS UNDER CONSIDERATION BY THE ADVISORY COMMITTEE

A. World Plan of Action for the Application of Science and Technology to Development

1. Implementation of the World Plan

7. The Advisory Committee had before it a note by the Secretariat (ACAST/XVII/CRP.1) as well as the text of resolution 1717 (LIII) adopted by the Economic and Social Council on the World Plan. The Committee took note of the conclusions recorded in the Secretariat paper of the meetings arranged to discuss the World Plan in Linz-am-Rhein (Federal Republic of Germany), Baden (Austria), Washington D.C. and also of similar meetings planned for Canada and Poland.

8. The Committee received from V.L. Urquidi a report of the discussions of the World Plan in the Economic and Social Council at its fifty-third session. It appeared that there was a consensus among Governments against the establishment of a separate World Plan fund or account in the United Nations Development Programme (UNDP). The Advisory Committee agreed not to pursue this idea further and to concentrate instead on promoting the implementation of the Plan through specialized agencies, regional economic commissions, other relevant organizations and above all, through national Governments. It stressed the need for special emphasis to be placed on the rapid implementation of the Plan at the country level. The principal function of the World Plan was to serve as a guideline and source of inspiration to national Governments in the choice and design of projects most relevant to individual countries for inclusion in national development plans. If needed, they could then be presented with requests for assistance from multilateral or bilateral donors. It was agreed that the Advisory Committee's position on these issues should be reflected in the statement to be addressed to the Committee on Science and Technology.

9. The Advisory Committee recalled that the majority of the programmes proposed in the World Plan had been formulated in accordance with the proposals made by the specialized agencies and it therefore felt entitled to assume that the implementation of these programmes would to a great extent be undertaken by the United Nations agencies as far as resources would permit. As to the other programmes, project identification and elaboration would be a prerequisite of drawing upon and attracting other financial support. The suggestion was made that systems studies of development be undertaken to provide a basis for national planning decisions. In that connexion, in addition to UNDP, it would be worthwhile exploring the possibilities of stimulating

the interests of the International Bank for Reconstruction and Development (IBRD) as well as regional bodies such as the Inter-American Development Bank and the regional development banks in Asia, Africa and the Caribbean area in financing projects prepared under the guidelines of the World Plan. The Committee was gratified to learn that UNDP was seeking the co-operation of the Advisory Committee on global projects and that the IBRD had recently interpreted its mandate more widely, making it possible to finance a broader range of development programmes including, in appropriate cases, applied research. If current proposals linking the issue of special drawing rights for development financing, should materialize, it would be desirable to allocate a part of such issues to supplement resources normally available through the international lending agencies and UNDP for projects involving the application of science and technology to development.

10. Despite the several activities generated by the World Plan, the Advisory Committee shared a strong feeling that the World Plan was insufficiently known and little understood in scientific and other circles concerned with development. Consequently, it was recommended that a continuous world-wide publicity effort, utilizing the mass media and the world's scientific and technical journals should be made to make the Plan more widely known.

11. As to its future work, the Committee agreed to set up a permanent Working Group to review on a continuing basis the implementation and financing of the World Plan. The Group would consist of the committee chairman and the chairman of the regional groups. It also favoured the idea that meetings on the world and regional plans be organized in individual countries. This would make it possible not only to make these plans known but to turn the proposals into specific programmes and projects. Science and technology projects would thus be included in national development plans in the developing countries and in the aid programmes of the developed countries. Individual members of the Committee could be of great assistance if they could participate in such meetings.

2. Regional Plans

12. The Advisory Committee had before it the following regional plans: an Asian Plan of Action for the Application of Science and Technology to Development (I & NR/ASTD(VIII)/7); African Regional Plan E/CN.14/L.407, and S & T/WPA/42/Rev.1); Regional Plan for Latin America, Elements for a Regional Plan for the Application of Science and Technology to Development in selected countries of the Middle East (ESOB/RR/72/31), and Report on a meeting of experts to consider the Regional Plan of Action for

the Middle East, Beirut, 9 to 11 October 1972 (ESOB/HR/72/33).

13. Subject to the incorporation of small amendments and corrections agreed upon at the meetings of the respective regional groups held during the session and at the plenary meeting of the full Committee, the Advisory Committee approved as guidelines the regional plans for Asia, Africa and Latin America. P. Auger, however, reserved his position in respect of the latest modifications of the regional plan for Africa which he had not received in time to consider in adequate detail. The Advisory Committee noted that as the draft was based on lists of priorities in the science and technology field collected by the Economic Commission for Africa from member countries, the African Regional Group had not felt able to accept a suggestion by A.H. Bunting that Chapter III should be expanded to cover agricultural raw materials for industry, and distribution and marketing systems for agricultural products.

14. The Advisory Committee commended these plans to the respective regional economic commissions for consideration at their annual session in 1973. It was hoped that the commissions might be in a position to adopt resolutions recommending the implementation of the plans by Member States and by the interested agencies in the United Nations system, as well as regional organizations. The secretariats of the regional economic commissions were asked to take the initiative in following the plans through by organizing - in close co-operation with specialized agencies - consultations with science policy-makers and planners in national Governments (Asia), by organizing national committees (Africa) or by any other means at their disposal. The commission secretariats were requested to arrange for the printing and wide distribution of the plans, not only to governments, but to leaders in research, scientific associations, industry and business. It was important that the co-operation of UNDP be sought with a view to implementing the recommendations of the regional plans in regional and country programming. The regional plans had to be brought down to practical project levels. The Advisory Committee also recommended that these plans should be made available for information at the first meeting of the Standing Committee on Science and Technology for Development when it considered the World Plan of Action. The regional groups were requested by the Committee to keep the implementation of the plans under consideration and review in co-operation with the regional economic commissions and the specialized agencies.

15. The regional proposals for the United Nations Economic and Social Office in Beirut area (12 countries in the Middle East) were reviewed by an Ad Hoc Working Group of the Committee consisting of V.L. Urquidi (Chairman), A.H. Bunting, M. Castel,

T. Mukaibo and L. Rousseau. The Working Group addressed itself to general comments on the document as a whole, as well as specific comments on a number of particular items. In general, the Working Group felt that the revision into a draft regional plan should take as a point of departure and as a general framework the development objectives of the region as a whole and of individual countries within it. An attempt should be made to picture the kind of economic and social development within which the application of science and technology would be applied. Once broad objectives were defined, programmes could be set and projects listed. Moreover, the regional plan should make a distinction, as the World Plan had, between knowledge which existed but needed to be applied, on the one hand, and new knowledge or research needs, on the other. The regional plan should also proceed from a more positive premise and the areas where "transfer" of technology was pertinent should be clearly identified. The Advisory Committee agreed with the Ad Hoc Working Group that the United Nations Economic and Social Office in Beirut proposals required considerable revision along the lines indicated by the Working Group, as well as by the Beirut meeting of experts before it could be endorsed by the Advisory Committee for submission to Governments in the area. It noted that a revised version would be presented to the Advisory Committee at the eighteenth session in New York in April 1975 when the Working Group would also meet for its second review of the draft regional plan.

B. Research for developing countries

1. Preparation of a global project

16. The Committee had before it the report of a meeting of members of the Ad Hoc Working Group on Global Projects which, in accordance with the decisions taken at the sixteenth session (E/AC.52/L.138, para. 19), had met with representatives of UNDP to discuss detailed arrangements whereby the Advisory Committee might collaborate with UNDP in the promotion of global research projects (ACAST/XVII/CRP.2). This recommended that in addition to being prepared as a body, as well as individually through its members, to comment on proposals of global projects received by UNDP from other sources, the Committee should prepare for UNDP consideration a specific "pre-proposal" for a global project. From the three areas identified by UNDP as of specific interest to it; namely, (a) the building and construction industry, particularly housing; (b) urban water supply and sewage treatment; and (c) the adaptation of appropriate production and management techniques, it was suggested that the Advisory Committee should in the first instance address itself to the area of the building and construction industry, particularly housing.

17. The report of the Ad Hoc Working Group had also been considered by the European Regional Group at its third session, and its views were reported to the Committee. The Committee also heard a statement by the representative of UNDP on the present position relating to global projects in UNDP. The principal criteria for such projects were global application (ACAST/XVII/CRP.2), originality of subject content, high expectation of practical results, strong management of the executing institution and a realistic possibility for partnership with other donors. In the latter connexion, some members of the Committee made reference to the International Consultative Group for Agricultural Research as a desirable pattern which might be followed in setting up other joint research arrangements in important fields having global implications.

18. In conclusion the Advisory Committee decided:

(a) That it would, on request, be prepared as a body, as well as individually through its members, to assist UNDP in the assessment of proposals for global research projects received from other sources;

(b) To undertake, with the assistance of the Office for Science and Technology, the Centre for Housing, Building and Planning, UNDP, Members of the Ad Hoc Working Group, and if necessary, making use of outside consultants, the preparation of a draft "pre-proposal" of a global research project related to the building and construction industry, particularly housing. After review by the Advisory Committee at a plenary session such a proposal would be placed before UNDP;

(c) That if such a pre-proposal were accepted by UNDP it would be prepared to review and comment on the complete project proposal when it had been developed by UNDP;

(d) That in the long run the Advisory Committee should not restrict itself to the subjects suggested by UNDP but should, in the light of its own views on priorities as expressed in the World Plan and elsewhere, be prepared to make its own suggestions for project proposals.

2. General guidelines for the presentation of research proposals

19. The Advisory Committee had before it the report of a consultant (ACAST/WG/WP.1) prepared in response to a decision of the Committee at its fourteenth session that a draft of a document on general guidelines for the presentation of research proposals by developing countries should be prepared. In introducing the document, the Director of the Office for Science and Technology suggested that as a result of the discussions in the Working Group, the Committee endorsed the decision not to pursue any further the

collection of case studies on the analysis on which the guidelines were based. Members of the Advisory Committee felt that the analysis on pages 1 to 11 of the report which preceded the actual guidelines was too long and not sufficiently general as it had been based on a limited number of case studies and that it would be better presented in an annex. Another shortcoming of the report was that it did not distinguish between presentation standards for large and small project proposals. It was also felt that before finalizing the guidelines, the report should be circulated for comments to a number of research institutes in developing countries as well as to major donor agencies with experience in the assessment of research proposals from developing countries. The consensus of the Committee was that the guidelines should not be issued as an Advisory Committee paper. It was left to the consideration of the United Nations Secretariat to arrange for its publication in a revised and streamlined form.

3. Possibility of establishing a clearinghouse for research proposals from developing countries

20. The Advisory Committee appointed an ad hoc working group to discuss a proposal for the establishment of a clearinghouse and sponsoring office for the promotion of research projects on problems of importance to developing countries (ACAST/XVII/CRP.19). Its report was introduced by A. Keynan. He stressed that although the report had been fully endorsed by all the members of the ad hoc working group (with the exception of M.G.K. Menon who had been obliged to leave the session earlier), it was still only a very tentative proposal submitted for consideration so as to allow a fruitful discussion of the matter at the eighteenth session.

21. With respect to the contents of the proposal he underlined the following points:
To be at all effective the clearinghouse would have to publicize actively its services and exercise a fair amount of judgement in the assessment of project proposals and in the approach to sponsors. Initially the service should be operated on a "pilot" project basis relying in the main on one senior staff member with relevant experience who would endeavour to assess project proposals and to select sponsors in a pragmatic way, mainly through his personal knowledge and contacts.

22. Members of the Advisory Committee lent their support to the idea behind the proposal. C. Chagas suggested that the clearinghouse make as one of its principal objectives the bringing about of closer contacts between scientists of various developing countries and regions in order to promote the exchange and use of their often more relevant experiences in the development process. Other members of the Committee

suggested that the proposal be further elaborated, illustrated by concrete examples and defined as to its complementary role with regard to existing similar bilateral service arrangements.

23. Reservations were expressed, however, by representatives of two major agencies concerning the feasibility of entrusting to any one agency a mandate embracing the whole range of scientific disciplines which are at present the responsibility of individual agencies within the United Nations system. Secondly, somewhat disappointing experiences had been encountered with clearinghouse operations in other fields.

24. The Committee decided to put the subject on the agenda for consideration at its eighteenth session and invited A. Keynan to prepare for a more detailed proposal of the project for discussion at that time.

C. Appropriate Technology

25. The Advisory Committee had before it two papers with suggestions for its work prepared by T. Kristensen (ACAST/WG/WP.2) and V. Urquidi (ACAST/WG/WP.3). In addition, the Committee had the following documents prepared by the International Labour Organization: "Scope, approach and content of research-oriented activities of the World Employment Programme"; "Report of the first meeting of the steering group" (September 1972) and "Progress report No.1, Research and action project relating to technology and employment" (October 1972) (WEP 2-22).

26. The Committee was advised of the work programme of the ILO in appropriate technology and employment and took note with appreciation of the fact that the programme was on the one hand coming down to specifics and on the other building up the theoretical framework for the question relating to the choice of technology and employment policy. The question of fiscal and other incentives necessary to encourage the use of appropriate technology in the private sector was discussed and the difficulties noted.

27. On the future work of the Advisory Committee, T. Kristensen in his paper had noted that the previous work of the Committee had concentrated upon the choice of appropriate technologies in industry. He proposed that it be extended to construction, agriculture and services. It was also necessary to consider the question of "appropriate" education. V.L. Urquidi, in his proposal, suggested that the Advisory Committee, in consultation with relevant agencies, draw up a global project relating to appropriate technology in the design of industrial equipment and processes, to be carried out through a consortium

mechanism to which UNDP and other funding agencies would contribute and which would have an adequate executive secretariat.

28. In view of the interest indicated by UNDP in receiving a global project in the field of construction, the Advisory Committee decided that the construction sector may be selected first for intensive consideration from the standpoint of developing labour-intensive technologies, utilization of locally available materials and of saving foreign exchange. The subject would cover a wide range: building materials, housing, construction of public buildings, factories, roads, dams and essential services such as water supply and drainage. Housing construction should take account of the fact that, particularly in rural areas and also in the unorganized, growing urban settlements, much of the need for housing can be met by self-built housing. Housing and other construction provide major opportunities for reducing unemployment and under-employment in the developing countries. There also is a well-defined and large housing deficit throughout the developing regions which must be met at the lowest possible social cost. Work on this subject should be related to the "pre-proposal" that the Advisory Committee has been invited to submit as a global project to UNDP on the subject of housing and other forms of construction.

29. Secondly, consideration should be given to the proposal on the design of capital-saving and labour-intensive industrial equipment. The basis for this proposal is that most industrial equipment is designed by engineers, inventors and others in the developed countries almost entirely in terms of the need for labour-saving methods of production. The developing countries, through various institutes and other means, have begun to give consideration to and experiment with new designs of a labour-intensive, but nevertheless efficient nature, but the bulk of the research development and engineering work is carried out in the developed countries. Consequently, at least a fraction of the efforts and talents in these countries could be devoted to design of such equipment, in co-operation with experts from the institutes of the developing countries. The purpose of the project would be to organize a global project for systematic research, possibly through a consortium arrangement under the leadership of UNDP.

30. The third project to be undertaken would be devoted to the problems of appropriate technology in agriculture and rural development from the point of view of the optimum use of the labour-time available at different times of year for farming and many other purposes in the rural communities of developing countries.

31. The studies by the Advisory Committee could be followed up by one or several meetings organized with planners in the countries to see to it that the results are applied and made relevant to their experience in the field.

32. The Committee decided to hold two sessions of its Working Group on Appropriate Technology in 1973. The first meeting of the Working Group will study the subject of existing and planned research in the choice of technology in the housing and construction area, on the basis of documents to be prepared by the Office for Science and Technology with the co-operation of the Centre for Housing, Building and Planning, UNIDO, the ILO and other concerned agencies. It will also give preliminary consideration to the design of industrial equipment.

D. Problems of the human environment

1. United Nations Conference on the Human Environment

33. The Advisory Committee had before it the report of the United Nations Conference on the Human Environment, held at Stockholm from 5 to 16 June 1972 (A/CONF.48/14 and Corr.1) as well as a note by the United Nations Secretariat (ACAST/XVII/CRP.5). It received an oral report on the conference from V. Urquidi who had represented the Committee at Stockholm and presented a statement on the Committee's behalf. One aspect of the Conference had been the emphasis on the importance of the "interface" between environmental concern and development. Environmental problems in developing countries arose from their poverty and lack of development as well as from such factors as urbanization and the need for better planning in industrialization and the use of natural resources. The importance of international co-operation in applying science and technology to prevent worsening environmental conditions and improve existing ones was stressed. That was another aspect of the Advisory Committee's direct concern in development as shown by the many aspects of the World Plan related to environmental problems. Much of the work in which the Advisory Committee was already engaged was therefore of importance to the environment, such as protein malnutrition. Its work on appropriate technology should take account of the technology on the environment of the developing countries. The encouragement of research in developed countries for the benefit of developing countries could also involve such fields as environmental control.

34. A large number of recommendations from the Action Plan for the Human Environment were suggested by V. Urquidi and in the Secretariat paper, as areas in which the Advisory

Committee could co-operate with the organizational machinery for the environment which the General Assembly was expected to establish. It was reported that the Secretary-General of the Conference looked forward to such co-operation and hoped the Advisory Committee would be able to provide him with assistance and advice in its fields of concern.

35 In the discussion which followed, members of the Advisory Committee emphasized the importance of the role it could play in the environmental field. It should help in promoting a major effort directed towards providing scientific information needed to solve environmental problems and in attacking weak scientific points. The Committee could contribute to a better understanding of the relationship between the environment and economic development and it should consider these matters at the global level, through its regional groups and across regional boundaries.

36. The Committee reaffirmed its great interest in the science and technology problems of environment of concern to developing countries and agreed that this field should be a major and continuing item on its work programme. Among areas on which it might concentrate were appropriate technology, research for developing countries and the costs of non-pollutive technology, as well as the relevant aspects of the World Plan of Action. The Committee wished to collaborate to the full with any United Nations environmental machinery to be set up, and to this end established a standing working group (see annex II) to discuss details of collaboration with this machinery when it was established. It hoped that such discussions could be held before the nineteenth session. It also requested its regional groups to take up the question of their own interests and future activities in this field at their next meetings.

2. International registry of potentially toxic chemicals

37. The Advisory Committee had before it a report on the establishment of an international registry of potentially toxic chemicals (ACAST/XVII/CRP.6) prepared by a consultant in response to a decision taken at its sixteenth session (E/AC.52/L.138, para. 16). The report was introduced by C. Levinthal, Chairman of the Registry Commission of the Special Committee on Problems of the Environment of the International Council of Scientific Unions (ICSU) which had originally brought the matter to the attention of the the Committee. He provided examples of specific questions with which the registry might deal and drew attention to the more important provisions of the report. In a general discussion which followed members of the Committee emphasized the great importance of the question and commented on the high standard of the report before them.

A number of technical points were raised in connexion with the data to be recorded and such questions as those arising from commercial secrecy.

38. It was noted that subsequent to the Advisory Committee's decision to arrange for the preparation of the report, a resolution had been adopted at the United Nations Conference on the Human Environment at Stockholm in June 1972, recommending that the possibility of establishing such a registry should be studied (A/CONF.48/14 - Recommendation 74(d)(IV)). Members agreed that while it would be inappropriate for the Advisory Committee itself to be involved in any direct or operational way in the establishment of the registry, it was of the greatest importance that further steps should be taken towards this end and that the Committee should do all it could to encourage them. It accordingly decided (a) to endorse the concept of an international registry of potentially toxic chemicals as put forward by the ICSU Special Committee on Problems of the Environment and as outlined in the consultant's report; and (b) to transmit the report to the Secretary-General of the United Nations Human Environment Conference with a recommendation that he should take steps to implement its proposals. In this connexion he should consider convening a meeting to explore the practical steps to be taken to put the recommendations into effect. The meeting could be attended by representatives of the secretariat of the Human Environment Conference, the appropriate United Nations bodies, the Advisory Committee, ICSU and other interested parties.

39. While it appeared that a careful feasibility study would be needed before any decisions on the site of the registry were reached, the Committee saw great advantage in locating it in WHO. Account would have to be taken, however, of the mandate and activities of other similar registries maintained by the agencies, by national governments and by other bodies. The concern of ICSU should also be borne in mind. When the international registry was eventually established it was felt that a standing advisory group, perhaps along the lines of the Protein Advisory Group and consisting of representatives of the agencies as well as individual experts, might be set up. The Advisory Committee itself would wish to keep in touch with the steps taken to establish the registry, and to review the situation from time to time, particularly concerning its relationship to the interests of developing countries.

IV. REGIONAL GROUPS

40. The Advisory Committee had before it reports from the regional groups for Africa (ACAST/XVII/CRP.7), Asia (ACAST/XVII/CRP.8), Latin America (ACAST/XVII/CRP.9) and Europe (ACAST/XVII/CRP.10). Those groups reported on meetings held respectively at Addis Ababa, Bangkok, New York and Madrid.

41. The groups for Africa, Asia and Latin America had reported that they had completed the draft regional plans for their areas and had made recommendations on future steps to be taken for their implementation. These groups also held meetings during the seventeenth session of the Advisory Committee. As noted earlier, the Advisory Committee endorsed these plans subject to the amendments and corrections agreed upon at the regional group meetings and at the plenary meeting of the full Committee. The Committee also endorsed the recommendations of the regional groups on further steps regarding the regional plans. The regional group for Latin America decided to hold its next meeting at Economic Commission for Latin America (ECLA) headquarters (Santiago, Chile), in February 1973 to hold joint discussions with the ECLA secretariat on the latter's activities in line with the general approach in the world and regional plans of action. In addition to the Economic Commission for Latin America, the group recommended that the Plan should also be considered by the UNESCO Standing Conference of Directors of National Councils for Science Policy and Research Organizations of the Latin American Member States at the end of 1973 and by the Organization of American States Inter-American Committee for Science and Technology at its forthcoming session. The regional groups for Africa and Asia would meet at a later date to be decided at the eighteenth session.

42. The Committee took note of the report of the regional group for Europe. The term "appropriate education" was explained as education which is in conformity with the cultural heritage of a country without emulating the (inappropriate) systems of education of the advanced countries. The Advisory Committee also reflected upon the regional group's suggestion in (ACAST/XVII/CRP.10, para.39) of its report that the Advisory Committee should prepare a major paper on the human and social sciences. The Committee agreed that in its recommendations and reports it had implicitly, and even explicitly, taken account of the social aspects as an integral element in the application of science and technology to development. However, it decided to have an informal review of the subject at its eighteenth session. The United Nations Secretariat was requested to obtain background material on the present activities of members of the United Nations family in this area. The Committee also considered the proposal

which had been presented to the regional group by A.H. Bunting on international links among applied scientists and technologists in developed countries concerned with agricultural development. Bunting suggested that the Advisory Committee should become associated with the implementation of this proposal not only in the sphere of agriculture but also in other professions which might thus be activated to interlink with the United Nations machinery.

43. The suggestion was also made that rather than limit the proposed informal association to the European region, the Advisory Committee should aim towards the establishment or reinforcement of bodies associating scientists from all countries with specific developing regions, in line with the functions of the Association for the Advancement of Agricultural Sciences in Africa.

44. During the session the subject of closer links between developing countries - possibly through the regional groups - was repeatedly emphasized. C. Chagas was asked to prepare a preliminary paper on this subject for the eighteenth session.

V. ITEMS FOR REVIEW AND INFORMATION

A. Transfer of technology

45. Following a decision taken at the sixteenth session, J. Valenzuela had attended the third session of UNCTAD at Santiago on behalf of the Advisory Committee. As he was unable to attend this meeting, V.L. Urquidi communicated his report to the Committee. The report underlined the importance of UNCTAD resolution 39 (III), entitled "Transfer of technology", which might be regarded as a breakthrough, as it met practically all of the preoccupations expressed by developing countries on the subject in the "Declaration and Principles of the Action Programme of Lima" (Lima Declaration) adopted by the group of 77 at the Second Ministerial Meeting on 7 November 1971 (TD/143, section G). There could be no doubt that this major step forward towards improving conditions for the transfer of technology was in many ways due to the work done by the Advisory Committee which had had this subject under review since its inception.

46. The representative of UNCTAD, in a statement reviewing the main points of the resolution which as he said could be regarded as a new charter for developing countries, emphasized the endorsement of it, not only by developing but also by advanced countries.

47. Many of the activities called for in the resolution had already been initiated by UNCTAD. Substantial progress had been made, in particular in completing of guidelines for the transfer of technology and in the study of the main obstacles hampering that effort. A number of country studies had already been accomplished and several more were under way.

48. The objectives of the UNCTAD programme of work in this field were as follows:

- (a) Creating an awareness of the very considerable costs involved in technological transfer which had been estimated at \$1,500 thousand million per year;
- (b) Contributing to the analytical understanding of restrictive business practices as a basis for remedial action;
- (c) Involving public authorities in the control of the transfer in order to avoid leaving it exclusively to private enterprise;
- (d) Strengthening the bargaining position of the developing countries through training and the creation of suitable national institutions;
- (e) Reinforcing the capacities of developing countries in the assessment of technological projects.

49. The representative of UNCTAD also expressed the hope that UNCTAD's work would ultimately pave the way to a time when products of man's mind would no longer remain the property of private individuals.

50. In the ensuing discussion it was suggested that UNCTAD be involved from the outset in the identification and preparation of projects for the regional plans of action which concern institutional machinery for the import, assessment and effective transfer of new technology to developing countries. The proposal was made that UNIDO, with its range of activities complementary to those of UNCTAD, should be invited to present its programme to the Committee for the transfer of technological knowledge.

51. With reference to a paper on the transfer of technology (ACAST/XVII/CRP.12), it was suggested that the subject be embraced by the Committee's working group on appropriate technology. It was suggested, however, that the two concepts, namely, adaptation of foreign technology to specific local needs, and the legal and institutional problems involved in the transfer of foreign technology to local application, be kept distinct. The Advisory Committee commended the progress achieved in this field by UNCTAD.

B. Computer technology for development

52. The Advisory Committee had before it a note prepared by the United Nations Secretariat (ACAST/XVII/CRP.13) reporting on the steps being taken by the Secretary-General to prepare the second United Nations report on the Applications of Computer Technology for Development called for in General Assembly resolution 2804 (XXVI). Members emphasized the great importance of this matter and expressed their keen interest in the preparation of the Secretary-General's report. It was unfortunate that the timetable required for the preparation of the report did not allow its examination by a meeting of a working group on computer technology. Members requested that the draft of the report be sent, after the meeting of the expert group which would review it in November 1972, to all members of the Committee (except those who specifically indicated that they did not wish to receive it) for their individual comments. It was hoped that it might be possible to extend the deadline for the receipt of such comments beyond the end of December. In addition, it was agreed that the members of the Ad Hoc Working Group on Science Policy which would be meeting in Paris from December 11 to 15, 1972 should take that opportunity to discuss the draft report and make any collective comments they felt appropriate.

C. Protein malnutrition confronting the developing countries

53. The Advisory Committee had before it a note by the United Nations Secretariat (ACAST/XVII/CRP.14) on developments in United Nations work on protein malnutrition since its sixteenth session. It also heard statements from representatives of the Protein Advisory Group (PAG) and FAO. It was pleased to note that the question of United Nations sponsorship of the PAG was under consideration at the twenty-seventh session of the General Assembly, and also that for the first time there appeared to be a positive interest on the part of some Governments in the possible establishment of a protein fund.

54. The need to consider the protein problem in the context of nutrition as a whole was strongly emphasized. Political, administrative and financial aspects were as important as the technical aspects. The role of newer sources of protein should not be overemphasized. The link between the protein and population problems should be underlined. The growing recognition by IBRD of the importance of nutrition problems was welcomed and it was suggested that arrangements should be made for a group from the Advisory Committee to consult with IBRD about its concern with protein. It was also agreed that the Consultative Group for International Agricultural Research should be invited to provide a factual statement on its work relevant to the protein problem for the next session of the Committee.

55. The Advisory Committee requested the United Nations Secretariat to report to it at its eighteenth session on the outcome of the various matters presently under consideration and referred to in the note before its present session. It would then decide on its own future activities in the light of any developments.

D. Role of modern science and technology in the development of nations (implementation of General Assembly Resolution 2658 (XXV))

56. The Advisory Committee took note of the progress being made in the preparation of the report of the Secretary-General requested by the General Assembly in resolution 2658 (XXV). This report was being prepared by a consultant with the assistance of an expert group which was to meet at United Nations Headquarters in December 1972. Before completion, the report would be sent to the members of the Committee for their review and comments in their individual capacities. It was also agreed that L. Rousseau should attend the expert group meeting in New York on behalf of the Committee.

E. Twenty-second Pugwash Conference
on Science and World Affairs

57. The Advisory Committee had before it a note on the Pugwash Conference (ACAST/XVII/CRP.16) and noted that it was an important meeting which, in its quinquennial review of its future activities, had decided to give equal importance to the problems of development and disarmament. The Conference had adopted three criteria for its selection of development problems: issues which cannot readily be dealt with through conventional diplomatic scientific or political channels; issues susceptible to scientific analysis and discussion and issues which are "timely" in the sense that recommendations following a carefully prepared Pugwash analysis can be expected to have an influence upon the course of events. The Committee decided to keep in close touch with these developments since Pugwash attracts an influential group of scientists. A working relationship between Pugwash and the Advisory Committee should be built up and important reports and documents of the Advisory Committee should be sent to the Pugwash secretariat.

F. Human rights and scientific and
technological developments

58. The Advisory Committee had before it a note by the Secretary-General (E/AC.52/L.143) reporting on various aspects of the study on human rights and scientific and technological developments being made in accordance with resolutions of the General Assembly and the Commission on Human Rights. The drafts of the reports so far prepared had been submitted to the Liaison Group appointed by ACAST for the purpose. Members of the Advisory Committee expressed their gratification at the progress of these studies and emphasized the growing importance and urgency of the subject. P.V. Auger, C. Chagas and J. Novak were requested to continue to serve as a liaison group to advise the United Nations Division of Human Rights, on behalf of the Advisory Committee, on these studies.

59. Members also noted with interest the report on the Seminar on Human Rights and Scientific and Technological Developments held at Vienna from 19 June to 1 July 1972 (ST/TAO/HR/45).

G. UNISIST: progress report by UNESCO

60. The representative of UNESCO introduced a progress report on the establishment of the World Science Information Systems (UNISIST) (SCP/2426/250972) and reported that parts II and III of that report were expected to be approved by the UNESCO General

Conference at its seventeenth session. This would ensure that during the coming biennium the first stage of the system would be established. This would be concerned with the basic natural sciences; it would later be extended to cover engineering and then the social sciences. Specific arrangements were being made for the developing countries to be involved and to enable them to "plug into" the system. An inter-governmental steering committee would ensure representation of developing countries in its management.

61. The Advisory Committee expressed its pleasure at the developments reported to it and the fact that the scheme was shortly to pass from the planning to the establishment phase. It reaffirmed its interest in the UNISIST programme - particularly those features of concern to developing countries - and asked to be kept informed of future progress.

H. International Federation of Institutes of Advanced Studies

62. The Advisory Committee heard a report from A. Salam on the recent establishment of the International Federation of Institutes of Advanced Studies (IFIAS). The preliminary moves towards the setting up of such a federation had been reported previously to the Committee and members were pleased to hear that it was now formally established. It was gratifying that several institutes headed by members of the Advisory Committee were foundation members of the Federation. The Federation was an independent body, though it would have links with the United Nations family through some of its members (for example, the International Institute of Theoretical Physics). Members of the Committee expressed interest in the significance of the Federation to developing countries and were pleased to learn that one immediate outcome might be the extension of the system of the Trieste-type associateships for scientists from developing countries, which the Committee had long recommended. The Committee asked to be kept informed about the progress of the Federation, in particular on the studies it undertook which would be of interest and significance to developing countries. It was noted that there was no existing relationship between IFIAS and the recently established International Foundation for Science.

VI. ADMINISTRATION AND OTHER MATTERS

A. Tenth report of the Advisory Committee
to the Economic and Social Council

63. In view of the fact that the first session of the Committee on Science and Technology for Development would be held before the eighteenth session of the Advisory Committee, it was agreed that an interim report covering the seventeenth session of the Advisory Committee should be prepared and transmitted to the Committee on Science and Technology. This would later be incorporated into the Advisory Committee's tenth report to the Economic and Social Council, which would be prepared after the eighteenth session. It was decided that the United Nations Secretariat should finalize the draft of the interim report and, after obtaining the approval of the chairman, transmit it to the Committee on Science and Technology.

64. It was agreed that the Advisory Committee's statement for the Committee on Science and Technology for Development should be submitted as a separate document to the Committee on Science and Technology and that it should be annexed to the tenth report to the Economic and Social Council.

B. Arrangements for meetings of the Advisory
Committee and its working and regional groups

65. It was agreed that the Advisory Committee would hold its eighteenth session at United Nations Headquarters from 2 to 13 April 1973.

66. The Committee decided to invite M.G.K. Menon to serve as chairman of that session. The Committee decided that the selection of the chairman at the end of each session would facilitate preparations for the following session.

67. It was decided that the Working Group on Appropriate Technology should hold a separate meeting during the eighteenth session.

68. The regional group for Latin America decided to meet at Santiago in February 1973.

69. Decisions as to the meetings of other regional and working groups would be made at the eighteenth session.

70. The Advisory Committee was informed of an inquiry by the Executive Director of UNIDO if the Advisory Committee in principle would be interested in examining some aspects of industrial technology as part of the preparations for the Second General Conference of UNIDO to be held at Vienna early in 1975. The Committee agreed to the proposal on the understanding that the details would be worked out later.

C. Matters for substantive consideration
at the eighteenth session

71. It was agreed that the following topics should be included on the agenda for the eighteenth session:

Report of the Committee on Science and Technology for Development on its first session

Appropriate technology

World Plan of Action:

(a) General review

(b) Regional plan for the Economic and Social Office in Beirut area

Problems of the human environment

Research for developing countries:

(a) Global research projects

(b) Proposal for a research clearing house

Informal links between professional scientists in the interests of development

Protein malnutrition

Subjects for preliminary informal discussion and information on the basis of papers by members would include:

(a) Scientific links between developing countries (C. Chagas)

(b) Nature of the development process (A.H. Bunting and T. Kristensen)

(c) Human and social sciences and development (A.H. Bunting and F.T. Sai)

72. It was agreed that in the future, the Advisory Committee would merely take note of information items unless a discussion was requested by one of its members.

D. Attendance of members of the Advisory Committee
at international meetings

73. The Advisory Committee designated the following members to attend on its behalf the meetings indicated:

T. Kristensen and V.L. Urquidi: Expert Group on Targets for Science and Technology in the second United Nations Development Decade, Paris;

L. Rousseau: Expert group to review draft report on role of science and technology, New York;

V.L. Urquidi: Economic Commission for Latin America, fifteenth session, Quito;

L. Mukendi: Economic Commission for Africa, eleventh session, Accra;

T. Mukaibo: Economic Commission for Asia, twenty-ninth session, Tokyo.

Annex I

MEMBERS OF THE ADVISORY COMMITTEE

P.V. Auger (France)
A.H. Bunting (United Kingdom of Great Britain and Northern Ireland)
M. Castel (Algeria)
C. Chagas (Brazil)
W.K. Chagula (the United Republic of Tanzania)
R. Diez-Hochleitner (Spain)
J.M. Gvishiani (Union of Soviet Socialist Republics)*
J.G. Harrar (United States of America)*
A. Keynan (Israel)
T. Kristensen (Denmark)
Sir Arthur Lewis (Trinidad and Tobago)*
M.G.K. Menon (India)
T. Mukaibo (Japan)
L. Mukendi (Zaire)
J. Novak (Czechoslovakia)
L. Rousseau (Canada)
F.T. Sai (Ghana)
A. Salam (Pakistan)
I. Staicu (Romania)*
V.L. Urquidi (Mexico)
J. Valenzuela (Chile)*
N.B. Videnov (Bulgaria)
M. Yeganeh (Iran)
Sir Ronald Walker (Australia)

* Did not attend the seventeenth session.

Annex II

MEMBERSHIP OF GROUPS
Ad Hoc Working Groups

Appropriate technology

A.H. Bunting
M. Castel
J.M. Gvishiani
T. Kristensen
V.L. Urquidi
J. Valenzuela
Sir Ronald Walker
M. Yeganeh

Global projects

R. Diez-Hochleitner
A. Keynan
L. Rousseau
J. Valenzuela

Clearing house for
research proposals

M. Castel
A. Keynan
T. Mukaibo
L. Rousseau
M.G.K. Menon

Computer technology
for development

P. Auger
M.G.K. Menon
J. Novak
V.L. Urquidi

Human rights

P. Auger
C. Chagas
J. Novak

Human environment

P. Auger
C. Chagas
T. Mukaibo
T. Sai
V.L. Urquidi
V. Videnov

Regional plan for
Economic and Social
Office in Beirut area

A.H. Bunting
M. Castel
T. Mukaibo
L. Rousseau
V.L. Urquidi

Annex III

AGENDA

1. Opening of the session
2. Election of officers
3. Adoption of the agenda
4. Organization of the work of the session
5. World Plan of Action for the Application of Science and Technology to Development
6. Research for developing countries
7. Appropriate technology
8. Problems of the human environment:
 - (a) United Nations Conference on the Human Environment
 - (b) Proposal for an international registry of potentially toxic chemicals
9. Reports from regional groups
10. Items for information:
 - (a) Committee on Science and Technology for Development
 - (b) Transfer of technology
 - (c) Computer technology for development
 - (d) The role of modern science and technology in the development of nations
 - (e) Protein malnutrition confronting the developing countries
11. Other matters relating to the work of the Advisory Committee
12. Adoption of the record of the session

Annex IV

LIST OF DOCUMENTS

Agenda item and title	Symbol
<u>Adoption of the agenda (3)</u>	
Provisional agenda	E/AC.52/L.139/Rev.1
Revised annotated provisional agenda	ACAST/XVII/INF.1
<u>World Plan of Action for the Application of Science and Technology to Development (5)</u>	
Note by the Secretariat	ACAST/XVII/CRP.1
African Regional Plan	E/CN.14/L.407
African Regional Plan summary	E/AC.52/L.140
Asian Plan of Action	I & NR/ASTD(VIII)17
Latin American Regional Plan	
Latin American Regional Plan summary	E/AC.52/L.142
Middle East draft Regional Plan	ESOB/HR/72/31
Report of the meeting to discuss the Middle East Regional Plan	ESOB/HR/72/33
Paper prepared by T. Kristensen	ACAST/WG/WP.4
<u>Research for developing countries (6)</u>	
Report of a meeting between members of ACAST and UNDP	ACAST/XVII/CRP.2
Report of the <u>Ad Hoc</u> Working Group	ACAST/XVII/CRP.19
General guidelines for the preparation of research proposals	
Note by the Secretariat	ACAST/XVII/WG/WP.1
<u>Appropriate technology (7)</u>	
Report of the <u>Ad Hoc</u> Working Group	ACAST/XVII/CRP.4
The World Employment Programme	
Paper prepared by T. Kristensen	ACAST/XVII/WG/WP.2
Paper prepared by V.L. Urquidi	ACAST/XVII/WG/WP.3

Agenda item and title	Symbol
<u>Problems of the human environment (8)</u>	
(a) <u>United Nations Conference on the Human Environment</u>	
Report of the Conference	A/CONF.48/14
Note by the Secretariat	ACAST/XVII/CRP.5
(b) <u>Proposal for an international registry of potentially toxic chemicals</u>	
Note by the Secretariat	ACAST/XVII/CRP.6
<u>Reports from Regional Groups (9)</u>	
Report of the Regional Group for Africa	ACAST/XVII/CRP.7
Report of the Regional Group for Asia	ACAST/XVII/CRP.8
Report of the Regional Group for Latin America	ACAST/XVII/CRP.9
Report of the Regional Group for Europe	ACAST/XVII/CRP.10
Reports on the meetings of regional groups	ACAST/XVII/CRP.20
<u>Items for information (10)</u>	
(a) <u>Committee on Science and Technology for Development</u>	
Terms of reference	E/RES/1715 (LIII)
Programme of work	E/RES/1718 (LIII)
Draft statement	ACAST/XVII/CRP.18
(b) <u>Transfer of technology</u>	
Report prepared by UNCTAD	ACAST/XVII/CRP.11
Institutions for the transfer of technology	ACAST/XVII/CRP.12
(c) <u>Computer technology for development</u>	
Note by the Secretariat	ACAST/XVII/CRP.13
(e) <u>Protein malnutrition confronting the developing countries</u>	
Note by the Secretariat	ACAST/XVII/CRP.14
<u>Other matters relating to the work of the Advisory Committee (11)</u>	
(b) <u>Twenty-second Pugwash Conference</u>	
Note by the Secretariat	ACAST/XVII/CRP.16
(c) <u>Human rights and scientific and technological developments</u>	
Note by the Secretary-General	E/AC.52/L.143
<u>Adoption of the record of the session (12)</u>	
Draft prepared by the Secretariat	ACAST/XVII/CRP.15



PROTEIN ADVISORY GROUP OF THE UNITED NATIONS SYSTEM

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28 September 1972

Mr. Harold N. Graves
Devel. Services Dept.
Intl. Bank for Reconstruction
& Devel.
1818 H St., N. W.
Washington, D. C. 20433

Dear Harald,

Thanks for your note of 25 September correcting our use of the acronym for CIAT. It is obviously easy to confuse this with IITA. But then we could invoke the qualities of Shakespeare's rose

Harold, please recall your promise to send me the preliminary reports or records of the TCA/Consultative Groups meeting in August. These would serve only for our personal information. This favor will be appreciated.

With kind regards.

Yours sincerely,

Max Milner
Scientific Secretary and
Director, PAG Secretariat

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Oct 10/72

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Mr. Graves

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May 3-7/71

NUTRITION AND DEVELOPMENT:

THE VIEW OF THE PLANNER[#]

Alan Berg* and Robert Muscat**

[#]Paper prepared for May 3-7, 1971, Meeting of the Secretary-General's Panel to Formulate a United Nations Strategy Statement on the Protein Problem Confronting the Developing Countries.

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The interpretations and conclusions are those of the authors and do not necessarily reflect the views of the above organizations.

NUTRITION AND DEVELOPMENT: THE VIEW OF THE PLANNER

Alan Berg and Robert Muscat

In recent years we have heard much about the magnitude and implications of malnutrition and the need to attack the problem with a new sense of urgency. Yet when looking at the development plans of most countries in the developing world, one seldom finds nutrition getting more than passing mention. Even where better nutrition is cited and discussed as an objective of a plan, its relative priority -- measured by allocation of resource, or specific policy proposals -- is low.

One is therefore tempted to ask: Have we demonstrated a convincing case that malnutrition should warrant more funds, given the competing demands on scarce resources?

In a paper in 1969 (1), we examined a series of policy issues relating to this question and concluded then that from the planner's view, an acceptable case for nutrition had not been made. It was also said that until a sufficiently strong case is presented, the impact of the extensive research of the scientific community would not reach beyond the periphery of the malnutrition problem. Since then, a rich dialogue has developed among many of those sharing these concerns. Issues have been more sharply defined, new rationale has been examined, and new conceptual approaches have evolved. In short, we believe the case can now be advanced for nutrition's role in the mainstream of development. This paper is an attempt to explore that case, looking at nutrition from the viewpoint of the development planner.*

At the outset we should state an important caveat to be borne in mind throughout this paper. We do not mean to imply either that malnutrition can be treated or overcome in isolation from other elements of the socio-economic framework, or that better nutrition alone is a panacea for underdevelopment. On the contrary, nutrition is one of the many interrelated determinants of human performance requiring advancement. We do question whether the relative importance of nutrition, its role among the many factors, has been given the attention it deserves. We also suggest that under certain circumstances nutrition may be a precondition to the advancement of these other factors.

* Some nutrition proponents may take issue with this approach. It is commonly argued that the very fact of widespread malnutrition is itself grounds for large programs; that children should not have to justify their sustenance on societal economic grounds. With clear appreciation of the human tragedy implied in malnutrition, we point to the evidence that over the years the case for nutrition as 'a moral imperative' has proved insufficient to claim more than a token portion of development resources.

SIZE OF THE PROBLEM

In examining the relationship of malnutrition to national development, the planner's first interest is the magnitude of the problem. This need be discussed only briefly to set the problem in its broad context. We will consider child mortality, the relationship of malnutrition to that mortality, and malnutrition of the survivors.

By any measure, child mortality in developing countries is of staggering proportions.*

- . Children under 5 in Pakistan and Brazil constitute under one-fifth of the population, but account for four-fifths of all deaths; in India, for 65% of the deaths, in the U.A.R., 68%. (In industrialized countries, deaths at this age are significantly smaller than their age proportion in the population, e.g., in Sweden, young children account for 7.4% of the population, but only 2.2% of deaths.)
- . The percentage of children ages 1 to 4 who die in Pakistan is 40 times higher than in Japan; and 80 times higher than in Sweden.
- . Of children between the critical ages of 1 and 2, the proportion of deaths in rural Punjab (one of India's strongest and healthiest areas), is 72 times higher than in Sweden; in the U.A.R. it is 107 times higher and in Gambia, 111 times higher.

Although it is difficult to isolate a single cause for these death rates -- a number of obviously related environmental factors are involved -- there is little dispute to FAO's contention that "malnutrition is the biggest single contributor to child mortality in the developing countries." (2) Studies currently being conducted in 8 Latin American areas report malnutrition to be the underlying or an associated cause of 52% of all deaths of 1 to 4 year olds (3). In Monterrey it is 65%; in San Salvador 67%; in Recife 70%.** Even in the early months of life (1 to 5 months), malnutrition was related to 58% of the Recife deaths. The same Latin American study shows that immaturity -- often nutritionally related -- caused 47 to 74% of deaths in the first month of life. A recent study from Jamaica (4) reports that 65% of deaths in the 6 to 36 month old children had malnutrition as either the primary or a contributing factor.

The 5 principal causes of childhood death account for 50% of all pre-school deaths in a sampling of developing countries.*** Deaths due to all 5 causes are often nutrition-related. For example, the Latin American study estimates that among children under 5, malnutrition is an associated cause in 55% of the deaths attributed to infective or parasitic diseases.****

*See Appendix, Tables I and II.

**See Appendix, Table III.

***See Appendix, Table IV.

****See Appendix, Table V.

Deaths are measurable. Less dramatic and less visible is the toll among the survivors. How widespread, the planner then wants to know, is malnutrition? How severe is it and what does it mean? FAO recently reported that of the 800 million children now growing up in developing countries, more than two-thirds will "encounter sickness or disabling diseases either brought on or aggravated by protein-calorie malnutrition" (5). Children who do survive will be plagued by illness that might not occur or be as serious were it not for their reduced resistance caused by malnourishment. Recent studies in Latin America, South Africa and India show that 20 to 30% of the time, the young child is experiencing acute infection (6). A sense of the severity within this group is suggested by a summary of 16 of the most recent nutrition surveys (7). This shows a range of severe malnutrition, (i.e., third degree: below 60% of standard body weight per age), from 0.5 to 4.5%. An additional 25% of the children are commonly found to be suffering from moderate malnutrition, (second degree: 60 to 75% of norm). Thus, in some areas, such as rural Mexico, almost 1 out of 3 children fall below 75% of the accepted standard. It has often been reported elsewhere that an additional 40 to 45% of the children have mild malnutrition (first degree: 75 to 90% of norm).

Three standard techniques have been used to measure the extent of malnutrition: food-balance sheets, consumer expenditure surveys, and direct nutrition surveys. Each has its drawbacks,* but taken together, the different methods

* A method developed in great statistical detail by FAO is the food-balance sheet. This estimates supplies of different foods available within a country (or region), and translates these supplies into calories and nutrients to compute per capita availabilities. (Both supplies, population and food demand can be projected forward to form an estimate of how the demand-supply situation might look, say ten years ahead, under a given set of assumptions.) Per capita availabilities can then be compared with recommended standards for that country to arrive at an estimate of the aggregate nutritional gap. There are several problems associated with this method, chief of which is that all aggregate measures conceal the features of the complex reality they describe. The approach does not take account of income differences within the population, regional variations, or intra-family food distribution mores. Thus, it does not yield an estimate of how many actually are suffering from malnutrition, or a profile of who they are. Since even countries with apparent large surpluses of nutrients, as shown in the balance sheets, still have malnutrition problems due to the wide variations around average intake, (and associated health problems that show a higher incidence in the poorer groups), this approach does not indicate absence of a problem where an aggregate surplus exists, but it does guarantee that a serious problem exists where a country has anything less than a moderate surplus.

A second technique uses a combination of income distribution data and consumer expenditure surveys. The latter often tell us how much of what foods are purchased, by what levels of income or expenditure. This information can then be paired with

income distribution data to derive estimates of the numbers of people consuming different levels of calories and nutrients. Two recent studies illustrate this method. One by P. D. Ojha (8) estimates that at least 60% of the Indian population in 1960/61 (about 200 million people), was consuming less than the minimum recommended daily calories. A study of Korean consumer income and expenditure data estimated protein deficiencies by broad occupational categories, concluding (for example) that 90% of the households of urban "daily workers" were in a critical deficiency range (9). Depending on the reliability and detail of the data, these surveys can give a good picture of the overall magnitude of nutritional deficits, the distribution of the deficits among areas and groups of the population defined according to different characteristics, and the apparent consumption levels of different nutrients. Although these methods provide a closer look than the balance-sheet approach, they still omit many important characteristics of the nutrition problem, such as cooking habits and their impact on the nutrient content of food, intra-family distribution habits and incidence of parasites or other factors affecting absorption.

A third technique is the direct nutrition survey, involving a field examination of the nutritional status of a sample of the population. For the specific group studied, this is the most accurate of the three determinations, but also the most costly, the most time-consuming and the most difficult. By necessity, the sample is small and question may be raised as to how representative it is of the whole population. Virtually all national populations are nutritionally heterogeneous. Thus, any sample for identifying specific nutritional problems is less useful the larger is the proportion of the population that the sample is meant to describe. In making necessary comparisons among various surveys to project a broader picture, one often runs into a lack of standardization of clinical definitions, uneven representativeness of the materials, and methodological problems such as failure to make allowances for seasonal variations.

present a consistent and reasonably reliable picture of a problem of major magnitude. Information available from studies employing the three techniques demonstrates the presence of an enormous mass of subclinical malnutrition in the developing countries, i.e., malnutrition that does not show up in conventional medical statistics. This mass amounts to something on the order of a billion persons (10).

ECONOMIC IMPACT ON THE INDIVIDUAL

Having obtained some idea of the magnitude of the problem, the planner next may ask: What does malnutrition mean to the individual as economic man and thus, in a composite sense, to society and to national development? The planner hears that malnutrition affects mental development, physical development, and productivity. He wants to know to what extent this is so and in what ways and to what degree this affects national development.

Mental Development: It is now clear that malnutrition during the fetal period and in infancy is associated with intellectual impairment. Severe malnutrition reduces the size of the brain, decreases the number of brain cells and is responsible for abnormalities of behavior (11). Some beginnings of functional quantification have been attempted, and the results are not pleasant to contemplate (12).

Recent research also suggest these changes may be irreversible and that severe malnutrition* could be responsible for a permanent impairment in brain development and ultimate function (13, 14).

Those directly working on this question, such as Winick, generally contend "the evidence is becoming more and more weighty that malnutrition in infancy permanently affects the minds of the children who have been afflicted." (15) Others, such as Frisch, although appreciating the difficulties of such investigations, find shortcomings in the existing studies and thus conclude that "surmises should not be treated as facts." (16) Unfortunately, the question whether damage brought on by malnutrition is reversible has dominated our thinking and our work, and has tended to direct attention away from the more significant public policy considerations. This is understandable; the mention of irreversibility suggests a dramatic difference in kind, a difference infinitely less tolerable.

*Perhaps because of the difficulty in isolating the nutrition variable, almost no work has been conducted to measure the effect on brain function of mild or moderate malnutrition. Although there is observational reporting suggesting a lag in mental performance, clearly more quantification is desirable.

This has been reflected in discussions we have had with public officials who imply that "if malnutrition is irretrievably limiting, we must quickly do something about it; if it isn't, it is a matter of lesser importance and poses a lesser sense of urgency."

Such posture is dangerously misleading. Two points need to be made to place the matter in policy perspective.

First, malnutrition clearly interferes with a child's ability to learn, whatever its ultimate effect on the condition of the brain itself. Learning time is lost during the most critical periods of learning. A malnourished child is listless, lacking in curiosity, and unresponsive to stimulation. Even if he were less passive, the maternal stimulation a small child requires for proper development frequently is unavailable; the mother herself often a victim of nutrition lethargy.*

Whether a child's apathy results from his own or his mother's nutritional deprivation, he is late in reaching the standard development milestones. He slides from the norms, and by the time he enters school he already is behind his adequately nourished classmates. This child is less aware of his world than are his well-nourished counterparts. Much passes him by. He is mentally and physically fatigued and thus has difficulty being attentive in class. Frequently he seems detached from the life around him.

If this were not a sufficient competitive disadvantage, the malnourished youngster falls further behind because of his frequent bouts with nutrition-related illnesses. In the United States an estimated 8 school days a year are lost because of sickness (18). It has been computed in four Latin American countries that more than fifty days of school are missed a year because of illness (19). In some instances this constitutes one-third of the available school days.

The malnourished child thus falls still further behind, often until he is unable to cope with the school situation.** Obviously, other factors are also at work, but there is little doubt that malnutrition contributes to the poor performance, to the low aspiration to higher education levels, and to the

*Rosenzweig reports that stimulation may affect brain size (17).

**To the extent the duller children fail to advance in grades, they occupy seats that others might fill. The level of a teacher's instruction to all students must be lowered to accommodate the scope of comprehension of the dull children. Thus, the returns to education expenditure where the dull child is present are reduced by malnutrition.

substantial student drop-out rate often found among the poorly fed portions of the population.

Thus, whatever may or may not happen to his brain development at some future date, the malnourished child is permanently handicapped. He has suffered an irreversible loss of opportunity.

A second and perhaps more compelling policy consideration concerns the uncertainty of the relationship between malnutrition and permanent mental retardation. Discussion of reversing mental deficiency assumes that the nutrients now in short supply will be available at some future date. We have attempted in earlier papers (20, 21), to demonstrate that this is an assumption of questionable validity. For a substantial portion of people in developing countries, that 'future date' will not fall within their lifetimes, given their present low incomes and likely rates of income growth. For example, for a third of the families in India at least twice the current incomes are required to meet even the minimum acceptable diets. Unless a new nutrition strategy is evolved to shortcut the traditional means of providing nutrition, it will be well into the next century before more than 150 million Indians will afford even a minimum adequate diet. And it has been suggested that these projections were overly optimistic, being based on a 5.5% annual national growth rate, compared to a 3.5% trend over the past 13 years.

All this questions the policy relevance of the discussion about reversibility or irreversibility of mental retardation. It also emphasizes the need for solutions other than conventional income solutions to meet the nutrition problem.

Physical Development: Next we come to the relationship of nutrition to physical growth. Heredity is the key to the ultimate size a youngster can attain, but it is nutrition which largely determines how close he will get to his genetic potential. It is now clear that large parts of the populations of the developing countries are falling significantly short of their genetic potential because of inadequate nutrition* (22). In fact, low income populations have an almost universally smaller body size. According to FAO, more than 300 million children from these groups suffer "grossly retarded physical growth." (24) It is not uncommon to mistake these youngsters for healthy

* Bengoa has written that "Despite genetic differences and other disease factors ...short stature in a population is now regarded as an indication that malnutrition exists, and plays an important role in physical development in many developing countries," (23) i.e., a person small for his age may well have been malnourished during some important period of his development.

children, though their growth may be retarded 20 to 30%. This means that by the time the child reaches the age of 12, he has the physical development of a normal 8 year old.

Other than for certain kinds of jobs requiring more than average physical prowess, physical size in itself generally is not economically significant. More important is the possibility that the shortfall in size may be related to a shortfall in performance. It is now clear that small stature often reflects the disabilities of stunted mental growth. A study of presumably healthy Arab children (25) showed that alertness, good proportions, and good physical condition camouflage dwarfing to such an extent that "without knowledge of their exact age they could have been taken for healthy children." In fact, 70% were short for their ages and their accomplishments and behavior were more in keeping with their size than their age. Similar observations were noted in Mexico (26).

Other Productivity Considerations: The above concerns result primarily from inadequate quality of diet, especially childhood diet. The relationship of nutrition to productivity also poses what is largely, (although not solely) a quantitative consideration. Man is subject to the laws of thermodynamics; he must absorb energy to produce an energy output (27). Classic work studies during and following World War II (28), as well as the numerous studies of output before and after the introduction of factory feeding programs (29), show a direct relation between dietary improvements from clearly inadequate starting levels, and subsequent increases in work output. Those who would apply the usual caveat that the observed correlations do not prove a direct causal relation may be justifiably skeptical in cases where other motivational factors are at work and where the diet outside the institutional feeding has not been properly observed. But it would be too fastidious to quarrel with the general conclusion that these studies corroborate, under closely observed conditions, the commonly observed fact that inadequate food intake leads men to make compensating adjustments in energy output to preserve their internal processes.

The adult worker with an inadequate diet compensates for this intake shortfall by living, in effect, a less than average life as a less than average man. His adjustment falls short of putting him into a clinically defined state of undernutrition or malnutrition. It comprises a mixture of slowly paced work, savings on muscular exertion, opportunities for innovation or extra effort foregone, low body weight, and a moderate departure from

a condition of general well-being -- in short, a mix of work performance below a man's potential and a chronic condition of ill-being. As indicated earlier, the picture is further complicated by the interaction of malnutrition and other sources of illness.

Most of the concerns reflected in the foregoing discussion are a consequence of protein and/or calorie malnutrition. These are the most severe and widespread of nutritional deficiencies, especially among children in the formative years. Additional problems are induced by inadequacies of other nutrients, either directly or in combination with protein and/or calorie shortages. Although there exists a profusion of medical studies of the diseases emanating from these deficiencies, data on their prevalence is sparse. One comes away from a search of the literature sensing that the generous space nutrition textbooks devote to these once serious problems may no longer be a valid reflection of their importance in today's world. This is not to suggest that such classic nutritional deficiency diseases as rickets, scurvy, beriberi and pellagra no longer exist. Rather, for policy purposes, as a general rule they are of only secondary importance.* There are two reasons for this: first, where such nutrient deficiencies have been identified, and where a feasible method of distributing a dietary supplement exists, the cost of corrective programs are likely to be relatively modest. They pose for the planner no major resource problem of a size approaching the problems of protein/calorie deficiencies. As such, an effective plan to eradicate such deficiencies would not be likely to prompt serious resistance. Second is the matter of numbers. The cases of such diseases probably are relatively few, at least when compared with protein deficiencies that can be measured in the hundreds of millions.

There are two prominent exceptions. Among some adult populations, nutritional anemia is a widespread deficiency. The resulting sickness and sluggishness is a condition so common in poorer societies, it is often accepted as the norm. Nutritional anemia is particularly severe in pregnant women -- 56% of expectant mothers studied in South India are anemic; 80% in North India (30) -- and is responsible for a considerable portion of maternal deaths (31).** Nutritional anemias in mothers are also responsible for the

* A rule that does not hold in certain areas under certain sets of unusual circumstances.

** It should be noted in this connection that maternal death rates of developing countries are many-fold those of more affluent societies. India's maternal death rate is 17 times that of Denmark's. (32)

precarious health of the newborn. Premature births are much more common among anemic mothers, and premature children are much more likely to die. 70% of the deaths in the perinatal period were in infants weighing less than 2.5 kg. at birth (33). Anemias are also common among children; 50% of those studied in a recent large Indian survey were anemic (34).

The second exception is vitamin A deficiency, which in its most severe form of deprivation can lead to blindness.* Estimates have been made that in India alone there are more than 4 million cases of blindness, a million of which are of nutritional origin and thus preventable (36). But these numbers in themselves are a bit misleading, since children blinded from diseases brought on by inadequate vitamin A often will not survive. In Indonesia, for every survivor, one child dies. And the survivor then has a lower chance for further survival than his age partners (37). For every Indian case of total or near-total blindness, another three Indians are said to be suffering from mild to moderate degrees of visual handicap (38). For example, 10 to 15% of children in India are said to suffer from night blindness and more severe ocular manifestations of vitamin A deficiency (39). Further, the severity of protein deficiency cases is intensified when accompanied by vitamin A deficiency. Usually, good hospital treatment can lead to recovery of half of the cases of severe protein deficiency. When vitamin A deficiency is also present, the fatality rate rises to 80% (40).

IMPACT ON NATIONAL ECONOMY

What effect do these individual disabilities of malnutrition have on economic development?

Human Capital: Malnutrition is a disease. Expenditures to overcome or avoid disease have commonly been regarded as a form of consumption, and consumption is often an unwelcome word in the halls of national planning agencies. This has not always been the case. Earlier developers of economic thought recognized that wealth flows from some kinds of expenditures on people, which were tantamount to investment in human capital, as well as from investment in non-human capital. Their view implies that expenditures to prepare a person to enter the labor force, or subsequently to increase or maintain

* Although compilations have been made of available studies (35), it is still difficult to assess the magnitude of this problem. Comprehensive statistics of quality are rarely available, and when they are, they often differ as to what constitutes blindness. It is even more difficult to assess the numbers who are blind because of malnutrition. Also, the % of malnourished children who show clinical signs of eye impairment varies considerably from region to region.

his productivity, eventually will produce a flow of income. However this train of thought was eclipsed by the more mathematically precise economic growth models that came into vogue in the 1940s.

The planning models in general use do not take explicit account of the notion of investment in human beings. The models develop a view of the growth process which sees increases in tomorrow's income as resulting primarily from today's additions to material capital (or investment). The nature and productivity of the investment then determines the extent of the increase of future income.

Obviously, the more one consumes today, the less is available for investment -- and thus, for generating future income tomorrow. Viewed in this light, consumption becomes an enemy of growth, not a handmaiden. Investment in steel plants, large dams, and other modern temples thus attained a new kind of sanctity. Consumption in the form of educational and health services, clothing, and eating -- and even more flippant forms of consumption such as entertainment which can affect a person's motivation -- is recognized as having an instrumental impact on productivity. But since the effects are so difficult to identify, all growth in income is imputed to those measurable factors included in the model.*

Expenditures on health have suffered from this stigma. In the national accounts they fall in the category of consumption. They contribute to the current sense of well being and are consumed immediately, as is food or a visit to the cinema.

In recent years, however, a new school of economic thought has begun to advance beyond the confines of the models. A body of literature has developed the theory of human capital, measuring returns to investment in people. Guided by the techniques applied to measuring material capital and the returns to investment, several writers have attempted to develop similarly rigorous approaches to human capital. The impetus to extend the concept of capital to human beings, developed from the observation that the theory previously used could not explain all of the increases in national output that had been achieved in several countries. As Professor T. W. Schultz,

* The planner's personal vision may transcend the confines of his model -- or at least the inherent bias against consumption, but his plans are constructed around the model nonetheless.

a leading proponent of the development of human capital theory, wrote in 1961:

Although it is obvious that people acquire useful skills and knowledge, it is not obvious that these skills and knowledge are a form of capital, that this capital is in substantial part a product of deliberate investment, that it has grown in Western societies at a much faster rate than conventional (non-human) capital, and that its growth may well be the most distinctive feature of the economic system. It has been widely observed that increases in national output have been large compared with the increases of land, man-hours, and physical reproducible capital. Investment in human capital is probably the major explanation for this difference (41).

Elaborate work by Denison (42) and others (43) has shown that a significant part of economic growth in the United States and Western Europe has been attributable to education, but that even after taking education into account, there remains an unexplained residual growth. Denison attributes this to "knowledge". To examine these efforts and their limitations further would exceed the scope of this paper. For our purposes, it is enough to note here these authors reflect a breakthrough in economic thought -- a recognition that the quality of the labor force is an important factor in economic growth.

Inspired by this development in the theory of education, economists have attempted to develop a parallel approach to the economics of health. Several methods have been devised to measure the economic returns and they show substantial returns to health investment in the United States. The most common technique is to compare the costs of preventing a death with the worker's future income, had he lived (44).* Another measurement is the investment in human capital that is lost through death any time prior to retirement. This second approach yields an estimate of the health "capital" that has been invested in a member of the labor force, along with food, clothing, housing, education and other expenditures necessary to enable a person to develop his particular skills. A variation in this approach measures the economic cost of debility, where death is not a factor (45).

* The ratio of the income benefit to the costs of preventing its loss, is a ratio that is comparable to benefit-cost measurements of more standard project analysis. It is sometimes objected that the individual's future consumption should be deducted from his income in calculating the net benefits. This is an error, since the objective of growth (and of economic activity generally) is future consumption, not merely the residual after personal consumption. The benefit consists both of a life saved and the consumption enjoyed by that person; if he also turns out to generate for future investment, so much the better.

Whether an illness results in temporary loss of work days, or some temporary or permanent reduction in work capacity, the loss in output can be estimated in various ways and added to the cost of medical care. This can then be compared with proposed expenditures for preventing the occurrence of the illness in the first place.

Similar techniques are applicable in measuring returns to expenditures on better nutrition. From the earlier discussion of the impact of malnutrition on the individual, an improvement in nutrition (or an avoidance of under-nutrition or malnutrition) can be economically equivalent to curing (or preventing) any other disease. Improved nutrition that returns an absent worker to the active labor force, or that overcomes a debility that is reducing a worker's productive capacity, or that enables a child to return to school or to improve his understanding or retention of things taught, or that enables an adult to absorb more effectively in-service training or the advice of agriculture extension, clearly increases the flow of earnings above what it would have been in the absence of the improvement in well-being.

Once a person is restored to well-being, adequate nutrition (e.g., sufficient iron supply), is a maintenance expenditure. From then onward it contributes to present income only in the sense that in its absence, the person would lose some of the income-generating capacity he or she has when nutrition is adequate. And it contributes to future income in the sense that its absence would interrupt current learning, or otherwise dilute activities that are necessary or contributory to future income generation.* Increments of nutrition lead to diminishing increments in potential productivity and then only up to a certain point. Beyond that point, in either quantity or quality, further increases in ingestion at any one time do not contribute to productivity, and in fact can reduce it.

In sum, an improvement in nutrition can have a continuing, current or maintenance effect on the productivity of an active member of the labor force, or it can take the form of an investment, enabling a person to earn a higher future income stream.

* All distinction between consumption and investment would be destroyed if the expenditures on eating by all people who were adequately fed were labelled investment by extension of the idea that they were a necessary condition for maintaining a flow of income.

Returns in a Developing Country: Let us assume that our planner accepts the notion of human investment and the logic of the methods for calculating the benefits from avoiding death or restoring (or increasing) productivity through reducing or eliminating malnutrition.* These analyses of the developmental importance of nutrition and well-being have been worked out for economies already highly developed. Before the conclusions can be aggregated and applied to the poorer countries, the planner faces another set of problems arising from important differences between developed and developing economies.

We might start with a benefit that is often central to discussions of health economics, the savings of medical costs where adequate nutrition would reduce the number of clinical admissions into the medical system. As long as there is an unsatisfied demand, i.e., as long as the potential case load exceed the treatment capacity of the medical system, the elimination of a kwashiorkor case frees up a bed (and other medical resources) for some other sick person who was otherwise unable to gain entry into the system. Since this is the typical situation, reduction of malnutrition is not likely to bring about a reduction in current medical expenditures, or a slowing of the rate of growth in medical system investment, given the inadequacies of these systems. However, the adequate nutrition would enable the system to increase the welfare and restore the productivity of all those persons on the queue who would then be able to gain entry.**, ***

* The reader should be reminded of our initial caveat. Reduction of malnutrition and consequent realization of benefits may require joint attacks on other related problems, particularly synergistically-related diseases.

** The childhood morbidity data referred to earlier indicates the contributory role of malnutrition to some of the major prevailing childhood diseases. Examination of medical system statistics in any country would show the extent to which these diseases claim medical resources, and would give an indication of the numbers of people on the queue who might gain access as a result of reductions in malnutrition-related morbidities.

*** A benefit that has been cited but does not seem appropriate to transfer to a developing country is the saving in additional nutrients that a sick person otherwise consumes if his illness involves a loss in the efficiency of absorption. In such situations, the person must offset the malabsorption by eating more during the period of recovery (46). Where malnutrition is widespread, and food supply and income levels place severe limits on the consumption available to low-income families, the malnourished either do not have access to these medically-recommended high intakes (if they did, the malnourishment would not have arisen in the first place), or the extra needs of the clinically ill must be met by reducing the intake (and increasing the malnourishment) of those suffering less severe deprivation. In short, it cannot be said there would be a saving of cost when no cost is actually being incurred.

A category of benefits that appears to be potentially very large for a developing country* is the reduction in productivity losses caused by the debility of a substantial portion of the labor force. Calculation of these losses, using the standard methods of health economics in the developed countries, would be extremely difficult. Medical data of the kind needed for such calculations are not available for most developing countries. The excess demand on the medical system also means that many of the sick never enter the statistics. The data that are available often reflect cursory diagnoses by paramedical personnel or by doctors whose need to work their way through long queues prevents careful examinations. Moreover, the synergistic character of much prevailing illness makes it difficult to pin down the exact contribution of malnutrition to illness or death. Beyond these problems is the overriding fact that most malnutrition does not show obvious signs and it rarely puts the suffered into the queues. Thus, the methods used to measure returns to health in the developed countries** are, with some exceptions, usually not very helpful in the developing countries. This is especially true for the added step of determining the malnutrition component.

An alternative approach is to use aggregative data on food supply and the occupational distribution of the labor force. An interesting example is the work of Correa (47). He starts with an estimate of daily caloric need in different occupations which was worked out by Lehmann and others in Germany in 1949 (48). The German study calculated the % shortfalls in work capacity resulting from different levels of shortfall in caloric intake. Correa works out the average caloric need for a country by dividing its labor force into occupational groups comparable to Lehmann's and then calculating a weighted average caloric requirement for 100% physical capacity (with adjustments for temperature and other factors). By comparing this average with the average national caloric consumption derived from food balance calculations, Correa arrives at national working capacity

* But much smaller for a developed country, especially where the prevailing social philosophy calls for relatively equal income distribution.

** In the developed countries, the fact that a very large fraction of the labor force is registered under institutional arrangements of some kind means that days lost due to illness, and even the nature of the illness can be derived from non-medical statistical sources outside the medical system itself, such as employment data, or medical insurance records. In the developing countries the coverage of medical insurance is normally small, and the large fraction of the labor force that works outside formal institutionalized employment, especially in agriculture, precludes generation of such data.

shortfalls, which for developing countries are almost always very substantial, many being as high as 50% or more.*

The Problem of Surplus Labor: In attempting to apply to a developing country any of these methods of calculating the cost of ill-being for present output (or for future output, in the case of a death prevented or a worker brought up to and kept at "par"), one must reckon with the implicit assumption behind all such studies, that the labor force -- or more precisely, the occupational groups in which the relevant individuals fall -- is fully employed. Restoring a person to good health adds nothing to national production if he has no meaningful job. In our discussion with development economists, this is perhaps the most frequent and basic objection raised to all claims for economic benefits to better nutrition.

Developing countries are usually assumed to have a substantial labor surplus resulting from a combination of open unemployment and underemployment. This appears at first glance to weaken the case for seeking productivity benefits from better nutrition, especially for the masses of the unskilled. Although it would take us far afield in this paper to examine the employment problem in any detail, it will be useful to touch on a few aspects that have emerged from recent studies. These are changing our

* As Correa recognizes, this method poses the same problems that limit the usefulness of the aggregative methods for estimating the incidence of malnutrition. Data limitations necessitate numerous heroic assumptions. The model equates productivity with human energy capacity, a weakness of all static "caloric gap" calculations that cannot take into account the impact of malnutrition on physical and mental capacity during the growth period of those now included in the labor force. A high level of aggregation (e.g., agricultural labor would include everything from chicken keepers to lumberjacks) and lack of regional or ecological differentiation (e.g., the differences in nutrients based on soil quality) can easily lead to large errors, and to the overlooking of the detailed features of the malnutrition problem that would enable one to understand its characteristics and draw relevant programmatic and policy conclusions. Still, the approach is imaginative and conceptually useful. It lays out for the first time, step by step, some of the links between impact on the individual worker and final aggregation into potential impact on the national economy. For a single country, a more refined model could be developed using finer breakdowns of the labor force, adjustment of Lehmann's factors for local conditions, estimates of caloric requirements more carefully adjusted by occupation and local conditions (including seasonal factors) and estimated daily intake by income level. While this more elaborate approach would take one closer to an estimate of a potentially significant economic shortfall for occupations heavily reliant on human energy, it would stop short of taking account of important additional factors such as early childhood diet, intra-family food distribution, the impact of cooking habits on nutrient content, and the problems of efficiency of absorption.

previously oversimplified picture and thereby are weakening the implication that health expenditures in developing countries are essentially welfare improvements with no productive economic payoff.

First, in rural areas it is often more common for labor to be in short supply than in surplus during harvest and other periods of intense activity (49).^{*} Do these workers try to feed themselves seasonally to higher capacity, like draft animals, then recede back to undernourishment and apathy during the slack periods? What happens to productivity when a person undergoes a chronic regime of alternating periods of malnourishment? Can wage labor feed itself up to par in the weeks preceding harvest, when its cash income is at the lowest annual point and grain prices are at their pre-harvest peak?^{**} It is commonly said that in some countries a significant portion of the workers could be taken off the land without affecting production. Perhaps during certain months this may be so; on an annual basis with present technology it clearly is not so in most cases, and in the future it will be even less valid. With the spread of irrigation, now spurred by the development of the higher yielding and faster maturing varieties, slack time during the agricultural year is diminishing.^{***}

* This short labor supply condition may be reflected in labor-saving arrangements such as have been common in Thailand's rice delta, where there would not be enough people to harvest the rice if it all matured at the same time. Accordingly, farmers plant paddy fields on different days during planting season to be able to form groups that harvest each member's fields in succession as the rice matures on a staggered schedule. Or short supply may be reflected in market conditions -- that is, seasonal increases in wages -- where harvesting and other activities are usually carried on with the help of wage labor. This has been dramatically illustrated in India's wheat areas with the substantial increases in the size of crops to be handled that have resulted from the spread of the new high yielding varieties.

** Labor which is dependent on seasonal employment and market wages but has some mobility, is in a different position from labor which traditionally makes annual contracts with a farmer under which compensation takes the form of partial wages in kind and the labor resides on or near the farm. In the latter case, there may be no seasonal fluctuation in the availability of foodgrain to the worker, and he has no geographic mobility in slack periods.

*** The impact of these developments on the demand for agricultural labor will vary by crop and by changes in technology, particularly the opportunities for and economics of mechanization. The eventual impact of the new agricultural technology within the context of overall economic expansion, on the demand for labor raises issues beyond the scope of this paper (50).

Second, even where open unemployment exists, many functions impaired by a worker's malnourishment cannot be satisfactorily fulfilled by hiring additional workers. In such cases the existence of a surplus does not argue against returns to better nutrition. In other words, quantity cannot substitute for quality. If a job is strictly machine paced -- that is, the machine has an independent rhythm, perhaps in a sequence of times operations on an assembly line -- a chronically malnourished worker would have narrow scope for reducing his performance below the machine's automatic demand on its operator. In such a situation, malnutrition might be reflected in shoddy output. This is of special significance when the worker's manual precision or strength figures in the operation, the quality of the work being dependent on the quality of the worker. Malnutrition also is reflected in accident rates and absenteeism. The literature contains numerous examples of factories where feeding programs were introduced and lower accident and absenteeism rates were subsequently observed (51).*

Third, it is worth recalling that many areas of the developing world have relatively low man-land ratios and do not appear to have a substantial underemployment problem. Much of Southeast Asia was historically a textbook case of what Adam Smith called a "vent for surplus" economy. This is an economy in which only an increase in export demand was needed to motivate farmers to extend their area of cultivation, trading leisure for additional work to take advantage of a vent for exporting the potential surplus. Many parts of Africa today would seem to fit this description, which is becoming less apt for Southeast Asia as increasing population pushes into marginal lands.

Fourth, on closer examination, the pool of unemployment in many urban centers is not the commonly perceived homogeneous army of mere surplus human energy. Although considerable numbers of unskilled laborers are included in

*While a reduction in accidents brings about both a welfare and an economic gain, the impact of reduced absenteeism is less clear in an employment market characterized by open unemployment and where employers make a practice of hiring apparently redundant labor, a common industrial practice in some countries. If two men are in effect sharing one place at a machine or work bench, the absenteeism of one is covered by the presence of the other, the employer (and the employees) sharing the wage for one work place between two men. If one of them were fed enough (and diet was sufficient alone) to eliminate his absenteeism, the result would be an increase in unemployment (unless union rules barred firings for mere--real--redundancy).

the pool, recent studies show there is also a large amount of unemployment among the educated. The rate of urban unemployment is greater among skilled and educated young people than among manual laborers.* The young remain unemployed for a while by choice preferring to wait for the job that will gain them entry into the professional field for which they are trained, and in which they will earn the largest future stream of income. This portion of the pool is conspicuous, often volatile, and therefore a problem; but it reflects what economists call frictional unemployment.

In sum, to dismiss the value of nutrition as a factor in increasing productivity is to assume that underemployed labor is available** in the vicinity of an activity, at the right time, that it possesses required skills, and that the work is technically capable of being divided among more workers than are currently employed. Conversely, however, provision of adequate nutrition to an adult now in the labor force does not necessarily lead to higher output and may not be the most efficient route to higher output. Better health may be a necessary condition to a worker raising his productivity, but it is not a sufficient condition if health is only one of a number of obstructions, such as lack of cooperant factors, or limitations of technology, that have the effect of limiting the possibilities of additional returns to additional labor input. The conditions just spelled out may well exist to a significant extent in some rural areas. Whether an economically relevant labor surplus really exists at a given time and place, and what factors bar that surplus from productive employment, are empirical questions to which no general answers can be given apart from empirical examination. The key economic question, however, is not merely whether positive returns are possible, and under what circumstances, but rather how these returns compare with costs and with alternative resource uses. Before commenting

* For instance in Malaya (1965), the urban unemployment rate among males 15 to 24 with secondary education was 30.9% and among those with primary education 19.5% compared to 10.4% among male illiterates of the same age. In urban areas of Venezuela (1969) the rate among laborers with secondary education was 10.2%; with primary education 7%, and among illiterate laborers, 4.3% (52).

** Or can be made available at a transfer cost lower than the incremental nutrition cost of providing equivalent work from the labor already in the vicinity.

on this, we should touch on two other aspects of the nutrition/productivity relationship.

Quality of Human Labor: Implicit in both the surplus labor model and in the attempts made thus far to measure the national production "cost" of malnutrition is the assumption that productivity is exclusively a function of human energy -- of numbers of workers. Although energy loss no doubt is substantial, it is a limited basis for calculating the effect of malnutrition on national production. As development proceeds, human quality becomes more important than sheer physical capacity. Human energy gradually is replaced by machine energy (combined with more refined human skills) in many occupations traditionally reliant on human (and animal) strength. The proportion of the work force in agriculture declines, thus reducing demands on human physical energy output. Although this may sound like a longrun description of the development process, it is in fact already happening in many parts of Asia.

Timely initiative, physical dexterity and comprehension of increasingly sophisticated techniques all become critical to the successful exploitation of the new technologies. It has been commonly observed, for example, that large numbers of farmers fall short of maximizing net returns because they fall short, in varying degree, from full application of the recommended practices for cultivating the new high yielding varieties. To some extent this failure reflects constraints beyond the farmers' control, (e.g., in accessibility or high cost of credit). Other shortfalls like planting depth error are not economic, but reflect factors such as education, mental performance level, dexterity and attention.*

Probably the most important example of how poor quality cannot be compensated for by quantity is the small farmer. His decision-making on the use of his own resources is not divisible. If protein malnutrition during his childhood has impaired his mental development, and undernourishment as an adult is compounding his disadvantages, his efficiency as a farm entrepreneur is not increased by the presence of unemployed labor in the neighborhood.

Although many of these notions are new in the context of development planning, it is of interest to note that for some years they have been endorsed

*To our knowledge no effort has been made to sort out the factors in a systematic attempt to identify the limiting ones. Thus, at this stage, one can only point to the potential impact that malnutrition could now be exerting on adult farmers.

and commonly incorporated into the planning of military establishments (53). Special nutrition units have been established and special nutritious products developed. In some developing countries a sizeable portion of the total nutrition research budget is directed to the relationship of nutrition to the effectiveness of the fighting man.

Other Economic Benefits: There also will be additional economic benefits of a nutrition program besides the direct productivity benefits as measured by the previously discussed techniques:

- . Activities of housewives which do not get measured in the national accounts because they do not enter the market economy, are economically important for many reasons, not least of which is the quality of care for the young.
- . The increased income of the well nourished worker (or well nourished child when he enters the labor force) will improve the living standards of his dependents, thereby raising both their current consumption and their future productivity.
- . The lower incidence of communicable diseases among the adequately nourished will, in turn, reduce the exposure to these diseases of others not participating in a nutritional program.
- . Improved nutrition will raise the returns to other investments closely related to human well-being, such as education where the malnourished child often is unable to cope with the school expectations.

Comparison of Benefits with Costs: Finally, even where significant opportunities exist for returns to better nutrition, one needs to weigh the costs in relation to benefits. Will the increase in production achieved by the proposed expenditure be greater than the input or resource cost of achieving that increase and how will it compare with returns to alternative investments? The answer to this question will depend on whose malnourishment is to be corrected, what increments in productivity can be expected from these target people, how much the program of extra nutrition will cost, whether the productivity effect is immediate or delayed, and in the latter case, what discount rate is applied to obtain the present values of the benefits and costs that are to be compared.

Even in a labor-surplus market, there are several groups from whom a current or fairly short-run productivity payoff from nutrition investment could be obtained: workers employed in machine-paced occupations in modern manufacturing sectors; students for whom malnutrition limits the potential joint returns from education and health expenditures; and small farmers

facing the more exacting demands of new agricultural technologies. The most lasting and numerically widespread impact, however, probably would derive from providing adequate nutrition to mothers in the last trimester of pregnancy and to children from 6 months up through 3 years of age. Even if the children's diets are fully adequate only during these critical months, but return to the average levels of their family income thereafter, they will have been brought much closer to their growth potential, particularly their intellectual potential. Even if their energy intake level remains inadequate by some desirable norm during adulthood, their productivity nevertheless will have been ratcheted up to a higher level that is more relevant to a modern economy than a level measured by sheer caloric output capacity.

We might illustrate the arithmetic of an investment in child nutrition with the following example:

Suppose a program designed to meet all nutritional deficiencies costs \$8.00 per child per year,* and provides a nutritional supplement from 6 months through the third year to meet existing deficiencies. Let us also suppose that as a result of this program, a disability in a child's performance potential is avoided, and the child-turned-breadwinner produces \$8.00 more income per year in his years 15 through 50, than he would have otherwise. If his income otherwise would have been \$200 per year, productivity would be raised to a 4% higher level (or \$208 per year), for the (45) year earning period, and our nutrition investment of about \$20.00 would appear to be yielding an annual return of approximately 40%. Of course, returns beginning only 12 years after the investment is made, and stretching so far into the future, are remote compared with more immediate returns available from other investment opportunities. Thus, the notion of our annual 40% return is deceptive and needs to be corrected to take account of the long waiting period for this type of investment.

*The \$8.00 estimate is based on meeting deficiencies of a diet which currently satisfies three-fourths of a child's protein need and two-thirds of his caloric need. The calculations were based on actual productive and distribution costs of Bal Ahar, an Indian-produced blended food currently provided in institutional child feeding programs. (It should be noted that the child feeding program is being used here only for illustrative purposes, and is not being suggested as the lowest cost means of achieving a pre-determined nutrition goal.) The Bal Ahar commodity cost per child per year is \$5.60; administration cost is 65¢. The remaining \$1.75 of the \$8.00 estimate has been included for what are often non-measured costs such as fuel, cooking equipment and the time that teachers and health center officials devote to the program at the expense of their other duties.

The standard method of comparing different future streams of costs and benefits is to reduce these streams to a single amount representing their present values. The standard set of compound interest tables used for this purpose show that even if we discount our 35 year \$8.00 stream to its present value at a discount rate of 10%,* our \$20.00 investment still "breaks even." Put another way, if we discount the future returns at 10%, the amount of annual productivity increase needed to break even is about the same as the annual cost of the feeding.

Our illustrative increase in future productivity of 4% looks modest as a minimum result from higher levels of intelligence. What in fact, the actual rate of return will be depends on a large number of factors. The higher the initial income, the smaller proportionately need be the break even increase in productivity. The larger the potential mental shortfall due to malnutrition, the greater might be the increase in potential performance from better nutrition. Whether the range of mental shortfall is relevant to future productivity depends on what occupational difference the performance improvement can lead to. In addition, the idea of increased productivity used in the example should be broadened to include the values of the side benefits and enhanced returns to other investments, mentioned above.

There are many links in the chains between diet, performance potential and economic returns which are better understood now than just a few years ago, but which require further research before our understanding is satisfactory. However, a broad increase in the intelligence of a substantial fraction of the future labor force is certain to have significant implications for economic growth and modernization. While work proceeds to define these implications more clearly, economic judgment recommends that the search for effective low-cost nutrition delivery systems should be pressed, that development plans be shaped to take account of nutrition objectives, and that investment in child nutrition be significantly increased above present levels. The question, "How much does better nutrition cost?",

*A discount rate of 10% is often used in project analysis in the developing countries, based more on a hunch consensus than an accepted body of theory and empirical underpinning.

is obviously just as important as the question of benefits. Space precludes an extended discussion of alternative programs and their costs.

Suffice to note that revolutions in both agriculture and food technology are now underway which may now provide answers to old problems at lower costs than was previously possible. A broad multi-policy approach to a nutrition strategy and nutrition problems viewed as socio-economic problems - rather than strictly medical or dietary problems - might yield interesting new directions for attacking malnutrition.

BEYOND STANDARD ECONOMIC BENEFITS

Leadership: The discussion thus far has concentrated on the costs to society from malnutrition among the working masses. Another consideration, even more difficult to quantify but no less real, is the loss to society of potentially outstanding individuals. Since the origin of so many superior people in the middle and upper class is a result of opportunity rather than genetic potential, it seems appropriate to ask how many superior minds have been and are being lost or repressed because of malnutrition? If nutritional risk is as high as studies now indicate -- affecting perhaps half of some populations -- a substantial number of superior people will never come forward. This refers not just to the priceless contributions of the Tagores and the Ghandis, but also to the one-in-a-thousand or one-in-ten-thousand who can organize large resources, who can innovate, who can move men. Considering how very thin is the leadership elite in most countries on whom rests the burden of the nation's success or failure, such loss would seem to inhibit the chances for economic development.

Equality: A related economic consideration has social and political overtones. For societies whose prevailing philosophy places a premium on egalitarianism, it can be said that the intellectual loss caused by malnutrition is the strongest obstacle to attaining this social goal. This is not to state the case for nutrition as a panacea; educational barriers, for example, are immense. However, a malnourished child's chances for social mobility are greatly restricted no matter what else is offered in education or other avenues designed by policy makers to facilitate upward movement within a society. Adequate mental development, hence adequate nutrition, would seem to be a necessary precondition to validate other programs for mobility that are being developed as a matter of social policy. In short, if a child lacks curiosity and mental energy -- to say nothing of the possibility of mental capacity -- the other opportunities are not significant.

Human Well-Being: Most planners today appear to view malnutrition as a welfare issue, and programs designed to alleviate it are budgeted accordingly. To move beyond this stage of token resources, many of us have assumed the need to justify the relationship of nutrition to development in traditional economic terms. In such terms, the life of the agricultural laborer and his family usually would be categorized as "very poor" or "destitute." Yet, for all their economic privation, they have the potential for enjoying a wide range of non-economic consumption. We speak, of course, of man's appreciation of nature, of love, of friends, of good talk at the tea stall, and of the joy of children. These enjoyments may be viewed as independent of one's economic status. They include some of the major sources of satisfaction in life, satisfactions which by their nature are not marketable services, neither quantifiable nor measurable in the national accounts when the economist totes up the per capita availability of goods and services for personal "consumption." But the person who is apathetic and physically drained by nutritional anemia or debilitated by the seemingly constant bouts with nutritionally related diarrheas, cannot really savor these satisfactions. It is well-being, not income, that primarily determines whether or not a man, rich or poor, has the capacity to enjoy these most fundamental sources of human satisfaction. Well-being is the primary requisite, the sine qua non that determines the utility men derive from all other forms of consumption, whether measurable or not. The developing economies are not likely in the near future, to provide a very much wider range of material goods at the lower income levels. But it may be within the power of public policy to improve the level of nutrition, which in turn can increase the capability for a substantial portion of the population to enjoy whatever sources of consumption are available.

Objectives of Development: The purpose of development -- of foregoing consumption today in favor of more investment -- is to generate a higher level of human well-being tomorrow for more people. To most people in developing countries, that higher level of well-being substantially means a better diet. Food is a major, perhaps the major problem of their lives. It is central to both their consumption and their production activities. For a person living at the income level that characterizes the malnourished, typically 65 to 80% of income goes for food. As his income rises, the proportion devoted to buying more food declines; but throughout the income range of the problem, the proportion remains high. The inadequacy and

uncertain availability of food from year to year represents the condition of underdevelopment at its most immediate and palpable and dangerous.

Thus nutrition cum food represents the thin margin between mere survival and adequate growth and well-being. To be concerned with food as a commodity but not with nutrition -- which is food analyzed into its nutritional constituents -- reflects a double vision. The economic distinction between food and nutrition -- ranking food "high," nutrition "low"; or food "essential," nutrition "welfare" -- is a false distinction. Food has obvious tangibility features that nutrition lacks. Food costs and supplies can be measured and subjected to economic analysis. Food is unmistakable to the consumer and commands a price that allows measurement for entry into the national accounts. Nutrition in contrast is invisible, dimly understood by most consumers, and seldom commands a price. In fact, despite the essentiality of nutrition for life, the individual's effective demand for nutrients is in many ways inefficient for meeting his needs. Eating is a complex activity that satisfies several wants besides nutrition -- alleviation of hunger, esthetic preferences, religious prescriptions, social customs. Some of these demands may be mutually inconsistent (e.g., esthetics vs. nutrition). As the consumer tries to maximize his satisfaction of these several wants, the nutritional demand may be the one most prone to distortion. The consumer is least capable of evaluating the nutritional component and of recognizing the degree to which meeting the other objectives, within his sharp income constraint, is depriving him of the health he assumes he is acquiring. Such considerations argue strongly for government intervention to compensate for consumer inefficiency.

Although one cannot make a valid economic distinction between food and nutrition, one can make a physiological distinction between food quantity and food quality. Both are important; both are inadequate. To propose in 1971 a broad attack on the quantitative or caloric side of malnutrition would coincide with agriculture objectives to which most developing nations already are pledged. Certain countries have attained or soon will attain self sufficiency in cereals. The qualitative side of the food problem is a different story. Many countries, including the United States, are demonstrating that caloric sufficiency of itself is no answer to malnutrition, but finding solutions to other debilitating nutritional deficiencies has not received the same policy attention. This is not to quarrel with the existing emphasis on quantity, especially when recalling the bleak projections

of just a few years ago. Yet, one can now envision a time in the near future when caloric inadequacies shall have been much reduced while serious nutritional deficiencies remain. Knowing what is now known, planners would be derelict in their responsibilities if they awaited the day of cereal adequacy before awakening to the additional needs and the program preparation time implied in meeting such needs. As indicated earlier, new nutrition-related technologies may now provide more direct shortcuts and enable people to achieve substantially better nutrition and well-being at a much lower income, and much earlier in time than previously was possible.

NUTRITION AND POPULATION

No discussion of nutrition and development would be complete without mention of certain aspects of the population problem.* Better nutrition would appear to have the initial effect of increasing population growth by reducing mortality, especially infant mortality. If this were all there were to say on the nutrition-population relationship, nutrition programs would appear to be affecting per capita income in opposite directions at the same time. On the one hand, productivity increases would raise income per capita. On the other, reduced mortality would accelerate the growth in population, tending to lower income per person. What would be the upshot? At this stage of knowledge, we think the answer would take the following form:

In the short run the net effect would depend on whose nutrition is being improved. For example, factory feeding programs for adults could have immediate impact on output with marginal impact on mortality; with infant and child feeding, the impact is the reverse; mortality reduction is immediate, while the income effect is delayed. Indeed, a Malthusian might argue that the increase in real income experienced by the poor who are (or whose children are) getting a nutrition supplement, would merely allow population to increase until the higher number had cancelled with mortality rising back to its former level.

We know, however, that in the modern era, declining mortality has been followed by a decline in fertility, with per capita incomes rising to high levels and population growth rates falling and even nearing total stability in some countries. The fertility declines have resulted from a variety of

*For a more comprehensive discussion of the subject, see reference 54.

profound rural and economic changes that separate the modern era from man's previous history. High fertility has usually been perceived as desirable and beneficial where children were an economic asset, where security in old age vitally depended on surviving sons in the face of high mortality rates, and where religious and social customs favored large families. The value and satisfaction of each successive child begins to decline as incomes rise, as the costs of child education increase, as compulsory education postpones the time when a child begins to add to, rather than draw on, family income, as the convenience of contraception improves, and as opportunities increase for female education and higher paying female employment, to mention a few among many factors. One of the most powerful factors inducing smaller family size appear to be declining mortality. As parent's confidence in the survival chances of their earlier children rises, their need for additional children to ensure achievement of desired family size declines. Thus, better nutrition which lowers child mortality can favorably affect one of the most important of the variables determining fertility rates. In addition, nutrition programs may add a significant incentive to family planning programs by directly linking services for contraception with measures to raise the well-being of existing children, and thereby their chances of survival.

Population stability in the past was maintained by higher rates of both births and deaths. With mortality declining in the developing countries, clearly the only acceptable route to reestablishment of stability (or much slower growth), is a regime of low rates of both births and deaths. Although further lowering of child mortality is not sufficient by itself, fertility is unlikely to come down to acceptable levels without it.

Thus, paradoxically, an important contribution to lower population growth may be to keep children alive. Because of malnutrition's enormous role in today's high child mortality rates, a planner who accepts this hypothesis would look to nutrition programs for an important contribution toward attaining family planning objectives.

* * * * *

A FINAL NOTE: As the planner begins to probe for answers, he finds that the nutrition professions have built an impressive body of literature on the effects of malnutrition. Extensive laboratory investigations describe animals systematically deprived of calories and of specific nutrients, and considerable

related clinical work has been done among severely malnourished children. As the planner looks for studies of human beings subjected to mild nutritional stress -- those who are the majority of the malnourished -- he finds a body of knowledge less comprehensive and less exact. This reflects the relative youth of the field (e.g., the notion of a relationship of malnutrition to mental development is primarily a product of the 1960's), and the enormous complexity of measuring human growth and performance.

Isolation of the nutritional variable from the constellation of other factors can never match the kind of scientific elegance that is possible, for example, in studying the effects of an alloy that result from varying slightly the proportion of chemical inputs, or -- a better example -- the effects of the yield of a particular cereal strain caused by a slight variation in the quantity or composition of fertilizer applied. The human condition reflects physiological and psychological dimensions of vastly greater complexity.

It is not surprising, therefore, that a planner reacts with uncertainty to the suggestive, but at times, imprecise nutritional data before him. In his uneasiness, the planner should recall that he has been making decisions on the allocation of substantial resources in many areas where the returns were long-run and difficult to calculate with anything approaching precision (such as in education), or where projects had an engineering and economic precision that proved to be illusory (with benefits below expectations because of real-life complexities such as make the study of malnutrition's impact so difficult). One might point again to the example of cereal varieties. In the case of rice, the differences between controlled research conditions and conditions on the farm have turned out to be substantial from one area to another, resulting in costly mistakes along the road generally recognized as the right one to higher rice production.

In short, the planner should not insist on greater exactness in measuring the impact of malnutrition than he does in other fields where he is accustomed to allocating large sums. However, he should insist that a new claimant for scarce resources provide a reasonable description and measurement of the problem to be addressed and offer program choices that promise to yield benefits significant in relation to the size of the problem and the cost of the programs. As indicated at the outset, knowledge of nutrition is at a stage where this can be done. Although a great deal more investigation clearly is needed to reduce the ranges of uncertainty, this should not detract from the

significance of what already is known. The contention here is that enough knowledge is available to justify substantial resource allocations to nutrition-oriented programs.

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APPENDIX

TABLE I

PERSPECTIVES ON CHILD MORTALITY, 1970 ^{1/}

C O U N T R Y	Percent of children who die each year				% children born live that die before 5th birthday	approx. age in years at which comparable % die in	
	Of all infants ^{2/} under 1	Of all children 1 - 2	Of all children 1 - 4	Of all children under 5		Taiwan	U.S.A.
India	13.9	2.6 ^{3/} 7.2 ^{4/}	4.4	8.7	28.1	61	63
Pakistan	14.2	N.A.	5.3	9.0	31.0	63	66
Gambia	8.3 ^{5/}	11.1 ^{6/}	N.A.	N.A.	N.A.	N.A.	N.A.
UAR	11.7	10.7 ^{7/}	3.9	5.8	24.8	60	61
Zambia	25.9	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Guinea	21.6	6.8 ^{8/}	5.2	9.3	36.7	66	68
Cameroon	13.7	N.A.	3.9	6.3	26.5	61	62
Brazil	17.0	4.9 ^{9/}	1.6	5.2	22.2	58	61
Guatemala	8.9	6.2 ^{10/} 5.2 ^{11/}	2.8	4.3	18.5	55	57
Taiwan	2.0	1.9 ^{12/}	0.4	0.8	3.6	5	20
Portugal	5.9	1.6 ^{13/}	0.5	1.7	7.6	32	46
Japan	1.5	0.3 ^{12/}	0.1	0.4	1.9	1	1
U.S.A.	2.1	0.2 ^{12/}	0.1	0.5	2.5	2	5
Sweden	1.3	0.1 ^{12/}	0.1	0.3	1.7	1	1

N.A. = Not Available

Computations based on data found in: "1970 World Population Data Sheet," Population Reference Bureau, Inc., Washington, D. C., April 1970;

Demographic Yearbook, United Nations, New York, various issues;

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"Progress Report of the Inter-American Investigation of Mortality in Childhood," Report presented to the Ninth Meeting of the Advisory Committee on Medical Research, Pan American Health Organization, Washington, D.C., June 15, 1970, Table 2.

CONTINUED.....

TABLE I (cont'd.)

- Legend:
1. 1970 data unless indicated otherwise.
 2. Live births.
 3. 1961 Bombay only.
 4. 1957-59 rural Punjab.
 5. Bathurst, 1967.
 6. Bathurst, 1949-53.
 7. 1961.
 8. 1955.
 9. Sao Paulo only, provisional 1970.
 10. National figure 1963.
 11. Rural 1958-64.
 12. 1963.
 13. 1960.

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APPENDIX

TABLE II

WHAT CHILDHOOD MORTALITY RATES MEAN IN ABSOLUTE NUMBERS:

Number of deaths by age group at existing rate compared to number if rates of India, Taiwan Japan and Sweden were applied ^{1/}

COUNTRY	Infants Under 1 ^{2/}					Children 1 to 4					Children Under 5				
	1000's deaths at current rate	1000's deaths difference if one applies rate of...				1000's deaths at current rate	1000's deaths difference if one applies rate of...				1000's deaths at current rate	1000's deaths difference if one applies rate of...			
		India	Taiwan	Japan	Sweden		India	Taiwan	Japan	Sweden		India	Taiwan	Japan	Sweden
India	3238		-2772 ^{3/}	-2888	-3181	2928		-2643	-2841	-2881	6166		-5598	-5854	-5925
Pakistan	972	+ 21	- 835	- 962	- 884	1059	- 180	- 973	-1033	-1045	2031	- 75	-1851	-1932	-1954
Gambia	<u>4/</u>	<u>4/</u>	<u>4/</u>	<u>4/</u>	<u>4/</u>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UAR	171	- 32	- 53	- 156	- 152	173	+ 21	- 154	- 167	- 170	344	+ 166	- 297	- 318	- 324
Zambia	57	+ 26	- 52	- 54	- 54	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Guinea	41	- 14	- 38	- 38	- 39	29	- 4	- 27	- 28	- 29	70	- 5	- 64	- 67	- 67
Cameroon	40	0	- 34	- 35	- 36	36	+ 4	- 32	- 35	- 35	76	+ 28	- 66	- 71	- 72
Brazil	617	+112	- 544	- 562	- 570	193	+ 336	- 142	- 192	- 193	810	+ 540	- 686	- 742	- 757
Guatemala	21	- 12	- 16	- 17	- 18	20	+ 12	- 17	- 19	- 19	41	+ 41	- 33	- 37	- 38
Taiwan	9	+ 48		- 2	- 3	7	+ 63		- 5	- 6	16	+ 158		- 7	- 9
Portugal	12	+ 16	- 8	- 9	- 9	4	+ 30	- 1	- 3	- 3	16	+ 66	- 9	- 12	- 13
Japan	30	+244	+ 10		- 4	9	+ 292	+ 20		- 4	39	+ 726	+ 31		- 9
USA	77	+425	+ 5	- 22	- 30	15	+ 627	+ 48	+ 4	- 4	92	+1488	+ 53	- 12	- 30
Sweden	2	+ 14	+ 1	<u>5/</u>		<u>6/</u>	+ 21	+ 2	+ 1		2	+ 50	+ 3	+ 1	

NA = Not Available

Computations based on data found in:

Demographic Yearbook, 1969, United Nations, New York, 1970 and "1970 World Population Data Sheet," Population Reference Bureau, Inc., Washington, D. C., April 1971.

CONTINUED....

TABLE II (cont'd.)

- Legend:
1. 1970 estimates of population and mortality rates. Figures rounded to nearest 1000; if less than 1000, figure appears in footnotes.
 2. Live births.
 3. Minus sign (-) indicates number of lives that would be saved at projected rate.
 4. 130 infants die at current rate, 88 more would die if India's rate applied; applying the rates of Taiwan, Japan and Sweden would reduce the number of deaths by 98, 106 and 109 respectively.
 5. + 200 deaths.
 6. 300 deaths.

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APPENDIX

TABLE III

MALNUTRITION AS THE UNDERLYING OR AN ASSOCIATED
CAUSE OF DEATHS IN CHILDREN AGE 1 - 4

A R E A ^{1/}	% of deaths in which malnutrition is the underlying cause (A)	% of deaths in which malnutrition is an associated cause		% of all deaths in which malnutrition is the underlying or an associated cause ^{4/} (D)
		Contributory ^{2/} (B)	Consequence ^{3/} (C)	
Kingston, Jamaica ^{5/}	8	24	11	43
Monterrey, Mexico	11	29	25	65
S. Salvador, El Salvador ^{6/}	26	25	16	67
LaPaz, Bolivia	4	34	14	52
Santiago, Chile ^{7/}	5	24	8	37
Recife, Brazil ^{8/}	8	51	11	70
S. Paulo, Brazil	10	21	12	43
San Juan, Argentina ^{9/}	4	29	8	41
* * *				
Average of the Above	10	30	13	52

Computations based on provisional data found in:

"Progress Report of the Inter-American Investigation of Mortality in Childhood," presented to the Ninth Meeting of the Advisory Committee on Medical Research, Pan American Health Organization, Washington, D.C., June 15, 1970, Tables 1, 2, 9 & 10.

- Legend:
1. Not limited to city cited but includes surrounding rural areas.
 2. i.e., malnutrition pre-exists the underlying cause of death.
 3. i.e., malnutrition results from recurring episodes of diarrheal disease.
 4. Excludes two deaths in Kingston Area, two in San Salvador Area, two in Sao Paulo Area and one in Santiago Area with nutritional deficiency as an associated cause as well as an underlying cause and one death in Monterrey with two types of nutritional deficiency as a consequence of measles. Failure of columns (A) + (B) + (C) to equal (D) due to rounding.
 5. Including St. Andrew parish.
 6. Including 3 neighboring communities: Apopa, Nejapa, Quezaltepeque.
 7. Including 4 neighboring communities: Colina, Lampa, Quilicura, Til-til.
 8. 3 districts.
 9. San Juan Province.

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APPENDIX

TABLE IV

PERCENT OF DEATHS BY AGE GROUP FOR SELECTED COUNTRIES ^{1/} DUE TO
THE FIVE PRINCIPAL NUTRITION-RELATED CAUSES OF DEATH

COUNTRY	% of deaths caused by gas- tritis, enteri- tis, etc. ^{2/}			% of deaths caused by pneumonia, in- fluenza ^{3/}			% of deaths caused by measles ^{4/}			% of deaths caused by bronchitis ^{5/}			% of deaths caused by whooping cough ^{6/}			% of deaths from these 5 causes		
	Under 1 yr.	1 - 4 years	Under 5 yrs.	Under 1 yr.	1 - 4 years	Under 5 yrs.	Under 1 yr.	1 - 4 years	Under 5 yrs.	Under 1 yr.	1 - 4 years	Under 5 yrs.	Under 1 yr.	1 - 4 years	Under 5 yrs.	Under 1 yr.	1 - 4 yrs.	Under 5 yrs.
Chile	14.9	11.4	14.5	26.2	30.3	26.8	2.2	11.6	3.5	negl	negl	negl	negl	negl	negl	43.3	53.3	44.8
Colombia	20.2	26.4	22.6	10.2	12.1	10.9	0.9	4.7	2.3	10.1	9.7	9.9	negl	negl	negl	41.4	52.9	45.7
Costa Rica	23.2	23.9	23.4	9.0	11.9	9.8	1.7	11.7	4.2	6.0	5.0	5.8	negl	negl	negl	39.9	52.5	43.2
Dominican Republic	24.3	26.1	24.9	2.6	4.1	3.1	negl	negl	negl	2.7	3.9	3.1	negl	negl	negl	29.6	34.1	31.1
Ecuador	14.5	15.8	15.0	7.5	8.6	7.9	1.7	7.8	4.0	16.7	13.5	15.5	8.4	11.1	9.4	48.8	56.8	51.8
El Salvador	8.3	9.6	8.8	4.5	4.5	4.5	1.6	7.8	3.8	4.7	4.9	4.7	negl	negl	negl	19.1	26.8	21.8
Guatemala	13.2	20.8	17.0	18.0	21.0	19.5	2.7	9.5	6.1	negl	negl	negl	6.8	10.4	8.6	40.7	61.7	51.2
Mexico	18.1	19.2	18.5	19.8	20.8	20.1	0.9	6.9	2.8	5.6	3.8	5.1	1.3	5.3	2.6	45.7	56.0	49.1
Nicaragua	25.4	19.4	23.4	5.6	6.4	5.9	0.6	3.3	1.4	negl	negl	negl	1.3	3.8	2.1	32.9	32.9	32.9
Paraguay	15.5	27.9	19.4	11.9	13.2	12.3	0.4	4.3	1.6	3.3	3.2	3.3	negl	negl	negl	31.1	48.6	36.6
Peru	11.0	13.7	11.9	20.5	22.0	21.0	negl	negl	negl	9.6	8.4	9.2	7.4	10.3	8.4	48.5	54.4	50.5
UAR	53.1	62.2	57.1	2.8	5.0	3.7	0.6	3.0	1.7	10.7	17.9	13.9	negl	negl	negl	67.2	88.1	76.4
Angola	21.5	23.2	22.2	8.3	11.8	9.8	negl	negl	negl	negl	negl	negl	negl	negl	negl	29.8	35.0	32.0
Nigeria	11.3	5.6	7.6	23.8	11.6	15.9	4.5	4.9	4.8	negl	negl	negl	negl	negl	negl	39.6	22.1	28.3
Mauritius	31.5	44.9	35.6	5.3	5.9	5.4	negl	negl	negl	4.0	5.6	4.5	negl	negl	negl	40.8	56.4	45.5
Philippines	8.0	15.3	10.9	17.6	33.1	24.8	1.0	4.2	2.3	6.9	11.4	8.7	0.1	0.1	0.1	33.6	64.1	46.8
Average of above LDCs	19.6	22.8	20.8	12.1	13.9	12.6	1.2	5.0	2.4	5.0	5.5	5.2	1.6	2.6	2.0	39.5	49.7	43.0

negl = negligible

Continued.....

TABLE IV (cont'd.)

COUNTRY	% of deaths caused by gas- tritis, enteri- tis, etc. ^{2/}			% of deaths caused by pneumonia, in- fluenza ^{3/}			% of deaths caused by measles ^{4/}			% of deaths caused by bronchitis ^{5/}			% of deaths caused by whooping cough ^{6/}			% of deaths from these 5 causes		
	Under 1 yr.	1 - 4 years	Under 5 yrs.	Under 1 yr.	1 - 4 years	Under 5 yrs.	Under 1 year	1 - 4 years	Under 5 yrs.	Under 1 yr.	1 - 4 years	Under 5 yrs.	Under 1 yr.	1 - 4 years	Under 5 yrs.	Under 1 yr.	1 - 4 years	Under 5 yrs.
Japan	4.0	4.8	4.1	9.3	11.2	9.7	0.3	1.2	0.5	0.8	1.3	0.9	negl	negl	negl	14.4	18.5	15.2
U.S.A.	1.3	2.2	1.4	7.2	10.7	7.7	negl	negl	negl	negl	negl	negl	negl	negl	negl	8.5	12.9	9.1
Canada	1.3	2.2	1.5	8.2	9.4	8.4	negl	negl	negl	negl	0.8	0.1	negl	negl	negl	9.5	11.6	9.9
Sweden	0.6	1.2	0.7	2.2	7.6	2.9	0.8	3.2	1.1	negl	negl	negl	negl	negl	negl	3.6	12.0	4.7

negl = negligible

Computations based on data found in:

Health Conditions in the Americas 1965-1968, Pan American Health Organization, Scientific Publication No. 207, Washington, D. C., September 1970, Table XII; Demographic Yearbook, 1967, United Nations, New York, 1968, Table 25; World Health Statistics, 1967, World Health Organization, Geneva, 1970, Tables 2, 4.1, 5.1.

Most data are for 1967; exceptions being Nigeria (1963), UAR (1964), Angola (1965), Guatemala and Nicaragua (1966) and Canada (1968).

Legend: 1. LDCs are defined as those countries in which the infant mortality is equal to or exceeds 5% and the GNP per capita is less than US \$500 and are selected on the basis of availability of data. Developed countries are selected for comparison

According to various standard international classification systems:

2. 543, 571-72 or A101 and 104 or B36.
3. 480-83, 490-93 or A89-91 or B30-31.
4. 085 or A32 or B14.
5. 500-02 or A92-93 or B32.
6. 056 or A22 or B9.

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APPENDIX

TABLE V

MALNUTRITION AS THE UNDERLYING OR AN ASSOCIATED CAUSE OF
DEATHS OF CHILDREN UNDER 5 ^{1/}

A R E A ^{2/}	% of deaths in which malnutrition is the underlying cause	% of deaths due to infective & parasitic diseases ^{8/}	% of deaths in column B with malnutrition as associated cause	% of deaths due to measles ^{4/}	% of deaths in column D with malnutrition as associated cause	% of deaths due to other causes ^{5/}	% of deaths in column F with malnutrition as associated cause	% of all deaths in which malnutrition is underlying or associated cause
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
Kingston, ^{6/} Jamaica	7	41	44	1	NA	52	34	43
Monterrey, Mexico	7	56	69	10	75	37	27	56
San Salvador, ^{7/} El Salvador	13	53	48	8	62	34	33	50
La Paz, Bolivia	4	58	62	25	56	38	19	47
Santiago, Chile ^{8/}	6	35	50	1	NA	59	36	45
Recife, ^{9/} Brazil	6	66	69	29	72	28	47	65
Sao Paulo, Brazil	6	45	57	7	41	50	37	49
San Juan, ^{10/} Argentina	8	53	40	18	34	39	33	46
* * * Average of the Above	7	51	55	12	57	42	33	50

NA = Not Available

Computations based on provisional data found in:

"Progress Report of the Inter-American Investigation of Mortality in Childhood," presented to the 9th Meeting of the Advisory Committee on Medical Research, Pan American Health Organization, Washington, D. C., June 15, 1970, Tables 3, 4 and 6.

CONTINUED.....

TABLE V (cont'd.)

- Legend:
1. Excludes neonatal deaths, i.e., in first 28 days of life.
 2. Not limited to city cited but includes surrounding areas.
 3. i.e., classifications 000-136 including measles, diarrhea and other intestinal infectious diseases; whooping cough; tetnus; diphtheria; tuberculosis.
 4. Deaths from measles included in percentages appearing in column (B).
 5. i.e., not covered in columns (A), (C), and (D), such as diseases of nervous system, and sense organs, diseases of the digestive system, of the respiratory system, etc.
 6. Including St. Andrew parish.
 7. Including 3 neighboring communities: Apopa, Nejapa, Quezaltepeque.
 8. Including 4 neighboring communities: Colina, Lampa, Quilicura, Til-til.
 9. 3 districts.
 10. San Juan Province.

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