My statement today will touch on several items of concern to the future program of the Centre.

I. A PROGRAM DIVISION FOR INDUSTRIAL AND ENGINEERING SCIENCES

In the Program of Work and Budget approved last September, the Board gave tentative authorization for the establishment of a fifth program division — the Division of Industrial and Engineering Sciences. The Board authorized a small budget to cover the steps necessary to establish the Division in the financial year of 1973-74 and tentatively provided a program budget of $1.0 million for the financial year 1974-75. However, the creation of the Division was subject to the condition that the Centre executive bring to this meeting of the Board a work program for the I and ES that would outline its objectives and likely project content.

To more closely examine the purposes of the Division, I appointed three consultants of quite different backgrounds to investigate the major research needs related to the industrialization of the developing nations, and to recommend to me a range of program elements that might be embraced by the Division’s work. A draft report of one of these consultants, Mr. Leib Wolofsky, has been circulated to the Board. In his report, Mr. Wolofsky focuses on the importance of small- and medium-scale industry and on the potential for developing new products suitable to small- and medium-scale manufacture by developing country industrial enterprises. He reviews the employment potential of such enterprises, and the possible increased use of labor in civil and other engineering activities. I have also received draft reports from Mr. Maximo Halcy C., an industrial expert formerly with the OAS and now an IDRC Research Fellow, and from Mr. Saadia Schorr, formerly a Director of the Tempo Laboratories of General Electric and General Electric Vice-President for Technology and presently a Vice-President of one of the major industrial consulting firms in the U.S.A. Neither of these reports are yet at the stage of completeness for circulation among Board members. Completed reports should be available within a few months.

In addition to these reports, I have made my own investigations into problems of industrial development in the developing countries. I have consulted with people from the U.S. National Academy of Sciences and the U.S. National Academy of Engineering Sciences, with the staff of the World Bank, and with persons closely associated with UNIDO, and with experts from both developed and developing countries familiar with industrial problems in developing countries.
A confused picture has emerged. There is significant unanimity on the major issues facing the developing nations as they seek to encourage industrial growth and expansion. But there is little unanimity on the relative importance of each of the issues posed, and virtually no agreement on how the problems could be attacked by an agency such as the Centre. In the completed version of Mr. Halty's paper, the case will be made that the Centre foster in the developing nations an indigenous capacity to create, adapt, or absorb the technologies required for local industrial development, leaving to other agencies the task of financing industry, e.g., the World Bank group; the task of providing specific product and process technologies, e.g., UNIDO; the task of relating industry to employment, e.g., ILO; the task of relating industry to trade, e.g., UNCTAD; and so on. It is Halty's view that the Centre should focus primarily on the policy components required to promote and assist the development of the technical competence and expertise required to master the processes needed for the successful industrialization of a nation.

Schorr's report promises to be, in many respects, the most comprehensive. A major concern of his examination is the establishment and implementation of the full mix of public policy strategies and tactics needed for successful industrialization. It is his view that most low-income countries hobble industry by adopting inappropriate, contradictory and excessively bureaucratic industrial policies. But he also believes that should these policies be changed, most nations will find their potential for industrial expansion severely constrained by a lack of adequately prepared middle managers. Schorr has had a wide experience in the developing regions, and he is convinced that the problems of industrialization do not lie in a lack of entrepreneurship or the availability of risk capital, nor in the identifying of products to meet local demand. Instead it is the problem of combining the separate and sequential steps of making a product into a cohesive manufacturing technology that assures a profit in competition with imported goods. This problem is confronted in its most elemental form on the production floor where a lack of skilled foremen, floor managers, production superintendents, inventory controllers, etc., capable of providing direction to an industrial labor force is the major impediment to a growing and efficient industry.

On the question of small- and medium-scale industry, many of the industrial experts I have spoken with, including Schorr, are pessimistic in varying measure about the IDRC's potential usefulness. The arguments used are essentially economic. The cost of improving efficiency in small industry can be very high relative to the returns such investments will earn when spread over a small output. For the most part, the closest observers of LDC industrial development agree with the position taken by Senor Roberto Campos at the IDRC's Board meeting in Bogota last year, a position that argued that little will be gained for either the Centre or the nation by an expenditure of resources on research to foster small- and medium-scale industry. But there is no assurance either that a concentration on industrial policies (Schorr), or on policies to develop indigenous technical capacities (Halty), or on the invention of new products or engineering opportunities for employment (Wolofsky) will produce a significant or even useful pay-off.
I have mentioned to the Board before my positive reaction to the small industry development activities pursued by Singapore. Essentially, the model was one of creating an institution to provide research into product and manufacturing technologies; joining with it the training of skilled workers, especially at the production level, who could become middle managers; and complementing the training and research with an industrial development credit institution that provided supervisory extension services to local industrialists at all levels of business and plant operation. The model is an immensely provocative one. It has all the elements of the U.S. approach to agricultural development through the "Land Grant" colleges system. And it appears, on the surface at least, to hold promise of being usefully generalizable to other developing nations. By combining teaching, research and extension, there is a flexibility that can be molded to the unique requirements of a nation's small industry. And because of its success in Singapore, I am reluctant to abandon its potential as an activity for the Centre to study, test, and disseminate.

The nub of the uncertainty surrounding the program of the proposed Division is the separate roles research, development, training and technical assistance must play in fostering industrialization. There is doubt among many of our consultants as to whether there is a valid set of research activities that the Centre should seek to support. Industrial development is clearly beyond both the Centre's mandate and its resources; if training is the need, neither a new Division nor a large program seems called for in the light of the immense support for training presently being funnelled to the developing nations from bilateral and multilateral sources; and the Centre is not a technical assistance agency, a function best left to CIDA and other national and international bodies. What research, then, can the Centre usefully finance to assist industrial development beyond its present small projects in information sciences and industrial science and technology policy? The answer remains unclear!

Accordingly, I would like to recommend that at this time the Board postpone a formal decision on establishing a Division for Industrial and Engineering Sciences. I would suggest that the Centre executive continue to work with the consultants and give further attention to the Singapore experience, especially to its possible application to other nations. I will bring a further review of this work to the next meeting of the Board. In the meantime, I will welcome comments from the Governors that might help guide our decisions on the matter.

II. CENTRE POLICY FOR ASSISTANCE TO RESEARCH IN EDUCATION

Last September I discussed with the Board the importance of augmenting the Centre's work in research in technical agriculture with support for work in the social and economic aspects of agricultural development. I began my comments at that time by declaring an intention to use these meetings to bring to the Board short statements recommending a broad policy stance that the Centre should take in particular subject matter fields. These subject-oriented vignettes should be heard against the background of the
Centre's general philosophy of assistance to developing nations outlined in my statement to the Board in Bogota last March, a statement published under the "Eleven Issues" title. In today's statement, I would like to examine and encourage discussion on research in education.

I need not argue to this Board the importance of education as a critical component to the development of low-income nations. But to many developing countries the soaring costs of educating massive numbers of children has become a budgetary factor that threatens the fiscal integrity of the nation, or of its local jurisdictions responsible for providing educational services. These costs are increasing as a function of growing populations and the rising expectations of the rural majority who have come to regard easy access to education as a right that will open social and economic opportunities hitherto closed to their social strata. In viewing the present and likely future demands for budgetary allocations to education, many observers have concluded that it will not be possible for low-income nations to meet their needs through the established "formal" school system. Thus, it has become fashionable in world circles concerned with the support of educational activities in the developing regions to criticize, even denigrate, the accomplishments and the usefulness of the "formal" structure of schools, teachers, periodic tests of the progress of students, and the certification of accomplishment by means of a diploma or certificate or a degree for those who complete successfully a prescribed curriculum.

The rejection of the school system is bolstered by a widely accepted belief (only weakly supported by actual observation) that the established schooling, and particularly prevailing university education, has left large numbers of the educated unfitted for employment, numbers who become a dissatisfied brigade of educated unemployed who are prey for those advocating radical solutions to national problems. And it is further supported by the contention that educated people from rural regions have a higher migratory propensity than those who are uneducated, a propensity that is augmented by a curriculum that focuses on university entrance academic requirements instead of a teaching program directly relevant to the life dimensions of a rural or agrarian environment.

The debate among modern educators usually begins with a discussion of the importance of a change in current educational patterns for the large mass of people living in rural areas. It ultimately condemns the established pattern of schooling on the grounds of an inappropriate subject matter for the realities of rural life, plus the high costs of operating the system. The substitute proposals of those engaged in the debate is to establish a "non-formal" structure of education with radically different subject matter content and through delivery means that will avoid the labor-intensive costs of teachers' salaries (these account for from 65 to 80 percent of the recurrent expenditures in educational budgets) by substituting new teaching technologies or volunteer instructors.

The Centre staff concerned with education have reviewed carefully the substance of the proposals now current for promoting non-formal educational systems. An analysis reveals that few of them carry any calculation of cost, or assurances that large numbers can be reached and
taught, or that they will answer the popular demand for education. Although
all promise reduced budget imposts, there is little evidence that these cost
savings will be a reality. Indeed, it is the opinion of the Centre staff
that many of the solutions offered by those proposing new, non-formal systems
will likely result in substantially higher per pupil costs than presently
established educational forms.

In worldwide discussions and interviews with leaders responsible
for national education policies, the Centre staff have found little enthusiasm
for any new pattern that would consciously discriminate between rural and
urban areas in the provision of educational opportunities. This, however,
is what the non-formal systems would do as they are almost exclusively seen
as a substitute for current and future rural schooling. Few exponents of
non-formal approaches suggest that a school system leading to higher diplomas
or degrees be eliminated from urban areas. The closing of opportunities for
upward social and economic mobility through attainments in school that would
occur for large numbers of a nation’s rural masses if an educational system
with a significantly different curriculum denied access to higher studies for
rural youth, is an explicit purpose of the non-formalist, although there is
sometimes a grudging acceptance of the need for a parallel school system of
the more traditional form, and a resignation about the resulting higher costs
of two independent methods of educating people running simultaneously.

IDRC personnel are convinced that there is little popular desire
in rural areas for schooling if it means that rural youth are to be given an
educational preparation that would not fit them for pursuing the studies that
will open employment possibilities in off-farm occupations. For most rural
people, education is seen as the only way their children can rise socially
and economically in national society. The demand of these people is for an
educational system that will equip their youth for life in non-rural, non-
agrarian environments. If it can also provide the basic human skills necessary
to a modernizing rural milieu, so much the better, but it must give first an
opportunity for upward mobility.

In weighing these several considerations, the Centre Officers
have recommended to me, and I recommend to the Board, that the Centre focus
its attention primarily upon the preservation of the established school
system. And within this system, to develop educational delivery systems
through the application of new and appropriate technologies that will achieve
a better cost and effectiveness ratio. As a component of such delivery
systems, the Centre staff believe that the present ratio of 30-40 pupils per
teacher is too costly to be sustained, but that the ratio can be substantially
increased and teaching effectiveness improved through the use of new or
different educational techniques. But delivery systems using these techniques
need to be applied within the framework of the established pattern of school
education; a pattern that includes progress from one step to the next, an
appropriate set of tests and of certification, and a curriculum that is
designed to meet the social and economic aspirations of rural people as well
as the vocational needs of those large numbers who will remain in the rural
context.
To implement this policy, the Centre proposes to encourage innovation by invention, adoption and adaptation of new technologies of delivering educational services in hopes of making formal schooling a more efficient and effective instrument for educating people. It will focus most of its resources on the support of within-school educational experiments and the development of educational delivery technologies that are relevant to the rural primary school from grades one to six. It is in these grades that the basic skills of literacy and numeracy are built and hardened into life-long tools, and it is upon the foundation laid in these years that all future educational and vocational activities rest. While the Centre staff will not avoid promising projects that arise in other areas of education, such projects will be undertaken only if they do not represent a significant drain of resources from the focus of improving the primary schooling available for rural youth.

III. WORLD DEVELOPMENT - A CONSIDERATION OF NEW DIRECTIONS

The major emphasis of my remarks today will be on the state of world development and a view of the implications it holds for Centre activities. I will focus on population and food problems. Both are of concern to the Centre; both are at the core of an impending human crisis of unprecedented severity.

By such a statement I do not seek a position among the world's doomsayers. There is already an overabundance of those who assail all who will listen with an unrelieved cry of disaster. There is a darkness before us; but there is also a light. I want to dwell briefly on each.

Population

The stark fact: world population growth will not be slowed appreciably in the next two to three decades. Within 25 years this planet will be home to between six and seven billion people, a two-thirds increase over the 3.9 billion humans it now holds. Most of the increase will be in the developing nations, an increment of approximately 2.3 billion people added to the 2.6 billion already populating these countries, and raising the proportion of the world's peoples in the low-income regions from two-thirds to three-quarters.

This growth of human numbers appears unstoppable unless governments, and particularly developing country governments, take and implement powerful and probably coercive programs of birth regulation. A few governments have done so, Singapore and China (at least in urban areas) are notable exceptions; other governments have not. They have not because they lack a political desire to do so that can arise from many reasons, or because of an inability or reluctance to implement aggressively policies of fertility control already accepted and announced. And it is unlikely that this picture will change sufficiently in the next 25 years to slow the upward march of
population numbers. The women who will bear the world's added billions between now and the year 2000 are already born. The social and cultural patterns determining their fertility are their heritage and are slow to alter. Under the impact of the spread of medical services, death rates will continue to decline, and in many low-income nations the gap between births and deaths will widen, not narrow, for at least the next twenty years.

In other words, by the year 2000 it seems certain that the world must feed, clothe and house six to seven billion people. It is to be hoped that present and future fertility control programs will slowly reduce human fertility so that by the year 2050 world numbers will not be 14 billion. This seems possible, perhaps likely, if the world acts vigorously to control its longer term numbers, but for the span of the next generation the die is set, the numbers growth rates of 2.6 percent per year in the developing regions and 1.0 percent per year in the higher income countries may decline a little by 2000, but their combined action will inexorably result in our having over six billion neighbours to celebrate the new century.

Food

An increasing rate in the growth of world population is a twentieth century phenomenon. The 1974 estimate of global numbers is 3.9 billion. In the main these numbers are fed from an estimated 1.23 billion metric tons of food grain, an average of 695 pounds of grain per person.

But the per capita consumption of grain is not equal among nations. Wealthy North America averages about 2000 pounds of grain per person, most of it consumed as meat or in the form of livestock products such as milk, butter and eggs. In contrast, the almost 600 million people of India average about 390 pounds per head, most of it consumed directly as whole grain. The consumption of the rest of the world ranges between these figures with over half of mankind clustered at the Indian level.

The production and world distribution of food has changed drastically in the last fifty years. For example, until the early to mid-1930's, India was a net food exporter. In the ten years following World War II, India was only food self-sufficient. By the late fifties, the nation was a net importer, and except for a few years of 1966 to 1971, when the so-called "green revolution" harvests were being gathered, the nation has been a buyer of food on the world market, the purchases being mainly financed from international aid. The same story could be written about many other low-income countries. In fact, today only four countries remain as net exporters of food grain: the U.S.A., Canada, Australia and Argentina.

The post-war growth of world population caused by the rapid diffusion of medical techniques of death control -- India's male life expectancy at birth rose from 35 years at independence in 1947 to over 57 years in 1970 -- has been matched by a slightly higher growth in world grain production, approximate rates of 2.0 percent per year for population and 2.8 percent per year for all food grains. A balance that suggests a rising food abundance for all. And for some it has been just that.
Since the post-war reconstruction, the wealthy countries of the world, including the East European Soviet Bloc and Japan, have become increasingly large consumers of grain transformed into meat and livestock products. Between 1962 and 1971 the world's production of red meats and edible offals has grown from 79.2 to more than 100 million metric tons, a rise of over 27 percent and a rate of growth of 2.7 percent per year.

The changing food habits associated with the affluence of the industrialized world is best summarized in regional rates of growth for meat consumption. In Western Europe total meat off-take has grown at the rate of over 3.0 percent per year, in Eastern Europe and the U.S.S.R. the rate of increase has been in excess of 3.7 percent per year, and in Japan it has grown at over 11.0 percent per annum; in contrast, North America has expanded at a rate below 2.2 percent per year.

The trends in meat consumption per capita are also interesting:

<table>
<thead>
<tr>
<th>Region</th>
<th>1962</th>
<th>1971</th>
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<tbody>
<tr>
<td>W. Europe</td>
<td>55 Kg/caput</td>
<td>73 Kg/caput</td>
</tr>
<tr>
<td>E. Europe</td>
<td>48</td>
<td>56</td>
</tr>
<tr>
<td>U.S.S.R.</td>
<td>36</td>
<td>44</td>
</tr>
<tr>
<td>Japan</td>
<td>7</td>
<td>19</td>
</tr>
<tr>
<td>U.S. &amp; Canada</td>
<td>81</td>
<td>92</td>
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By 1971, meat consumption per head in Western Europe was approaching the 1962 level in affluent North America; Eastern Europe had attained the 1962 level of Western Europe; and the Soviet Union was at about the 1962 level in Eastern Europe. Indeed, it is now evident that the huge 1972 purchases made by Russia from U.S. and Canadian grain stocks were to ensure the availability of a livestock feed supply that would maintain current levels of Soviet meat consumption. Previously, when faced with a shortfall in grain harvests due to adverse weather conditions, Russian farmers disposed of animals and the nation ate bread instead of meat. The deliberate change in Soviet policy, from belt-tightening to maintaining an animal economy by imports, caught the world unawares generating a food price inflation and reducing known world food stocks from roughly a 10- to 12-week supply to what, by June of this year, will be a less than a three-week inventory.

For the developing nations the prospects engendered by ever higher levels of animal product use and its associated impact on world grain resources are frightening. Accustomed to relying on the grain bins of Kansas and Saskatchewan for their food in case of drought or crop failure, it is disquieting to realize that these bins are now virtually empty; that world reserves of food this year, and probably for the next few years, simply cannot provide the assurance of freedom from want.
What is even more difficult, however, is to bring the affluent nations to the realization that it is unlikely that the bins of Kansas and Saskatchewan will ever be filled again to the level of annual carry-over that was the farm surplus headache of the fifties and sixties. The continued rise in grain consumption by the livestock-oriented agricultural economies of the rich nations will provide a growing market for the grain producers of the export countries. Already there are signs of a heightened awareness of the market potentials of Europe, Russia and Japan. The U.S. Department of Agriculture is consciously strengthening its agricultural attaché service in Eastern Bloc countries at the expense of servicing the developing nations. Recent announcements from Canada indicate a clear awareness of the growing market prospects in the industrialized countries for hard currency purchases of Canadian feed grain. In fact, the new urging by FAO that the world build an international food reserve to protect the developing nations against the tragedy of crop failure can be met only with sympathy, not action. And even if reserves of the size that enabled the exporting nations to sustain the masses of Asia in the drought years of the sixties were accumulated, they would no longer be equal to the task. Asian population growth in the past decade -- an added 500 million people -- translates to a requirement of a 25 percent greater real level of assistance to maintain parity with what was received ten years ago.

I believe the world can no longer rely on the prospect that food reserves in the four grain exporting nations will ever again be able to meet the short-term calamities that may befall the major populated areas of the world. For India, Indonesia, Pakistan, Bangladesh and much of Southeast Asia, the only prospect for a true food reserve is the enhancement of their national agricultural production capacities to produce minimal needs in a drought year. It is to their own agricultural economies that they must turn for protection, a prospect that is not easily accepted because it entails making large investments in agricultural development. And agriculture is not the glamorous sector of the economy that brings a sense of growth, development and modernity to a nation.

In the longer term, however, such investments cannot continue to be ignored. I do not think the allotments of grain between the animal product demands of the affluent and the food needs of the poor will alter significantly in the next decades. In 1962 the affluent nations used roughly 400 million metric tons of grain for livestock production, by 1971 this increased to approximately 490 million tons, a growth rate of about 2.4 percent per year for that group of the world's population that is growing at the rate of 1.0 percent per annum. In fact only two-thirds of the 30 million tons of grain added each year to world food output is available to those of the world's peoples who generate almost three-quarters of the population increment.

If these trends persist over the next 25 years, the index of grain absorption by the affluent will rise 95 percent, with only 28 percent accounted for by population increase; total grain output will double and developing country populations will grow by 85 percent. The 1971 annual per capita grain equivalent consumption in the industrialized world was close to 1000 pounds, of which 880 pounds was eaten as animal products; in the developing regions per capita consumption was approximately 460 pounds, of which about 65 pounds was transformed through livestock. By 2000, the affluent
will have raised grain consumption to about 1800 pounds per person (to the level of today's Canada) for a total consumption of about 1.3 billion metric tons. On this projection, grain consumption in the developing nations will have grown to only 497 pounds per capita. Clearly, if present population and food production trends persist, and if the world's rich continue to garner the grain harvests necessary to fill their growing craving for animal products, the masses in the developing nations can expect to continue receiving only a marginal food supply.

It would seem, then, that in both the immediate and longer term, the low-income nations must look to the development of their own agricultures to fill the food needs of their peoples. The short-term vision is one of peril. A repeat in India of the weather failures of 1972 when the nation was forced to use the reserves of 9.0 million tons built from the "green revolution" gains of the late sixties plus imports in excess of 2.0 million tons -- a total quantity sufficient to feed over 62 million people at present levels of consumption -- would be truly catastrophic. Equivalent world reserves are not available today; they will not be available tomorrow. In the longer term the prospects are not significantly better; each year the fear will be of crop failure, and population growth will continue to pace food supply expansion. Only a whole new set of policies and action programs can break the threat of tragedy.

Fertilizer and Foreign Exchange

If present trends yield a grim prognosis for man's capacity to feed his growing numbers in the short and longer term, the outlook was made more perilous by the recent, sudden price increases for grain and petroleum. Since mid-1972 the world prices of wheat, rice and crude oil have risen from three to five fold. For most low-income nations these increases will severely cripple new and often hard-won development initiatives. At present prices of wheat, India's import bill to feed one year's increase in population of 13 million people (2.2 million tons of grain) would be $590 million, two years ago it would have been $170 million. To maintain crude and refined oil product imports at the 1972 levels when they cost $170 million, will cost India over $900 million in 1974. In fact, India's import bill for oil in 1974 will absorb about half of its foreign exchange earnings.

For the non-oil producing developing nations as a whole, current prices of grain and oil will drain an added $9 to $12 billion from the foreign exchange receipts and reserves, an amount almost 50 percent above expected official governmental aid from the richer countries. Because aid agencies strive first to meet emergency needs among the poorer nations, an unexpected and significant change in crop prospects in the more populous developing regions would have wide financial repercussions for all low-income countries. For those directly affected, there would likely be deep social and political consequences.

The most serious harbinger of immediate trouble is the world shortage of fertilizer, especially manufactured nitrogen. The genesis of the shortage is complex and not critical to our concerns. That said, it should
be pointed out that even before alterations occurred in the world pattern of crude oil trading, there was an increasing shortfall in nitrogen supplies relative to the demands generated by farmers because of higher agricultural commodity prices. The enhanced oil prices have raised the price of naphtha, a refinery by-product and a major fertilizer feedstock, and has, thereby, lifted still higher a rising price for bagged nitrogen. Between 1972 and the present, the price of a pound of nitrogen as urea has risen from 7 to 16 cents in the U.S. and Western Europe if and when a source of supply can be found. Because of the supply shortage in Western countries, several desperate Asian nations have paid as high as 22 to 30 cents per pound ($220 to $260 per metric ton of urea) for delivery contracts from Eastern Europe, Russia and the Arab countries of the Mid-East.

To the most populous of the non-aligned nations, India, the fertilizer shortage has become an ominous threat to survival. The "green revolution" varieties of wheat and rice that spread throughout the nation's irrigated farming areas to raise output by over 20 percent between 1968 and 1971, were successful because their yield was responsive to high inputs of nitrogen. To underpin the farm's use of these varieties, the consumption of nitrogen rose from less than 500,000 tons in 1967 to almost 2.0 million tons in 1972, one-third being imported, the remainder coming primarily from domestic manufacturing using naphtha. The increased costs of crude imports has reduced the amount refined domestically, and the world shortage of nitrogen has greatly lowered imports. As a result, Indian farmers now face a critical shortage of plant nutrient. In the words of one Indian leader, "fertilizer is not just a factor of production, more importantly, it has become a political commodity". Indeed, it is evident that this year's shortfall in nitrogen supplies will cause a decline in grain output of between five and seven million tons. And if the supply picture does not alter by this autumn, an unlikely prospect unless the Arab oil producers act to protect the poorer nations from the effects of oil price increases, the grain production drop next year may well exceed ten million tons.

The Light

The concatenation of separate but linked events of the past several months can only leave a sense of an impending cataclysm.

I can see no way of easily bridging the short-term impact of a widespread drought such as that experienced in 1972 when the total world grain harvest fell by slightly over four percent. If the oil-rich Arab nations allocate portions of their new wealth to aid low-income states, or if the affluent reduced greatly their intake of meat, serious and widespread famine could be avoided. But I am more cynical than optimistic about the probability of these events coming to pass. Man's charity to man is still expressed in terms of what each of us finds surplus to our own wants. Prayers and crossed fingers seem the best answer while we sit and wait.
It is for the longer-term problem that I believe purposeful men can grasp a solution. There is a light under whose rays mankind's present and future populace can be fed from abundance.

I begin by rejecting the arguments of FAO and others that a world grain reserve can be built in sufficient volume to buffer adequately the effects of adverse weather of the magnitude experienced in 1972. At present prices a buffer stock of even half the size of the production drop in those years would cost in the order of $7 billion plus another $10 to $12 billion for capital and operating expenses in the early years of its accumulation. And even if such a reserve could be established, it could not for long provide the insurance needed by the world's growing numbers.

Instead I think the time is at hand to focus attention on wresting from the resources of the developing nations the food abundance they will require for their burgeoning populations. And where feasible, to build into the agricultural economies of these countries the assured production capacity to meet national food needs in times of adversity.

This can be done. And it can be done for expenditures that are not significantly larger than those required to build and manage international food reserves.

The most promising large area of high production potential in the non-communist world is the Indus-Gangese-Bharamaputra plain of North India. Comprising an area of more than 100 million acres of rich alluvial soil; this plain, farmed with present multiple cropping technologies of the kind being researched with Centre support in Asia, is capable of producing as much as 10 tons of grain equivalent per acre per year, a total of more than 1.0 billion tons of food grain, an amount almost equal to present world production, and ten times India's present level of output, enough to feed the billion citizens the nation will have in 2000.

The realization of this potential will require a major effort by India and the world's wealthy nations. It can only be accomplished through the international cooperation of Nepal, Pakistan, Bangladesh, Bhutan and Sikkim. Rivers must be dammed for electrical power and water control; deep tub-wells must be sunk to tap the underground rivers of the Gangese and Bharamaputra basins; land must be shaped for irrigation; canals and drainage channels must be dug; a whole new organizational pattern must be built among the cultivators; and new agricultural supply, credit and marketing structures must evolve. It would be the most formidable development task ever tackled by the world community. It can be done with present knowledge, and it will require relatively little of the world's resources. What it does need is an organized will for its accomplishment and time for its implementation. If the span of our vision is 25 years, the time to begin is now, it will take that span to reap its full fruits.

But India is not the only country so endowed. Similar, if less spectacular promise is held in most nations cradled between or close to the tropics. A year-round growing season, abundant and often assured rainfall, and tropical sunlight hold a vast potential for feeding man if the proper
development policies are framed, articulated and implemented with the investments necessary to grasp what now lies latent and unused. Even for land not blessed with nature's largesse, modern agricultural technologies offer great opportunities to enjoy the benefits of a prospering agriculture. The irrigation technologies developed in Israel; the discoveries now being made in plant drought resistance and photosynthetic efficiency, in pest and pathogen resistance, and in maximizing the product of the symbiotic interactions of plant, soil, water and sunlight; the improvements in the effectiveness of farm production inputs and in the elimination of waste in the processing and handling of farm products; and the work underway to upgrade the nutrient quality of the food produced; open vast new frontiers through science to provide an assurance that all can eat.

The task before the community of nations is to make explicit the promise of abundance and to give it manifestation. I believe the IDRC can and must play a major role in its accomplishment.

A World Food Policy Institute

The Centre can give a strong initiative to mobilizing world resources for an action program to assure food for all the world's people. In doing so, it would depart somewhat from its previous program foci by providing: 1) direct assistance for the establishment of new institutions or institutional arrangements that will earn world leadership in charting the actions needed to provide freedom from want; 2) support for the broad agricultural development planning of specific geographic areas, such plans to be prepared through Centre administered projects mounted in cooperation with other interested national and international agencies.

If it is the wish of the Board that the Centre seek the initiative among world agencies to accomplish these purposes, I will bring to you in September a proposal that the Centre commit up to $3.0 million over the next five years to establish and finance the operating costs of a world food policy institute. We would probably be joined in this endeavour by the Ford and Rockefeller Foundations, and possibly by the World Bank, UNDP and FAO. It is likely that the full operating costs of the institute in its first years will be between $750,000 and $1.25 million per year. The IDRC would be the senior partner.

It is too early for me to speculate on the details of organizational structure and functions of the institute. I am working with Sir John Crawford and the Technical Advisory Committee of the Consultative Group on International Agricultural Research to define these more closely. The present thinking envisages establishing an international centre with its own board of trustees, possibly to be located in Rome in loose association with, but not administered by, the Food and Agriculture Organization of the United Nations. If such an institute were to come into being, Sir John has agreed to serve on its board, and I assume there would also be direct representation of the Centre. As now planned, the institute would be charged with preparing an annual world food
outlook report that would contain detailed short- and long-run assessments of national agricultural development programs and policies. The report would not be politically oriented as are the uncritical, and, therefore, not very useful outlook documents released by FAO. The institute would also be expected to produce periodic reviews of the food production, consumption and trade policies of major world nations.

As with other international agricultural centres, the policy institute would be expected to have a training program for developed and developing country scholars, as well as a program that would attract senior agricultural policy scientists who wish to undertake special investigations of the dynamics of world food.

In addition to the world food policy institute, I believe that the Centre should allocate a portion of its increased resources to the support of specific investigations in cooperating nations of the steps that might be taken to better utilize their resources for food production. Where possible and feasible, the Centre should cooperate with multilateral and bilateral aid agencies in undertaking these investigations. Further, it should make strong efforts to see that the findings are translated into implemented action through the joint endeavours of international and national development organs.

World Population Programs: Review and Assessment

At a meeting of the heads of aid agencies held at Bellagio in May, 1973, to discuss world population, I proposed that an international committee of population specialists be founded on a continuing basis to review critically national, bilateral and multilateral programs seeking better control of world fertility rates.

At the present time, over $300 million annually is being devoted by international and bilateral agencies to the support of the population programs in the developing regions of the world. And a much larger sum is being spent by the developing countries themselves on their own national population endeavours. This money is being used for a variety of programs administered by private and public agencies in both the rich and poor countries, and by various organs of the United Nations. My proposal was to provide a mechanism whereby this entire expenditure would be reviewed and assessed for the lessons learned, mistakes made, and opportunities left unexploited. I argued the need for a committee of eminent persons with an independent chairman and members who would serve in their individual capacities. They would be drawn from the various fields of specialized knowledge relevant to population problems, and membership would be equally divided between rich and poor nations. The committee's findings would be addressed to all interested private, public, governmental and international organizations concerned with population control. In effect, the committee was to establish a "watching brief" on all activities related to the solution of the world population problem, and to make an independent assessment of these activities, and to recommend how current and future action on population might be much more effective.
To ensure a hearing for the work and findings of the committee, the President of the World Bank has offered to provide a forum for all parties expressing an interest in learning of the committee's investigations. It was further suggested that to forge a close association between the committee and the United Nations, the committee secretariat be located with the U.N. Fund for Population Activities (UNFPA), the largest international agency charged with assisting low-income country programs to control population growth.

It is evident now that the UNFPA will probably not be able to provide a secretariat for the committee. Indeed, it is possible that the Fund, by a decision of its Governing Council, will not be able to play other than a minor role in the work of the panel.

Notwithstanding this, and with the urging of some of the other participants at Bellagio, I have explored with the World Bank, the Ford Foundation, CIDA, the Population Council and others, the desirability of moving ahead to establish the review committee without the official participation of the United Nations. I have received a unanimous mandate so to do.

If encouraged by the Board, I will bring in September a proposal that the IDRC participate with other interested donors in the creation of a population technical review committee, and that the Centre contribute to the work of the committee and to the financing of its secretariat (wherever it is located). Present estimates of cost to the Centre are from $100,000 to $200,000 per year depending upon the extent of participation by other donors. It is expected that the committee's budget for its meetings (probably two per year for approximately five years) and for its external consultants, review missions, etc., and for its secretariat, will be approximately $500,000 per annum. Initially, the committee would be established for five years. It would have between 12 and 15 members plus its chairman. The World Bank has agreed to extend an invitation to all agencies who might be interested in receiving the reports of the committee, and the Bank will convene an annual meeting of those responding to discuss the committee's findings. The work and the finances of the committee would be monitored by a mechanism agreed upon among its several financial sponsors.

I believe that by taking an initiative to establish two new international institutional structures, one to focus on world food problems and the other to evaluate and assess programs for population control, the IDRC will become a major contributor to the rationalization of world development activities in the next decade. I believe also that through a careful expenditure of Centre resources, these institutions can be made viable and can be brought to the point where the linkage between thought and needed action can be articulated in a manner that, if pursued by the world community, would manifest a vision of abundance.
As a result of an investigation undertaken by USAID, the U.S. National Academy of Sciences and U.S. National Academy of Engineering Sciences, in which Centre staff members assisted, the IDRC convened a small international task force in Montreal last spring to examine the feasibility and usefulness of establishing an International Institute for Industrialization. The broad mandate and purpose of this Institute have not been fully defined and, as with the establishment of a program division for Industrial and Engineering Sciences, it will take some time before I can bring action proposals to the Board. But I am taking this opportunity to inform the Board of our interest in continuing to support the exploratory studies and preparatory conversations that might lead to the formation of such an institute. Whether Centre support should be forthcoming for the Institute, if and when it is established, is a matter for future discussions. The Governors might be interested in knowing that the editors of Fortune magazine are examining the possibilities of publishing a feature article on the need and scope for such an institute; and that senior officials of several private and public corporations and agencies are working with Centre support on the development of a prospectus for the Institute, the preparation of which will determine whether its establishment will be useful for the developing world.

In March last year, the Board approved a project covering the Centre's acquisitions and use of the "Integrated Set of Information Systems" (ISIS) developed by the International Labour Office (ILO) to automate library management and to provide a computer method for the storage and retrieval of information. ISIS was demonstrated to the Board in September and the system is now being used by the Centre Library. Miss Kate Wild, the Program Officer responsible for the Centre's work on ISIS, is now the editor of an international ISIS newsletter being issued jointly by ILO, the Swedish Agency for Administrative Development and the IDRC.

Centre experience with ISIS over the past year has been mixed. We have encountered many frustrations in adapting the ILO computer-based system to a terminal operation at the Centre headquarters linked with a private Ottawa service bureau computer. However, despite these frustrations, ISIS is functioning and has become an important component of the Centre's Information Sciences program. It has evoked interest among librarians and other specialists in information sciences in the Ottawa area. And the IDRC adaptation and extension of ISIS to information needs beyond those developed by ILO promises to make ISIS a major worldwide system for handling information.

Upon the recommendations of Mr. John Woolston, and after discussions with the Centre staff involved with ISIS, I am recommending to the Board that the ISIS program be continued for another year in accordance with the proposal submitted last March. If the second year's work is successful, ISIS will be incorporated as a regular part of the program budget of Information Sciences on the same basis as the Centre's Library and other in-house information activities.