SPEECH TO THE NUTRITION RESEARCH CENTRE
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Mesdames et Messieurs

Je veux remercier le professeur Brisson, directeur du Centre de recherches en nutrition, qui m'a invité à venir vous rencontrer aujourd'hui.

Je voudrais d'abord vous présenter les hommages de M. David Hopper, président du Centre de recherches pour le développement international, et du Conseil des governeurs présidé par le très honorable Lester B. Pearson. Le C.R.D.I., comme vous le savez, a été crée l'an dernier par le Govervement du Canada.

Les buts du Centre sont: d'entreprendre, d'encourager, de soutenir et de poursuivre des recherches sur les problèmes des régions du monde en voie de développement et sur les moyens d'application et d'adaptation des connaissances scientifiques et techniques.

Le Conseil des gouverneurs a décidé de se concentrer au cours des premières années sur les problèmes qui touchent au bien-être des populations vivant dans des endroits ruraux et qui sont en voie de transition d'un mode de vie traditionnel à un mode de vie moderne.

Le Conseil a donc decidé "d'aider les régions en voie de développement à se livrer à la recherche scientifique, à acquérir les techniques innovatrices et les institutions ises pour résoudre leurs problèmes."

Les activités du Centre sont groupées sous quatre programmes: sciences de l'agriculture, de l'alimentation et de la nutrition; sciences de l'information; sciences de la population et de la santé; sciences sociales et ressources humaines.

La division des sciences de l'agriculture, de l'alimentation et de la nutrition s'occupe de projets visant à accroître la productivité ainsi que les profits des fermiers et des pêcheurs et à améliorer les systèmes de protection, de distribution et d'utilisation des cultures vivrières. Une attention égale sera consacrée à l'impact de la recherche poursuivie par le Centre dans les domaines de l'agriculture, des pêcheries et de la foresterie sur l'ensemble des éléments qui influent sur la santé des peuples ruraux et sur leur bien-être économique et social. Une attention particulière sera portée au développement de technologies nouvelles qui conviennent à la création d'industries rurales de transformation. Etant donné que le Centre se soucie aussi bien des besoins du consommateur que du producteur rural, la recherche portant sur les problèmes de la production ne sera pas théorique mais aura toujours rapport avec les besoins éprouvés par les peuples des pays en voie de développement.

J'aurais vivement souhaité faire tout mon discours en français, mais arrivant tout juste d'une mission en Asie, je n'ai pas eu le temps de traduire le reste de mon texte, et, vu la compétence de mon auditoire, je pense qu'il m'est nécessaire de m'exprimer en anglais pour donner le meilleur de moi-même. Si jamais j'avais l'occasion de revenir ici et que je dispose alors d'un plus long délai, je ferai certainement un effort special ... au risque de heurter les oreilles sensibles.

Permettez donc que je passe à l'anglais.

For the remaining time available to me I should like to describe to you, first some of the projects in which we are cooperating and supporting and secondly some of my own thoughts on the important and more comprehensive role which Canadian food and nutritional scientists should play in the international development process, a role which so far they have tended to neglect.

First, a brief description of some of the projects which IDRC is supporting or considering under its Agriculture, Food and Nutrition Sciences Programme.

The first of these we call the Cassava-Swine Project and it is being carried out through a contract between IDRC and the International Centre for Tropical Agriculture in Colombia. Cassava which is also known as manioc and tapioca is a starchy root which is a staple food for many peoples in the humid tropics of Latin America, Africa and Asia. Since the cassava root can be left in the ground for many months without serious deterioration, it can be regarded as a valuable reserve or famine relief crop.

Cassava suffers from one main disadvantage ... Its edible portion consists almost entirely of starch and other carbohydrate materials and its protein content is rarely in excess of 2%. Furthermore, throughout most of the world it is produced by peasant farmers with very little attention to varietal selection or scientific agronomic practice. Hence the yields tend to be low and the quality of the harvested product highly variable.

The research programme we are supporting will endeavour to develop an agricultural technology which will substantially increase both the yield and protein content of selected varieties of cassava and to develop optimum packages of agronomic inputs. In addition we are exploring the use of cassava roots in animal feed stuffs, particularly as a source of energy for swine, poultry and some ruminants. Within this project we are establishing cooperative programmes between the tropical research centre in Colombia and several Canadian universities in an attempt to direct Canadian agricultural research expertise towards the problems of the developing countries.

A second project relates to the new man-made cereal grain 'triticale'. Triticale is a synthetic genus produced by a cross between two familiar cereal grains, wheat and rye. The objective of this genetic manipulation of naturally occurring grains is to produce a new food crop, the agronomic characteristics and nutritional value of which will be superior not only to those of its two parents but to all other cereal grains, particularly those which are grown in food deficient areas of the world where climatic conditions are unfavourable for other cereal grain production. This new research project will rely upon the cooperation of the International Maize and Wheat Improvement Centre in Mexico and the Faculty of Agriculture at the University of Manitoba where the first major triticale research was undertaken. Already there are indications that certain lines of triticale possess extrordinarily high protein contents of a biological value significantly superior to either rye or wheat.

A further area of agricultural research which greatly intrigues us is multiple croppig. In many of the rain fed areas of the less developed world farmers produce only one crop annually. Throughout Southeast Asia the crop is usually rice. Traditional varieties of rice are grown during periods of heavy rainfall and require about 120 days to mature. Some of the newer varieties of rice developed at the International Rice Research Institute in the Philippines will mature in a little over 100 days and work is now in progress to determine what additional food and cash crops can be grown during the balance of the year. We are proposing to support a number of research studies involving both scientists and rural farmers in a number of developing countries to enable them to profitably grow a wider range of crops and thus improve both their nutritional well being and increase their incomes.

We are particularly concerned that the combination of food crops produced provide an adequate nutritional balance and therefore the attention and guidance of the nutritional scientist in these programmes is vital to their success. I shall return to this point later.

In both French and English speaking countries of West Africa we are engaged in the formulation of a rural fisheries research and development programme. The whole coastline of West Africa from the Congo as far as Morocco is inhabited by thousands of small fishermen, many of whom employ extremely primitive techniques of both harvesting and preserving their catch. The project under development has three main objectives:

1. To improve the design and efficiency of the small fishing boats, the fishing gear and the techniques of fishing;
2. To improve the simple methods of preservation by smoke and salt drying;
3. To create a more effective and profitable system of marketing and distributing the preserved fish, particularly among those protein deficient communities who live in the inland rural villages and subsist largely upon starchy roots

and other low protein foods.

We are also encouraging the development of new and inexpensive techniques for milling and processing cereal grains and grain legumes. The large cereal and provender mills which we find in Montreal and other large Canadian cities are unsuitable in design and much too expensive to be employed in the rural villages of Africa and Asia. We are consequently supporting the development of simple milling systems based upon abrasive removal of the seed coats followed by attrition grinding of the endosperm. It is our hope to establish a series of such small mills in several Francophone and Anglophone countries of Africa.

We are also supporting the development of new systems of bread making which will permit the developing countries to use large proportions of their own cereal grains such as millet and sorghum in addition to cassava starch and other indigenous materials in bread and other cereal foods. We are also giving attention to improving the protein content of such foods by the addition of high protein meals from oilseeds and grain legumes which are grown in these Tropical countries.

STUDY OF FARM WATER MANAGEMENT - BIOLOGICAL CONTROL OF PESTS

With your permission I should now like to say a few words concerning the neglected responsibilities of food and agricultural scientists in international development. Though some of the important nutritional problems of the less developed world require the attention of highly specialised scientists, the undernourished nations would benefit greatly if nutritional scientists in general would accept a more comprehensive responsibility, a responsibility so far inhibited by what we might call "scientific isolationism".

The breadth and scope of the food and nutritional scientists' responsibility can be illustrated by reference to the serious world wide problem of protein malnutrition. At least five areas relevant to protein malnutrition require urgent attention:

1. A more precise definition of the protein problem: its location, nature, extent, magnitude and cause;
2. Reliable standards of protein quality and more satisfactory methods of analysis and determination of biological value;
3. The development of improved protein sources which satisfy a defined human need;
4. A more comprehensive understanding of plant biochemistry from which to develop high yielding, disease resistent plant protein sources;
5. A greater influence in the formulation of national and international agriculture, food and nutrition policies.

I am not suggesting that Canadian scientists can assume responsibility for the entire protein programme of the whole world. But we should remember that many of the food and nutritional scientists from the less developed world receive their training in North American universities and therefore the nature and quality of what we teach will greatly influence the philosophy, the attitude of mind and the quality of performance of these young people when they return to their native countries. I believe it is the responsibility of this and other universities continually to review constructively and critically Canada's programme of international development and the programmes of such agencies as FAO, WHO and UNICEF. It is sad to reflect that not one Canadian is or has ever been represented on the United Nations Protein Advisory Group, the group largely responsible for formulating the policies and programmes of the United Nations vis-a-vis protein malnutrition.

A number of countries in Africa, where protein malnutrition is known to be wide spread, are primarily French speaking and hence there exists a unique opportunity for a significant contribution from members and graduates of this distinguished university.

Dramatic increases in wheat, rice and maize production offer hope that the world's population:calorie equation can eventually be brought into balance. On the other hand, according to WHO, per capita consumption of protein is declining in much of the less developed world. A recent Latin American study indicates that protein malnutrition is a primary or associated cause of 52% of all the deaths of children between one and four years of age and of 55% of all deaths attributable to infectious diseases.

There has been some recent controversy in which scientists have debated whether the mental damage sustained by protein deficient infants is or is not reversible. Such debate appears to me to be highly irrelevant. Malnutrition clearly interferes with the child's ability to learn, whatever its ultimate effect upon the condition of the brain itself. Most children of the less developed world are not permitted a second opportunity to re-live the comparatively short period in which they receive a formal education. Nor do they have a chance later in life to catch up with the learning they failed to acquire in childhood. Consequently whatever biochemical reparation may subsequently occur, the malnourished child is probably educationally and vocationally handicapped for the rest of its life. Malnutrition also increases the child's susceptibility to infectious diseases thus significantly reducing the number of days he or she spends in school during his short educational period.

FAO states that more than 300 million children in the less developed world suffer grossly retarded growth as a result of malnutrition. Many such impressive global estimates are pronounced by the international agencies, but we lack specific population case studies from which to determine reliably the location, nature, extent, cause and consequence of protein malnutrition. Such data as exists has been largely collected using one of three general methods.

The food balance sheet method translates estimates of staple food supplies into average per capita availability of calories and major nutrients, which, when compared with recommended standards quantify the "nutritional gap". The method, which is based upon national or regional averages, tends to overlook deviations caused by uneven distribution, seasonal changes and losses during storage, distribution and preparation. For example, the diet of the Sandi, a Sudanese rural people, fluctuates each year between 1900 and 2800 calories and between 33 and 60 grams of protein per day dependent upon the season. Such variations do not appear in food balance sheets.

A second survey method analyses and relates income and food purchases. It can be misleading in that nutrient composition is usually derived from published tables of food analysis which, being averages, rarely take account of regional, seasonal and varietal differences in nutrient content.

The third and probably most reliable technique employs a clinical examination of a representative population sample and records simultaneously their dietary patterns. The method is the most difficult when undertaken under genuine and not simulated conditions. A further constraint is the apparent world-wide shortage of qualified medical scientists willing to undertake clinical studies among rural communities of the less developed world.

The need is indeed urgent for reliable determinations of nutritional well-being among major groups within less developed countries. Most of the countries possess little information upon which to base food and nutrition policies or with which to convince their politicians that food and nutrition policies are even necessary. The Canadian National Nutrition Survey is indeed a welcome initiative. It is to be hoped that the unique competence of this survey team will eventually be made available to the developing world.

Traditionally, understandably and commendably the first objective of international plant breeding research programmes is to increase the yield of crop per unit of cultivated land. But many plant scientists now seek to improve the nutritional quality particularly of the protein in many major crops. These plant scientists urgently need and seek the cooperation of nutritional scientists to provide reliable and relevant chemical and biological methods by which to assess protein quality and to determine specific amino acids. The methods need to be simple, rapid, reproducible and ideally non-destructive since the quantity of material available from the plant breeder for analysis and reproduction is severely limited.

Lysine is the first limiting amino acid in cereal grains and therefore plant breeders in many international research centres are endeavouring to increase the lysine content of cereal grains. Consequently there is an urgent need for a rapid method of determining lysine in cereal grains.

The lysine and trytophan content of maize varies more in the endosperm than in the embryo regardless of genetic background. If a small portion of the maize endosperm is removed for analysis with a fine drill, the embryo remains untouched and seeds selected on the basis of dye-binding analysis can be subsequently planted. In the new high lysine varieties of maize lysine to tryptophan is in fairly constant 4:1 ratio. Consequently for rapid screening it is more convenient to determine tryptophan by the rapid Opienska Blauth method using acidified ferric chloride following hydrolysis with papain than to determine lysine by the somewhat tedious pyridine method.

The plant breeder urgently needs more rapid and economical biological methods of protein evaluation. As an alternative to the conventional weanling rat some scientists now favor young chicks or white mice. Of particular interest is the method of Dr. Fred Elliott and his colleagues at Michigan which employs the meadow vole (Microtus pennsylvanicus). The meadow vole weighs two to three grams at birth. It reaches sexual maturity in 25 to 35 days. It produces seven litters of 5 or 6 offspring annually and each young vole grows at an average rate of 1 gram per day. Each vole is fed daily six grams of a 7% protein diet and at the end of five days a conventional protein efficiency ratio is determined. Rat assays require 12 grams of food per day for 28 days, pigs need 1,200 grams of food per day for 45 days. Thus the total food per test animal is 36 grams for the vole, 336 grams for the rat and 54,000 grams for the pig. The preference of the plant breeder for the vole is not surprising. However we still need to know how well the results with the vole correlate with those of more familiar techniques.

Most attractive would be a microbiological method of determining the PER on a few milligrams of endosperm material. One group of workers has suggested that certain parasitic protozoa might be used for this purpose.

To many of us the literature covering protein biological evaluation appears confused and confusing. Casein and egg yolk are no doubt convenient reference standards but should they be presented as desirable goals for plant breeding and protein supplementation programmes? A very eminent plant breeder remarked recently he wished the nutritionist would tell him clearly what protein standard he ought to be aiming for, casein, egg yolk or some other. I suggested he adopt a new slogan "Plant breeders of the world unite - you have nothing to lose but your yolks".

Using the tools of improved genetic manipulation and biochemical control plant scientists may be able to vary significantly the amino acid composition and protein content of future food grains and grain legumes. The nutritional scientist has the responsibility of defining what is truly desirable in terms of human need. Let us remember that ill considered or unnecessarily difficult nutritional objectives may result in the sacrifice of desirable agronomic properties and an excessively prolonged and costly breeding program.

If one reviews the past 50 years of cereal breeding research, certain facts relevant to our discussion of protein content are apparent:

1) Most of the research was at the genus or species level of botanical classification;
2) Wheat has received most attention;
3) The rheological properties of hydrated wheat

protein can be influenced by genetic manipulation, but the total protein nitrogen content of wheat appears more greatly influenced by agronomic factors than by genetic background;

4) Though lysine content does vary among wheat varieties and within varieties in different environments, no spectacular high lysine gene has yet been discovered in wheat.

The correlation between lysine content and protein content in wheat is of significant concern to the nutritional scientist and was discovered during a recent screening of the world collection of wheat varieties. Lysine expressed as a percentage of total protein content correlates negatively with wheat protein content ($R = -0.63$). But lysine expressed as a percentage of the whole grain is in positive correlation with wheat protein ($R = 0.83$). This illustrates the importance of defining clearly what we mean when we ask the plant breeder to increase the lysine content.

In 1964 Mertz at Purdue University demonstrated that introduction of the opaque-2 gene will double the lysine and tryptophan contents of maize endosperm protein. Both weanling pigs and hogs weighing more than 125 pounds are found to gain weight as quickly on a pure opaque-2 corn diet as animals fed on normal corn supplemented with soya bean meal. Opaque-2 corn meal was found to be biological equal to skim milk when fed isonitrogenously in the diet of South American infants.

The Floury-2 gene in maize presents an interesting problem for the nutritional scientist. Many strains containing this gene are by analysis equivalent in lysine and tryptophan but in protein efficiency ratio significantly inferior to opaque-2 strains. The reason for this biological anomaly has not yet been satisfactorily explained.

High lysine corn varieties present many problems for the plant scientist to wrestle with. In addition to lower yields and greater susceptibility to certain diseases and parasites the opaque-2 strains are unfamiliar in appearance and unacceptable in endosperm properties to those major consumers of Latin America who are accustomed to flint type corn. Nevertheless, if nutritional and plant scientists cooperate, these difficulties can be overcome and farmers will be provided with a whole new generation of corn varieties suited to a wide range of environments and possessing high protein of good biological value and properties satisfactory both to the agronomist and the consumer.

Though the amino acid profile of rice is superior to that of conventional wheat and maize the protein content averages less than 7%. During screening of more than 8,000 varieties the International Rice Research

Institute discovered a few which in succeeding generations maintained a significantly higher than average protein content. These were back crossed with high yielding varieties such as the famous IR 8 and from these have been derived a number of lines now in the F5 plant generation which demonstrate good plant characteristics, protein contents between 10 and 13 percent, lysine in excess of 3% of the protein and threonine in excess of 5%.

It is interesting to note however that only about 40% of the threonine present is biologically available a phenomenon which has not yet been adequately explained.

Millet and sorghum, though of immense importance as food grains in the arid regions of Africa and Asia, have received less attention from the plant breeder and nutritional scientist than have wheat, maize and rice. Little is known about the genetic factors which affect protein quality in sorghum but recent research has revealed some intriguing nutritional problems. During a large screening test with week old chicks it was found that lysine retention varied among sorghum samples from below 50 to 98 percent. Using the nylon bag technique with fistulated steers, dry matter disappearance among 1,000 samples ranged from 17 to more than 80 percent. Rat feeding studies on sorghums ranging from 6 to 17 percent protein varied in digestibility from 37 to 86 percent. It is known that the biological value of sorghum is influenced by tannins present and can be improved by flaking and steam processing. Nevertheless, much more needs to be learned about the variability in biological value and digestibility of this important cereal crop. It is IDRC's intention to give considerable encouragement to millet and sorghum research particularly in those Francophone countries of West Africa.

A brief word about a much neglected family, the grain legumes. Grain legumes contain two to three times the protein content of cereal grains and being high in lysine and threonine their amino acid profiles are largely complementary to cereal protein. Throughout the less developed world the grain legumes are normally eaten in combination with cereals. Many varieties of _Phaseolus_ are grown and eaten together with corn in Latin America; chick peas, mung beans, lentils and soya beans are served concomitantly with rice in Asia, and cow peas combined with millet and sorghum, form the staple diet of many Sub-Saharan Africans.

The significant variation in protein content and amino acid profile among and within varieties, the high incidence of toxic compounds and anti-metabolites among the grain legumes demonstrate the scope for profitable collaboration between nutritional and plant scientists. Comparison of electrophoretic patterns has turned up several oriental soya bean varieties which are distinctly different genotypes and contain significantly lower levels of trypsin inhibitor than varieties customarily grown in North America.

If widespread protein malnutrition is significantly suppressed it will be largely through the development of improved food crops. But if we are to avoid a total reliance upon empiricism we need a greater knowledge than we possess of plant biochemistry, of the physiological function of chemical substances which influence germination and plant growth, of the mechanism of nitrogen uptake and translocation, and the means of controlling disease and infestation by biochemically induced resistance. The work of WAIN with VIOLA XANTHIN and related alkaloids which retard plant growth, and with the specific herbicide SIMAZINE, and with the naturally occuring antifungal antibiotic WYERONE illustrate the potential contribution of the biochemist to plant breeding.

Nutritional scientists might also give their attention to improving protein by reducing demonstrable losses and by fortification of staple foods. Post harvest losses expressed in terms of the percentage by weight or volume destroyed by infestation fails to take full account of the nutritional implications. Many insects prefer protein to starch and therefore preferentially attack the protein-rich fractions of stored grains. It is well documented that certain micro-fungi attack specific amino acids such as methionine which is first limiting in many grain legumes.

More opportunities exist for protein fortification of staple foods than have as yet been explored or exploited. Bread consumption is increasing throughout Africa at between 8 and 10 percent per year. A recent survey in India predicts a 13.2% annual compound growth rate in bread consumption over the next five years.

The fortification of bread is a convenient example by which to illustrate the opportunities and difficulties of improving the quality of cereal proteins.

Greater attention could profitably be given to fortification with selected proteins of the cereal grains. The flour mills in many developing countries export all of their wheat bran and germ to the animal feed industries of more prosperous nations. Yet recent research has demonstrated the technological feasibility of producing high lysine, high protein concentrates by selective milling of wheat bran and germ.

Using novel methods of bread making, high protein legume and oilseed flours can be combined with wheat and other cereals to produce cheap nutritious bread.

Much has been written about fortification with amino acids. Synthetic lysine and threonine can be considered as bread supplements only when they can be satisfactorily manufactured and distributed among many small mills and bakeries within the less developed bread eating countries.

High quality fish protein concentrate is nutritionally attractive on account of its high protein and lysine content. It is probable that its reportedly adverse influence upon bread volume, color and flavour can be overcome by improved technology. But whether it can be produced consistently, economically and in adequate quantity within the less developed countries has yet to be demonstrated.

Single cell protein, the protein derived from micro-organisms, appears to be exciting exceptional interest among Canadian food scientists, probably based upon the knowledge that organisms will grow upon virtually any waste or cheap carbohydrate or hydrocarbon source. Since yeast is one of its four basic ingredients, bread would appear to be an ideal vehicle for single cell protein fortification.

But in addition to potential toxic hazards, many micro-organisms possess indigestible cell walls and contain high levels of nucleic acids, excessive intakes of which can cause gout and the formation of uric acid

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stones in the kidney. The processing necessary to remove the cell wall and nucleic acid material would undoubtedly raise the cost of production.

I would advance a more fundamental objection to the wide spread acceptance of single cell protein in the less developed world. To be economical, single cell protein must be made in large factories using continuous fermentation and concentration procedures. Such factories employ a very low labour input. Agriculture in the less developed world is both the source of nutritional well being and the principal means of livelihood. Consequently I would prefer to see our development resources devoted to improving and protecting cereal grains and grain legumes in the tropics than to the construction of microbial protein factories.

I have just finished a review of some 300 papers dealing with protein fortification of bread. These fall into two classes:

(a) those by cereal technologists which describe how added protein affects the volume, crumb texture and color of bread;

(b) those by nutritional scientists which report the influence of added protein upon biological value, in most cases expressed as the Protein Efficiency Ratio.

The latter results demonstrate an almost perfect correlation between PER and the amount of lysine added to the bread in the protein supplement. In very few instances is any reference made to the total nutritional benefit of the added protein, and the relative cost is almost completely ignored. These points can be best illustrated by the slide which shows:

(a) the amount of supplement to contribute 0.25% of lysine;

(b) the amount of additional protein added;

(c) the cost of the addition.

At first glance, synthetic lysine appears to offer the best value for money. But all of the other protein sources add not only lysine but additional protein, calories and other nutrients. Furthermore, all but lysine provide water-binding solids and therefore increase the total quantity of bread produced. 9.6 lb. of milk powder or 8 lb. of soya would increase the bread yield by 10%; 23.6 lb. of wheat protein concentrate by close to 30%. Consequently I would urge that when nutritional scientists report on protein fortification they quote not only PERs, but evaluate the total consequence of the added protein.

Finally, may I refer briefly to what I term: "total nutrition management". International development cannot be defined solely in terms of economic growth. It is above all concerned with the quality of human life. But many politicians think only in economic terms and regard food and agriculture as of economic consequence but malnutrition as a matter for social welfare. Food and nutritional scientists need to demonstrate to politicians that economic growth depends upon adequate health, welfare and nutrition and that malnutrition and the consequent loss in human efficiency and productivity represent a significant drain upon the national economy. Food and agriculture, and nutritional well-being, are in fact indivisible. Food is for people and the protein gap exists not in the farmers field but in the people's stomach.

There is evidence to indicate that good health derived from a satisfactory diet may influence family size. A recent study of vital statistics in India suggests that rural families must bear more than six children to ensure the survival of one son to the father's 65th birthday. The average number of births in India per couple is about 6.5 which indicates that parents deliveratel.y produce the size of family which empirically they have discovered will ensure security in their old age.

As a nation develops economically and technologically the quality of its work force is more important than sheer physical output. Human energy tends to be replaced by machines and more highly refined human skills. If its mental and educational development is impaired during childhood the efficiency of the agricultural and industrial labour force will prove inadequate to manage the new technologies essential to national growth.

The primary objective of international development should be to provide all people with a satisfactory quality of life. For most people in the less developed world this requires first a greatly improved diet. The responsibility lies clearly with food and nutritional scientists to address themselves to the broader issues of nutrition management to educate and persuade the politicians that economic development depends upon a health well-fed nation.

Le Marquis de Cussy, gastronome sans pareil et bon ami de Napoleon nous a dit:

"Pour bien manger, il faut y consacrer de l'étude et de l'attention; c'est un art qu'aucun philosophe ne devrait mépriser."

Au même temps: Pour bien nourrir un peuple, il faut y consacrer de l'étude et de l'attention; c'est une responsabilité que l'homme politique ne devrait écarter.