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LEAGUE OF NATIONS

THE PROBLEM OF NUTRITION

VOLUME I.

**INTERIM REPORT OF THE MIXED COMMITTEE
ON THE PROBLEM OF NUTRITION**

[Communicated to the Assembly,
the Council and the Members of
the League.]

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VOLUME I.

**INTERIM REPORT OF THE MIXED COMMITTEE
ON THE PROBLEM OF NUTRITION**

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CONTENTS.

Volume I.

INTERIM REPORT OF THE MIXED COMMITTEE ON THE PROBLEM OF NUTRITION

	Page
PREFACE by the Chairman of the Committee	5

INTRODUCTION.

1. Action taken on the Decisions of the Last Assembly	7
2. Character of the Present Report	10
3. Nutrition Statistics	11
4. The Various Volumes of this Report	13

Chapter I. — GENERAL SURVEY OF THE NUTRITION PROBLEM.

1. Is there a Nutrition Problem ?	15
2. The New Teachings of Science	17
3. The Health of the Child—the Kernel of the Problem.	20
4. Education and Popular Instruction	21
(a) Doctors and Hygienists	22
(b) Education of the General Public	23
5. Economic Considerations	24
6. Agriculture	26
7. National Nutrition Policy and Social Welfare	26

Chapter II. — NUTRITION AND HEALTH.

1. Introduction.	31
2. The Principles of Correct Nutrition	32
3. “ Energy-bearing ” and “ Protective ” Foods	34
4. Special Dietary Needs of Different Classes and Age-groups	36
(a) Expectant and Nursing Mothers	37
(b) Infants	39

	Page
(c) Early Childhood, Pre-school Age, Nursery-school Age	43
(d) School Age	44
(e) Adolescence	48
(f) Young Soldiers	49
(g) Adults	50
5. The Modern Science of Nutrition and the London Report : The New Science of Nutrition	53
6. Dietary Standards adopted in the London Report	55
(a) Energy Requirements	56
(b) Protective Foods, Mineral and Vitamin Requirements	57
(c) Energy-bearing Foods	62
7. Problems recommended for Further Study	64
8. Principles of Government Action	66

Chapter III. — NUTRITION AND LABOUR.

(Survey of the Nutrition Problem by the International Labour Office)	69
1. Workers' Diets and Under-nourishment	70
2. Social and Labour Legislation	73

<i>Chapter IV. — SOME CONSIDERATIONS ON THE ECONOMIC ASPECTS OF THE NUTRITION PROBLEM</i>	<i>77</i>
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Chapter V. — NUTRITION AND AGRICULTURE.

1. Malnutrition among Agricultural Populations	84
2. Improved Nutrition and Agricultural Production	87
3. Can Agricultural Practice be adapted to meet the New Requirements of Better Nutrition?	89
4. The Effects of Agricultural Adaptation on the Economics of Farming	92

Chapter VI. — PRELIMINARY RECOMMENDATIONS.

Recommendations of the Mixed Committee on the Problem of Nutrition	97
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PREFACE BY THE CHAIRMAN OF THE COMMITTEE.

The marked interest which the last Assembly showed in nutrition was due, in the first instance, to the realisation of the possibilities of great improvements in public health and special betterment through better nutrition ; but, while these factors were undoubtedly uppermost in the minds of delegates, the interest displayed was also due to the fact that, through improved nutrition, it should be possible to contribute, first, towards a solution of national and international agricultural problems and, secondly, towards an improvement in the world economic situation.

Any study of the evidence which can be collected from many sources and from many countries compels one to realise :

The degree to which achievements in these sciences which can be applied to agriculture have increased man's control over nature and therefore his powers of producing food ;

The possibilities which this increase in power of production opens up for improving the standard of living and general well-being of all nations.

Any study of the world as it is, simultaneously brings one face to face with economic difficulties which have to be overcome if mankind is to derive full advantage from the potential abundance which science can make readily available.

One is, indeed, forced to realise that there is as great need for constructive economic thought as for further immediate progress in science.

At the conclusion of its first meeting, the Mixed Committee realised that it would be quite impossible for it to cover the immense field which its terms of reference required in time to present a comprehensive report to the 1936 Assembly.

It therefore decided on an interim report and hopes to be in a position to continue the study of the many aspects of its task and to present a comprehensive report to the Assembly at a later date.

It hopes that even this interim report will, however, make clear to the Assembly that, through national and international action towards improved nutrition, it should be possible to go some distance towards securing in part the heritage which all men are entitled to claim—namely, the possibility of the full enjoyment of the achievements of science.

It is not inappropriate to conclude this brief introduction to this report with a quotation from the final presidential address of Sir Frederick Gowland Hopkins, the late President of the Royal Society of Great Britain, who, referring to the prospective work of the Mixed Committee, said :

“ Policies concerned respectively with the production, transport, distribution and consumption of foods will all, we may hope, be discussed. They seem to be the very proper business of the League, and, if discussion goes deep enough and is frank enough, it may well do no small service to the interests of peace itself.”

ASTOR,
*Chairman of the Mixed Committee
on the Problem of Nutrition.*

INTERIM REPORT OF THE MIXED COMMITTEE ON THE PROBLEM OF NUTRITION.

INTRODUCTION.

I. ACTION TAKEN ON THE DECISIONS OF THE LAST ASSEMBLY.

During the last thirty years or so, and especially since the great war, there has been a growth of interest in nutrition questions in consequence of social and scientific developments. Accordingly, the question of nutrition was taken up several years ago by the Health Organisation of the League of Nations, which found it desirable to make enquiries in certain countries. A report published in its *Quarterly Bulletin* in June 1935 by two of its members, Dr. E. Burnet and Dr. Aykroyd, aroused widespread interest.

At the meeting of the Assembly in September 1935, following a request made by twelve delegations, there was a full discussion of this problem in relation to public health on the one hand and economic and social organisation on the other.

On being referred to the Second Committee, this problem formed the subject of a three-day debate, in which twenty delegations took part. As a result of these discussions, the Assembly adopted the following resolution :

“ The Assembly, having considered the subject of nutrition in relation to public health and of the effects of improved nutrition on the consumption of agricultural products, urges Governments to examine the practical means of securing better nutrition and requests the Council :

“ (1) To invite the Health Organisation of the League of Nations to continue and extend its work on nutrition in relation to public health ;

“ (2) To instruct the technical organisations of the League of Nations, in consultation with the International Labour Office and the International Institute of Agriculture, to collect, summarise and publish information on the measures taken in all countries for securing improved nutrition ; and

“ (3) To appoint a Committee, including agricultural, economic and health experts, instructed to submit a general report on the whole question, in its health and economic aspects, to the next Assembly, after taking into consideration, *inter alia*, the progress of the work carried out in accordance with paragraphs (1) and (2) above.”

In June 1935, moreover, the nineteenth session of the International Labour Conference had unanimously voted the following resolution :

“ Seeing that nutrition adequate both in quantity and quality is essential to the health and well-being of the workers and their families ;

“ And seeing that in various countries evidence has been brought forward to show that large numbers of persons, both in town and country, are not sufficiently or suitably nourished ;

“ Seeing, moreover, that an increase in the consumption of agricultural foodstuffs would help to raise standards of life and relieve the existing depression in agriculture :

“ The Conference welcomes the attention drawn by the Director in his report to the problem of nutrition and requests the Governing Body to instruct the Office to continue its investigations of the problem, particularly in its social aspects, in collaboration with the Health and Economic Organisations of the League of Nations, the International Institute of Agriculture and other bodies capable of contributing to its solution, with a view to presenting a report on the subject to the 1936 session of the Conference.”

* * *

To give effect to the first paragraph of the Assembly resolution, the Health Committee appointed a Technical Commission, which held its first session in London from November 25th to 29th, 1935, and set forth its findings in document C.H.1197, entitled “ Report on the Physiological Bases of Nutrition ”.

To give effect to the second paragraph of that same resolution, the Secretary-General, in November 1935, requested Governments to forward to the Secretariat, in the form of a general statement, any information which appeared to them to have a direct bearing on the improvement of nutrition. He drew the special attention of Governments to a number of particular questions :

(a) The practical measures taken by the central Government and by the local authorities to ensure an improved dietary for various

population groups, such as : mothers and infants, school-children, inmates of institutions, industrial workers and agricultural labourers, unemployed, persons in receipt of relief, etc. ;

(b) The work of private organisations (co-operative societies, employers' and workers' associations and the like) in the same field;

(c) The means at the disposal of the public authorities for testing the prevailing level of nutrition, more especially with a view to ascertaining whether certain parts of the population are under-nourished ;

(d) The methods employed for the collection of information on nutrition and the form in which such information is compiled (by occupational groups, income groups, etc.) ;

(e) The dietary standards laid down for certain groups of persons whose food is provided by the public authorities—*e.g.*, army, navy, employees and workmen, inmates of institutions, etc. ;

(f) Action taken by public authorities or private organisations to disseminate among the public a knowledge of the principles and practice of rational nutrition.

To give effect to paragraph (3) of the Assembly resolution, the Council set up the Mixed Committee on the Problem of Nutrition, which held two sessions in February and June 1936 under the chairmanship of Lord Astor.¹ Members of the

¹ Composition of the Mixed Committee :

The Viscount ASTOR, (Chairman.)	Member of the House of Lords, Chairman of the Milk-in-Schools Advisory Committee (under the Milk Marketing Board); formerly Parliamentary Secretary to the Ministry of Food and later to the Ministry of Health.
Baron G. ACERBO, (Representing the International Institute of Agriculture.)	President of the International Institute of Agriculture; former Minister; Dean of the Economic and Commercial Faculty in Rome University.
Professor Thure BJOERKMAN,	Secretary-General of the Royal Agricultural Academy, Stockholm.
M. C. B. BRAMSNAES, (Representing the International Labour Office.)	Director of the National Bank of Denmark; former Finance Minister, Copenhagen.
M. Ramon CANTOS,	Former Deputy in the Cortes, Madrid.
M. Léon DUPRIEZ,	Secretary-General of the Belgian Economic Recovery Office; Professor of Political Economy at Louvain University; Director of the Institute of Economic Sciences at Louvain, Belgium.
Dr. L. FEIERABEND,	President of the Grain Monopoly, Prague.
M. Casimir FUDAKOWSKI,	Senator; former President of the Polish Federation of Chambers of Agriculture; Vice-President of the International Agricultural Commission; Member of the Economic Committee of the International Institute of Agriculture, Warsaw.
M. Enrique J. GAJARDO, (Representing the Child Welfare Committee.)	Head of the Permanent Bureau of Chile at the seat of the League of Nations.
M. Jules GAUTIER,	Vice-President of the International Agricultural Commission, Paris.

Continued on the next page

Technical Commission of the Health Committee, and representatives of the International Labour Office and of the International Institute of Agriculture sit on the Mixed Committee, whose title emphasises the diversity of the interests bound up in the problem of nutrition.

2. PRELIMINARY CHARACTER OF THE PRESENT REPORT.

After its first session, the Mixed Committee was able to obtain some idea of the extent and complexity of the questions into which it had to enquire.

The problem of nutrition is by no means identical in all countries. There are considerable differences between communities, both in the degree and nature of malnutrition

Continued from previous page:

M. Edo MARKOVIC,	General Manager of the Privileged Joint Stock Company for the Export of Products of the Kingdom of Yugoslavia, Belgrade.
Professor E. V. McCOLLUM,	Professor of Biochemistry, School of Hygiene and Public Health, Johns Hopkins University, Baltimore, United States of America.
Mr. F. L. McDougall,	Economic Adviser to the Australian Government, London.
Professor Dr. Ed. MELLANBY,	Secretary-General of the Medical Research Council, London.
M. G. DE MICHELIS,	Ambassador; Senator; Member of the National Research Council, etc., Rome.
Professor Edwin G. NOURSE,	Director of the Institute of Economics, Brookings Institution, Washington.
Dr. Carlos A. PARDO,	Commercial Counsellor at the Argentine Legation in Switzerland, Berne.
M. H. QUEUILLE,	Senator; former Minister of Agriculture and former Minister of Public Health, Paris.
M. VAN RIJN, (Representing the International Institute of Agriculture.)	Vice-President of the International Institute of Agriculture, Rome.
M. STEVENS,	Engineer; Inspector of Agriculture; Head of the Agricultural and Economic Information Department of the Ministry of Agriculture, The Hague.
Miss Faith WILLIAMS, (Representing the International Labour Office.)	Chief of the "Cost of Living Division", Department of Labour, Washington.

* * *

M. HALBWACHS, Professor at the Sorbonne, Paris, took the place of Miss Faith Williams at the first session, and of M. Bramsnaes at the second session.

M. Jan WSZELAKI, Economic Counsellor at the Ministry for Foreign Affairs, Warsaw, took the place of M. Fudakowski at the first session.

Mr. Warren C. WAITE, Professor at Minnesota University (United States of America), and Mr. Harold B. ROWE, of the Brookings Institution, Washington, took the place of Professor Nourse, the former at the first session and the latter at the second session.

M. de Michelis and Baron Acerbo did not attend the second session.

The representatives of the International Institute of Agriculture were assisted by :

M. AUGÉ-LARIBÉ,	representing France and the French colonies on the Permanent Committee of the Institute.
M. BRIZI,	Secretary-General of the Institute.
M. DORE,	Head of the Bureau of General Statistics.
Dr. PAVLOVSKY,	Head of the Bureau of Economic and Social Studies.

and in the extent to which the national resources would allow of improvements. In every country, therefore, there is a problem to be solved, a defect to be corrected, a task to be undertaken.

On consideration of the studies and investigations so far undertaken by the Secretariat of the League (especially the Health Section), the International Labour Office and the International Institute of Agriculture, the Mixed Committee has been forced to recognise that it is impossible to cover at the outset the vast field of work embraced by the terms of reference given to it by the Assembly.

Knowledge of the conditions and of the means of action available in Europe and in countries of Western civilisation is already sufficient to enable a practical study of nutrition to be begun at once. In the Far East, in Asia and in Africa, however, preliminary investigations need to be undertaken, and hence the enquiries instituted on behalf of the Mixed Committee have been limited so far to the countries of European and Western civilisation. Arrangements for investigations in tropical regions and Far-Eastern countries have already been started by the League Health Organisation, and the Mixed Committee desires to draw the Assembly's attention to this fact and hopes that the Governments concerned will give their full support to this work.

The Committee has accordingly decided to lay before the 1936 Assembly a preliminary report, but hopes to be in a position to submit a general report to a later Assembly.

Since it is clear that the whole nutritional question depends upon the relation of adequate nutrition to public health, the Mixed Committee decided that, in this interim report, it was essential to study this aspect of the problem as fully as circumstances permitted. It has therefore devoted a major part of this report to Nutrition and Health (see Chapter II). It has only been able to place on record its preliminary observations on the economic and agricultural aspects of the problem, but hopes to be in a position to elaborate them in its final report.

3. NUTRITION STATISTICS.

The Mixed Committee has found it necessary to give special attention to the availability of adequate statistical information,

desiring that its findings and recommendations should be based upon a firm foundation.

Accordingly, the Mixed Committee enlisted the help of the International Institute of Agriculture, and set up a Sub-Committee on Nutritional Statistics, which met at the International Institute of Agriculture in March 1936.¹

Statistical evidence is of special importance for the measurement of the adequacy or deficiency of the nutrition of different categories of persons in any country ; for estimating the trend of national consumption of different foodstuffs and changes in popular dietary habits ; for estimating the additional demand for food products which would be entailed by an improvement in the prevailing level of consumption in any country.

Unfortunately, the Sub-Committee found that nutrition statistics are very often incomplete or defective, and that this is especially true of some kinds of food, such as milk, vegetables and fruit, with the consumption of which the Committee's enquiries are most closely concerned.²

In spite of these difficulties, the Sub-Committee asked the International Institute of Agriculture :

(a) To furnish such information as exists on the consumption of cereals, sugar, meat, milk and other dairy products, poultry and eggs, fresh vegetables and fruit ;

(b) To show as far as possible the trends of production, consumption and prices of these products in those countries for which reasonably complete statistics are available ;

¹ The report of the Sub-Committee will be found at the end of Volume III.

² It is shown, for example, that, while the statistics for the production of cereals are fairly complete, it is difficult to obtain good statistics of consumption. The data on sugar production and consumption are adequate. Those on such an essential commodity as milk, on the contrary, are very imperfect, as very few countries possess regular annual returns of milk production. The total production figures are often arrived at indirectly from the number of milch cows and the estimated average yield per cow. As these yields vary greatly, the margin of error in these statistics is serious. The absence of adequate production statistics makes it impossible to obtain reliable estimates of national consumption. Statistics on butter and cheese are slightly more satisfactory than those on milk, but they are nevertheless inadequate. There are reliable statistics on poultry and eggs for only a very small number of countries. The statistics on potato production are fairly complete and accurate, but it is difficult to obtain statistics of consumption. It is very difficult to obtain statistics of the production of fresh vegetables, as such large quantities are grown in gardens. The position with regard to certain vegetables, such as onions and tomatoes, is more satisfactory in a few countries which produce large quantities. The consumption of exotic fruits can be estimated from the foreign trade figures ; only rudimentary information is available for apples, pears, etc.

(c) To obtain municipal data on the quantities of milk and fresh vegetables entering large cities and to utilise these data to supplement the information referred to under (a) and (b) ;

(d) To continue its established policy of improving agricultural statistics, giving special attention to the deficiencies in the material now available on the protective foods ¹, and to draw the attention of each Government to the particular directions in which improvement is desirable ;

(e) To collect data bearing on the financial aspects of the assistance received by the national agriculture of various countries and on the effects of such assistance on the production, imports and exports of foods ;

(f) To collect and study wholesale and retail prices, particularly of the protective foods, and to relate such price data to the trends in production and consumption in various countries.

4. THE VARIOUS VOLUMES OF THIS REPORT.

This report to the Assembly comprises four volumes :

Volume I, Interim Report of the Mixed Committee on the Problem of Nutrition (the present volume), is the report proper, embodying the suggestions made by the Mixed Committee to the Assembly and giving a general idea of the problems involved.

Volume II, Report on the Physiological Bases of Nutrition, contains a report drawn up by the Technical Commission of the Health Committee.

This Commission first met in London in November 1935. The conclusions arrived at were submitted to the first session of the Mixed Committee and formed the starting-point of its consideration of the scientific aspect of the nutrition problem (see Chapter II below). This is now presented in a revised and amplified form as a result of a meeting held by the Technical Commission in June 1935.

Volume III, Nutrition in Various Countries, gives the substance of the actual data received by the Committee, including the essential portion of the information contained

¹ See Chapter II.

in the replies of certain Governments to the Secretary-General's Circular Letter of November 30th, 1935. It also contains a survey of developments in popular dietaries in a number of countries since the war.

In addition, there will be found in this volume the report of the Sub-Committee appointed by the Mixed Committee to examine the available statistical material concerning the consumption of foodstuffs.

Volume IV, Statistics of Food Production, Consumption and Prices: A Documentation prepared by the International Institute of Agriculture, contains a valuable documentation assembled by the Institute at the request of the Mixed Committee, reviewing the available statistics of food production, consumption and prices.

* * *

Reference may also be made to the report submitted by the International Labour Office to this year's session of the International Labour Conference, entitled "Workers' Nutrition and Social Policy",¹ a brief account of which will be found in Chapter V below. This report makes an important contribution to the material now available for the study of the nutrition problem.

¹ International Labour Office : Studies and Reports, Series B (Social and Economic Conditions), No. 23 : "Workers' Nutrition and Social Policy", Geneva, 1936, 249 pages.

Chapter I.

GENERAL SURVEY OF THE NUTRITION PROBLEM.

I. IS THERE A NUTRITION PROBLEM ?

Leaving the more backward countries out of account for the time being, we have to ask at the outset of this enquiry whether there is, in fact, in the countries of Europe and those of Western civilisation in other continents a general or widespread deficiency in popular nutrition.

Evidence on this question has been received from many sources. First of all should be mentioned the authoritative statement of the Technical Commission of the Health Organisation. The members of this Commission express their agreement with the conclusions of the Burnet-Aykroyd report that " deficiencies in important nutrients are a common feature of modern diets and that these deficiencies usually occur in the protective foods (foods rich in minerals and vitamins) rather than in the energy-giving foods (proteins, fats and carbohydrates) ".

Governments' replies to the questions submitted to them by the Secretariat contain much information as to the state of nutrition in a large number of countries. This information has been amplified by statements received from members of the Mixed Committee on Nutrition, while more detailed examination of the results of special studies and scientific investigations has been made by the International Labour Office. In some countries, investigations of great importance have recently been undertaken. The volume of available information is thus, in the aggregate, considerable and comprehensive. The evidence that inadequacy of diet is widespread is conclusive. Malnutrition is manifest in the prevalence of rickets, scurvy, poor musculature, teeth of poor structure, anæmia, chronic fatigue, poor condition of the skin and subnormal growth and weight, to mention the more easily observable symptoms.

In examining the evidence, it is at once clear that the nutrition problem takes very different forms according to the

circumstances of particular countries. There is, unfortunately, in many countries a nutrition problem due to the world crisis and the diminution of normal economic and commercial activity, resulting in widespread distress.

Over large areas of both agricultural and industrial countries are to be found distressed groups of population, especially where the incidence of the depression has been most severe. This is true even in such well-to-do countries as the United Kingdom and the United States of America.

Defective nutrition among wide sections of the population is not, however, limited to countries or areas specially affected by the economic crisis, such as impoverished urban communities or depressed agricultural areas. In the light of modern knowledge, it is abundantly clear that in no country does the whole population attain the standard scientifically desirable in the interests of health. Much exact information exists as to dietary habits of different sections of the population in a number of individual countries, and on the basis of such evidence it is manifest that defective nutrition is to be found among large sections of the population even in well-to-do countries, with the inevitable consequence of the prevalence of deficiency and the unsatisfactory standard of physique of the population as a whole. The high proportion of rejections on physical grounds of recruits for the army, even in well-to-do countries, is a typical illustration of a situation which prevails widely.

In the United States of America, it was thought, until recently, that the standard of life was high, especially having regard to recent improvements in the popular dietary, more especially with regard to the consumption of milk and other protective foodstuffs. Nevertheless, recent enquiries by scientific workers have shown that a number of persons are insufficiently fed and a much larger number badly fed. Even in 1928-29, which was a period of great prosperity, most families were living on inadequate diets. Since the economic depression, the position has become worse.

In the United Kingdom, a recently published report¹ on the adequacy of diet in relation to income shows that, dividing the population into six groups according to income, the average diet of the lowest income group, representing 10% of the total population, is inadequate for perfect health in all of the constituents considered. The diet of the next

¹ "Food, Health and Income", by Sir John Boyd ORR (Macmillan).

group, representing 20% of the population, is adequate only in total proteins and total fat. The third group, containing another 20% and living at a better income level, has a diet adequate in energy value and protein and fat; but even the diet of this group is, on the average, below the standard in mineral and vitamin constituents.

It thus appears that, in the United Kingdom, the diet of at least 50% of the population falls short of the desirable standard; and it is estimated that to raise the consumption of this low-income half of the population merely to the level of the next group would require an increase of 16% in the amount of milk consumed, 15% in that of butter, 18% in eggs, 12% in meat, as well as a 25% increase of expenditure on fruit and vegetables. Even then the diet would leave room for considerable improvement.

The analysis of family budgets carried out by the International Labour Office, the results of which are published in "Workers' Nutrition and Social Policy", demonstrates the existence of similar conditions in other countries.

2. THE NEW TEACHINGS OF SCIENCE.

During the last thirty years, scientific research in the field of nutrition has led to findings of great significance. In November 1935, these findings were reviewed by a technical international Commission of physiologists convened by the Health Organisation of the League, which reached full agreement on certain principles and recommendations as to the composition of a rational diet. The conclusions arrived at, which are explained in greater detail in the chapter which follows, constitute a scientific formula for an *optimum standard of human diet*, which incorporates the results of modern research and is intended to provide an adequate supply of nutritive elements for all the physiological requirements of the human body.

It is known, for example, that there are twelve inorganic mineral elements which play an important part in human nutrition, since their absence produces definite deficiency diseases. Then there are the vitamins, substances which exist in the human body in minute quantities, but have a highly important influence on health. There are at least nine of these vitamins, and the absence of any one gives rise to a specific disease characteristic of defective nutrition.

For these reasons, special emphasis is laid by modern teaching on the great importance of certain "protective" foods—that is, foods rich in the elements necessary to prevent the incidence of the specific maladies referred to. These protective foods consist mainly of products of dairy farming and of the market garden, and include meat, milk, eggs, cheese, vegetables, fruit and potatoes. Assuming that adequate provision is made in the composition of the diet for the supply of these protective foods, energy-bearing foods, such as cereals, vegetables, fats and sugar, are recommended for supplementary use so as to make up the calorie requirements of a complete diet. Of all the protective foods, milk is regarded as of outstanding importance, since it is a food containing most or all of the materials necessary for growth and for the maintenance of life, and provides these in a form ready for immediate utilisation by the human body.¹

The ill-effects of improper feeding are of special gravity in the case of pregnant women and children. One reason for this is obvious—namely, that there is a greater need for good nutritional material during the period of growth than for the maintenance of a fully grown person. Even more important is the fact that tissues and organs of the body are often badly constructed if a proper supply of essential chemical substances, such as are present in protective foods but are deficient in energy-bearing foods, are not supplied during the period of rapid growth. Some of these defects are not only serious but irreparable, even when followed by a period of proper feeding. Individuals may, and often do, bear the stigma of defective feeding in childhood throughout life.

As the new knowledge now available becomes widely diffused and its significance to individual health and national prosperity is realised, it is certain that progressive changes in the existing dietary practices of many countries will be brought

¹ "Milk contains the energy-giving nutrients, protein, fat and carbohydrate; all the known essential vitamins; calcium, phosphorus, iron, sulphur, iodine, magnesium, potassium, sodium, chlorine and copper, some of the physiological rôles of which are known; and a number of other elements, present only in minute amounts, such as manganese, zinc and fluorine, the exact functions of which are not fully understood, but which would seem to be as necessary for normal nutrition as any of the other constituents." — See "Memorandum by the Advisory Committee on Nutrition on the Nutritive Value of Milk", issued by the Ministry of Health and the Secretary of State for Scotland, March 1936.

about through the gradual development of popular demand in the directions indicated by science as desirable. This may, indeed, lead to strengthening the demand for bread made from the less highly milled cereals and for the liberal use of potatoes, on account of their protective contents. On the other hand, less importance may be attached to the use of sugar, which contains no vitamins or mineral salts, while, indeed, its excessive consumption diminishes the appetite for more important protective foods. It must be realised that instinct and appetite alone cannot be regarded as reliable guides in the choice of food.

Much work and time will be required before these scientific principles can be fully applied. The principles themselves are not worked out in terms of dietary practice, and in many cases alternative sources exist from which to secure particular necessary elements. Practical application, therefore, must vary widely, according to the conditions which exist in different countries and communities, and the different resources in food supplies possessed by the inhabitants of different regions.

The objective must be, not to attempt to prescribe a single type of diet for all the peoples of Europe and other countries of Western civilisation, but to promote the development of agricultural production along the lines which science makes possible, having regard to differences of soil, climate, etc., with a view to providing the most efficient food supply, taking into consideration the traditional dietary habits of the people.

There are, of course, very wide contrasts in the customary diets in different parts of the world, consideration of which will serve as a reminder of the extent of man's primary dependence upon local food supplies. The extent of this variety of practice is illustrated by information summarised in Volume III of this report.

It is known, for instance, that Esquimaux can live on nothing but *meat foods*—on condition, however, that they consume all parts of the animal, the liver, the kidneys, the brain, the glands, the blood, etc., as is also the habit of beasts of prey. It is an established fact that the human body cannot subsist solely on the muscular parts which contribute most of the meat commonly consumed in temperate climates.

In Arabia, another type of limited diet is found. Here 70% of the energy requirements are supplied by *sour milk*; to this basic food, there is added from time to time a small quantity of barley, a few dates, or

the like. The Bedouins scarcely ever eat meat, yet are well able to subsist on their limited customary diet—indeed, their teeth are far better than those of Europeans, since the requisite protective elements are all provided.

Again, the populations of the hot countries of Asia, which know no cereals other than *rice*, are able to subsist on their diet by adding certain foodstuffs such as cabbage or bamboo shoots, a few figs, eggs and pork, thereby making up for the deficiency of calcium, vitamin A and protein which characterises the cereals. Such a dietary is, however, far from ideal. In these countries, the physical resources of the women are severely taxed by childbirth; the mothers' milk is of poor quality and infant mortality exceedingly high. Furthermore, such races have been observed to age rapidly and have a comparatively short average length of life.

These instances are extreme examples of possible wide divergencies of diet. They illustrate, however, the wide limits of dietary which are compatible with existence.

3. THE HEALTH OF THE CHILD—THE KERNEL OF THE PROBLEM.

Many of the most difficult problems affecting adult nutrition at the present time arise in large measure from the effects of the economic crisis in areas, whether industrial or agricultural, which are impoverished by reason of commercial dislocation and trade restrictions. Viewing the nutrition question as a whole, however, the greatest emphasis deserves to be laid on one particular aspect—namely, the nutrition of children. The national interest which attaches to securing an adequate diet for young children springs from the fact, now fully recognised, that only by adequate nutrition in the earliest years of life can the health and full development of the future citizen be assured. Pregnant women, nursing mothers, infants and young children must be considered from a nutritional standpoint as the most vulnerable portion of the population, in the sense that damage inflicted in childhood by bad food cannot be subsequently repaired.

It is definitely established that many of the ill-effects which result from deficient diet in childhood, such as rickets, bad teeth and nutritional anæmia, are avoidable by adequate provision of ordinary foods, the most important of which is milk. There is

abundance of experimental evidence to show that milk is the most valuable food known for promoting health and growth in children and in preventing characteristic ailments due to nutritional defects. Observations on the development of children receiving additional milk show the definite improvement in health and in the rate of growth which is attained if the principles of rational nutrition are observed. An abundant supply of milk is therefore an essential item in the diet of children in order to secure a sound physique and good health. There is, unhappily, no less abundant evidence that very few countries, if any, have as yet attained the standard which secures to the child population as a whole this essential basis for sound nurture.

In the light of these facts, attention should chiefly be concentrated on ensuring adequate nutrition for the young. Remedial treatment for the older age-groups, who must often be regarded as "damaged goods", must also have its place in the planning of a nutritional campaign; but it is the preventive rather than the curative aspect of the problem which should be given the first place. From a national standpoint, the cost of the investment so made in the health of the children will be more than compensated by the improved vigour and physique of the adult population.

4. EDUCATION AND POPULAR INSTRUCTION.

Ignorance of the principles and main features of the modern science of nutrition is one of the commonest causes of deficiencies in nutrition. That is abundantly proved by the information at the Committee's disposal. Ignorance is prevalent, not only among the poorer classes of the population, where it aggravates the ill consequences of lack of resources; investigations made in the wealthiest countries have revealed the fact that defective, inadequate or ill-considered nutrition exists, and that even among the wealthier classes there is ill-considered nutrition due to inadequate knowledge.

In the Committee's opinion, effective teaching and propaganda are likely to produce important and rapid results. The changes

that have taken place in recent years in the dietary habits of a number of countries bear witness to this.

The work of spreading knowledge may be conducted through many and widely different agencies and by widely different means (universities, elementary schools, secondary schools, schools of domestic science, demonstrations in various forms, publications, wireless, cinema, etc.). The means adopted in any country will have, therefore, to be carefully co-ordinated if satisfactory results are to be obtained. The central authority referred to in the introductory chapter of this report will have an important part to play in this respect.

Exchanges of ideas and experience on an international scale could do much to improve the methods of the individual countries. The Mixed Committee considers that it would be desirable to organise meetings for this purpose, perhaps with the collaboration of appropriate international institutions which possess an organisation enabling the public at large to be reached.

The methods followed will naturally vary according to the characteristics of the particular country. Nevertheless, experience shows that the progress of science can gradually be embodied in dietary habits and practices by the following means :

(a) *Doctors and Hygienists.*

Until quite recently, in most faculties of medicine, very little space was allotted to nutrition in the curriculum of the basic sciences and clinical medicine. In clinical medicine, the student learnt little more than the diagnosis and treatment of the most characteristic diseases of the digestive organs and the principal diseases of nutrition, such as diabetes and gout. Only for the nutrition of infants was an adequate place found in medical training. The teaching of preventive medicine, and hence also instruction in nutrition as a form of preventive medicine, is still in its initial stages.

The time has now come to introduce rational nutrition into curricula and examinations. This should be possible without unduly taxing the resources of either. It is to-day recognised that physiology (with biophysics and biochemistry) is the

fundamental basis of medicine, and there is a tendency to give this subject ampler treatment. More attention should be devoted than in the past to questions relating to protective and energy-bearing foods, vitamins and the modern science of nutrition, and practical applications should be found for theoretical knowledge.

Clinical instruction may include, not merely characteristic nutritional diseases, but also pre-morbid conditions and the general effects of malnutrition—in short, the nutritional aspect of preventive medicine. The student can be initiated into the technique of dietary surveys, family budgets, and the adjustment of family incomes to nutritional requirements. In nutrition, as in the other branches of curative and preventive medicine, medical practitioners must be sufficiently well trained to be effective agents of progress in the family and in the community at large.

The fundamental education of students must be such that, with additional knowledge which they can acquire in advanced courses, they can become useful advisers as medical officers to schools (elementary, secondary, and higher), public institutions (hospitals, sanatoria, the army, prisons, etc.), industrial and commercial concerns, and private associations, and can help to give instruction in household management.

A doctor wishing to specialise in nutritional hygiene should be able to obtain the advanced instruction he needs. This instruction should be partly scientific (in the form of laboratory research) and partly social (in the form of statistics and, especially, surveys of population groups).

In the sphere of social hygiene, specialised visiting nurses exist in many countries as intermediary agents between the doctor and the general public. Their rôle can easily be extended to the sphere of nutrition. The instruction given in nursing-schools should make them capable of giving practical advice on the choice of food, the way in which it should be cooked, etc.

(b) *Education of the General Public.*

This should begin in the primary school, with elementary instruction in physiology in a very simple form. The child should be taught the nutritive value of the principal foodstuffs

(milk, bread, green vegetables, fruit) ; school meals will teach him dietary habits based on reasons of health. This instruction and these habits will quickly spread from the school to the family.

Secondary schools, special schools (domestic economy, vocational schools, etc.) should take account in their curricula of this essential factor of social progress.

There is no need to enumerate the methods of reaching the general public. They are of many kinds and are well known. The public can be given pamphlets, books, propaganda articles in the Press ; it can listen to lectures and wireless talks, and can be shown posters, pictures and films. The aim should be to make recent discoveries in the science of nutrition available to everyone in a simple form ; to spread such teaching among ever wider circles and gradually to convert the results of scientific researches from current opinions into daily habits. By these various means, the housewife will be taught how to choose food and how to prepare wholesome meals which are suited to the physical needs of her family and are at the same time economical.

5. ECONOMIC CONSIDERATIONS.

The Committee proposes to deal more fully with the economic and agricultural aspects of the problem of nutrition in its final report. It has thought it desirable, however, to insert two brief chapters on these subjects in this interim report (see Chapters IV and V below), though these are not intended to do more than indicate the nature of the economic and agricultural problems that arise for study.

As has been stated above, the nutritional adequacy of the diets of various groups of population is mainly dependent upon the income of those groups. The purchasing power of every individual is a function at once of his money income and of the level of prices. A fall in retail prices might, therefore, be expected to improve nutrition. This would, indeed, be so if the reduction in retail prices was due to a reduction in the costs of distribution. But in recent years that fall has been due, to a very large extent, to the general economic depression and, in particular, to the depression in agriculture. It has been

accompanied by a still greater reduction in income of many classes of the population, and this, in turn, has led to serious malnutrition amongst certain classes.

A question which has often attracted attention and which has become accentuated by the effects of the depression is the large margin or spread which is often found to exist between the wholesale and the retail prices of given commodities. Examples of abnormal margins are not hard to find in any country, whether due to permanent or to temporary conditions. Such contrasts have become more prominent in recent years in consequence of the fall in wholesale prices due to the crisis—at a time when charges for transportation, handling and marketing, rent of retail shops and other overhead costs have remained stationary or have changed but little. The glaring contrasts in value which are often brought to notice create a popular discontent shared by producer and consumer. The aim must be to secure the better organisation of the machinery of distribution so as to ensure that the consumer enjoys the benefit of the lowest possible price consistent with the adequate remuneration of producer and distributor.

There remain a number of difficult questions as to the influence of economic policy in any country upon the level of food prices, especially where measures of a fiscal or protectionist character intended to restore and maintain agricultural prosperity are the accepted basis of national policy. Attention has been drawn to the very wide differences which exist between the cost of particular food materials and products in different countries, a fact which seems to suggest that consumption in certain communities is restricted, since they are deprived as a result of such policies of the benefits of abundant and cheap supply.

This particular aspect of the nutrition problem is an important one, and its proper understanding is essential in a study of the influences which impede nutritional progress. Clearly, every effort must be made to harmonise the policy of promoting production with the policy of safeguarding nutritional interests, for policies which limit the abundance of food supplies at low prices must in the long run react unfavourably upon producers. It should be very seriously considered whether some of the

resources at present devoted to the encouragement of production might not beneficially be directed towards stimulating increased consumption.

6. AGRICULTURE.

A widespread improvement in the nutrition of the general population cannot but affect the demand for food materials and, therefore, agricultural activity, national and international. This is a region in which much careful investigation is required before sound conclusions can be reached. Scientific progress and improvement in agriculture make it possible to bring about rapid and important developments, and new methods and new processes are available to facilitate the adaptation of agricultural technique. Changes in demand or augmented demand for particular products will have important reactions on national agriculture, particularly since the forms of food to which attention is specially directed consist of products which by their nature are especially suitable for local production. Fresh milk, fresh vegetables and fresh fruit are clearly best produced in the neighbourhood of the market where they will be consumed. It is no less significant that the characteristic structure of agriculture in densely populated countries is as a rule particularly well suited for the development of production of this character. Should this movement spread, therefore, and lead to a substantial change in agricultural structure, it may help to bring about, in some measure, the restoration of international trade in foodstuffs which can be more advantageously and economically secured by importation. This aspect of the nutrition problem has thus many encouraging features.

7. NATIONAL NUTRITION POLICY AND SOCIAL WELFARE.

The economic interests of the community as a whole are bound up in maintaining the standard of physical efficiency among the people and laying the foundations of the health and well-being of future generations. Moreover, there is a definite social and political interest in the accomplishment of this task, owing to the well-ascertained relationship between

the deficiency of food and especially of protective foods and social unrest.

The relief of destitution, sanitation and education have long been recognised as social obligations. Remedies for unemployment, whether by insurance, by direct maintenance or by the provision of work, have in more recent times become one of the leading preoccupations of Governments. At the same time, there has been a great extension of the public medical services, together with action to promote industrial welfare, better housing and the care of maternity and childhood. Progressively, stress is laid on preventive as contrasted with curative treatment for social maladies.

This vast network of national endeavour has for its underlying aim the promotion of individual well-being. More and more clearly it is seen that rational nutrition is a primary requirement. A new emphasis has thus been given to the nutrition aspect of the social problem, and the recent advances made by the science of nutrition have given a new specific direction to the campaign for social betterment.

It is now beginning to be realised that, in order to secure a proper co-ordination and direction of the public activities involved, it is necessary that the campaign for better nutrition should take its place as an integral part of national policy.

A *national nutrition policy* requires the supervision of some central authority having special responsibility for this matter, in order to utilise to the best advantage the teachings of science and to apply them in the practical field. There must be co-operation between bodies engaged in research on the one hand and authorities and organisations responsible for the administration of public assistance and for education and popular instruction on the other. There must equally be co-ordination of action in the economic field, so that measures affecting the supply of food may be brought into harmony with nutritional requirements. On this side of its work, the authority should be entitled to be consulted in matters affecting agricultural policies and the importation of foodstuffs. An effective means, for example, of bringing nutrition and national economic policy into harmony would be to empower the authorities responsible for the conduct of nutrition policy to help in an advisory capacity

whenever a Government is about to take important economic decisions affecting nutrition.

The campaign for improved nutrition launched at last year's Assembly would have an excellent prospect of achieving its object if Governments, when called upon to take important decisions affecting production and trade—both national and international—should henceforward concern themselves as much with maintaining the nutritional basis of public health as with safeguarding the legitimate interest of producers.

At its first session, in February 1936, the Mixed Committee, being convinced of the great importance of central responsibility and direction, adopted and gave publicity to the following recommendation :

“ In view of the importance of carrying on the studies and researches which can best safeguard human health by means of a better nutritional hygiene, the Mixed Committee hopes that, in as many countries as possible, suitable means will be found for centralising the documentation, information and measures for the improvement of nutrition in order to gain a better knowledge of the influence which has been and may be exercised in the different countries by the scientific results already achieved. With this end in view, wherever organisations adapted for this task do not yet exist, it is hoped that national committees or other suitable bodies will be set up under the authority of the Government, or in relation with the latter, and in liaison with the scientific institutions, in order to investigate on a national plane :

“ (i) What centres for the study of and scientific research into human nutrition are already in existence.

“ (ii) What action is proposed and what steps appear to be desirable for the development of these studies or researches.

“ (iii) What application has been made of the scientific findings already established, in particular :

“ (a) By instruction in the form of lectures, travelling exhibitions, radio, etc. ;

“ (b) By instruction in domestic economy ;

“ (c) By the education of doctors, teachers or stewards, military supply service officers, hotel-keepers, etc. ;

“ (d) By the supervision of diets in educational establishments, barracks, public relief institutions, in which a rational diet may be introduced by a decision of the public authorities ;

“ (e) By the distribution of certain foods to children ;

“ (f) By any other action taken up by the State or by occupational or other groups.

“(iv) What should be done in future to improve the nutrition of the country.

“(v) The probable consequences, and particularly the new requirements from the point of view of the food supplies of their country (reduction or increase in the consumption of certain products), of the application of a normal dietary drawn up in accordance with the Technical Commission’s conclusions.”¹

The Mixed Committee has not attempted to give definite advice as to the lines which this policy should follow in the various countries. That must necessarily depend on circumstances, administrative methods and national traditions.

Once it has been recognised that one of the collective duties of the State is to exercise general supervision over the nutrition

¹ In some countries, there is already a central authority or body responsible, in some degree, for advising upon or directing the different activities in the sphere of national nutrition. As examples and without attempting to give a complete list, the following organisations may be mentioned :

United Kingdom : Advisory Committee on Nutrition.

Bulgaria : Rational Nutrition Commission.

Denmark : Advisory Nutrition Committee.

United States

of America : Department of Agriculture : Bureau of Home Economics.
Department of Labour : Bureau of Labour Statistics and Children’s Bureau.
Department of the Treasury : Public Health Service.

Italy : National Research Council.

Mexico : Nutrition Research Institute.

Poland : Polish Health Association.

Sweden : Social Board.

Since the Mixed Committee was constituted, it has been learned that several other countries have decided to set up national nutrition committees or councils.

Australia : The Commonwealth Government has established an Advisory Committee to examine the existing diet of the various sections of the population, collect data, and report upon any defects in Australian conditions and possible remedies.

Canada : The Government of Canada has set up an Interdepartmental Committee to consider questions arising out of the League enquiry on nutrition.

Finland : The Government has appointed a Committee of Enquiry in the matter of improving the popular diet and increasing the consumption of home agricultural produce.

France : The French Government has set up a National Committee for the Study of Nutrition, consisting of four commissions—a scientific commission, a commission on education and practical application, an economic commission, a commission on the inspection and control of foodstuffs.

India : The Government is contemplating the establishment of a Nutritional Advisory Board.

Netherlands : Consideration is being given to the advisability of establishing a mixed official committee representing various public services which will deal with the related questions of nutrition, agriculture and public health.

Uruguay : A National Committee for Rational Nutrition has been created.

Yugoslavia : The Ministry of Social Policy and Public Health has established a National Committee to study the nutrition problem. This Committee consists of representatives of the authorities concerned and of private organisations.

of the people as a whole, and especially to guarantee to those groups in which the damage inflicted by malnutrition has the most serious consequences the minimum of nutrition required, an appropriate organisation is obviously needed to carry out those tasks in close co-operation with the Government of the country.

The duties of those bodies which the Mixed Committee advocates are essentially national. It is obvious, however, that their existence in a large number of countries could be extremely useful as a basis for international collaboration.

Chapter II.

NUTRITION AND HEALTH.

I. INTRODUCTION.

The progress made in medical science and hygiene in the second half of the nineteenth century led Governments to the realisation that great possibilities of improvement in national health were within the reach of mankind. The knowledge of the infective nature of many maladies indicated ways of stamping out epidemic disease. Means were discovered of making the human environment more healthy and of fortifying the body by physical training, which became increasingly popular. It was confidently hoped that the ancient ideal of *mens sana in corpore sano* would become the heritage of all human beings if the work thus begun was pursued further with devotion and enthusiasm.

But this very work has revealed the extent of the ills which it has to cure. In spite of the application of the knowledge of medicine and hygiene, the physical condition of a large part of the human race is still far below the accepted standard, and the more recent advances in medical science have established the fact that this inferiority is largely due to imperfect nutrition.

In the great war, nations which were obliged to enroll large numbers of very young soldiers were appalled at the poor quality of the recruits that were presented for service. Medical inspection of schools revealed then and still reveals a large number of sickly children below the normal standard of development for their age. The considerable decline in infant mortality in some countries only renders more impressive the persistence of high infant mortality in others. Certain epidemics display a destructive power that seems due, not solely to the virulence of the infective agent, but also to a lack of resistance in the population attacked.

At the same time, the discoveries of the last thirty years leading to the "newer knowledge of nutrition" show with ever-increasing certainty that inadequate nutrition plays an important part in infant mortality and can account for the excessive proportion of under-developed school-children and adolescents and the poor health and small output of a large number of workers. Deficiencies in diet and diseases of nutritional origin can be observed, not only among urban populations, but also among dwellers in country districts, and not only in poor or primitive countries, but also in the rich nations with an old and highly developed civilisation.

Interest having thus been awakened as to the importance of correct nutrition for the public health, investigation of the existing conditions has spread to every quarter of the globe, the results of which have created the suspicion that a large part, possibly the greater part, of humanity may be ill-fed or underfed.

2. THE PRINCIPLES OF CORRECT NUTRITION.

The diet must supply the necessary substances for the growth and repair of the organism and energy for the production of animal heat and muscular work. The organism being in some respects comparable to a heat-machine which converts fuel into calories, its energy requirements may be estimated in calories. The fuel or energy needs of the body are supplied by the fats, carbohydrates and proteins of the diet, the proteins having the additional function of building new tissue for the growing animal and of repairing tissue wastage in the adult. For these purposes, the proteins contained in animal foods are of better *quality* than those contained in foods of plant origin, the proteins of milk, eggs and glandular animal tissues (liver, kidney) being specially valuable. The diet should contain a certain proportion of foods providing "good" protein, and it is usually held that about 50% of the protein in a diet should be of animal origin.

Recent nutritional research has stressed the great importance of other essential food elements, vitamins and minerals, which are also indispensable, though required in relatively small quantities.

Vitamins.

The vitamins, of which about ten have been differentiated, have been called food hormones,¹ the conception being that, in the economy of the body, they direct the correct utilisation of the other dietary elements. A long list of diseases, including rickets, osteomalacia,² beri-beri, pellagra, dental caries, scurvy, ophthalmia, are now known to be of nutritional origin and to be caused partly or wholly by deficiency of one or more of the vitamins. The vitamins have been extensively studied in the last twenty years, some have been isolated in the pure state, while, of the nature and function of others, knowledge is still very imperfect. The principal vitamins, all of which are necessary to promote growth and maintain health, have been classified as follows :

Vitamin A (fat-soluble). — Deficiency of vitamin A is manifested by certain skin diseases and eye affections, including night blindness, and corneal ulcer leading to total blindness. Populations deprived of vitamin A have a high death rate due to infections of the lungs and intestines.

Vitamin B Complex (water-soluble). — The different constituents of this group are concerned with prevention and cure of beri-beri, pellagra and possibly also of sprue and some forms of anæmia.

Vitamin C (water-soluble). — Necessary for prevention of scurvy.

Vitamin D (fat-soluble). — Required for correct utilisation of calcium salts and phosphates in the nutrition of the growing and adult skeleton, for prevention of rickets, osteomalacia and dental disease. Vitamin D can be taken in the food (in egg-yolk or fish or liver oils) and is also synthesised in the skin by the action of certain of the sun's rays which, in temperate regions, are present only in summer, but are abundant and powerful in their action in tropical and Southern-European countries.

¹ From a Greek word meaning "messenger". Hormones are thus chemical messengers.

² Osteomalacia is a disease in which the bones of adults become largely composed of osteoid tissue which contains very little calcium and is therefore soft. Great deformity of these bones may result.

The nutritional diseases mentioned above are, except in the case of rickets, the outcome of long-continued severe deprivation of the vitamins in question. It is perhaps even more important to emphasise, however, that a less severe deprivation in time or extent or a partially inadequate intake of these essentials may involve ill-defined and disabling departures from health of which the causes may remain undiagnosed.

Minerals.

Recent researches have revealed the great importance of an adequate amount, and a correct balance, of essential minerals in the diet. Of these, calcium, phosphorus, iron and iodine have a special interest. Since a large proportion of the human body is composed of calcium phosphate, forming the skeleton and teeth, the need for ample supplies of calcium and phosphorus is self-evident. A smaller but necessary supply of iron is required for nutrition of blood elements and prevention of anæmia, and a minute provision of iodine is also necessary for the prevention of simple goitre or increase in size of the thyroid gland.

3. "ENERGY-BEARING" AND "PROTECTIVE" FOODS.

A useful division of foods into two classes has been made—(1) the protective foods, those chiefly valuable for providing minerals, vitamins and "good" protein, and (2) the non-protective foods, chiefly valuable as energy-providers. Lack of calories causes starvation, lack of protective foods causes various "deficiency" diseases which may develop in spite of an abundant calorie intake.

The table given opposite contains a rough classification of some of the commoner types of foods into these two classes and shows their relative value as vehicles of energy, good protein, minerals and the more important vitamins.

Among the most important protective foods are the dairy products, especially milk. Then the glandular animal tissues (*e.g.*, liver) and eggs; "fat" fish, green vegetables and fresh fruit are also very rich in vitamins and minerals. Finally, there are certain fats (butter and cod-liver oil) of special value

NUTRITIVE VALUE OF FOODS.

Food	" Good " protein	Minerals	Vitamins					
			A	B	C	D		
Milk	++	+++	+	+	+	∅	+	∅
Cheese	++	++	+	+	—	—	—	—
E Eggs.	++	++	+	++	—	—	++	++
E Liver	++	++	+	++	—	—	+	+
E Fat fish (herrings, etc.)	+		+	+	—	—	++	++
Green vegetables, salads	+	+++	+	+	++	—	—	—
Raw fruit, fruit juices		+++	+	*	+	++	—	—
E Butter	—	—	+	—	—	—	+	∅
Cod-liver oil	—	—	+++	—	—	—	+++	+++
Yeast	+	+	—	++	—	—	—	—
Meat (muscle)	+	⊥	—	+	⊥	—	—	—
Root vegetables, tubers			+	*	+	+	—	—
Legumes (dry peas, lentils)			—	+	—	—	—	—
E Cereals, bread (whole-meal)	+	⊥	⊥	+	—	—	—	—
E Cereals, bread (white)			—	—	—	—	—	—
E Cereals, rice (polished)			—	—	—	—	—	—
E Nuts	⊥		—	++	—	—	—	—
E Sugar, jam, honey.			—	—	—	—	—	—
E Margarine, olive oil and other vegetable oils			—	—	—	—	—	—

Highly protective foods

Less protective and non-protective foods

E = foods of high energy or caloric value.
 +++ signifies very rich.
 ++ signifies rich.
 + signifies present.
 ⊥ signifies present in small amount or traces.
 — signifies absent.
 ∅ signifies in summer, when the cows are on pasture.
 * signifies if yellow in colour.

for providing vitamins A and D. Vitamin D, which is sparsely distributed in ordinary foodstuffs, is a vital necessity for young children living in temperate climates or in industrial regions where sunlight is scarce, especially in winter.

Among the prominent energy-giving foods are the fats, the cereals and sugar. The ordinary mixed diet should form a collection of protective and non-protective foods supplying the requisite energy for the body's activity and containing all the necessary protective elements in a correct balance. An unlimited number of different diets could be composed, all of which would satisfy this nutritional ideal. According to the variation in the food supply in different climates and under different circumstances, so the problems of correct nutrition will in practice be met by a large variety of different food combinations. The *principles* of correct nutrition, however, remain the same.

4. SPECIAL DIETARY NEEDS OF DIFFERENT CLASSES AND AGE-GROUPS.

Study of the incidence of nutritional disease has demonstrated the general principle that, where a specific dietary deficiency exists, evidence of its effects will be first apparent in those individuals who are subjected to special physical strain.

If the protective elements are adequate in a diet, the needs for support of extra manual work can easily be met by additional non-protective foods, such as fats and carbohydrates, from which the additional energy can be obtained. Where the supply of protective elements is inadequate, physical strain will often make the defect manifest. Thus, in the history of arctic exploration, where the diet lacked the antiscorbutic elements, men performing hard manual work have frequently been the first to sicken of scurvy. In the East and West Indies, where the diet consists too exclusively of polished rice and is lacking in B vitamins, beri-beri frequently attacks expectant and nursing mothers as well as gangs of coolies performing heavy work. Where the diet is deficient in calcium salts and phosphates (as, for example, in Northern China and North-West India), it is chiefly the child-bearing women who suffer from osteomalacia, although the men are also affected if the

deficiency is very severe. Special need for protective food arises in cases of expectant and nursing mothers, who have to perform extra nutritive functions in addition to nourishing their own bodies. Growing children also require an abundance to provide nourishment for their growing tissues and the younger the child the greater the need for the protective foods. In these cases, there is special need for an adequate mineral and vitamin supply and for "good" protein. The results of deficiency may remain latent for some length of time in a manner analogous to the incubation period of an infective disease of low virulence, such as tuberculosis. Malnutrition, especially in children, affects, not only the physical health, but the mental development. It is a great evil at all ages, but there are specially sensitive periods when the organism is growing; such are found in uterine life, in early childhood and in adolescence, when the ill-effects of faulty nutrition are much more serious and may even be irreparable.

(a) *Expectant and Nursing Mothers.*

There is good reason to believe that a large amount of sickness and disability associated with child-bearing, and the high mortality rates of pregnant women, could be substantially reduced by improved feeding of these women. During pregnancy and lactation, the mother has not only to be supplied with all the nutritional factors necessary for her own health, but has also to sustain the extra burden of having to provide many essential chemical substances for the development of the growing embryo and foetus. It is undoubted that many modern diets are deficient in certain chemical substances and bring about much ill-health to the mother as well as defective development and diminished resistance of the foetus and infant. One of the commonest defects in modern civilised diets is a faulty mineral supply leading to disordered calcium metabolism, so that the mother has to sacrifice the calcium salts of her own bones for the developing offspring. This deficiency may be so great as to result in osteomalacia, but, whereas this is rare in European countries, smaller defects in calcium metabolism are undoubtedly common. This is evident in the increased tendency to dental caries in women at these times. Other distressing complaints

during pregnancy, which are apparently related to the defective calcium nutrition, include muscle soreness and weakness, and the consequent inability to perform ordinary daily activities, which is generally not relieved by rest during the day or on retiring at night; also, the inability to sit or lie long in one position, a condition often associated with intervals of more definite muscle spasm and contractions which may be quite severe. In an investigation made in America on 576 cases of pregnancy,¹ 316 complained of symptoms of this nature. In almost all these cases, relief followed the administration of additional calcium and vitamin D. It must be remembered that, between the twenty-eighth week of pregnancy and full term, the maternal organism has to supply to the fœtus as much as 25 grammes of calcium and 15 grammes of phosphorus, amounts which ought to be provided by a sufficient intake of milk and other protective foods in her diet. Similarly, a nursing mother also provides as much as 0.4 gramme of calcium daily to her infant, which, over a period of months, causes a large drain on her own supplies unless she is receiving an abundant amount in her food. In a Norwegian investigation, eleven women out of sixteen were found in a condition of negative calcium balance towards the end of pregnancy—that is to say, these women were losing more calcium from their body than was provided in their food, and this negative balance could only be made positive by increasing the daily calcium intake to 1.6 gramme by providing them with about two pints of milk a day. Other sources of vitamin D, such as cod-liver oil or egg-yolk, also had a powerful effect in improving this condition.

Another substance which is likely to be deficient in the diet of pregnant women is iron, of which the maternal organism has to supply a relatively large quantity to the fœtus. A large proportion of women of child-bearing age suffer from simple anæmia, and this condition is exaggerated by pregnancy and lactation. Thus, in an investigation made at a hospital in London, rather more than 50% of nursing mothers had a hæmoglobin content of the blood of less than 80%. This common deficiency can be repaired either by giving iron salts in pregnancy or,

¹ *Am. J. Obstet. & Gynecol.*

better still, by giving foodstuffs rich in iron, such as meat, egg-yolk and vegetables.

It is well known, also, that a deficiency of iodine in the diet of pregnant women may be of great significance. It is true that only small quantities of iodine are necessary to supply the demands of the offspring at this time, but this minimum is essential to prevent cretinism and goitre, and ordinary foodstuffs are so deficient in iodine that it is sometimes impossible to ensure even this small amount. In some countries in Central Europe, this difficulty is overcome by giving iodised salt in food—that is to say, sodium chloride containing 1 part of sodium iodide in 200,000 parts of sodium chloride. As regards natural foodstuffs, sea fish is the only rich source of iodine and, where procurable, this ought to be included in the diet of all pregnant women once or twice a week. Otherwise, it is essential to add iodised salt to the food.

There is evidence that vitamins are commonly deficient in the diet of pregnant women. The commonest deficiency is probably that of vitamin D ; vitamins A and C are also ingested in deficient amount in many instances. These dietetic defects, except in the case of vitamin D, can be readily overcome by including such protective foods as milk, eggs, green and other vegetables and fruit in the diet. Where there is lack of sunshine, vitamin D can be provided in abundance in the form of cod-liver oil or of some preparation of the vitamin itself.

Although it is true that our knowledge of feeding in pregnancy and lactation is elementary, it can be said with some assurance that, in regard to the health of both mother and offspring, an increase in the protective foodstuffs would have a large effect in eliminating many of the ills of pregnancy.

(b) *Infants.*

The importance of breast-feeding. — Complete breast-feeding of infants is of very great importance. It is cheaper, simpler and cleaner than artificial feeding and, in the case of a properly fed mother, the benefits brought to the infant are great. Impressive evidence on this point was supplied by a large-scale enquiry reported from the Infant Welfare Centre of Chicago,

in which 20,061 infants attending the centre between the years 1924-1929 were closely followed up for the first nine months of each infant life. Of these, 48.5% were wholly breast-fed, 43% partially breast-fed, and 8.5% wholly artificially fed. The artificial feeding was carried out on a definite plan, and all the infants—artificially fed and otherwise—were attended at intervals by the officials of the centre. The mortality rates of these different groups of infants were as follows :

	Number of infants	Total deaths	Percentage of deaths of infants
Wholly breast-fed	9,749	15	0.15
Partially	8,605	59	0.7
Artificially fed	1,707	144	8.4

It will be seen that the mortality rate among the artificially fed infants is fifty-six times greater than that among those completely breast-fed. The difference in the death-rate between these classes of infants was largely due to deaths following respiratory infections and, to a less degree, gastrointestinal and other infections. Thus, whereas only four out of 9,749 of the breast-fed infants died of respiratory infections, eighty-two out of the 1,707 artificially fed infants died from this cause.

No clearer evidence could be obtained to enforce the advantages of breast-feeding as compared with artificial feeding. Similar impressive evidence on the value of breast-feeding was afforded by the enquiry of the League of Nations into the causes of infant mortality in six European countries and four South-American countries, which also demonstrated the part played by bad feeding in infant mortality. Where this mortality was low, the digestive troubles usually caused by defective feeding were rare ; where it was high, digestive troubles were very prevalent—they were the outstanding cause of death, and it is by reducing them that mortality can be reduced. Conversely, where breast-feeding was general, the “ nutritional peril ” was usually small ; where artificial feeding predominated, it was great. But, although the superiority of breast-feeding over artificial feeding with cow’s milk has been demonstrated,

breast-fed infants may yet be improperly nourished if, in addition to their mother's milk, they are given other untimely or unwholesome food, or do not receive the necessary vitamins in the form of supplementary foods.

The increased frequency of respiratory, gastro-intestinal and other infections in artificially fed infants and the resulting greater mortality can be ascribed to two causes. One is the " food peril " itself, which may be due to the infected milk of an artificial diet or to the irritating and indigestible nature of other constituents, and the other is the diminished degree of resistance to infection produced in infants fed on artificial diets as compared with those receiving mothers' milk.

Common nutritional defects of infants. — The necessity for proper feeding of the nursing mother in order to allow the maintenance of her own health, to ensure the presence in her milk of a good supply of all the essentials for the infant's health and development, and even for the continuation of an abundant milk secretion, has been mentioned above. In breast-feeding under good conditions, the need for giving supplementary dietetic substances to the infant is diminished. In most cases, however, it is advisable to include cod-liver oil to supply additional vitamins A and D and iodine, and some form of vitamin C, such as orange juice.

Infants at birth have an abundant supply of iron stored in their livers and, in the period of milk-feeding, these stores are gradually used up so that the hæmoglobin in the blood is reduced from 100% at birth to about 70% at the age of three months. This can be regarded as a physiological type of anæmia, as it occurs in practically all infants, both breast and artificially fed, although the fall is more severe and the recovery during subsequent months less in artificially fed than in breast-fed infants. The administration of iron to these infants will raise the hæmoglobin level to 77% and upwards in the period from 5 to 12 months of age. In untreated infants, the hæmoglobin will generally drop from 70% at 5 or 6 months of age to 65% at 12 months of age. It has also been shown that the infants with low hæmoglobin in their blood have a much higher sickness rate due to infections than those receiving iron. The need for including iron-containing foods, such as egg-yolk or

some form of iron itself, into the diet of infants over 6 months seems evident.

Even in the case of breast-fed infants, it may be desirable to give dietary supplements, but the need varies according to the climate. Thus, infants born in the tropics and exposed to much sunshine may need no extra vitamin D. Where infants are not so exposed it is of great importance that the diet should have a high calcifying value from birth onwards to ensure perfect calcification of the developing teeth and the proper growth of the jaws, preventing subsequent irregularities of the teeth. Such a diet will also prevent rickets and osteoporosis¹ and ensure the formation and growth of good bones.

In the case of the artificially fed infant, the inclusion of vitamin D and other specific protective substances is of much greater importance. Such infants ought always to be given cod-liver oil, orange juice, or some other product rich in vitamin C, also egg-yolk, because the common illnesses of infants, such as rickets, defective formation of teeth and anæmia, are much more frequently found in artificially fed than in breast-fed children, while gastric and respiratory infections in the former are much more likely to be severe and even fatal.

There is a common practice nowadays of including cereal and cereal products in the diet of young infants. The immediate effect of giving such foodstuffs is often apparently beneficial, as indicated by the increase in weight. The modern teaching of nutrition, however, is against giving cereals before 8 months or so, and even then only small amounts should be given. Many cereal products are very poor in vitamins and available mineral elements and their inclusion in the diet limits the intake of milk and other protective foods. There is also evidence that they actually are harmful in the sense that they increase the demand for vitamins A and D and calcium and that their own calcium and phosphorus content are not available for the formation of bone in the growing organism under some circumstances. Thus a rapidly growing infant nourished with cereals is more liable to suffer from defects of calcification of the bones and teeth than one on a diet of milk

¹ Osteoporosis is a condition of the bones in which the substance which gives them hardness—*i.e.*, calcium phosphate—diminishes. Such bones easily fracture.

and other protective foods only. It is probable also that the consumption of cereals by these young infants diminishes their resistance to broncho-pneumonia, intestinal and other infections.

The enquiry made by the League of Nations into the causes of infant mortality referred to above made it clear that the pernicious combination of poverty and ignorance was largely responsible for the malnutrition of infancy, as, indeed, for that seen in other stages of human life.

(c) *Early Childhood, Pre-school Age, Nursery-school Age.*

As a rule, maternal and infant welfare institutions do not yet follow the child beyond the end of its second year, and there is consequently a gap in the health supervision between infancy and school age. Yet that is the time when malformations of the bones, dental defects and abnormalities of the pharynx appear. They will be discovered by the school medical officer, but it will then be too late to prevent and, in some cases, to remedy them. It is desirable to prevent these causes of chronic ill-health as far as possible by procuring improved feeding of children in these early years, both by extending the application of social services and infant welfare institutions forwards, or of the school medical services backwards to this age, and by increasing the knowledge and means of poor parents for better feeding of their offspring.

By the time children enter school, at the age of 5, large numbers show some form of physical defect and, although there is no proof that all of these defects could have been avoided by improved feeding, there is good evidence that many would not have developed under such conditions. In a recent enquiry (1931) in London schools, it was revealed that, among children of 5 years of age, there were from 67% to 88% of cases of abnormalities of the bones, 67% to 82% (according to the gravity of the symptoms) of cases of adenoids, enlarged and septic tonsils, and other disorders of the pharynx, 88% to 93% having badly formed or decayed teeth. There is evidence that the defective bone formation and much of the dental decay among

these children would have been avoided by the inclusion in their diet of large quantities of the protective foods, such as dairy products, and therefore less reliance upon bread and other cereals. How serious and widespread may be the defects in the feeding of children at this age can be seen in the following example : in 1921, in a city in the United States, out of 6,015 children of pre-school age, 90% were found to be receiving an inadequate diet according to current standards, 57% never received any fresh milk, 16% no milk of any kind, 59.5% no eggs, 60% practically no fruit, 50% no vegetable other than potatoes. As an aggravating circumstance, these dietary deficiencies were accompanied by a lack of proper rest or sleep. Is it any wonder that so many of the children beginning school life show physical defects and mental inactivity ?

It is just at this age that there is great need to maintain the resistance of children at the highest possible level against the ravages of the infectious diseases to which they will be exposed, such as measles and scarlet fever, and especially their sequelæ, broncho-pneumonia, middle-ear disease and nephritis. These diseases, if they do not kill, often leave the child with some chronic disorder which disables it for life. It is, for instance, at this age that deafness often has its starting-point owing to infection of the ear following measles and scarlet fever. Below the age of 3 years, measles is a particularly deadly disease, and there is suggestive but not conclusive evidence that the high mortality rate at this and older ages could be reduced by better nutrition of such children.

(d) *School Age.*

In the early years of school life, many of the children are already "damaged goods". They frequently show evidence of previous defective feeding and lack of care in deformity of the bones of the limbs, chest and head, in bad dental structure often associated with decay, in deafness to a greater or less degree, in running ears, septic tonsils and adenoids, and in simple goitres. These indications of disease are not generally, however, from the present medical point of view, regarded as evidence of

malnutrition and, indeed, there is no definite proof that some of them—*e.g.*, running ears, enlarged and septic tonsils—would have been prevented by proper feeding from early life, although this is probable.

Malnutrition is usually diagnosed in school-children on the basis of subnormal growth and weight and general sickly appearance of the child. Nothing is more important than that a new attitude should be adopted towards this problem, for whereas such results of improper feeding as subnormal growth and weight and undefined general ill-health can usually be rapidly improved by better feeding conditions, the more chronic conditions due to earlier defective dieting cannot be so easily remedied, but continue to act as a handicap throughout life. The system of medical inspection of children that is now generally established under State control in different countries must be sadly handicapped so long as it has to deal with many children who come under its control from the beginning in a pathological state. Prevention rather than treatment of disease must be more and more emphatically stressed and, so far as this can be procured by better feeding, this ought to be done.

Even, however, on the present basis of diagnosis, there is abundant evidence of malnutrition in school-children. From 20 to 30% of school-children were found to be under-nourished in the poor quarters of Paris; in some cases, the only meal the children had during the day was that provided by the school canteen. Such cases are reported as frequent in Yugoslavia. In Poland, according to a recent estimate, 25% of school-children are ill-nourished in certain regions, 7% are threatened with tuberculosis, while additional meals should be given to at least 50% (according to documents received by the Mixed Committee). In the United States, 7½ million school-children were under-nourished in 1933, according to a statement by the Secretary of Agriculture.

In 1917, according to specialists in rickets, nearly all the children of the negro population of New York were suffering from this disease; 83% in Connecticut in 1923; 43.4% in the villages in the north of Norway in 1931; 33 to 67% in two northern counties of Sweden. Rickets is still an important

social disease in England, although the discovery of its ætiology and means of prevention is gradually causing its reduction. As regards dental caries, the enquiries carried out in various European countries have shown it to be present in from 50 to 95% of the children examined. In a recent enquiry undertaken in Norway, only 160 out of 25,000 school-children examined possessed perfect sets of teeth. According to the English report mentioned above, out of 3,303,983 children examined in 1933, 2,263,135 needed dental treatment.

It is true that all these observations have not been based on uniform tests and that the state of ill-health of children likewise depends on other causes : sequelæ of previous infectious diseases, faulty hygiene in the home and inadequate amount of sleep and exercise in the open air.

So far as greater height and weight, muscular strength, general vitality and more vigorous activity are concerned, there is definite proof that much can be done by improved feeding of school-children. The evidence is of two kinds : first, derived from observations in which diets of school-children in boarding-schools have been constant over a period of years and then changed over a further period of years ; and, secondly, from experiments in which milk or some other supplement has been added to the dietary over a period of months, and the effect of this change on the children noted. An example of the first of the experiments is seen in one English Public School, where the diet was closely controlled over the years 1913 to 1933. Between the periods 1919-20 and 1928-29, there was a substantial increase in milk consumption, butter was substituted for vegetable margarine and there was a decreased consumption of bread. Associated with these changes in the diet, the average height of boys of 11 years of age increased from 4ft. 6.65in. to 4ft. 7.33in. and that of boys of 15 years of age increased from 5ft. 2.89in. to 5ft. 3.97in. There was a correspondingly large increase in weight of these children during the period of improved feeding. Curiously, two other improvements in general condition, probably due to increased milk consumption, were observed which are of great significance — namely, (a) a great decrease in fractures of bones in accidents, and (b) a decrease in rheumatism and rheumatic conditions.

The effect of adding milk and other supplements to the diet for a period of one year was, according to an English writer, equally dramatic in its action. A pint of milk added daily to what was considered a good diet in an institutional boarding-school caused in boys of 6 to 11 years old an increase of 2.63 inches in height and of 6.98 lb. in weight as compared with increases of only 1.84 inches and 3.85 lb. by similar boys who did not receive the supplement of milk. It was also remarked that there was much less illness among the extra-milk children, especially naso-pharyngeal catarrh, a reduced tendency to chilblains, a better condition of the skin, while the children were more high-spirited and irrepressible, which may or may not be regarded as a good change, but at least indicates that their nervous system had shared with the rest of the body in the stimulating effect of the milk. Burnet and Aykroyd have given accounts of other similar experiments on adding milk to the diet of school-children, and it may be taken as completely proved that the addition of milk to the diet of school-children would greatly increase their average height, weight, strength, vitality and general health.

Since school-children do not develop rickets or bone deformities, but only carry the stigma of earlier attacks of this disease, it is often assumed that they do not require so much milk to supply calcium as in earlier years. There is an element of truth in this idea, but only an element. The bones and teeth of school-children are growing and calcifying rapidly, and defective calcification of bones makes itself obvious by the ease with which they break. The frequency of bone fracture is a great social problem in some countries, especially in industrial countries, and deserves more attention than it receives, and there is little doubt that this trouble would be greatly reduced by the consumption of larger quantities of milk and other protective foods.

Another important problem of child health is the tendency, during the school age, to contract acute rheumatism with its tragic associates, chorea, heart disease (rheumatic endocarditis), one of the commonest causes of chronic disability, ill-health and early death in some countries. If the greater consumption of protective foods can reduce these distressing conditions—

and there is some suggestive evidence that it can do so—a great blessing would be conferred on mankind.

Compulsory education has been generally adopted throughout the civilised world. It is agreed that large numbers of school-children are not mentally or physically capable of profiting by this universally accepted recognition of the social obligation to educate the mind of every individual. Might it not be as well to make such children more physically and mentally fitted to benefit fully from these educational facilities by assuring that their nutritional needs are fully satisfied ?

(e) *Adolescence.*

The state of nutrition among adolescents is much less accurately known than among school-children. All authorities on the subject are, however, agreed that, under normal conditions of life, this is one of the most crucial periods. The rapid rate of growth of the adolescent makes abundant and efficient nutrition particularly important and yet this is a period when the State ceases to show a maternal interest in his physical well-being. There is evidence that, even in the case of boys and girls entering good employment at the age of 14 or 15 with reasonably good physique, they suffer much deterioration by the age of 18, a condition which is largely due to insufficient and unsuitable food eaten during this period.

This is the age when the most serious cases of pulmonary tuberculosis occur. Every tuberculosis specialist is convinced that the appearance of tuberculosis before the twentieth year is due to two main causes : overwork and malnutrition.

Although the general incidence of tuberculosis has been decreasing in many countries gradually during the past 100 years, and especially during the past thirty years, it is a distressing fact that this rate of reduction does not occur to the same extent in the case of adolescent and young adult people. Indeed, in young women there has been an increase in tuberculosis during recent years in some countries. This state of affairs has been ascribed by some to the modern habit of "slimming", by others to the greater expenditure dictated by

modern habits of life on clothes, which leaves too little money for the purchase of proper food. Whatever may be the real explanation, it is undoubted that many adolescents in all countries, but particularly in industrial countries, are being improperly nourished at the present time and are suffering in consequence. Efforts of an educative nature ought to be taken to make adolescent boys and girls realise that the best health and the fullest physical and mental development is only possible if their dietary contains an abundance of the protective foodstuffs.

(f) *Young Soldiers.*

Military service claims young men at the end of adolescence, before they are fully mature. The rejection as unfit of a proportion of the men called up is not evidence that malnutrition is the only cause of their rejection, but military doctors do, in fact, assert, on their knowledge of the facts, that malnutrition is one of the main causes. In Belgium, as a result of the examination of 49,000 recruits in 1931, it was found that physical fitness had declined as compared with pre-war statistics, and among the causes (increase in school work, unemployment, excessive championship-hunting in sports), the defective feeding of children during the war and the increase in the incidence of diseases of the digestive tract are ranked first. In Denmark, a third of the recruits present a combination of symptoms known as "Danish disease" (flat feet, varicose veins, pains in the extremities and cramp in the calf of the leg). In Finland, notwithstanding the very high level of athletic attainments, 21% of recruits are rejected, and doctors attribute this to general malnutrition among the poorer classes. In Poland, where there is a mass of evidence to show the vast extent of malnutrition, the proportion of recruits rejected amounts to 50%. It is a pity that the examination of recruits is not made more use of as a means of enquiry into malnutrition. How can we help being alarmed when we learn that, in the army of a large European nation, the proportion of men rejected for physical unfitness has risen, between 1923 and 1932, from 45.25 to 67.78 per thousand ?

(g) *Adults.*

Every fresh enquiry, in town or country, reveals either patent or latent malnutrition.¹

The recent history of the high incidence of malnutrition among adults seems to be identified with that of unemployment. If unemployment has not augmented the evil of malnutrition to the extent that might have been expected, it is because malnutrition has been held in check by the development of Public Health Services. The effect of unemployment relief is reflected in an improvement in the diet of the unemployed. On the one hand, expenditure of energy and food requirements were diminished, and, on the other, when large-scale social organisations take care of the unemployed, the latter's diet, though less abundant, is often more rational.

It would be a mistake to believe that, generally speaking, unemployment produces no harmful effects. Its effects are to be sought, not so much among the adult unemployed as among their growing children. For more than two years now, in the United States of America, the Children's Bureau has been collecting information of different kinds from various sources which proves that the depression is having an increasingly bad effect on the nutrition and health of children. Thus, according to the New York City records, the percentage of school-children in a bad state of nutrition rose between 1929 and 1932 from 16 to 29 in Manhattan and from 13 to 23 in the Bronx. At Philadelphia, among young children under 6 years of age examined at the "Community Health Center", the figure rose from 11 (1928-1930) to 24 (in 1932).

The ravages caused by rickets, the most serious deficiency disease in countries of the temperate zone, have been described above in the section on children. It is in adult women, however,

¹ In the United States of America, according to a recent communication from the Cost-of-living Division in the Ministry of Labor, of 209 families examined in the North-Atlantic States, 14% were found to be under-nourished "from every point of view". In Yugoslavia, the so-called "passive" regions, which produce neither wheat nor other vegetable foodstuffs, are suffering to a great extent from malnutrition owing to the exiguity of their purchasing power. Among certain classes of workers, wages are not sufficient to provide an adequate dietary, particularly when there are not enough wage-earning members of the family. In certain districts in Northern Sweden, where agricultural production is scanty and foodstuffs are scarce, a deficiency of vitamins has been observed. Cases of anaemia and scurvy are not infrequent.

that one of the most serious disabilities of rickets becomes manifest, although the cause of the trouble has really started in the young and adolescent stages of life. The condition referred to is contracted or rickety pelvis, a defect frequently found in women in industrial centres. The small size and deformed shape of the pelvis in such women prevents the easy birth of the infant. A greater call on surgical interference is therefore made in child-birth under such circumstances, and this not only means greater distress to the mother, but also an increase in the liability of these women to puerperal fever, one of the commonest causes of death after child-birth. This is one of the best examples that can be given of the importance of prevention when dealing with a common and widespread disorder. The problem of the large number of deaths associated with child-birth is rousing much interest in some countries. Surely an essential point in any attempt to diminish this serious state of affairs is first to ensure fully developed and perfectly formed pelvis bones in child-bearing women by proper feeding of female children and adolescents. If this were attained, surgical help in child-birth would be much less needed and there would undoubtedly be a diminution in maternal mortality.

Another deficiency disease, pellagra, still plays havoc in temperate countries and causes 3,000 deaths a year in Roumania and 4,000 in the United States of America. If complete data were available, deficiency diseases, whether patent or latent, and their sequelæ, would probably be found to occupy a far more important place in the annals of malnutrition than at present appears. Certain diseases which were thought to have been stamped out or to have become very rare are again making their appearance. In connection with the privations caused by the war, Danish doctors noted a sort of recrudescence of diseases of the eye caused by nutritional deficiencies, including a deficiency in vitamin A : thickening and opacification of the cornea, and weak vision, particularly at dawn and dusk. These symptoms would be detected more frequently if they were looked for more often.

There is considerable evidence of the influence of defective feeding on the tuberculosis death rate. The figures must be treated with caution, because in most cases other physical and



mental causes are present, such as overcrowding, slums, overwork and worry. But no doctor who has had any experience of tuberculosis will deny the influence of diet upon the outset, progress and also the prevention and cure of this disease. Moreover, there have been, in the recent history of Europe, during and after the war, certain sad exceptional periods distinguished—unenviably—by food restrictions with which have coincided a very marked recrudescence of tuberculosis mortality: in the United Kingdom as from 1915, in the Netherlands as from 1916 and in French Flanders during the enemy occupation; in Germany, during the war and during the inflation period of 1922-23. A few months after the cessation of the restrictions or blockade, the death rate fell to its pre-war figure. Generally speaking, it had been higher in the towns than in the country, because the country population could grow their own food and thus were not affected by some of the restrictions. In Denmark, the tuberculosis death rate, which had been steadily falling before the war, increased a little during the war as a result of food restrictions, although at that time there was no housing shortage. Subsequently, after the war, the tuberculosis death rate resumed its downward trend in spite of a prolonged housing shortage; circumstances had dissociated two of the causes of tuberculosis mortality—housing and nutrition—and had demonstrated the outstanding importance of the latter.

Tuberculosis in industrial centres, although diminishing in incidence, is still one of the great killing diseases. It must also be remembered that, although this disease is being gradually reduced, the rate of reduction is much smaller in adults than it is in children. In fact, in dealing with adolescents, it was pointed out above that the incidence of tuberculosis in young women (15-25) and to a less extent in young men has actually increased in some years during the past decade. Apart, however, from adolescence, the death rate due to tuberculosis in the adult is still very high, and it may be hoped that a wider adoption of the teachings of the present report by adults will bring about a substantial decrease in incidence, together with a corresponding fall in the death rate. Bronchitis, like tuberculosis, is a more deadly disease among poor people than among the well-to-do, in contrast to the greater frequency with which diabetes mellitus

and appendicitis occurs among those with more money to spend. The position as regards the question of some relationship between bronchitis in the adult and malnourishment is similar to that of tuberculosis—that is to say, there is only suggestive, but not established, evidence of a direct correlation. Here again, therefore, it is possible that an increase in the consumption of protective foods, especially by poor people, would reduce the incidence and death rate due to this disease.

Though further enquiries will be necessary to establish the influence of certain given foodstuffs on human susceptibility or resistance to infection, there can be no doubt as to the general value of a proper diet in increasing resistance to disease.

5. THE MODERN SCIENCE OF NUTRITION AND THE LONDON REPORT. ¹

The New Science of Nutrition.

In determining human dietary standards, physiologists in the past have generally devoted their attention to minimum requirements. Such was the usual standpoint of Governments and administrations when called upon to fix the rations for bodies of workers, or to feed large masses of soldiers and civilians in war, or when obliged to assist the unemployed and their families during the time of industrial depression.

The idea of an *optimum* diet, on the other hand, has been developed and brought into pre-eminence by modern science. An optimum diet is one which provides for the full development of the individual for efficiency without exhaustion and for his resistance to disease.

The standard for adequate nutrition, like the standard for hygiene in general, cannot be limited to that required for the prevention of avoidable diseases by means of a minimum or barely adequate diet; the business of adequate nutrition is to create health by means of the optimum diet.

Many of the well-recognised vitamin-deficiency diseases—such as scurvy, rickets, beri-beri, pellagra—are caused by severe,

¹ The London Report on "The Physiological Bases of Nutrition" by the Technical Commission of the Health Committee in November 1935. It has since been revised and amplified and in this form is reproduced as Volume II of the present report (see Introduction).

prolonged deficiency of one or other of the essential protective vitamins. Except for rickets, they are, fortunately, of relatively rare occurrence in temperate regions, and their full manifestation can usually be prevented by a minimal intake of the appropriate preventive factors. Much more common are the latent states of malnutrition, which may give rise to no visible disease—states which might be called pre-rickets and pre-osteoporosis, pre-pellagra, pre-beri-beri, pre-caries or the formation of teeth of imperfect architecture. The opportunity that lies before the science of preventive nutritional medicine rests upon the knowledge that these states exist and upon the proof of the necessity for striving after *optimum* nutrition rather than *minimum* nutrition.

In this connection, it has been observed that nutritional research will exercise a greater influence in preventive medicine by increasing the vitality of the human species, with all that that implies, than by preventing the frank "deficiency diseases". The importance of this fact has not yet been fully recognised. The health of the individual, in the majority of cases, is destroyed, not so often by severe attacks of illness (which are more in the nature of accidents), as by the gradual action of persistent but unrecognised causes, of which one of the most important is a badly composed dietary. This is one cause of inferior physical development and nervous instability, of lack of recuperative power and endurance, and consequently of cumulative fatigue and lack of resistance to tuberculosis and other infections. Moreover, the diet largely influences the rate at which the organism ages and consequently the duration of life.

Preventive action against such nutritional diseases as scurvy, rickets and beri-beri, although superficially more impressive, is probably of less importance to the human race than the acquisition and application of such knowledge as will also improve the general condition and well-being of every man, woman and child, through the better choice, provision and utilisation of foodstuffs.

Such are the principles underlying the work of the Commission of Physiologists appointed by the Health Committee which held its first session in London at the end of November 1935.

6. DIETARY STANDARDS ADOPTED IN THE LONDON REPORT.

The Assembly resolution of 1935 recommended that the technical organisations of the League should make a study of nutrition in its relation to public health, labour, agriculture, trade and social progress. The basis of this work being the science of nutrition, it was necessary to obtain a pronouncement from nutritional experts as to the nutritional needs of the human being in the course of its development, from conception to the adult age. This pronouncement is contained in the report of the London Commission.

The question of human nutritional requirements has been under the close consideration of physiologists during the last three-quarters of a century, their conclusions being based either : (1) on the average spontaneous consumption of population groups ; (2) on statistics of food production and food imports and exports for a nation or a city ; or (3) on direct experiment with calorimetry on animals and human beings. The answers given by the scientists are matters of importance for public health, labour, agriculture, trade and public and private finance, and have been both numerous and varied. This circumstance has been a matter of amusement at times to the layman, but a source of anxiety and difficulty to the medical men and administrators who have to prescribe for individuals and to feed communities and masses of the population. Opinions regarding the necessary number of calories follow two tendencies : one towards the maximum and the other towards the minimum requirements.

In the London report, the two aspects of nutrition, the quantitative and qualitative, described in the Introduction to this memorandum, and the fundamental importance of protective foods, are brought out by the division of the report into two parts : I—dealing with energy, protein, and fat requirements ; II—dealing with mineral and vitamin requirements. In both parts, the dominant idea is the needs of the human being during development. At the beginning of life, the child is inseparable from the mother, and additions, not only of energy, but also of protein and of all protective

elements, are prescribed for pregnant women, nursing mothers, infants, children and adolescents.

(a) *Energy Requirements.*

The human race is not made up of arithmetical units, but of adults, adolescents and children of both sexes ; of childless women, pregnant women and nursing mothers ; of workers both manual and sedentary, and of idlers. If the ration for an adult male (and, even so, what type of male adult is meant ?) is taken as unity, what is the proper fraction for a woman, or for a child at different ages, or for an adolescent at different stages of growth ? In other words, what coefficient is to be used for conversion of the standard to the appropriate figures for each class ? There are in existence a score of scales of coefficients among which physiologists and hygienists can choose. The need is now felt, however, for a common scale which will allow of uniformity in national and international comparisons. The question was considered by the Rome Conference of Experts (1932), but only a provisional solution was reached. The questions of the standard calorie ration for the male adult and of the scale of coefficients were therefore dealt with at the London meeting.

Instead of adopting a mean figure representing the needs of an adult man performing an average but indeterminate output of work, the Commission fixed a basic figure representing the requirement for maintenance to which supplements are to be added for work, growth, pregnancy and lactation. This basic figure represents the need of the average adult, male or female, living an ordinary everyday life in a temperate climate and not engaged in manual work. The needs of such an adult are stated to be met by 2,400 calories *net* (*i.e.*, after deducting waste in cooking and at table) per day. Most authorities have agreed upon this figure for the type of adult under consideration ; and it so happens that the figure is convenient for calculation on a basis of 100 calories per hour. Conditions and age being equal, no difference is made between the sexes.

As the amount of muscular effort varies with the occupation and the number of hours of work, it is convenient to calculate the supplements on an hourly basis. Four grades of work are distinguished—light, moderate, hard and very hard—within which it will be possible for hygienists and engineers to place any given form of work.

(b) *Protective Foods, Mineral and Vitamin Requirements.*

In Part II of the London report, stress is laid on the need for protective foods. These are expressed in everyday terms as milk, butter, cheese, eggs, meat, potatoes, fresh green vegetables and fresh fruit. Sunlight is also reckoned as a protective nutritional agent, because it generates vitamin D in the organism.

Milk.

The need for milk in the human dietary. — The use of the milk of cows and other mammals in the diet of the human race is as old as the history of mankind, and during the long ages in which it has been thus used its value has ever been highly esteemed. A land “flowing with milk” was the ideal of pastoral tribes in ancient times and will still remain the ideal, if the correct nutrition and health of the people receive due consideration.

The value of milk is well demonstrated by a survey of the dietary habits of the different native races inhabiting the world. Fine physique, good health and virility are usually seen in races where milk has an important place in the diet, as, for example, amongst the Arabs and other races inhabiting South-Western Asia and South-Eastern Europe. The contrast in health, strength and stamina is proverbial between the Hill tribes of India, who partake largely of milk, and those dwelling in the plains, where the diet is more exclusively vegetarian and consists largely of cereals.

Modern scientific research has entirely confirmed the empirical conclusions drawn from human experience as to the dietary value of milk. Milk, which is designed to afford complete nutrition to the mammalian young, is known to contain all

the factors needed for satisfactory nutrition, combined in a suitably proportioned mixture of :

- (1) Protein of good quality,
- (2) Fat,
- (3) Carbohydrate,
- (4) Mineral salts,
- (5) Vitamins.

In this respect, *milk is the nearest approach we possess to a perfect and complete food, and no other single food is known that can be used as a substitute.* If this had not been so, milk would long ago have disappeared from the dietary of civilised peoples, especially of those dwelling in cities. For milk is not only the most *nutritious*, but is also the most *inconvenient*, and at times may be a *dangerous* foodstuff. For its high nutritive value makes it also a perfect medium for the growth of other organisms, including bacteria. In other words, milk will not “ keep ”, and an elaborate organisation is needed to bring it regularly to the consumer in a fresh condition. Apart from the bacteria concerned with the “ natural ” processes of souring and putrefaction, milk may also act as a vehicle for the spread of the germs of definite disease, such as tuberculosis, diphtheria, typhoid and scarlet fevers. The reason why, in spite of these drawbacks, we continue to include milk in our diet is because *its value is unique and we cannot do without it.*

The nutritive value of milk. — (i) The *proteins* contained in milk, lactalbumin and casein, possess a high nutritive value, since the amino-acids of which they are composed make them especially suited to supply the requirements of growth in the young, as well as of maintenance in the adult.

(ii) *The carbohydrate* is present in milk in a soluble form, as milk-sugar.

(iii) *The fats* of milk are present in an emulsion of different fats of low melting-point. Milk-fat, when separated as butter, is the most digestible and acceptable fat known to us and is a source of the vitamins A and D.

(iv) *Minerals*: cow's milk is one of the foods richest in salts, especially in calcium salts and phosphates. These two *minerals* are essential constituents of every cell in the body, so that an adequate supply is necessary for the maintenance of health at all ages. An abundant provision is specially necessary for the growing child, to support the growth of the bony tissues and teeth. The amount of lime in cow's milk (1.5—2 parts per 1,000) is only equalled by that contained in some green vegetables. In milk, however, the lime salts are present in a form specially easy of absorption.

(v) *Vitamins*: while the nutritive value of cow's milk depends to some extent on the diet and management of the cow, yet the nature and proportion of the protein, carbohydrate, fat and salts it contains are maintained with remarkable constancy over a wide range of variation in the type of feeding adopted. There is, however, more variation in the vitamin content, and the highest value in this respect is only found in the milk of cows which are exposed to the rays of the sun and fed on their natural diet of fresh green herbage—*i.e.*, on pasture in the summer; nevertheless, winter milk remains a valuable foodstuff in this respect. It is true that the amount of the antirachitic vitamin D, so essential for the growing child, is much reduced in winter milk.

Vitamin D, however, whose physiological function is to secure the retention in the body of the lime salts and phosphates ingested in the food, acts with much greater economy when these salts are present in abundance in the diet. In many climates in the winter, therefore, when, owing to the lack of sunshine, the growing child is unable to synthesise vitamin D for itself, an abundant supply of milk is specially needed, for the salts thus supplied will enhance the action of the diminished amount of vitamin D present in the milk and other articles of food.

The composition of the proteins of milk makes them specially adapted for the support of growth in young organisms and gives them a definite supplementary action towards those of cereals, which are inferior in nutritive value. Milk, it is recommended, should represent a large proportion of the diet at every age. The London report approved the tendency displayed in certain

countries to increase the consumption of milk to as much as one litre per day for pregnant women and nursing mothers, and to provide a comparatively large quantity for infants, children and adolescents. For these classes, it strongly recommends free or cheap milk distribution. It calls attention to the nutritive value of *skim milk*, which, although it has lost its fat and fat-soluble vitamins, retains many other valuable nutrients. It therefore deplures the way in which this valuable food is wasted in many countries. Of other milk products, *cheese* retains the proteins of milk, a large proportion of the calcium salts and vitamins, while *butter* is the most digestible and generally nutritious fat in the modern dietary.

Eggs.

Eggs are important as a source of good protein and of valuable minerals, including iron; the fat contained in the yolk is a rich source of most vitamins, especially of the B vitamins, also of the antirachitic vitamin D, which is otherwise sparsely distributed in foodstuffs.

Meat.

Meat has a special value as a source of protein and iron. Its popularity is chiefly due to its appetising and stimulating properties; but, from the nutritional point of view, the protein of ordinary muscle meat is inferior to that of eggs or milk. The glandular tissues, on the other hand—liver, kidney, sweetbread (pancreas)—are among the most highly nutritious foods we possess, as regards the character of the protein, the mineral and vitamin content. They are also rich in a substance which stimulates the formation of red blood-cells in the bone marrow.

Green and Leafy Vegetables.

Green leafy vegetables are rich in the B vitamins and in vitamin A; they are also among the richest sources of the antiscorbutic vitamin C. Since this vitamin is sensitive to heat, the dietary value of uncooked salads is obvious.

The abundance of minerals and vitamins in green vegetables and the special character of the protein, although present in

small quantities, make them of great value, especially as supplementary foods to a diet containing cereals. Just as among pastoral communities the defects of a cereal diet may be corrected with milk and dairy products, so, under other circumstances, correction can be obtained by green vegetables. In the densely populated regions of Southern China, for example, where animal foods cannot be raised, the deficiencies of the rice diet are largely repaired by the abundance of vegetables eaten.

Fruit.

The special nutritive value of fruit depends on high vitamin C (ascorbic acid) content. Different fruits vary greatly in their vitamin C content, the richest being citrus fruits (*e.g.*, oranges and lemons). Tomatoes are also valuable : grapes are relatively poor.

The total absence of vitamin C from the diet results in scurvy. In this serious condition, hæmorrhages may occur in all parts of the body, often accompanied by intense pain ; the gums are swollen and the teeth loosened. With infants and children, serious lesions occur in the bony tissues. Florid scurvy is developed under conditions of severe dietetic restriction ; but there is evidence that a less severe deficiency may lead to a departure from good health, the cause of which is not easily diagnosed.

Vitamin C is readily destroyed by heat, so that fruit jams and preserves usually contain none. It is probable that preserved fruits, however, may possess a dietary value due to their mineral content. Oranges, again, are rich in calcium salts, while grapes are rich in iron, and fruits generally may have a special value in supplying mineral constituents to those on otherwise restricted diets. Fruits having a yellow colour—*e.g.*, oranges and tomatoes—are often useful sources of vitamin A owing to their carotene content.

Cod-liver Oil.

The importance of cod-liver oil was stressed in the London report as a source of vitamin D for infants and growing children, especially for those living under climatic, seasonal and social

conditions where sunshine is limited. It is also a valuable source of iodine and vitamin A.

(c) *Energy-bearing Foods.*

The London report sets out some specimen diets for various age-groups up to the age of 5 years and for mothers. In these, the report so arranged the protective foods as to yield approximately 1,400 calories per head without the inclusion of any cereals, fats or sugar. These would have to be added as required to satisfy the energy requirements of any individual, as distinct from his essential mineral and vitamin requirements.

In their general recommendations, the experts, in the London report, emphasised the following views :

“ Although a simplified diet may be so constituted from a few protective foods as to be satisfactory, it is a general principle that variety in diet tends to safety, provided it contains a sufficiency of the protective types of food materials.”

“ White flour in the process of milling is deprived of important nutritive elements. Its use should be decreased and partial substitution by lightly milled cereals, and especially by potatoes, is recommended. The consumption of an excessive amount of sugar is to be condemned, and in this case also partial replacement by potatoes is urged.”

It will be noted that the London report recommends the modification in many countries of the proportions hitherto occupied in dietaries by the three foods named.

Cereals.

Cereals form a most convenient and acceptable food of high energy value and for centuries they have been the staple food of the great Asiatic and Mediterranean civilisations. Their value is self-evident ; but, in Europe especially, partly because of the increased availability of protective foods, their consumption has tended to diminish, except under conditions of heavy manual labour or because of limitations in income. At the same time, cereals are being consumed more and more

widely in a highly milled form. The report suggests that bread should be made more protective by restoring to the flour, as far as possible, the special nutritive principles contained in the husk and germ of the grain, particularly the vitamin B group. This recommendation, issued at a moment when the question of different kinds of bread is being discussed in every European country, is of great importance both for economic as well as for hygienic reasons.

Sugar.

In the last thirty years, sugar has become one of the cheapest forms of calories and the consumption has increased manifold in many European countries, especially among the poorer sections of the populations. In the United Kingdom, it has been estimated that a fivefold increase in average consumption has taken place during the last hundred years. Refined sugar, like highly milled cereal products, provides energy without any protective elements. An excessive proportion of sugar in the diet is especially bad for children, whose instinct to eat it seems altogether out of proportion to its nutritional qualities, since it occupies the place which should be filled by protective foods. It also spoils the appetite for the latter, which are even more necessary during the period of growth than in adult life.

Potatoes.

Special attention is called to the value of the potato as a food rich in calories and in starch and is particularly suited to substitute sugar and cereals in the modern European diet. The introduction of sugar and white flour to populations in remote districts has been followed by the occurrence of dental disease previously unknown. Examples are found among the inhabitants of Iceland, among Esquimo and native Indian tribes in Alaska and Western Canada and among the races inhabiting Northern Scandinavia. A large proportion of potatoes in the diet encourages no such predisposition to dental disease as is the case with cereals; populations showing relative freedom from dental disease with high consumption of potatoes are found in certain islands of the Hebrides, in rural Finland and in Poland, and in Tristan da Cunha, in which island at the present time

potatoes form a large proportion of the dietary, and dental caries is a rarity. Potatoes are also a valuable source of iron and vitamin C, and one of particular value, because they retain a high proportion of their vitamin C content after cooking.

7. PROBLEMS RECOMMENDED FOR FURTHER STUDY.

The London report is no more than the physiological basis of the concerted work conducted by the technical organisations of the League of Nations. It requires to be amplified by a series of practical investigations into nutrition in its relation to public health.

Among the problems earmarked in the report, some represent an extension of the questions that could not be fully discussed at the first session : minimum vitamin, mineral and fat requirements ; nutritive value of the various proteins, of various cereals according to the degree of milling, and sugar. The other questions form an integral part of the subject-matter of the London proceedings—namely, the nutritive requirements of the human being from conception up to adult age. They cannot be separated from it. The economist and the agriculturist have been provided with the needful data, but the application of the London report to nutritional hygiene is not possible without a study of these supplementary problems.

1. *Nutritive food requirements during the first year of life (or infancy).*
2. *The extent to which diets in common use fall below the standards recommended in this report.*

This involves the comparison of requirements as defined in the London report with resources available to mankind for their satisfaction.

3. *Assessment of nutritional state, especially that of children.*

These are the lines upon which the London report should be further expanded. Such a plan of work must necessarily be carried out internationally. The principles laid down in the report will be applied in different countries and will need

adaptation to a variety of populations, conditions, resources and forms of social life. Leaving aside the question of institutions and economic conditions, the rations as defined in the report will, for practical purposes, have to be expressed in terms of the foodstuffs which are customary in each country. The Commission which met in London accordingly decided that its report would be communicated for study to representative scientific institutions of various countries, which would, in turn, seek the advice of specialists interested in the various aspects of nutrition : internal medicine, pediatrics, school hygiene, preventive medicine, etc. It has thus organised an extensive scientific consultation on the bases laid down in the report and on the problems which it has recommended for further study.

The institutions consulted are of three kinds :

(1) National academies, academies of medicine and academies of science—this applies to Belgium, France, the Netherlands and Spain ;

(2) National scientific research councils—this applies to the United Kingdom, the United States of America and the Union of Soviet Socialist Republics ;

(3) National nutrition commissions, already in existence and prepared to undertake this co-operation (Denmark, Italy) or specially set up for the purpose (Norway, Sweden). These commissions consist of physiologists, clinicians and hygienists.

Exchanges of views between the League of Nations Health Organisation and these institutions have led to an extension of the programme of work referred to them.

Among the specifically scientific questions recommended for study in the London report, it is natural that each institution should select those which are of immediate interest to it, because they correspond to health and social requirements or because they are being specially studied by certain scientists.

The problems which are noted as the most important and most urgent are nutritive food requirements in infancy, tests for the assessment of the state of nutrition, and the comparison

of requirements with available resources. On this last point, it does not seem probable that any findings can be arrived at in the near future, since this is a question which requires a staff trained in the conduct of social enquiries, time and money. So far as concerns the other two, however, which constitute the plan of immediate work, the Health Organisation will arrange for international technical consultations by commissions of experts.

These consultations will, in addition, cover a number of questions which, although not expressly mentioned in the appended list of the London report, have been implicitly raised by the proceedings of the Commission and the text of its report, among them the problem of milk.

Concerted international action would greatly stimulate the development of rational nutrition. An enormous mass of information on nutrition is available in the world, but it is fragmentary, heterogeneous and frequently devoid of scientific basis. As will be seen, many institutions have been created to improve nutrition, but some are working by empirical methods and have not yet been brought into line with the modern science of nutrition. So far, it is very difficult for the hygienist to ascertain the real state of nutrition. It is from a comparison of requirements and resources that the most instructive knowledge will be derived. Laboratory research and statistics are essential, but enquiries among particular groups of the population are still more so. If any slogan were required for use at the present time, it could only be this : " Enquiries and still more enquiries ".

8. PRINCIPLES OF GOVERNMENT ACTION.

Nutrition has become an essential part of public health work. Gradually, under pressure of circumstances, Governments have adopted measures of protection and assistance in regard to food supply.

It is now recognised that care for popular nutrition is a task no less essential for the public health services than, for instance, the campaign against tuberculosis.

From an examination of existing institutions and the large volume of information communicated to the Mixed Committee, it is already possible to discern the general direction of effort in the field of nutrition for the purpose of safeguarding and improving public health.

The natural rôle of the State is to be responsible for legislation and general direction and control; the local authorities are principally responsible for executive action; and private initiative in general for the various activities which may be classed as social service. Just as there are supreme National Defence Councils and National Economic Councils, so there should also be a National Food Council. This Council would study food problems and their influence on social life.

There is no civilised country without its food legislation, its food inspectors, and its laboratories for analysing foodstuffs. The object in view was for a long time mainly to enforce fair trading (prevention of adulteration), but has come more and more to be the protection of health by the verification of nutritive values according to recent scientific discoveries. Staple and widely consumed foodstuffs—bread, milk and tinned foods—are already subject to special health regulations. Pharmacological preparations of vitamins should be officially assayed and passed. The regulations for the proper preservation of foodstuffs might well be collected in a "Food Code".

The Government should be kept informed of the position as regards production and consumption by its general and special statistical services. To ascertain and compare the food requirements, the food resources and the state of health of the people considered in relation to their actual food intake, it must depend upon enquiries into population groups and their family budgets. These enquiries should form the basis of the country's food policy, just as in some countries they are the basis for the fixing of wages. They should be carried on constantly, so as to provide "nutrition indices" continually reflecting changing conditions.

Apart from the direct action taken in health institutions (health centres, milk dispensaries, consultation and other clinics, holiday camps, etc.), the State should encourage, direct, legislate for, and superintend the application of scientific methods

of proved efficacy. For motherhood, there is need for an additional supply of protective foodstuffs, especially milk, for pregnant women. For infants, the lessons of the new science of nutrition should be applied both to breast feeding and to artificial feeding. When necessary, milk, and school meals—which should include protective foodstuffs, especially milk—should be provided for children of pre-school and school age in order to prevent irreparable malformation and physical deficiency. For other classes of the community who may need it, assistance should be given partly in the form of food.

Chapter III.

NUTRITION AND LABOUR.

Survey of the Nutrition Problem by the International Labour Office.

In its report issued in June 1936, entitled "Workers' Nutrition and Social Policy", the International Labour Office surveyed the problem of adequate nutrition for workers in considerable detail. It is therefore unnecessary to consider the problem at length here. All that will be presented here is a brief summary of some of the most significant findings of the report of the International Labour Office.

The report begins with a consideration of the physiological relationships between food consumed and work performed. The attempt is made to evaluate various dietary standards that have been put forward for the benefit of workers engaged in particular types of work. The conclusion is reached that this field of enquiry is still in an undeveloped state and that a considerable amount of exploration and study remain to be done before definitive results can be formulated.

The International Labour Office report then goes on to survey the "facts on workers' diets". This part of the report is based on family budget enquiries and on statistics of national consumption of certain foodstuffs. The consumption of the main classes of food by workers' families in different countries at different income levels is examined; the nutrition problems of special workers' groups—such as agricultural workers, native labour, and unemployed workers during the recent depression—are briefly surveyed. Although it is recognised that the statistical data are insufficient for arriving at definite conclusions, a number of broad generalisations (discussed below in some detail) are stated.

In two succeeding chapters, the report considers the productive capacity of agriculture to meet the requirements of an adequate diet and sketches the social and economic aspects of the problem. The general conclusions reached are, first, that the actual and

potential productive capacity of agriculture is sufficient to assure a higher level of diet for the workers ; and, second, that the fundamental question involved is that of raising the purchasing power of the working population. It is pointed out that much of the workers' expenditure, other than for food, is usually of a type that cannot be lowered or postponed. Though the available evidence shows that, as the workers' purchasing power increases, their food purchases provide diets of increasing nutritive value, there is keen competition for the workers' earnings between food expenditures and other budgetary expenditures, such as housing, customary pleasures or cultural activities. Consequently, improvement of nutrition standards is closely related to the improvement of living standards generally.

After this general survey, the report devotes two chapters to social legislation in its bearing upon dietary standards and to existing agencies for improving popular nutrition. In the latter chapter, the organisation and activities of public, semi-public and private agencies dealing with nutrition are briefly described.

For the present purpose, two questions will be treated here : first, What light do family budget enquiries throw upon the dietaries of workers in different countries and at different levels of the income scale ? Secondly, What approaches have been made by social and labour legislation towards improving the nutrition of workers ?

I. WORKERS' DIETS AND UNDER-NOURISHMENT.

Statements concerning the dietaries of workers in different countries and at different income levels cannot but be provisional and approximate at best. Such statements are based largely on family budget enquiries, whose statistical and other limitations are carefully considered in the International Labour Office report. Regardless of these limitations, the data do permit some broad generalisations which are summarised below.

National Differences in Workers' Diets.

The first important conclusion which emerges from an analysis of family budget enquiries is that the dietaries obtaining among

workers in different countries are in definite relation to national standards of living. In countries where the general standard of consumption may be assumed to be relatively high, workers' dietaries tend to approach closer to approved nutritional standards than in countries where the general standard of consumption may be assumed to be relatively low. More specifically, the consumption of bread and cereals by workers, with due allowance for national tastes and habits, tends on the whole to be higher in industrially less advanced countries and to be lower in the more advanced countries; meat and fish, on the one hand, and milk, milk products and eggs, on the other, show an opposite tendency; fats and margarine manifest no clear trend; the same applies to fruits and vegetables in general.

Workers' Diets at Different Income Levels.

The data available for the various countries studied show that daily calorie consumption tends to increase as workers advance along the income scale. It is significant that the calorie consumption at the lowest income levels in a number of countries falls below the London standard of 2,400 calories (net) daily. Thus, the budgetary enquiries among Polish workers indicate a rise from 2,200 calories in the lowest income group to 3,140 calories in the highest. Preliminary figures from a small sample taken from the large study now under way in the United States of America show that workers in the lower income groups obtain only 2,130 calories daily. The calorie intake for German workers ranges from 2,530 to 3,190; for Swedish workers, the variations take place on a higher level, from 3,120 to 3,480 calories.

Although the materials available for analysis are meagre, they seem to point towards the conclusion that the majority of low-income workers consume an insufficient quantity of calories to satisfy physiological requirements, on the basis of the standards set up by the Technical Committee of the Health Section of the League of Nations.

The conclusions which may be drawn concerning the adequacy of protein intake by workers are entirely approximate. If 70 grammes per day per adult male weighing 70 kgs. may be regarded as a satisfactory minimum standard, then the intake

of protein by workers in the lowest income group falls below such standard in many countries. The available data also suggest that, within each country, the consumption of animal proteins varies directly with the worker's income, while the consumption of vegetable proteins remains relatively constant.

Available data on fat consumption are scarce. They indicate that fat consumption by workers varies directly with income. Only a few budget enquiries contain data on the consumption of carbohydrates. Those data lead to conflicting results. In Sweden, it would seem that consumption of carbohydrates remains somewhat constant at different income levels. In the United States of America, on the contrary, the preliminary figures show that the consumption of carbohydrates rises appreciably with income.

The data on the consumption of particular foodstuffs by workers show that the quantity of foodstuffs consumed rises with increasing income and that the dietaries become more varied as workers advance along the income scale. At the same time, more adequate amounts of the protective foods are introduced into the diet. Almost all the family budget enquiries examined reveal a considerable rise in the consumption of meat and fish by workers as the income scale is ascended. The expansion is marked in all countries, but particularly so in the relatively poor countries. The consumption of fats and margarine by workers varies inversely with income. In general, it would seem that, at the very lowest level of income, workers concentrate their dietaries on bread and cereals; with the first increases above this level, more cheap fats and meat are consumed; with further increases in income, butter is introduced into the diet.

The data on the consumption of milk, milk products and eggs reveal the same tendency as the data on the consumption of meat and fish. Consumption rises very definitely with rising income. The poorer the country, the greater the spread between the quantities of milk, milk products and eggs consumed by workers at the bottom and at the top of the income scale.

The data on fruits and vegetables are difficult to interpret, because this group contains some of the most important

protective foods—fresh fruits and green vegetables—as well as some of the most bulky energy-yielding foods, such as potatoes and other root crops. In a general way, it appears that, as workers obtain larger incomes, they shift from bread and cereals to potatoes and other root crops for the satisfaction of their energy requirements. With regard to green vegetables, there is a marked tendency for consumption to increase with rising income. Even more marked is a similar tendency in the consumption of fresh fruits.

To sum up, the family budget studies brought together in the International Labour Office report indicate two important facts. First, that the consumption of protective foodstuffs increases greatly with increasing incomes, whereas the consumption of cereals remains more or less stationary. Workers' families with low incomes evidently find the protective foods too expensive and cannot afford them. *The question of income is thus at the root of the workers' nutrition problem.*

Second, an examination of the diets of the different income groups among workers shows that, on the basis of the London standards, the average diet in the lower income groups is inadequate for good health. The inference is that, among such groups especially, there is both malnourishment and undernourishment.

The above statements are based on data which relate to the consumption of food among employed workers. *A priori*, therefore, it might be expected that unemployed workers during the depression of the last few years have found it impossible to maintain satisfactory dietary standards. In fact, such few studies as are available for analysis indicate in general that, with some exceptions owing to special measures of social policy, such has been the case.

2. SOCIAL AND LABOUR LEGISLATION.

There are four main ways in which social and labour legislation touches directly or indirectly on the problem of workers' nutrition :

First, the amount and regularity of the worker's income—during periods when he has a job—are determined in part by

legislation which relates to the fixing of minimum wages and of family allowances, to the promotion of collective bargaining, to the forms in which and the intervals at which wages shall be paid, etc.

Second, the amount and regularity of the worker's income—during periods when he is out of a job—are determined in part by legislation which relates to insurance or relief in case of unemployment, invalidity, old age, etc.

Third, working conditions proper, as they relate to the meal periods during the work-day and the circumstances under which such meals are taken, are a frequent subject-matter of legislation.

Fourth, arrangements under which the employer is fully or partially responsible for the worker's board are also subject to a certain amount of legislative control.

A consideration of nutrition standards does not, as a rule, enter directly into the legislative control of wages, insurance benefits or relief allowances. At the most, such legislative control aims at assuring a "living wage" or a "reasonable wage". These are concepts which assume levels of nutrition actually existent rather than ideal standards. In principle, however, the legislative safeguarding of workers' incomes provides one of the fundamental conditions of adequate nutrition in so far as purchasing power is an important determinant of the worker's food consumption.

A more direct concern with nutrition enters into the legislation which aims at the abolition or the strict control of the "truck system". Basic to this legislation is the belief that the worker will be better paid if paid in cash rather than in food; and that he will be better fed if free to buy at his own will rather than restricted to shops dictated by the employer.

Direct nutritional objectives are also manifest in the laws which require that workers be permitted a pause (or pauses) for a meal (or meals); that the pause or pauses be of not less than a certain minimum duration (half an hour, an hour, an hour and a half, etc.); that sanitary and adequate facilities for taking meals be provided by the employer (in certain establishments, industries or districts where midday meals at home would not be practicable), etc. The importance of such legislation cannot be over-stressed. In almost all countries, the

routine of the worker's meals is adjusted to the routine of the workplace. Unless a proper balance be struck between the two, the worker's dietary is bound to be adversely affected.

Many groups of workers, finally, receive part of their wages in food. This is true of agricultural labourers in general, native labourers in particular, domestic servants, hotel and restaurant employees, and seamen. The nutritional problems of such workers are frequently the subject-matter of direct legislative control. So far as agricultural labourers, domestic servants, and hotel and restaurant employees are concerned, the legislative control tends to be couched in general terms : such workers are to receive "reasonable" amounts of "wholesome" and "substantial" food. With regard to native labourers and seamen, however, the legislative control tends to be much more definite : it often specifies the actual foods and the actual amounts which shall serve as the minimum basis. While such legislation may be misapplied and give rise to abuses, the principle involved is in accord with protective social policy.

The survey of existing labour and social legislation in its bearing on the improvement of workers' nutrition leads to two principal conclusions : first, except in a few special cases (regulation of the truck system and of working conditions ; native labour and seamen), legislation does not attack the problem of nutrition directly or in detail. Second, such efforts as have been made to deal with nutrition in fixing minimum-wage standards, setting the terms of collective agreements, or devising scales of insurance benefit and relief allowances, are based on an empirical approach rather than on scientific studies.

In brief, the gaps between available knowledge on nutrition and the application of this knowledge in legislative practice are very wide indeed. The problem is to bridge these gaps and to bring legislation and public agencies to bear directly upon the groups of workers—low income and unemployed for the most part—whose diets are deficient in quantity and quality. It is a task of relating action for improving workers' nutrition to the general problem of social policy.

The report concludes with an analysis of the educational, research and social-economic problems involved in improving levels of nutrition to the desired standards. These problems call first of all for action on a national plane. But international co-operation is indispensable in order that efforts to improve workers' nutrition may be in harmony with the needs of world economy. It is pointed out that such international measures are part of the general programme of the International Labour Organisation for raising living standards in all countries as a condition *sine qua non* of social justice and peace.

Chapter IV.

SOME CONSIDERATIONS ON THE ECONOMIC ASPECTS OF THE NUTRITION PROBLEM.

It is not necessary to stress the relationship between income and adequacy of nutrition. It is, indeed, obvious that the greatest single cause of defective nutrition in any community is poverty and the ignorance which is often associated with poverty. Elsewhere in this report, emphasis is laid on the importance of disseminating knowledge as to the principles of rational nutrition, and promoting the improvement in dietary practice by educational methods and by public propaganda. But such advice might well seem somewhat ironical if recognition were not first accorded to the fact that defective nutrition is, in the great majority of cases, a consequence of inadequate family resources. The examination of family budgets giving records of household expenditure for sections of the community at different levels of income demonstrates conclusively that a rise in income is accompanied by improvement in diet, and particularly in the direction of a balanced and more rational diet.

It must, however, be borne in mind that the protective foods, the generous supply of which is essential, are relatively costly. It is thus clear that the improvement of nutrition is associated with the maintenance and improvement of the general level of income. Even without effecting any changes in the level of national income or in its distribution, however, some measure of improvement in the standard of nutrition may be attained by better organisation of supplies, by education and by other methods.

In recent years, the standard of living in large areas of the world has been reduced owing to the effect on income of the economic depression and owing, further, to the restrictions on the international movement of goods which have been

imposed during the years of depression. To restrict the power of any people to obtain their foodstuffs at the lowest prices compatible with the maintenance of agricultural supplies must of necessity adversely affect that people's nutrition. The two first essentials of a sound economic policy directed towards improved nutrition are the absence of the restrictions on the supply of foodstuffs that tend to raise prices and provision against avoidable fluctuations in the availability of supplies.

To each individual, however, the availability of supply is a function at once of the physical production of foodstuffs and of his own income. A sudden drop in the general price-level is likely to reduce incomes. In consequence, policy must be directed at once towards stability of general prices (so long as the prices in any country are not clearly out of reasonable relationship with those in the rest of the world) and adequate food supply. The price at which food is obtainable in any modern community is dependent upon international influences, as well as upon the productivity of domestic agriculture. It is therefore necessary to examine both these aspects in any enquiry directed to ascertain how the intervention of public authorities can most effectively operate to bring about improvement in nutritional standards.

The dislocation of international trade which resulted from the crisis fell with exceptional severity upon agricultural exporting countries. One of the outstanding features of the depression was the disproportionate fall in the prices of agricultural products, leading to a restriction of purchasing power in agricultural communities and, consequently, to a limitation of the intake of industrial products. In three years, the price of leading products in the world market fell from the 1929 level by more than 50%, a development which might at first blush appear an ideal one for securing an abundant food supply through international trade. But, in fact, many industrial communities were unable to purchase their necessary supplies of foodstuffs owing to their inability to sell their products to the impoverished agriculturists. Industrial workers fell into unemployment; agricultural produce went into stocks, not into consumption.

Again, in many countries, the excessive fall of the price of agricultural products forced Governments to adopt policies

intended to safeguard the interests of national agriculture. To this end, access to the national market was restricted by duties, prohibitions and quotas, reacting still more severely on the exporting countries and on world prices. Indeed, as the application of these measures has been intensified and extended, the very term "world prices" becomes misleading. There can only be world prices when there are world markets. But the world has been divided into a series of national markets largely isolated from one another and characterised in their isolation by widely different levels of food prices. In agricultural countries, those farmers whose production did not consist mainly of mixed crops for their personal consumption have suffered severely from their inability to sell their produce at remunerative prices and therefore to buy the necessities of life. In industrial countries, where agricultural prices have been kept above the levels ruling elsewhere in an endeavour to protect domestic agriculture, the town workers have suffered at once from unemployment, due to the loss of foreign trade, and from the relative dearness of foodstuffs.

It is not the intention of the Committee to enter into any criticism of commercial or agricultural policies. Conditions since 1929 have been exceptional, and the difficulties with which Governments have found themselves faced have been very real. The Committee desires, however, to draw attention to certain of the effects of these policies upon national nutrition. Unfortunately, the impediments imposed upon the international movements of foodstuffs have had seriously adverse effects on nutrition, even where the aggregate food consumed has not diminished. Sound nutrition demands a mixed diet. When prices of staple foodstuffs are high or when incomes are low, the consumer is forced to abandon the purchase of the more costly foods in favour of those which satisfy at the lowest price the immediate claims of his hunger. But it is exactly the foodstuffs which are in most countries relatively more expensive that constitute the group of protective foodstuffs. Again, few countries enjoy a climate or are so agriculturally organised that they are able to produce all the classes of foodstuffs requisite for sound nutrition. In many cases, restrictions have been imposed on the import of products which are expensive

to produce at home, with the result that the domestic consumer has been forced to forgo products that the most elementary principles of sound nutrition demand he should enjoy.

From the standpoint of national policy, it is thus necessary to emphasise the need for balancing the interests of the poorer consumers in matters of cheap and abundant food supply with the interests of producers. The facts as to the wide contrast between the prices in different countries for certain leading articles of food—for example, butter¹—show that the existing situation is unsatisfactory from the standpoint of the consumer.

Emphasis has been laid on these aspects of the depression and on the harmful effects of certain of the policies that have been adopted in recent years, because they are of immediate and, perhaps, to-day, of predominant importance. It must not be assumed, however, that malnutrition results from the depression. Amongst certain groups of population the depression has intensified the ill ; it has not caused it. Adequate nutrition cannot be assured by a policy directed exclusively towards countering the effects of the depression. The need for a constructive nutritional policy will not cease when the last signs of the depression have disappeared.

The level of food prices must depend primarily on the operation of agricultural and trade policies. There are, however, other methods for alleviating the defects of nutrition caused by the reaction of food prices on consumption. There are, for example, various forms of direct action by which the State or public authorities can bring the supply of essential food products within the reach of the low-income and impoverished sections of the community. At the same time, there is a vast field for activity in the attempt to promote better market organisation and to bring producer and consumer into closer contact.

As was stated at the beginning of this chapter, the main cause of malnutrition is poverty. Malnutrition can never be

¹ See "Workers' Nutrition and Social Policy", International Labour Office, 1936, pages 112 and 113 :

"The 'world price' of butter in the year 1934 was 1.72 Swiss francs per kilogramme. In Italy, the price was 3.03 Swiss francs ; in France, 3.55 Swiss francs ; in Germany, 3.79 Swiss francs ; and in Switzerland, 4.75 Swiss francs. The differences between these national prices and the world price of 1.72 Swiss francs must be attributed to the effects of tariffs, quotas and other restrictions."

overcome when poverty is its principal cause, except by increasing the income of the poor. The income of the poor may be increased directly by an increase in national production, whether that results from the application of a sound economic policy or from increased knowledge of the art of production. It may be increased indirectly by public assistance, whether that be afforded in cash or in kind or in such a combination of these two as is constituted by rendering essential foodstuffs available to the poor at specially low prices.

When public assistance is afforded in kind or by means of price privileges, it is of the greatest importance that it should be guided by sound nutritional precepts and that those foodstuffs should be selected of which the lack is the most real.

The case of milk deserves special attention in this connection. Milk is of outstanding importance, not only because of its unique significance for the diet of children, but also because of its high protective value for general consumption. The supply of milk, moreover, is a matter which inevitably must engage the attention of public authorities and be submitted to careful control in order to establish a high standard of purity.

The problem of the margin between the price received by the agricultural producer and the price paid by the housewife is one of long-standing prominence in connection with discussions on food supply. It has often attracted attention from Governments and been made the subject of official investigation, in the hope of suggesting remedies for the glaring anomalies that may often be discerned where the original and final price for a particular article of food are compared.¹

Governments have from time to time endeavoured to check an increase in retail prices by measures of direct control. Experience has gone to show that such direct control, to be effective at all, requires to be so far-reaching and intensive as to lead to what is tantamount to a monopoly of sale and distribution, and frequently to the rigid allocation of orders amongst the various producing units. Economies in organisation may be effected and overhead costs reduced ; but, on the other

¹ The question of price margin between the producer and the consumer was studied by the Economic Committee of the League of Nations in 1930 and 1931 (see "The Agricultural Crisis", document C.239.M.105 1931. II.B, Vol. II).

hand, there is a grave danger that the whole system of control may tend to raise rather than lower prices to the consumer, for the costs of the less efficient producers and distributors tend to become the standard for the whole market. Maximum costs tend to become standard costs and to determine the minimum prices.

This whole problem of price control is an extremely complex one on which it would be as unwise to dogmatise as unsafe to generalise. But the evidence before the Committee seems to indicate that, as a general rule, measures designed to reduce costs, whether by lowering import duties, reorganising distribution or facilitating the adoption of improved methods of production, are more likely to achieve the desired object of reducing prices to the consumers without prejudice to the efficient producer or distributor than are measures of direct control or central price fixation.

This is a question where detailed and patient investigation is essential if useful results are to be achieved. It is natural that, in a market for perishable goods where the supply is variable, the most efficient marketing system should occasionally break down owing to the undue concentration of supplies at a particular point or at a particular period. It is not with such abnormalities that this enquiry is principally concerned, but with the divergencies between wholesale and retail prices which are of a stable and normal character in markets for essential food supplies. There is a widespread belief that the cost of handling, transport and distribution forms in many cases a disproportionate element in the final price. This is especially noticeable at a time when agricultural depression has reduced the wholesale price and the return to the producer is inadequate. In such circumstances, the problem cannot be lightly passed over and, in view of its outstanding importance to the interests of sound nutrition, it is desirable that continuous attention should be directed towards it. What is required is patient investigation which will build up the necessary volume of practical knowledge as to existing systems of marketing, from which it will be possible to deduce conclusions as to improvements and remedies for maladjustments in the existing system. In general, it will be found that there is a very large

field of action in which remedial measures may be applied, having for their object the creation of more adequate marketing facilities or the encouragement of more efficient marketing organisation.

One important method of making food available at reduced prices is that of reducing the services provided by the distributor. This can be secured by charging special prices for sale across the counter for cash, thus eliminating the costs of credit trading, door-to-door delivery, etc. This allows the price of the commodity sold over the counter to be lowered much closer to its cost of production, and the people whose purchasing power is too low to afford purchase at full retail price can obtain the commodity at a substantially reduced cost.¹

Again, in countries where standards of reference for grading foodstuffs according to quality have been developed by Government agencies, certain foods, graded by men trained and supervised by the Government, are sold with labels phrased in terms of the specifications with which they have been graded. The practice has possibilities: on the one hand, for promoting efficiency in the marketing of farm products, and, on the other, for effecting economies in consumer purchasing which would not otherwise be possible.²

Finally, reference must be made to the influence, in this field of action, exercised by producers' and consumers' co-operatives. These organisations, in many countries, achieve a considerable measure of success in their endeavours to reduce the cost of goods to the consumer.³

¹ In Northern Ireland, for example, a scheme such as this is in existence for the sale of milk. By this means, after a certain hour, milk is made available at less than half the normal price charged when delivered.

See also in Volume III, chapter V (United Kingdom), the account of an experiment conducted at Bishop Auckland by the Potato Marketing Board.

² In Canada, grading of fresh and canned fruits and vegetables according to Government standards has been very successful in decreasing distribution costs, and in making possible consumer education as to the cheapest way of buying an adequate diet. In the United States, Government standards have recently been established for grading meat, butter, eggs, potatoes, a few other vegetables and some fruits.

³ See, for example, Volume III, Chapter V, under France, Italy, etc.

Chapter V.

NUTRITION AND AGRICULTURE.

I. MALNUTRITION AMONG AGRICULTURAL POPULATIONS.

In considering the relationship of the problem of nutrition to agriculture and the implications that the new teaching on the subject may have for the agriculturist, it is necessary to bear in mind that, in the world as a whole, the agricultural producers are at the same time the main consumers of foodstuffs. Even in European and other countries with what is termed a Western civilisation, agriculturists constitute a large and important section of the total community—in many cases exceeding one-half of the whole population.

The prosperity of the farmers, peasants and agricultural workers is therefore an essential element in any policy directed towards improved nutrition.

Further, countries exporting agricultural produce and the agricultural elements in other countries constitute one of the main markets for industrial products. Depression in agriculture is reflected in unemployment in industry. Nutritional standards, therefore, will not be improved, but worsened, by policies which fail to maintain sound economic conditions in agriculture.

Before approaching the question of the possible repercussions of changes in popular nutrition on the interests of agricultural producers, therefore, it is well to remind ourselves that those who live by farming are not necessarily immune from the risks of malnutrition. The old saying, "Peasants have always enough to eat", is belied by the almost tragic situation of large masses of the rural population, particularly in Eastern Europe, living on land which either can only supply them with food during part of the year, or produce crops intended, not for personal consumption, but for sale. Such agriculturists have always been obliged to purchase elsewhere the additional food they

require. They were able to do so as long as the proceeds from their sales or the income from their minor industries remained at a reasonable level.

The distress among agricultural populations has, of course, been greatly intensified as the result of the crisis; and this is true of communities in relatively rich countries no less than in the relatively poor. To-day the situation is such that bare nourishment—not to speak of rational nourishment—is often problematical; and this state of affairs has lasted for several years, with disquieting results to general health and particularly to the health and growth of children.

By way of example, reference may be made to countries so widely different as Yugoslavia and the United States of America.

Yugoslavia contains certain regions which are able not only to supply themselves with vegetable products but even to engage in export; other regions, however, do not produce sufficient food (particularly wheat), and the people secure a bare living by breeding nondescript live-stock or growing miscellaneous products for export, such as tobacco, wine, wood, medicinal herbs, etc. The population of these latter regions, called "passive" from the point of view of nutrition, lives for the most part in a state of under-nutrition on account of its feeble purchasing power resulting from the fall in the value of its exports.

This state of affairs has for long been in existence and formerly the population resorted to emigration as a remedy. The emigrants helped their families by sending them money from abroad. These contributions amounted until 1929 to about one thousand million dinars per annum, most of this money being sent to the poorer regions. Contributions from abroad have since fallen to about 120 million dinars per annum. This fact, coupled with the impossibility of emigrating, has caused great hardship in these areas, particularly from the point of view of nutrition.¹

Turning to the sharply contrasted circumstances of a country such as the United States of America, we find a situation, as

¹ For a fuller account see Vol. III, page 63.

described by the Federal Emergency Relief Administration, in some degree analogous to the foregoing :

“The relief situation as shown by a sample study of nine major agricultural areas in February 1935 presents striking differences among the areas and reflects clearly the severity of conditions existing either temporarily or permanently in these areas. Effects of the drought are particularly noticeable in certain sections and a permanent condition such as exists in the Lake States cut-over¹ area has forced on the relief rolls almost 40% of the rural families in that area. This study also brings out the unfavourable position of non-farm families as compared with farm families ; the unfavourable status of the tenant and share-cropper groups as compared to the owner-operator group is also disclosed.

“Out of 5,200,000 households (cases) receiving emergency relief under the general relief programme in February 1935, it is estimated that there were about 1,900,000, or 36%, located in rural areas, and 188,000, or 4%, in small towns of 2,500 to 5,000 population.”²

The state of privation thus depicted is due in large measure to the catastrophic fall in agricultural prices ; and this in turn has been an obstacle which still bars the way to the return to a normal condition of international trade. The agricultural crisis is intimately linked with the international commercial crisis, and the essential basis for the restoration of the purchasing power of the farming community is to be sought in increased demand and a rising level of prices.

In the face of this general depression, which so seriously affected the agricultural community, Governments almost throughout the world adopted special measures in the endeavour to protect the agriculturist from the effects of the slump in prices and the growth in the burden of debt due to that slump. Certain of the measures adopted have, unfortunately, by blocking the channels of trade, increased the ills it was intended to avert or to cure.

¹ Deforested.

² Monthly Report of the Federal Emergency Relief Administration for July 1935, page 31.

2. IMPROVED NUTRITION AND AGRICULTURAL PRODUCTION.

Attention has been concentrated chiefly on the question of the surplus productive capacity which at present encumbers the activities of certain branches of agriculture in many countries and of the surpluses which are at present choking the market in certain products. This situation presents, undeniably, a problem of great immediate importance. But the utilisation or reduction of such temporary gluts as may exist at the present moment by no means exhausts the potential importance for agriculture of a dissemination of better dietary habits. While the problem of surpluses, in itself closely linked up with under-consumption,¹ is of a more or less casual nature, the position is quite different as regards the deep and permanent effects which dietary changes, as conceived by scientists, may have on the actual structure of agriculture, more especially in all the countries where the economic system offers the features usually met with in Western-European countries.

The Mixed Committee has received overwhelming evidence that there is ample scope, even in Western Europe and the United States of America, for a great increase in the consumption of many forms of food, while in the world as a whole there is need for the increased consumption of all foods. This evidence is fully supported by the information contained in the report of the International Labour Office.² There can, therefore, be no doubt that the real interest of nations demands, not a restriction of agricultural production, but the discovery of means whereby the real needs of each community for the health-giving foods may be correlated to the undoubted power of agriculture to produce all that is necessary for abundant health.

¹ "These expressions (over-production and under-consumption) which have been so loosely used in speaking of the economic depression obviously correspond to purely relative notions. The fact that to-day, in the countries of Europe as a whole, more meat or more butter is produced than was being produced before the war does not prove that this increased production could not be absorbed if the mass of the population, which has also increased, found itself in a normal economic situation. One need only think of the millions of people who are unemployed or under-fed to realise that the disparity between supply and demand must to a large extent be attributed to the falling-off in the number of persons possessing the wherewithal to purchase the commodities in question at the high prices kept up by the protectionist system." (See "Considerations on the Present Evolution of Agricultural Protectionism", document C.173.M.97.1935.II.B.)

² "Workers' Nutrition and Social Policy", International Labour Office, 1936.

The Committee, in this interim report, is not attempting to put forward any general solution of either national or world agricultural problems. More information is required before that can be attempted. Nevertheless, the effects upon agriculture that would follow from the adoption by many countries of sound national nutritional policies would be so considerable that the Mixed Committee has felt it desirable to indicate certain of those effects now, if only by way of illustration.

Hygienists have come to the conclusion that, if, particularly in countries with Western civilisation, there is to be the necessary physical strength and health, it is essential that all classes of the population, and primarily children and young people, should be able to consume regularly certain quantities of "protective foods". Fresh milk and fresh vegetables are nearly always produced and sold on the spot or within a comparatively limited area, and the same may be said of many fruits and of a great deal of dairy products, eggs and fresh meat. It follows from this fact that an increased demand for such produce would probably be met in the main by the output of national agriculture, and that, on the other hand, countries would probably resort to a greater extent to international and, more particularly, inter-continental trade to satisfy the demand for certain other products, such as cereals, sugar and frozen or chilled meat.

Moreover, it is a striking fact that an increased output precisely of the protective foods just referred to would fit in admirably with the typical agricultural structure of European countries with a mixed economic system¹ where the rural population consists mainly of small landed proprietors and small farmers. Such conditions are hardly favourable to the large-scale production of single crops (wheat, maize, etc.), which is better suited to the conditions in countries in the Eastern belt and oversea countries; they are, on the other

¹ "Nor must it be forgotten that the agricultural system of the older countries already existed, practically in its present distribution, at a time when the world movement of agricultural products was non-existent and when, consequently, the particular development of that agriculture corresponded to essentially local requirements. The peasant class in those countries still retains this former character, as regards both distribution and manner of living—a fact which places it in a position of relative inferiority in relation to oversea countries and often even in relation to certain Eastern-European countries, especially for big-scale production." (See "Considerations on the Present Evolution of Agricultural Protectionism", document C.178.M.97.1935.II.B.)

hand, very favourable to small-scale production such as is needed to meet the varied requirements of modern nutritional hygiene.

It is therefore probable that, if the dietary advocated by hygienists could be extended to the bulk of the population, local agriculture in those countries would be called upon to supply much larger quantities of protective foods. It would be very useful if it were found possible to estimate the extent of the changes which such an evolution might bring about in the various categories of agricultural production in particular countries and consequently in the areas which would in future be devoted to different crops. Much additional information is, however, needed before such calculations can be made. To mention only one obstacle, the "optimum" dietary is at present only expressed as a scientific formula. The general rules of nutrition have not yet been translated into national or local dietaries, and, even if they were, it would still be a moot point to what extent the new requirements would be met by national agriculture and to what extent by importation. This must depend on climate, soil, degree of agricultural specialisation, etc. The Mixed Committee hopes to go further into this question in its next report. It may at once be asserted, however, that an increased demand for protective foods would be calculated to introduce into agriculture, particularly in countries of the Western-European type, changes which would add to the prosperity of the agricultural community.

3. CAN AGRICULTURAL PRACTICE BE ADAPTED TO MEET THE NEW REQUIREMENTS OF BETTER NUTRITION ?

The question next arises whether the agricultural transformation considered above can be brought about, and especially whether it can be brought about at a rate corresponding to the contemplated changes in dietary practice. In other words, is agriculture, and more particularly the agriculture of Europe, in a position to respond to an increasing demand for protective foods? Fortunately, the Committee finds itself able to reply to this question in a very positive way.

Although the application of science to agriculture occurred later than to manufacturing industry, the effects have been cumulative. It would be difficult to say which branches of science have had the greatest effect upon agricultural production. Advances in agricultural engineering have reduced costs through mechanisation, increased knowledge of the nature of soils has made fertilisation more effective, the art of animal breeding is being fortified by the science of genetics. Perhaps the most spectacular advance, however, is due to the work of the plant-breeder. Owing to the patient endeavours of many workers in many lands, new varieties of economic plants are constantly being evolved. As a result, higher-yielding strains, resistant to plant diseases, are replacing other types of wheat, maize, sugar-cane or beet, root crops, fruit trees, or vegetables.

The work of Dutch plant-breeders in Java resulted in doubling the yield of sugar-cane per acre, with the result that the island's production was increased by 100% without any increase in the area devoted to sugar.

New varieties of early-maturing wheat have enlarged the wheat belts of Canada by enabling the crop to be harvested further and further north; at the same time, drought-resistant types have made wheat-growing possible in the drier parts of the Middle West of the United States of America, Russia and Australia.

The achievements of the plant-breeder on grasses and fodder crops are even more important so far as the supplies of protective foods are concerned. The selection and crossing of grasses, clovers, lucernes and other fodder crops are continually making possible the increase in the number of cattle or sheep carried on farms. Thus, in New Zealand, over the last three years, production of butter and meat has increased enormously without any material extension of the acreage on which the flocks and herds are depastured.

Farmers are conservative people, and the lag between scientific discovery and the full utilisation of the resultant improvements in agriculture may often be as long as one or two decades; but, with the spread of agricultural education, increased production now follows new discoveries with increasing rapidity. There

is certainly now no doubt that world agriculture can respond to increases in world demand for food as rapidly and as fully as there is any prospect of that demand arising.

While this is certainly true of world agriculture, can the same be claimed of the national agriculture of the various countries? Here the answer must be somewhat different. In almost every country there are possibilities of great further increases in the yield of crops, of pastures and from farm animals. Where farming has been carried on in an intensive way with a wide utilisation of scientific discoveries, the possibilities of further spectacular advances are less striking than where agricultural methods have been extensive rather than intensive or have remained traditional; but, even in Denmark or New Zealand, there is still room for higher efficiency, while in most countries it would be no exaggeration to claim that the full utilisation of the already fully ascertained results of science could immensely increase production.

One most important economic aspect of the improvements in plant and animal breeding must not be overlooked—namely, the effects upon cost of production. Experience has shown that better yielding and more resistant types cost no more to grow and harvest or tend than the poorer varieties. General speaking, marked reductions in agricultural costs follow from the utilisation of the breeder's work.

All national agricultures can therefore be expected to respond to increased demand by increased production, but it is not necessary to envisage that countries must obtain the whole of their requirements from their own soil. Indeed, if the nutritional campaign is to achieve its full effects on public health and to assist towards a revival of world trade, then a most important factor must be that Governments should exercise a wise discrimination in regard to the types of farming they will encourage in their own countries.

Here we find a task which Governments might well refer to their National Nutritional Councils.

The Councils might survey the national food consumption, compare this with the levels of consumption which science has demonstrated to be necessary for health, consider how far the national agriculture can be relied upon to make up the

deficiencies at reasonable cost, and how far it would suit the general national economy to rely upon importation.

The Committee thus foresees a gradual reorientation taking place in the agriculture of the industrial countries. With the growth of demand for the protective foods, farmers will produce more milk, more vegetables, more eggs and will become less concerned over the price of wheat or of sugar.

The outlook is one which Governments will welcome; for a state of affairs is foreseen in which national agriculture will be fully maintained or, indeed, increased, while there will be room for increased importation and hence for the export of manufactures. Apart from this general reorientation of agricultural policy and practice, the Committee considers that there is room for special arrangements between organised producers in different countries based on the seasonal differences in periods of production. A northern country could arrange to obtain supplies of vegetables from a southern one during early spring and herself become the exporter at a later part of the season.

The Committee attaches the utmost importance to this whole question of the organisation of national and world agriculture to meet the national and world needs for adequate supplies of food at reasonable prices and proposes to study the whole subject more fully in order to place more information before the Assembly in its next report.

4. THE EFFECTS OF AGRICULTURAL ADAPTATION ON THE ECONOMICS OF FARMING.

There can be little doubt that the progress of science and its technical application makes it possible to modify agricultural practice and to increase the output of particular products. The question remains, however, whether this adaptation will not necessitate important economic and financial adjustments. This aspect of the problem merits the most careful study by the countries concerned; meanwhile, it is difficult to reach a general conclusion, having regard to the very different conditions which are found in different countries. It can,

however, be said that expert opinion unanimously holds that fairly wide possibilities of substitution exist in most European countries, specially adapted for the production of the foodstuffs in which we are interested, and that such substitution would not have a harmful and disturbing effect provided, of course, that it were carried out gradually, by a natural process, contemporaneously with the changed demands of consumers.

It must, nevertheless, be realised that farmers in many countries, but especially in those with limited financial resources, will be handicapped in their endeavours to adjust their production to changes in demand owing to the lack of capital.

In almost every country in the world, the return on capital invested in agriculture is too low to attract sufficient money to enable the farmer to make adequate use of scientific improvements. The recognition of this state of affairs led to both the League of Nations and the International Institute of Agriculture studying the question of agricultural credit, and the question of the foundation of an international agricultural credit bank has been considered by the League of Nations.

The Committee has not been able as yet to study how far the factor of inadequate capital may handicap farmers in carrying out their part in the nutritional campaign, but it proposes to obtain information on this aspect and hopes to present its conclusions in its next report.

Closely allied to this question of agricultural credit is the possibility that producers' co-operative organisations might play a useful part in facilitating the reorientation of production towards the protective foods through the financial assistance they afford to farmers. This question, too, the Committee hopes to be able to study more closely.

Further, to the extent that foods of animal origin, such as eggs, meat and dairy produce, took the place of other production, there would be a fresh demand for vegetable produce for use as seed or fodder, over and above that intended for direct human consumption. Thus, a human diet involving a larger proportion of foods of animal origin would entail a wider demand for the produce of the soil, a demand which, as it could and probably would have to be met by the products of agricultural exporting countries, might tend to improve the

situation of those countries and to improve international trade in certain agricultural products.

The question might be asked whether a shift of consumption in the direction of protective foods might not be detrimental to the production of cereals and other energy-producing foods which, as should not be forgotten, have for centuries constituted, and still constitute, the basic dietary of populations of the Mediterranean type.

From the purely economic standpoint, the reply might be given that, if a change of production is the result of a spontaneous development in taste and if it is not thwarted by an agricultural policy opposed to such a development, the change from one form of production to another will be made only in so far as the farmer finds it to his interest to do so.¹

From the standpoint, again, of a country's food supplies, it is perfectly well known that there need never be any difficulty in meeting through world trade a demand for cereals which is not fully covered by national agriculture. This would have the advantage, first, of promoting trade between the various countries and continents, and, secondly,² of maintaining the efficacy of such a reasonable system of Customs protection as the European countries would probably think it necessary to maintain.

¹ The transformation which occurred in Denmark, from a country still exporting cereals in 1880 into a country with a large export trade in milk products and meat, is an example which merits careful examination. This transformation has made necessary a great increase in the supply of feeding-stuffs for cattle, a demand which has been met by an ever-increasing importation of cereals and oil-cake accompanied by a marked intensification of domestic cultivation.

The area devoted to cereals remains to-day, as in 1880, 41% to 42% of the agricultural area; but the area under root crops has risen from less than ½% to 14% of the agricultural area, while the area under fallow has almost disappeared. The importance of the land under green crops—clover and grass—in the crop-rotation system reached its maximum at the end of the nineteenth century. To-day, these areas do not form more than 22% of the agricultural area. Since the war, the cultivation of permanent grass crops has been developed on land not coming within the area of crop rotation.

The yield of all crops, reckoned in crop-units, increased between 1880-1884 and 1929-1933 by 163%, a development greatly accelerated in the last ten years. The yield of crops other than cereals has risen in these fifty years by 240%, though this has not prevented an increase in cereal crops of 70%.

The exportation of agricultural products has developed as follows:

	Butter	Condensed milk and cream (Millions of kilos)	Bacon	Eggs (millions)
1881-1885	14	—	8	60
1931	172	19	376	980

² “. . . agricultural protection far more than industrial protection must be moderate if it is to be really effective.” (See “Considerations on the Present Evolution of Agricultural Protectionism”, document C.178. M.97.1935.II.B.)

To the extent that demand tends to be transferred from energy-producing foods to protective foods, the prices of these two categories will not fail to adjust themselves in the same proportion. This adaptation will, in itself, act as an effective regulator of production.

In conclusion, there are good reasons for believing that the trend of dietary habits, particularly in countries with a Western civilisation, towards a larger consumption of protective foods would coincide with a parallel evolution of agricultural production, which would in all probability benefit the rural populations of the various countries, and might also greatly contribute to a resumption of normal economic relations between the nations.

Chapter VI.

PRELIMINARY RECOMMENDATIONS.

The Mixed Committee, as the previous chapters show, has directed its attention during the past year, in the main, to one part of its terms of reference—namely, Nutrition in Relation to Public Health. Its observations about the economic and agricultural aspects are of necessity preliminary. On the other hand, the Committee attaches great importance to the beneficial effects upon agriculture and trade which this movement may have. It proposes to go more fully into this side of the question in a later report.

Abundant evidence has been laid before the Committee to show that improved nutrition can bring about notable advances in human well-being, and, secondly, that the peoples of many countries, in so far as their financial circumstances permit, are tending to adopt more rational diets, with consequent beneficial effects. If, however, this welcome trend towards better nutrition is left without public guidance and assistance, many years must elapse before the mass of the people of any nation derive full benefit from the discoveries of science. Happily, it is within the power of Governments to accelerate this movement and thus to secure for the rising generation the physical benefits to which it is entitled. Public expenditure to this end might well be regarded as a premium paid on behalf of the whole community with every prospect of recouping the sums spent, not only directly in savings on medical services and assistance of many kinds, but by increasing the national assets by securing a healthier and more vigorous people capable of happier lives and increased productivity.

No one studying the ample documentation summarised in Volume III of the present report can fail to be struck by the interest already aroused in numerous countries by questions relating to nutrition. In submitting its report and recommendations, the Mixed Committee has been inspired

by the desire to maintain and foster this interest, to make it universal and to stimulate the movement for better nutrition through international action.

RECOMMENDATIONS OF THE MIXED COMMITTEE ON THE PROBLEM OF NUTRITION.

The Mixed Committee, while recognising the importance of the economic aspects of the nutrition problem, the fuller treatment of which it desires to reserve for a later report, submits to the Assembly the following preliminary recommendations, in the hope that, if they are approved by the Assembly and accepted by Governments, they will make a real contribution to the improvement of nutrition.

In order to promote endeavours to secure an adequate provision for all their people of necessary and, more especially, of protective foods, the Mixed Committee suggests to the Assembly to recommend that Governments should :

(1) Encourage and support in every possible way the further scientific study of nutrition problems with a view to ascertaining the optimum nutrition for each country, due consideration being given to differences of national economic structure, of climate and of available sources of supply ;

(2) Take all appropriate measures to ensure that the latest information about nutrition is included in the teaching of medical students and that medical practitioners, medical officers of health, district nurses, etc., have such information constantly brought to their notice ;

(3) Conduct a vigorous policy of education on popular nutrition for the instruction of the general public in this subject ;

(4) Support the Health Organisation of the League of Nations, not only in the work of its technical committees, but also in its endeavours in the field of public health and preventive medicine to promote the application of modern nutritional science for the benefit of the different age and occupational groups of the population ;

(5) Facilitate and promote international co-operation in education and propaganda and in the exchange of information, and, in particular, encourage all appropriate international organisations to lend their help ;

(6) Consider what steps should be taken, whether at the public charge or otherwise, to meet the nutritional needs of the lower-income sections of the community, and, in particular, the means by which they might ensure that adequate supply of food, especially safe milk, should be made available for expectant and nursing mothers, infants, children and adolescents ;

(7) Consider what further steps might be taken to meet the nutritional needs of adults, unemployed or otherwise in distress.

(8) With a view to giving the fullest possible effect to national propaganda and educational efforts for the improvement of popular nutrition :

Take all possible steps to make food supplies, and especially protective foods, so far as possible, available at prices within the reach of all classes of the community, while at the same time safeguarding the interests of the producers ;

Take steps to improve and cheapen the marketing and distribution of foodstuffs in both industrial and rural districts, and, with these objects in view :

Encourage collaboration between co-operative and other forms of producers' and consumers' organisations ;

(9) With a view to assuring purity of food and in the interest of public health, promote, so far as possible, the international unification of the technical analysis and control of foodstuffs, and of the control of preparations sold primarily for their vitamin content on the basis of the work being conducted on standardisation of biological products ;

(10) Set up standards of reference and specifications for grading foods of all kinds according to quality ;

(11) Consider whether any modification of their general economic and commercial policy is desirable in order to ensure adequate supplies of foodstuffs, and, in particular, to assist the reorientation of agricultural production necessary to satisfy the requirements of sound nutrition ;

(12) Co-ordinate the work done by different authorities which affects the nutrition of the people and, in the absence of a central authority, set up a special body for this purpose, in order to secure unity of policy and direction ;

(13) In order, *inter alia*, to ascertain how far existing national dietaries fall short of the new standards of nutrition, collect information on food consumption by families of different occupational groups at different income-levels as well as on the distribution of the population by family income ;

(14) Consider to what extent and by what means their national statistics of the supply and consumption of individual foods might be improved ;

(15) Assist the International Institute of Agriculture in collecting information regarding supply, national consumption and prices of foodstuffs.

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Furthermore, the Mixed Committee invites the Assembly to recommend the Governments concerned to give their full support to the Health Organisation in its enquiries into the widespread malnutrition which exists in the tropics and certain Far-Eastern countries.
