CURRENT SCIENCE

Vol. XI] FEBRUARY 1942 [No. 2

SOME FACTORS IN FOOD SUPPLY

IT was probably in one of the lectures of the genial Roscoe in Manchester that the present writer heard the story of Faraday and the untidy laboratory bench. It was related that a somewhat fussy old gentleman, on visiting the laboratory, rather pointedly drew Faraday's attention to a bent tube lying on the bench, containing a little yellow oil. "You should not leave oily tubes about on the bench like this," he said. Faraday made no remark, but the next day the old gentleman received a short note to the effect: "Dear Sir, the oil which you saw was liquid chlorine!"

To the writer it has always seemed that this incident records one of the most epoch-making among the great series of discoveries associated with the name of Faraday. Its importance lies not so much in the liquefying of chlorine, although at the present time tons of this liquid gas are used to sterilise the water supplies of great cities, but of more importance was the method used in bringing about liquefaction of this and other gases which meant a fundamental extension of the means available for the lowering of temperature. The greater number of modern refrigerating plants involve the alternate evaporation and recompression of either liquid ammonia or sulphur dioxide. This has rendered possible food storage on a large scale, with the consequent increase of facilities of travel and the transport of

perishable food over great distances. It has added greatly to the amenities of life in tropical countries and in the latest development known as "air conditioning" has actually altered the climate of whole buildings.

In consequence of the possibilities thus raised there has been great increase in the scientific knowledge of food storage and preparation, and the subject of dietetics has become of public interest; while large questions of agricultural and economic policy have come under consideration.

In the following paragraphs the attempt is made briefly to deal with some of the more interesting features of these topics.

Cold Storage. The problems concerned with the cold storage of differing types of food have involved a great deal of scientific research on various lines. Thus the proper storage of **meat** has meant the investigation separately of the effect of such storage on the proteins and fats of the various descriptions of flesh concerned. Careful control of moisture loss must be exercised. Possible bacterial infection has been prevented by the application of ultra-violet rays. The relation of the method of killing towards keeping quality has been found of importance, whether, *e.g.*, pigs are killed on the farm, or later in the factory.

The application of cold storage to the increased supply of **fish food** is of somewhat special interest. The newest method of refrigeration involves the production of ice in very small particles so that the flesh of the fish is not injured thereby in the subsequent processes of preservation and canning. As a result of improved methods of freezing, filleting and canning it has been possible to make use of 150 different kinds of fish instead of the former staples of cod and herring. The waste products are utilized, the skins and scales converted into fish glue and other refuse into fertilizer or cat food.

The cold storage of **fruit**, in addition to the improvement in bactericidal methods for the control, *e.g.*, of moulds on oranges, has involved a profound study of the "breathing" of certain fruits, particularly apples, pears and bananas, and the effect of varying proportions of gases such as carbon dioxide, or ethylene in the storage atmosphere, on the quality of the fruit on delivery.

Apart from the cold storage industry, arising directly from the investigations of Faraday, there are many other paths of research and industry accessory to this primary development. The **canning industry** has involved investigations in many directions, *e.g.*, the exceedingly troublesome subject of corrosion, and the possible contamination of the food with elements from the metallic containers. The lacquering of tins has affected the lac and resin industries.

Food Production. The foregoing factors are concerned, it will be seen, mainly with the preparation of food. Its production, since all food ultimately is derived from the soil, must depend on the workers in agriculture in all its multifarious branches. The work of the **plant breeder**, according to a recent article in the contemporary *Science and Culture,* has had enormous influence on the food supply of the world and particularly of India. The two staples of wheat and sugar have only to be mentioned. New possibilities of food plants also are under attention notably the soya

bean, concerning the dietetic value of which there seems to be some difference of opinion amongst responsible authorities.

The question of the relation between the method of cultivation of crops and their resulting quality, as well as of the kinds of food best suited to promote adequate nutrition, has furnished material for intensive discussion and considerable literary output. Thus a group of Cheshire doctors who have been in touch with 600 family doctors have published a medical testament in which they contend that health must be won by proper feeding and general use of fresh fruit grown on fertile soil. They therefore urge the necessity to maintain the fertility of the soil.

At a meeting at Crewe, Cheshire, at which the Lord Lt. Brigadier-Gen. Sir William Bromely Davenport took the chair and Major-Gen. Sir Robert McCarrison and Sir Albert Howard and others took part, Sir Robert and others pointed to four faults in existing nutrition. They are.

1. The use of denatured wheat flour.
2. Excessive consumption of carbohydrate food specially sugar.
3. Insufficient use of fresh green vegetables and salads.
4. Insufficient use of safe milk.

Though meat was not harmful too much was eaten.

In an important volume entitled: *British Agriculture* by Astor and Rowntree they state that the key is the marriage of agriculture and nutrition. They advise raising milk and importing wheat and beef. They think that 2½ million more cows are needed. Dairy lands and dairy herds must be improved. They do not however recommend self-sufficiency but think that the nation should hoard imported food stuffs and increase the productivity of the soil. The State, they contend, should be largely an agricultural landlord.

In a volume entitled: *Feeding the People in War-time,* by Sir John Orr and David Lubbock, they recommend more milk, more oat meal, and more vegetables, especially potatoes. They would cut out meat, eggs, sugar and bacon and compensate by cheese and dried fruits and fats. Weight for weight they state cheese contains twice as much nourishment as beef. The ideal war-time meal is porridge or cereals, margarined toast, perhaps sausage, potato, cheese and vegetables.

These normal physiological and dietetic complexities are not decreased when it is remembered that what may be scientifically excellent from the point of view of the nutrition experts may not be attractive to the appetite of the ordinary citizen. After all the psychological factor cannot be ignored.

The question of fertilizers at the present time is receiving special attention, particularly perhaps in England. The relative merits of mineral fertilizers generally summarised as N, P, K in comparison with organic materials is a subject of wide discussion. This is so much the case that quite recently a ten-year experiment has been initiated to arrive at some conclusion on this matter. The work is being undertaken under the inspiration of Lady Eve B. Balfour, the experimental area being located at the Haughley Research Farms in Suffolk, England.

The need for increased supply of high quality food has also led to an intensive study of the recovery and preparation of

organic refuse as fertilizer. A statistical survey has shown that the total quantity of vegetable and putrescible refuse available for Great Britain comes to about one million tons or some 13 per cent. of the total refuse, organic and other. This refuse together with the bugbear of the sewage works, *i.e.*, sludge of various types, has virtually started a new industry of fertilizer production. Thus at Kensington after hand-picking on moving belts the refuse is crushed, sprayed with an inoculant and fermented ærobically and anærobically, the resulting product being a coarse brown powder containing 30 per cent. of organic matter, 1 per cent. nitrogen, 40 per cent. inorganic solids and 30 per cent. of moisture, the product being termed "Hyganic". At other centres notably Maidenhead and Leatherhead ordinary sewage sludge and dry town's refuse are fermented together after suitable preliminary mechanical removal of metallic and other useful items. The heat of fermentation it is stated drives off the greater portion of the sludge moisture. In this way two troublesome waste products are made into a useful fertilizer, and from a personal communication to the writer it is learnt that this is always oversold to the farmers.

This modern fertilizer is naturally somewhat bulky and consequently the question of transport becomes of particular importance and may lead to the renewed utilization of the old canal system of England which had largely fallen into disuse through competition with the railways. Canal transport however has many advantages and might, one would think, be easily developed in India through the expansion of the irrigation canals, as well as the more efficient use of such waterways as the Buckingham Canal in the Madras Presidency.

An interesting proposal for modernising canal transport has been put forward by Mr. J. A. Coombs before the Institution of Sanitary Engineers. Mr. Coombs proposes to use a special type of conveyor which can be floated on the canal and transferred to wheels for land transit, propulsion being effected on the lines of the electric tram.

At the same time as this virtually new industry of fertilizer production is developing, 100 workers at Rothamsted are investigating numerous detailed problems of plant production by means of pot culture. One of the most notable observations is the remarkable effect of boron and also of other trace elements.

What is known as the "Dig for Victory" campaign in England has resulted in the creation of 2,000 Allotment Societies in Great Britain with a membership of 200,000. An average allotment measures 10×30 yards, *i.e.*, 1/16th of an acre, and can keep a man, his wife and his three children on potatoes and vegetables for 212 days out of 365.

Apart from the good food thus raised there can be little doubt that the physical exercise involved in the actual tilling of the soil, and the mental interest and relief in taking part in the growing of living things, must have a very beneficial effect on health and morale.

In addition to allotments the question of Hydroponics is naturally receiving attention. There appear to be two systems of soil-less culture, *viz.*, a water tank with suspended trays, and sand beds with circulated solutions of nutrient salts. From

interesting results recently obtained in connection with the small Activated Sludge installation at the Indian Institute of Science, Bangalore, it would appear likely that the question of humus may arise here also, as in the case of ordinary agriculture. It may be that the great Activated Sludge tanks at West-Middlesex and elsewhere may be made into "hanging gardens" on which tomatoes and other suitable vegetables can be grown in war-time, and tulips or roses in days of peace. It is quite possible that the hydroponics tank may be found side by side with the compost heap in a normal garden, the necessary aeration being produced by an electrically driven paddle wheel.

The Economic Factor

When it is realized what a vast field of study and scientific research has been explored in the endeavour to improve the quality and quantity of the peoples' food, it is indeed sad to read Sir John Orr's statement that 4½ millions of the population of England spend no more than 4 shillings per week per head on food. This expense he says should be doubled. It is when we come to consider this reverse of the picture, that other factors are seen to enter into the question of food supply. In the early days of the Industrial Revolution in England cheap food and consequent cheap labour was one of the main objectives of the industrial employers. The ultimate result of the concentration on this objective has been the development of mechanical industry at the expense of agriculture. This has meant the destruction in large measure of agricultural land both in Britain and elsewhere. Thus the virgin soil of the vast areas of the Western States of America was ruthlessly exploited and eventually the humus capital became exhausted so that we have the tragedy of the "dust bowls", humorously indicated by one former landlord in his expression: "My uncle will be along soon, I just saw his farm go by." In South Africa the lure of comparatively useless gold and diamonds has led to the neglect of the true wealth of the country. In India we learn from Dr. Maclagan Gorrie how increasing areas have been sacrificed to ill-nourished cattle and goats. Continually it seems to be forgotten that the land must always be recompensed for everything that is taken from it, if final disaster and food bankruptcy are to be avoided.

Ultimately the root cause of all this other side of the picture is cheapness which has been defined by a responsible Indian State official as "the curse of India". It is to be feared that India is not alone under this curse. The main reason why so great a proportion of the population, not only of England but also of India and many other countries, suffer from malnutrition is that in spite of all the scientific research and of the vast possibilities of food supply which exist under present conditions these unfortunate people are unable to pay for the food which is so needful for them.

Considering further the cause of this we find it to be largely the result of a defective monetary system, and the dominance of the Profit motive. The greater the possible supply of good food the less would be the possibilities of money profit. When therefore money is valued before men we have the dreadful phenomena of food desctruction, where fish is thrown back into the sea, coffee is burnt as fuel in

locomotives, and farmers are paid not to raise hogs. Other consequences also arise owing to the dominance of vested interests particularly, *e.g.*, the non-supply of whole meal bread, partly because of the difficulty of storing whole wheat flour. The most nutritious portion of the flour has thus to be first removed. A curious illustration of this trouble is given incidentally in a recent letter from England wherein the correspondent speaks of considering the possibility of installing a small hand-mill in her flat in order to obtain sound flour for her bread. The implication raised here concerning Mr. Gandhi's Village policy does not need elaboration.

What then is to be the solution of the grave tragedy of deficient or imperfect food, and of malnutrition? It is evident that in the "New Order" men will have to be considered before money. Recently every member of the British Parliament has been furnished with a copy of a small book by Sir Reginald Rowe entitled: "The Root of All Evil". It is not, as so often misquoted, that money is the root of all evil, but the love of money in itself does indeed fulfil this definition. Money in itself is merely a catalyst accelerating changes which would otherwise take place slowly if at all. The fundamental mistake has been to consider money as itself a commodity to be dealt in like ordinary goods and services. This concept of money apparently has the power of vitiating the whole area of financial thinking, creating the absurdity, *e.g.*, of considering a "favourable balance of trade" as being an advantage when what it ultimately means is that we are giving away our goods to our neighbours for nothing. It has been stated that "to financial experts and bankers, money is merely a hen for laying eggs of interest". An increasing body of opinion is coming definitely to the conclusion that money must no longer be looked upon as a commodity, but that it must be issued by the State in amount exactly to balance the requirements of the consumer. The consumer, in fact, must be subsidised rather than the producer. Otherwise the consumer starves at the profit of the farmer. With the proper adjustment of money counters both would be benefited. Already free milk is supplied to necessitous school children and proposals have been made for free food for everybody. According to this proposal there should be a World Food Council of all the nations of the world, and every nation should have its own food council. Through these national councils the general World Council should learn how much food is available from every nation and how much is needed by every nation. The World Council would effect an equitable distribution of the available food products, but as food can now be produced almost illimitably there should not be any shortage for any nation. There should be everywhere State-owned and State-run distributing centres through which the ordinary man who could not afford to pay or has less than a certain income could obtain free food, just as education is supplied free to all who require it. Free food is indeed part of the Russian programme.

In the United States some progress has been made in the provision of food for all through the intervention of what has come to be known as "Surplus Sal". The idea appears to be to allow people to spend some of their relief money in yellow stamps

which they can use at certain registered shops to buy food. Along with the purchased yellow stamps, they are freely given one blue stamp which is good for a food product which comes under the head of surplus. Thus there need to be no waste of crops of any sort and at the same time no serious dislocation of ordinary business operations.

In ways like this, and with the vast experience which war-rationing has furnished the Government, we may hope that the worst blot on our so-called civilization may, in part at least, be wiped out. In this as in other hoped-for features of the "New Order" it is not cheapness which must be relied upon, but rather, as the Editor of the ***Economist*** is reported emphatically to have remarked, "Brains."!

GILBERT J. FOWLER.

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SIR CATTAMANCHI RAMALINGA REDDY, Kt., M.A. (Cantab.), Hon. D.Litt. (Andhra), M.L.C.

THE happy news that Sir C. R. Reddy, M.A. (Cantab.), D.Litt. (Andhra), M.L.C., Vice-Chancellor, Andhra University, is amongst the recipients of Knighthood, will be received with gratification by a wide circle of his pupils, friends and admirers throughout India. Sir Cattamanchi is one of our foremost educationists who has played a conspicuous part in shaping the educational policy of this country. His "Memorandum on Education in Mysore" which was published in the year 1919 constitutes one of the epoch-making documents which continues to inspire and influence the progress of education in Mysore.

As Vice-Chancellor of the Andhra University, he has been exceptionally successful in stimulating private munificence through which several Chairs and Lecturerships have been founded in the University. Soon after the declaration of the present war, Sir Cattamanchi pleaded for an immediate orientation of the work of the University laboratories to meet the war economy of the nation. He referred to the situation which arose 25 years ago and pointed out how the European countries and America grasped the opportunity at the time to achieve a state of self-sufficiency. He said "by confiscating enemy patents, by vigorously promoting domestic industries in regard to dyes, drugs, etc., and utilising universities for purposes of the necessary researches, European countries and America became self-sufficient."

In 1930, he resigned the Vice-Chancellorship of the Andhra University as a protest against the repressive policy of the Government during the days of the Civil Disobedience movement.

By conferring upon him the Knighthood, His Majesty's Government have honoured a distinguished educationist, an accomplished scholar, a practical statesman and above all, an esteemed patriot. We extend our hearty and respectful felicitations to him on this occasion.