supply are not likely to be restored to us. If the food subsidies are greatly reduced, and dairy produce and other foods are sold at something more nearly approaching the cost of production, I doubt whether the consumption of butter will ever return to its pre-war level, but the demand for butter will certainly continue to be greater than the present available supply. It is doubtful whether cheese consumption can be maintained at its present level when meat becomes more plentiful, but the market for supplies of concentrated or dried milks is by no means saturated.

I hope that I have been able to show that the Commonwealth markets for dairy produce in the United Kingdom are capable of considerable expansion, particularly for butter and for concentrated and dried milks. With the wider appreciation of the high nutritive value of milk solids apart from the fat, the quantity of dried milk solids which could usefully be absorbed in this country is well beyond the Commonwealth's capacity to supply. I have in mind particularly a possibility that at some future date dried milk solids may be added to flour for bread making. There are definite signs that both Australia and New Zealand are eager to expand their export of dried separated milk. Unfortunately it necessitates a change in the butter industry from an organization in which only the cream is collected to one in which the whole milk must make the journey to the butter factory, and involving greatly increased needs for transport, heat and power for the production of milk powder.

Few would argue that the cheese market is not saturated with the existing supplies, but I am one who believes that the total consumption could be expanded if the variety of cheeses offered to the housewife was greater. Cheddar is too strong and sharp for many palates which might be tempted by less acid types of cheese such as Gruyère, Edam, Gouda and Port Salut. The demand for Cheshire cheese in the north-west has never been satisfied since before the war. Commonwealth cheese makers might, with considerable ultimate advantage to themselves, examine the possibility of shipping a small proportion of their output as varieties other than Cheddar.

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Commonwealth Contributions and British Requirement of Edible Fats and Oils

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There appears to be general agreement among those qualified to express an opinion that the world is short of oils and fats. The basis for this view is partly theoretical and derived from calculations of production before the recent world war in comparison with present supplies of oils and fats after allowance has been made for the increase in

population over the 10-year period. In addition, there is the undoubted fact that in many countries the demand for oils and fats is greater than the supply. In the world as a whole there was, of course, a shortage of fats before the last war, in that countries such as India and China preferred to export oilseeds or fats in order to be able to import certain other commodities which they considered to be more important, though this policy contributed to a starvation diet for a proportion of the population. The policy, which is unlikely to be repeated, is a variation of our own programme of exporting, for example, textile goods and going shabby, so that we can import foodstuffs to maintain our calorie intake.

This paper, however, can ignore the world situation, since it is required to refer only to conditions in our own country. Though our consumption per head of oils and fats for edible purposes appears to be about equivalent to what it was before the war, there is still a great deficiency of fats for soap-making. There is then little doubt as to the existence of a shortage of the total supply of fats in this country.

With edible fat, it is possible that the present rationing system has encouraged a greater consumption per head, which, it is possible also, may not be maintained when control is removed. A further point worth mention is that edible fats are required for three broad purposes, spreading, making of cakes and pastry, and frying. The effective use of fats for the making of cakes requires other constituents, such as eggs, dried fruits and sugar, and there is little doubt that less fat is used in the home for cake making than would be used if more of the other ingredients were available. It is sad to reflect how difficult it is to sell the cheap and coarser types of fish, even though the country is so short of animal protein. Perhaps the freer availability of oils and fats suitable for frying would help to solve the problem. This may be only another example of the precept that food is what tastes good to you; calories are medicine.

This country is fortunate in that it procures the overwhelming proportion of its oils and fats from Commonwealth countries or, with marine oils, from United Kingdom resources on the high seas. Still there is a shortage, and it would seem that measures to obtain additional supplies from Commonwealth countries on lines described by Mr Fuggles-Couchman (1950) must commend themselves to all reasonable men. I suppose that, if cost were the only criterion, to plant the oil palm would be cheaper than any other alternative, but the plan is not attractive for an immediate solution because it takes some 7 years for the trees to bear. Thus, no one can really quarrel with a decision to concentrate on the cultivation of groundnuts whereby valuable protein feeding-stuffs for the animal population are obtained as well as oil. It appears that as far as East Africa is concerned sunflower seed also will be produced, and it is reasonable to notice that no one has ever, to my knowledge, raised the question as to whether the oils and fats industry can use these various fats adequately without adverse effect on the quality of the products which they make. The fact is that the industry has developed such technical skill that it can use almost any fatty material for the purpose of its manufacture. It will, of course, have its preferences, but it can work miracles with what it is given, which is the situation that we have to face to-day.

Apart from the continued improvement in the technique of refining and deodorizing oils and fats to make them edible, the industry depends on certain important processes

to give the variety of materials that are necessary for the correct blending of fats for margarine. Foremost among these is hydrogenation. To the uninitiated, hydrogenation merely means the conversion of soft oils into hard fats, and no one who is not engaged in the edible-fat and soap-making industries can understand the vast variety of different fats that can be obtained by selective hydrogenation. The ability to vary the proportion of solid and liquid unsaturated isomers of a soft oil by carefully controlled conditions during its hydrogenation has revolutionized the industry. The possible variations increase with the greater complexity of the oil; so, for example, marine oils with their greater variety of fatty acids offer greater scope than other oils such as groundnut oil. It is interesting to observe that at present whale oil may be used only by the edible-oil industry and not for soap manufacture. The importance of the hydrogenation process is thus emphasized for, of course, whale oil cannot be used without hydrogenation. Another process which is finding increased application by the technologist in oils and fats is usually termed 'interesterification'. The natural fats acquire their properties by virtue of the particular make-up of the different fatty acids in their mixed glyceride molecules. This make-up can be varied by treatment with a suitable catalyst under certain conditions, and the final reaction mixture of fats frequently has improved properties in comparison with the natural mixture from which it originated.

In the treatment of fats the technologist is set many problems, one of the most important being to remove any unpleasant flavours which treatments of the type I have described may have introduced. Such difficulties have been solved as far as hydrogenation is concerned, but there are still some problems to be faced in connexion with interesterification.

There are other processes available to the manufacturer of edible oil and fat products, but space does not permit them to be mentioned.

It has frequently been suggested that the shortage of edible fats in this country could be met by diverting the materials used by the soap industry for use as food, and replacing them by synthetic detergents. I do not want to take time in discussing what I understand by synthetic detergents, and it is sufficient to say, for this argument, that they are detergents which do not require the use of oils and fats in their manufacture. On the face of it, there is something to be said for the suggestion, but I have not seen any references which indicate that those who favour the idea appreciate what is involved. At the present time, of the raw material allotted to the soap-maker, about 30% consists of residues from the edible-fat industry, and about 47% consists of inedible oils and fats such as low-grade palm oils and home-melt tallows. Of the remainder the most important proportion is palm-kernel oil, a type of material of which the edible-fat manufacturer already has enough if he is to continue to manufacture the class of products which the housewife expects and is used to. It is obvious that the inedible fats and margarine residues could be split, and the fatty acids distilled and re-esterified with glycerine, if it can be assumed that the problem of quality could be overcome. Costly plant would, however, be needed for splitting and distillation, and above all for making synthetic glycerine, since glycerine is scarce in this country, and if no soap were made all glycerine would have to be synthetic. The cost of the final product would not

be favourable compared with that of natural fats, and would almost certainly approach that of fatty acids from petroleum which presumably do not offer an attractive commercial proposition, since no company has yet undertaken the process.

I would suggest that synthetic detergents will command a share of the detergent market which will depend on their efficiency and price. To that extent they will relieve the requirements for oils and fats of the detergent industry. Meanwhile, until we have exhausted the possibility of providing oils and fats themselves, I would suggest that no useful purpose is served by forcing something on the housewife which she may not want, and which can in any case only be produced by erecting a vast amount of new plant and equipment to produce oils and fats at apparently uneconomic prices.

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Sugar and Food Yeast

By P. Lyle, *Plantation House, Mincing Lane, London, E.C.* 3

This morning, Dr Wiggins (1950) gave a comprehensive survey of the position of the sugar industry in the West Indies and I propose to amplify some of his remarks.

I happen to be connected with two companies owning sugar estates and sugar factories in Jamaica and Trinidad, and we are necessarily much concerned with the welfare and nutrition of the local populations which are increasing at an alarming rate. For instance, the population of Jamaica will, at the present rate, double itself in 35 years.

Sugar is the main crop in most of the islands, and increased production is of the greatest importance. More employment can be given when the increased production is the result of bringing new land into cultivation, but it is a fact that a great part of the increased production is caused by increases in yields of sugar per acre resulting from improved and mechanized cultivation, pest and weed control, and field trials of varieties and of manures, which are carried out on a large scale.

Increased production of sugar cannot alone do all that is required to feed the people, and we have to look for other methods, particularly in view of the fact that these islands, primarily agricultural, import large quantities of meat, milk and other foodstuffs from outside. One example of what is being attempted may be mentioned. In Barbados, where large quantities of condensed milk are imported, many of the sugar-cane estates are building up dairy herds. Fodder is plentiful in the wet season and cane tops can be used during the cutting of the cane crop; for the short period between the cane crop and the return of green fodder after the onset of the rains, making of silage is being developed.

In the peasant agriculture, most of the holdings are very small and worked by the