straightforward and less controversial than the political and economic problems. If food production is wanted it can be done so far as scientific problems are concerned. The political and economic problems lie outside our present scope; they have been fully discussed in Lord Selborne's report on rural reconstruction. During the war these problems have, in fact, been largely solved, and in the view of Lord Selborne's Committee the increased production could be permanently maintained.

Assuming this were done, then, it would be necessary to put on a permanent basis the present rearrangement of areas under crops. Various schemes have been submitted. Broadly speaking, they involve the maintenance in arable cultivation of the three and a half or four million acres now taken off permanent grass and adding it to corn, thus extending the rotation from four courses to five, or from five to six. The interposition of a corn crop in this manner is quite possible in practice on two conditions—the land must be kept clean and fertilisers must be used. A reasonable dressing to use for cereals in these circumstances would be 1 cwt. of sulphate of ammonia or nitrate of soda and 2 cwt. of superphosphate per acre. This would not give a measure of the total consumption of fertiliser necessary, because the taking out of 4,000,000 acres of permanent grass would necessitate the improvement of the remainder in order that the same quantity of grass might be grown; an average dressing per acre of 1 cwt. of basic slag would be a reasonable application here. Two estimates are given in the report:—

Estimated Post-war Consumption.

	Pre-war consumption:	Sir T. H. Middleton's estimate:	Sir Charles Fielding's estimate:
	tons per annum	tons per annum	tons per annum
Sulphate of ammonia...	60,000	—	360,000
Superphosphate	743,000	1,367,000	1,643,000
Basic slag	263,000	892,000	1,463,000

It is improbable that the production of basic slag would ever attain the high figures quoted here, while, on the other hand, much greater quantities of superphosphate can be made even than the 1·6 millions required on Sir Charles Fielding's estimate. Some of the slag would therefore in practice be replaced by superphosphate.

Of the two sets of figures Sir T. H. Middleton's is the more likely to be realised. Estimates for sulphate of ammonia are difficult to make because to a large extent, and yet not altogether, sulphate of ammonia is replaceable by, and can itself replace, nitrolim or calcium cyanamide and nitrate of soda. It would not be difficult to make a reasonable guess at the total amount of combined nitrogen the farmers of the United Kingdom might be expected to use, but it is impossible to forecast the way in which they will take it. Thus we might assume the following distribution of crops and consumption of fertilisers:—

	Area		Fertilisers used: tons	
	Total, million acres	Manured, million acres	Superphosphate and basic slag	Nitrogen expressed as sulphate of ammonia
Wheat, barley, oats	11·2	3·0	300,000	150,000
Potatoes	1·5	1·5	150,000	75,000
Swedes, turnips, mangolds	2·6	2·6	390,000	130,000
Other arable crops	1 6	0·9	90,000	45,000
Temporary grass	6·0	2·0	200,000	50,000
Permanent grass	23·8	12 0	600,000	20,000
Total	46·7	22·0	1,730,000	470,000

Here all the combined nitrogen is expressed for convenience in the form of sulphate of ammonia, but it must be understood that other compounds can be used also. This leads to the conclusion that 470,000 tons of sulphate of ammonia (or the equivalent of nitrolim and nitrate of soda) and 1,730,000 tons of phosphates (superphosphate and basic slag) could be utilised annually in the United Kingdom—figures, however, which are below those of Sir Thomas Middleton in so far as phosphates are concerned.

However, all these estimates are necessarily hypothetical; no one knows what will happen after the war. Unless the great political and economic problems involved are satisfactorily dealt with we may yet see the land going back to grass in spite of all our endeavours.

E. J. RUSSELL.

THE VALUE OF THE HERRING AS FOOD.

THE report for 1917 of the Lancashire Sea-fisheries Laboratory is chiefly devoted to a paper by Dr. J. Johnstone on the dietetic value of the herring. It is not necessary to emphasise the present importance of this subject, for the fact is now well known that in the days before the war a small proportion only of the herrings landed in this country was consumed by our own population, a proportion which Dr. Johnstone estimates at as low as 20 per cent. The Government Departments responsible for fishery questions are fully alive to the possibilities which will occur after the war for utilising the fish which were previously exported, and so adding substantially to the national food supply. Already steps are being taken with the view of placing these fish on the market in a more attractive and palatable form than the salted or pickled herrings which constituted the bulk of the exported article, and if the public once realises the food value of the fish the whole supply might well be retained at home.

Dr. Johnstone's analyses of the flesh of the herring have been made chiefly on fish from the Irish Sea, and as the most novel feature of his results is the clear and definite way in which he shows that the composition of the flesh varies very greatly in samples of fish taken at different seasons and in different states of development, it becomes important that analyses of a similar kind should be carried out in other fishery regions, especially in connection with the

great herring fisheries of the North Sea. As an example of the extent of this variation the following figures from Dr. Johnstone's paper may be quoted (p. 31):—

Manx Summer Herrings: Fisheries of 1916 and 1917.—Composition of the Flesh of the Fish: Monthly Means.

	Date			
	May, 1916	May, 1917	Aug., 1916	Aug., 1917
	Condition			
	Virgin	Virgin	½-Full	Full
Water	75·0	68·5	48·4	43·5
Oil	2·5	5·4	31·5	36·6
Proteid	21·1	19·7	16·5	15·7
Ash	2·3	3·3	2·3	2·9
Total	100·9	96·9	98·7	98·7
Energy values (calories)	1100	1330	3608	3943

The most striking variation is in the fat, which rises from about 2½ per cent. at the beginning of the season to more than 36 per cent. in August, when the fish are not far from the spawning phase. After spawning has taken place a great reduction in the percentage of fat occurs, spent fish obtained in September, 1914, showing a reduction to about 9 per cent.

In addition to many analyses of fresh herrings the paper contains similar figures for cured fish of various kinds, pickled herrings, kippers, bloaters, and red herrings. A few samples of sprats were also analysed.

It must be clearly stated that the figures given apply only to the "flesh" of the herrings, including the skin (*minus* scales). The author makes the curious statement that "from the point of view of dietetics it is only the flesh that matters," But surely the roes and milts of "full" herrings are about the best and most nutritious parts of the fish, and the value of the fish as food will not have been adequately dealt with until we have figures in which these are included in their due proportions.

Amongst other aspects of the question discussed by Dr. Johnstone are the effects of cooking and the chemical effects of salting herrings, as well as a number of physiological matters, such as the locus of the fat, the nature of the fat, and the seasonal metabolic phases. The paper is one of great interest, and it is to be hoped that the subject will be followed up. E. J. A.

THE METALLIFEROUS ORES OF THE IRON AND STEEL INDUSTRY.[1]

IN June, 1917, the Department of Scientific and Industrial Research published a report dealing with the metalliferous raw materials of the iron and steel industry of the United Kingdom, the Allies, and the neutrals. Its object was to collect and summarise in a form which can easily be consulted as much information as possible from the principal literature pertaining to the sources of iron ores, and other metalliferous ores accessory to the metallurgy of iron and steel; to describe their composition and character, giving analyses where possible, together with indications as to the geographical position and the accessibility of the minerals. The report did not claim to give the results of independent researches, but merely to provide for the inquirer information for which he would otherwise have to search through a great variety of publications and monographs issued by technical and scientific societies and geological surveys. How useful this publication has been to the iron and steel industry is shown by the fact that the stock of copies was almost exhausted three months after publication.

It soon became apparent that the value and the scientific completeness of the report would be greatly enhanced if an account were given of the supplies of the ores in enemy countries also, and the issue of a new edition has provided the opportunity of adding this information. Some later statistics are also given, and various errors and omissions have been corrected. The second edition accordingly consists of three parts: (1) Notes on the iron ores of the United Kingdom and British dominions; (2) notes on iron-ore deposits in foreign countries; (3) notes on the ores of the principal metals, other than iron, used in the iron and steel industries. The last-named part describes the occurrence and composition of the ores of chromium, cobalt, manganese, molybdenum, nickel, titanium, tungsten, vanadium, and zirconium, and the principal uses of the special steels or ferro-alloys made from them.

The German steel industry is based upon, and was rendered possible only by, a discovery of two Englishmen, Sidney Gilchrist Thomas and Percy Carlyle Gilchrist. This discovery, which in their hands became also an invention, brought within the scope of economic development the vast supplies of phosphoric ores (Minette) of Lorraine and Luxemburg, and of the Salzgitter and Ilsede districts, which were thus made available for the manufacture of commercial steel on a great scale. As the industry grew its requirements were supplemented by imports from the Briey orefield in France, which is the main part of the same ore body which extends to annexed Lorraine and Luxemburg. These ores were all treated by the "basic" process. For the raw materials of acid steel and steel of special quality, Germany had to depend on imports derived mainly from Sweden, Spain, and Russia.

In May, 1915, a secret memorial, drawn up by six great industrial and agricultural associations in Germany, was presented to the Chancellor. A translation of this was published by the Comité des Forges de France in August, 1915, and from it the following quotation is taken: "Concerning France . . . besides the iron-ore region of Briey, it would also be necessary to acquire the coal region in the Departments of Nord and the Pas de Calais; the security of the German Empire imperatively requires the possession of all the Minette mines, including the fortresses of

[1] "Report on the Sources and Production of Iron and other Metalliferous Ores used in the Iron and Steel Industry." (H.M. Stationery Office.) Price 2s. net.