

FOREIGN COMPETITION IN THE DAIRY INDUSTRY
OF THE UNITED STATES.

by

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...

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INTRODUCTION

In reviewing the truly enormous mass of material found available on various phases of the production and consumption of dairy products throughout the world, it has appeared increasingly clear to the writer that any unified treatment of the subject of foreign competition with our own extensive and diversified dairy interests must of necessity be confined to general statements of fact and principle. A comparative study of such world wide scope does not permit of any lengthy or complete description of the dairy industry anywhere, and most of such description as appeared indispensable to either regional or illustrative. Details have been dropped out of the picture in the attempt to bring out the high lights. Considerable statistical data that could be made much more adequate use of are appended for reference to the end that the general conceptions developed may be applied in their further analysis and interpretation. The treatment required also that a mass of historical detail be passed over in order to emphasize significant trends. And much that might be of interest and value locally was not found of sufficient importance in the price economy to justify its inclusion in a study of competition except where the potential developments are of particular interest.

In the main, therefore, the scope of the study is arbitrarily limited to commercial dairying under a system in which production for profit is the rule. The aim has been to make some contribution, first, to the price economics of dairying with reference to agriculture and industry universally, and, second, to the orientation of the dairy interests of the United States in their modern and hence essentially international setting. It is obviously unnecessary to urge the need for some interpretation of the confusing mass of published materials that deal with dairy developments abroad as more or less isolated bits of information.

The problem of determining the nature of the competition to which the dairy industry of the United States is subjected from outside its political boundaries involves some acceptance of economic principles as a lamp to one's feet. It is believed, however, that such principles emerge more clearly as a result of the comparative study of the far-reaching practical interests involved in the development of such an industry on a world-wide scale, and the opportunities afforded for the extended application of the "case" method under widely varying conditions. Since the principles are everywhere the same, much of the material gathered in the study of foreign developments in the production and sale of dairy products may serve to throw some additional light on the economics of our own industry. Statistical data which are notoriously inadequate for our own huge dairy industry are often found to cover some phase of the industry abroad in a way to supplement or complement our own, appearing at certain points to be best where ours are poorest. The study of the economics of the dairy industry abroad has the added real advantage, too, that the developments to be studied can often be seen in perspective as they can scarcely be viewed by one who is himself immersed in them.

THE ECONOMY OF HUMAN ENERGY GIVES RISE TO THE DAIRY INDUSTRY.

The recognition of competition in the dairy industry anywhere raises the fundamental question as to why there should be a dairy industry at all when the best dairy lands could sustain more human lives if given over to certain other lines of food production.

There is good authority for the statement that the food problem of the world has always been a bread problem. ^{a/} More human lives can find sustenance, as such, in a direct appropriation of the available plant food than in the additional maintenance of an animal economy. The Chinese regard it as utter waste to feed their good corn (kaoliang) to a pig or a cow. Their grain and other plant food will sustain the lives of a greater number of people when consumed as such, since some of its food value is necessarily appropriated by the animal for its own maintenance. The human energy used up, however, in the assimilation of crude foods is lost to all other possible uses of it, and the vicious circle sets in, - a mere round of human existence. Indeed, when once such a hand-to-mouth or land-to-mouth economy becomes established, it is difficult to see any possibility of the attainment of another involving an animal economy.

The technique of the dairy industry itself demonstrates this means of the conservation of energy. A well-developed dairy cow produces a highly artificial surplus of milk, - itself a perfect, concentrated, readily assimilated food. The quantity of this surplus is in turn determined not only by the quantity of the feed consumed by the cow, but by the readiness as well

^{a/} See Annals of the Association of American Geographers, Vol. XV, No. 1, March, 1925, in which C. F. Marbut in his presidential address on The Rise, Decline, and Revival of Malthusianism in Relation to Geography and Character of Soils presents a comprehensive survey of the effects upon food supply of the extensive utilization during the last half century for the first time in the history of the world of the comparatively limited black soils.

with which it is assimilated. The more concentrated and assimilable the feed, the less will the cow's energy be dissipated in the process of nutrition alone and the more substantial will be her contribution to her exploiter.

Fats may be assimilated from plants directly by consuming the plant food^{ds} under tropical conditions generally. Vegetable fats may be rendered still more assimilable by their concentration in the various forms of margarine. Or they may be assimilated still more indirectly, as in meat or in milk and its products, as they have long been consumed in the more temperate regions.

In the indirect production, feeds vary in fat content. No cow can make more butter-fat (in the long run, or beyond the possible compensation from her own body fat) than is in the feed. This accounts for the importance of the "concentrated" feed-stuffs in providing a supply of fats that can be assimilated without over-burdening the animal with bulky feeds.

As the cow can thus by being provided with more readily assimilated feed be made a more efficient machine, so man is made more efficient by conserving his energy through the consumption of the concentrated product of the cow rather than through direct consumption of the bulkier vegetable foods which mean loss of energy in their digestion and limit the total energy obtainable from them. Similar economy, of course, is to be noted with regard to proteins. From the point of view of nutrition excessive bulkiness in food amounts to much the same for man or beast as scarcity of food.

It is in this sense, then, of the true economy of human energy that the maintenance of a dairy industry both signifies and perpetuates a high standard of living. It is fundamental to any explanation of the rise and growth of a dairy industry, and would appear to justify its encouragement as a social policy.

DISTRIBUTION OF WORLD DAIRY RESOURCES AS GEOGRAPHICALLY DETERMINED

Any appraisal of the dairy resources of the world in relation to those of the United States involves as the first step the fixing of their purely physical or geographical basis. While this constitutes in itself a field of study only slightly explored as yet, such detailed studies as are available consistently amplify the broad generalization that commercial dairy production falls well within the temperate zones, coinciding, accordingly, with the regions of highest civilization and maximum energy of the population.

The exact combination of soil, moisture and temperature conditions that would represent the optimum for dairying is difficult to discover. Meteorological records are quite adequate for all the important areas concerned and have been appended to the text a/. The greatest difficulty lies in the isolation of geographic influences since the "state of nature" is everywhere more or less permeated by the art of the husbandryman. Such outstanding sections as Normandy, Ireland or the North Island of New Zealand, with their equable, moist climate and luxuriant grass growth certainly approach the optimum. Rainfall is clearly the chief determinant as evidenced by the prevalence of dairying in moist coastal areas despite variations in soils and temperature. See illustrations below of Australian coast and Australia and New Zealand entire.

The following tabular statements indicate relations that will be referred to in other connections, but may serve here to demonstrate the quite unlimited potential dairy lands of the world.

a/ Data abstracted from "The Climates of the Continents", by Wilfred George Kendrew, Oxford, Clarendon Press, 1922.

TOTAL LAND AREAS AND TYPE OF UTILIZATION BY COUNTRIES, 1925.

Countries	Arable land	Permanent grass and pasture	Wood and Forest	Other land	Total area
	1,000 acres	1,000 acres	1,000 acres	1,000 acres	1,000 acres
Germany.....	50,613:	19,615:	46,413	:	116,641
Austria.....	4,685:	5,728:	7,621:	2,481:	20,715
Belgium.....1/	3,015:	1,253:2/	3,254	:	7,522
Bulgaria 3/.....	8,584:	---	---	---	25,488
Denmark.....	6,499:	766:	3,366	:	10,631
Spain 4/.....	39,610:	62,469	:	24,107:	124,810
Estonia.....	2,496:	4,438:	2,219:	2,021:	11,174
Yugoslavia.....	14,868:	10,872:	18,745:	16,916:	61,401
Finland.....	5,271:	2,945:	76,695	:	84,911
France 3/.....	56,601:	27,238:	25,567:	25,029:	134,435
Great Britain.....	13,628:	31,216:	12,142	:	56,986
Northern Ireland.....1/	1,233:	1,730:2/	368	:	3,351
Hungary.....	13,566:	4,144:	2,678:	2,555:	22,963
Irish Free State.....1/	2,838:	10,470:2/	2,721	:	17,019
Italy.....	32,683:	16,934:	13,801:	13,205:	76,623
Latvia 5/.....	4,144:	4,117:	4,398:	3,598:	16,257
Lithuania.....	6,454:	3,496:	2,184:	1,619:	13,753
Luxemburg.....	279:	101:	259	:	639
Norway.....	1,658:6/	623:	17,734:7/	56,561:	76,576
Netherlands.....	2,886:	3,111:	583:	2,093:11/	8,073
Poland.....	45,139:	15,733:	22,392:	9,696:	93,060
Rumania.....	30,317:	10,672:	17,895:	13,983:	72,867
Sweden.....	9,407:	63,028	:	29,019:	101,454
Switzerland.....	1,255:	4,141:	2,226:	2,580:	10,202
Czechoslovakia.....	14,606:	6,380:	11,498:	2,197:	34,681
Canada.....	68,096:	---	---	---	2,338,604
United States.....1/	336,654:	---	---	---	1,903,194
Argentina 8/.....1/	52,736:	---	---	---	690,079
Brazil 9/.....	12,587:	---	1,235,673:	---	2,103,115
Chile 9/.....	5,066:6/	31,177:	12,217:7/	137,239:	185,698
India (British provinces) 10/::	305,629:	---	66,512:12/	302,277:13/	664,516
India (Indian States) 9/.....	80,189:	---	17,094:	39,706:13/	133,528
Japan 3/.....	14,863:	---	---	---	25,865
Algeria.....1/	8,013:	---	---	---	142,209
Egypt 3/.....	8,401:	---	---	---	247,100
French Morocco.....	7,480:	---	3,706:12/	91,350:	102,546
Tunis.....	7,060:	247:	2,693:	20,919:	30,919
Union of South Africa 9/.....	6,677:	---	---	---	302,292
Australia 9/.....	22,380:	---	---	---	1,903,633
New Zealand 10/.....	1,955:	16,449:	---	---	66,470

International Institute of Agriculture. 1/ Exclusive of bare fallows. 2/ Inclusive of bare fallows. 3/ 1924. 4/ 1922. 5/ 1923. 6/ Exclusive of pasture. 7/ Inclusive of bare fallows. 8/ 1922-23. 9/ 1923-24. 10/ 1924-25. 11/ Exclusive of water. 12/ Inclusive of permanent grass and pasture. 13/ Area of the territories for which statistical data are available.

TOTAL LAND AREAS AND TYPE OF UTILIZATION BY COUNTRIES, 1925.

Countries	Percentage in relation to the total area			
	Arable	Permanent	Wood	Other land
	land	grass and	and	
		pasture	Forest	
Germany.....	43.4	16.8	39.8	
Austria.....	22.6	27.6	37.8	12.0
Belgium.....1/	40.1	16.6	43.3	
Bulgaria 3/.....	33.7	---	---	---
Denmark.....	61.1	7.2	31.7	
Spain 4/.....	31.7	50.1		19.3
Estonia.....	22.3	39.7	19.9	18.1
Yugoslavia.....	24.2	17.7	30.5	27.6
Finland.....	6.2	3.6	90.3	
France 3/.....	42.1	20.3	19.0	18.6
Great Britain.....	23.9	54.8	21.3	
Northern Ireland.....1/	36.6	51.6	11.6	
Hungary.....	59.1	18.0	11.8	11.1
Irish Free State.....1/	22.5	61.5	16.0	
Italy.....	42.7	22.1	18.0	17.2
Latvia 5/.....	25.5	25.3	27.1	22.1
Lithuania.....	46.9	25.4	15.9	11.8
Luxemburg.....	43.6	15.8	40.6	
Norway.....	2.1	1.0	23.1	73.8
Netherlands.....	28.3	38.5	7.2	26.0
Poland.....	48.6	17.0	24.0	10.4
Rumania.....	41.6	14.6	24.6	19.2
Sweden.....	9.3	62.1		28.6
Switzerland.....	12.3	40.6	21.8	25.3
Czechoslovakia.....	42.1	18.4	33.2	6.3
Canada.....	29.0	---	---	---
United States.....1/	17.1	---	---	---
Argentina 8/.....1/	7.6	---	---	---
Brazil 9/.....1/	0.6	---	58.8	---
Chile 9/.....	2.7	16.8	6.5	74.0
India (British provinces) 10/11/.....	46.0	---	13.0	45.9
India (Indian States) 9/ 11/.....	60.1	---	12.8	29.7
Japan 3/.....	15.5	---	---	---
Algeria.....1/	5.6	---	---	---
Egypt 3/.....	3.4	---	---	---
French Morocco.....	7.3	---	3.6	89.1
Tunis.....	22.8	0.8	8.7	67.7
Union of South Africa 9/.....	2.2	---	---	---
Australia 9/.....	1.2	---	---	---
New Zealand 10/.....	2.9	24.7	---	---

International Institute of Agriculture. 1/ Exclusive of bare fallows. 2/ Inclusive of bare fallows. 3/ 1924. 4/ 1922. 5/ 1923. 6/ Exclusive of pasture. 7/ Inclusive of pasture. 8/ 1922-23. 9/ 1923-24. 10/ 1924-25. 11/ The data refer only to territory dealt with in agricultural statistics. 12/ Inclusive of permanent grass and pasture.

In the degree that dairying is controlled by geographical influences alone, its potential development appears to be limited only to the grass-growing areas comprised within the temperate or adjacent transitional zones.^a This by no means implies that the mere presence of grass is all-important or that the labor of the dairyman is equally productive wherever dairying is physically possible. In the matter of soil, climate, and location, and their various combinations, all degrees of adaptability to dairying are found. Hay and grains together with green pasture generally mark the areas of distinctive dairy resources, notwithstanding the apparent exceptions of New Zealand and even of Ireland where grass growth is so peculiarly favored by the cool and moist climate as to make the production of crops and hay in these countries unimportant only by comparison.

There would seem to be but little promise of obtaining any significant results as to the nature of foreign competition in dairying from the attempt to measure the total potential dairy lands of the world as such, since from a purely geographic point of view they are practically coextensive with the entire agricultural areas of the temperate regions. With the tendency toward greater economizing of land and of food resources generally, an increasing proportion of the rugged areas formerly providing grazing for dairy animals may be given over increasingly to tree crops. Insofar as the nut trees are increased there will be competition at this margin in the very important form of concentrated vegetable fats.

A recent study with reference to the proportion of total land area of the world that is physically available for wheat-growing ^b/ shows the limitations of such measurements for any immediately practical results. It has

^a/ Comparatively limited sub-tropical areas having sufficient elevation to counteract the influence of their exposure to equatorial suns are not to be ignored as potential dairy sections. Notable among these are parts of Brazil and Africa.

^b/ O. E. Baker, The Potential Supply of Wheat, Economic Geography, March, 1925 pages 15-52.

demonstrated that of the world's total land area of 52,000,000 square miles (excluding the polar continents), temperature conditions alone would permit of 41,000,000 square miles or approximately 80 per cent producing wheat. The requirements of wheat-growing as to temperature and moisture conditions together reduce the potential wheat area to 11,000,000 square miles or about 20 per cent. Further reduction owing to the inclusion of topographic influences leaves the potential wheat area at 7,000,000 square miles or 13 per cent. With the inclusion of the factor of soil conditions there is the still further reduction to 5,500,000 square miles, or about 10 per cent of the total land area permitting of wheat production. "But this tenth of the land surface physically available exceeds present requirements, less than one acre in ten of this available land being utilized for wheat. In other words less than one per cent of the land surface of the earth is in wheat at present". Inasmuch as wheat is generally preferred to other small grains, hay, or grass, where climatic conditions permit, it is clear that dairy resources are by comparison far more subject to economic influence than to purely geographic limitation.

ECONOMIC DISTRIBUTION OF DAIRYING AND ITS GROWING IMPORTANCE.

Since for various reasons the total land area actually devoted to dairying at any given time is not definitely measurable and since modern transportation so facilitates the shipment, especially of the more concentrated feeds on the one hand and of the finished products on the other, the distribution and expansion of dairying is being determined in a greater and greater degree by economic forces and not by geographic influences alone. Geographers are confronted with serious difficulties arising out of such over-lapping of their field by economic considerations. The prevalence of intensive dairying in Northwestern Europe does not coincide with virgin dairy resources. Location must, however, be included along with economic factors as the chief determinants of the nature and extent of the dairy industry of the world. This is fully recognized by Baker. In the monograph referred to above, he formulates six economic principles that help to explain why the various farm enterprises assume varying proportions in the occupation of the land.

1. "The crop or other agricultural product which is most limited in climatic or other physical requirements of production will, if the demand for it be sufficient, have first choice of the land. It possesses, so to speak, a sort of natural monopoly and consequently commands a price which gives it an advantage over other crops or products".

2. "The crop or other agricultural product which has small bulk or weight per unit of value can best bear the cost of transportation and will be grown, consequently, in those regions offering the most favorable physical conditions; but not to the exclusion of more bulky crops, because a certain quantity of these bulky crops that cannot bear the cost of transportation must be grown locally to meet the local demand."

3. "The varying seasonal requirements of the several crops and agricultural products for labor tend to diversify the agriculture of a region.

4. "Not only is it desirable to grow such a combination of crops as equalizes the seasonal requirements of labor, but also it is important to grow such a combination of crops as will maintain soil fertility and promote freedom from insects and diseases."

5. "Opposed to these tendencies toward diversification is a tendency to grow the most productive crops (value per acre) on the most valuable land, and as population increases and land becomes relatively scarcer this tendency becomes stronger, since the more expensive land and more abundant labor must be profitably employed."

6. "Lastly, but not least important, is the character of the farm population and the accumulated community skill and experience."

All of these principles are highly applicable in accounting for the rise and extension of dairying. Particularly the first, third, and fifth principles suggest how fundamental to any economic study is the geographical or physical background, but all of them together are a forcible statement of the inadequacy of geographic conditions in themselves to account for agricultural distribution.

How inextricably interwoven are the geographic and the economic factors is again emphasized when the distribution of dairying and its allied farm enterprises over a particular region such as Europe is considered. There is a striking parallel between Europe and North America in this regard. If one can imagine Europe turned about side for side as in a mirror, and superimposed upon the United States, not only would the size be quite closely comparable but there would be a very pronounced coincidence as to industrial and agricultural regions. Just as the greatest industrial and commercial developments center in the northeast and east central part of the United States, so they tend also to a similar concentration in the northwest and central west of Europe. These areas mark also in a general way the regions geographically and economically most suited to dairying.

The comparison of Europe as a unit with the United States as a whole and of each with the other, part by part, is in fact not a far-fetched nor idle comparison. It at least helps to avoid or overcome some of the artificiality of political divisions among economic units. The little republic of Switzerland, for example, is divided, like ancient Gaul, into three parts and each part is so characteristic of that country adjoining it not only in its language but in its agriculture that there is in reality an Italian, a French and a German Switzerland. There is likewise some advantage in the attempt to view the smaller units in their setting. Otherwise the forest cannot be seen for the trees. One gets the impression from current discussions of dairying abroad that Denmark quite dominates the situation whereas its total milk production is less than three per cent of the commercial supply of the world.

The parallel between the extent and distribution of the dairy industry of Europe and the United States is probably close as to total production of milk, when allowance is made for sections not included in the statistics given for the countries of importance commercially in Europe and for the differences in reports of our domestic milk production as given by the Bureau of the Census and the estimates of the Department of Agriculture. Without undue looseness of statement, too, other parallels may be pointed out in the interest of concreteness. In Denmark, for example, there is practically the same number of dairy cows as in the state of New York - the 1924 censuses showing 1,368,548 in Denmark as compared with 1,347,975 in New York. England, likewise, may be said to be to the metropolitan areas in Great Britain what New England is to its urban areas in its functions as a supplier of fluid milk. Siberia, in the matter of extent and nature of resources is quite accurately likened to the twelve north-central states of the United States.

In like manner a somewhat better comprehension of New Zealand's dairy industry can perhaps be gained by a knowledge of its growing similarity to Wisconsin a/ in the number of cows, and in the production of butter and cheese as well as in contrast with Wisconsin's vigorous climate. The very close actual similarity of climatic conditions and extent of dairying as between New Zealand and our Pacific section is discussed in some detail later in this report.

Canada is obviously similar to our own northern and northwestern states except that too thoroughgoing similarity is not to be assumed in the eastern parts in which the large bodies of water quite remarkably temper the climate.

The principal value, however, in regarding Europe as a unit in this connection is derived from the study of its economic structure as such. Agriculturally and industrially, Europe has been studied more intensively with reference to its resources than the outlying areas with which also we are here concerned. The results of these studies, it is believed, go far toward explaining developments in other areas. Jonasson distinguishes and describes the following agricultural regions of Europe with the statement that only in very few places have their boundaries been arbitrarily fixed or determined by unsatisfactory data.

AGRICULTURAL REGIONS OF EUROPE b/

Cold desert death zone.

Tundra region.

Transition zone.

Polar coniferous region, no agriculture.

a/ In 1925, Dean Russell and Professor Theodore Macklin of the University of Wisconsin visited New Zealand and wrote a valuable report of their observations for the information of Wisconsin Dairy interests as to their competition from that source. See Wisconsin Bulletin, Intensive Dairying in New Zealand and Wisconsin by Theodore Macklin and H. L. Russell.

b/ Olof Jonasson, Economic Geographer, University of Stockholm, Sweden, "Agricultural Regions of Europe", a dissertation submitted to the Graduate School of Clark University, Worcester, Mass., 1926, and reprinted from Economic Geography, October, 1926 and ...

Temperate or small grains zone.

Dairy, hay, and root-crops region.

Hay, dairy, and sheep subregion.

Two-row barley and dairy subregion.

Sugar-beet, wheat and dairy subregion.

Small grains, dairy and tree-fruit subregion.

Rye, potato, and dairy subregion.

Central wheat, wine and fruit region.

Hilly uplands subregion.

Major-mountains subregion.

Corn and wheat region.

Biscay subregion.

Lombardy subregion.

Hungary subregion.

Rumania subregion.

Caucasus subregion.

Trans-Caucasus subregion.

Hay and pasture region, practically without grain production.

Polar barley region, with coniferous forest dominant.

Oats region, with mixed forests increasingly dominant eastward.

Scandinavia-Baltic oats, rye and dairy subregion.

Russia oats, rye and flax subregion.

Rye and buckwheat region.

Sugar-beet and winter grains region.

Spring-wheat region.

Subtropical barley region.

Subtropical or Mediterranean fruit zone.

Humid and sub-humid wheat and Mediterranean fruit region.

Humid coastal citrus, wine, and wheat subregion.

Sub-humid interior wheat and pasture subregion.

Semi-arid barley, wheat, olives, and pasture, or subtropical
barley, region.

Transition zone.

Steppe region, agriculture negligible.

Dry desert death zone.

Desert region.

Jonasson points out that the dairy, hay and root crops region coincides remarkably with the main industrial region of Europe and with the region of densest population. "Northwest Europe may be regarded as one vast conurbation and considered as one geographic center of consumption and market facilities for the agricultural products of the entire inner belt of horticulture, olericulture, dairying, and other intensive land uses."

The process by which the agriculture of any area is modified by industrial growth is particularly well demonstrated in the history of Great Britain. The agriculture in general and the dairy industry in particular of that country have been thus profoundly influenced. Not only the industrialism of that country but in addition the focussing in that great free trade market of the competition from all agricultural surplus areas of the world have so determined the character of its present agricultural program as to justify particular attention at that focal point of foreign agricultural and industrial development. In this connection the general effects only upon the forms of land utilization will be considered with a view to emphasizing the tendency toward natural zoning of lands with reference to the market as well as to the more limited sphere of influences commonly referred to as "natural" resources or geographic influences proper. The following reproductions of officially prepared maps ^{a/} are selected for the graphic presentation of the relative importance of dairying in England and Wales at the center of the dairy, hay, and root-crops region of north-western Europe.

^{a/} Ministry of Agriculture and Fisheries, Agricultural Production of England and Wales in 1925.

The maps above are supplemented to advantage by material descriptive of dairying in England and Wales as published by the Board of Agriculture and Fisheries in 1919 a/. There was at that time, according to this report, no county in England in which milk production in some section was not a very important phase of farming. The dairy industry was stated to be of least importance in the eastern counties. Even in the neighborhood of London the density of milk cattle was comparatively low. The greatest density was found in the northwestern, and southwestern counties and in the west midlands. As dairying in England was characterized then, it remains still "essentially a pastoral industry". "Dairying and market gardening compete for land to some extent in the neighbourhood of towns, but it is probable that the lower costs at which milk can be produced in the pastoral counties and transported to the large centers will reduce the price of milk to such a level that dairy farmers in the neighbourhood of large towns will not be able to offer rents sufficiently high to compete effectively with market gardeners, wherever such competition arises. There is little competition between dairying and arable farming of any other type than market gardening, for dairying tends to concentrate on the low and rather heavy type of land. Nor is there very much competition between dairying and stock-raising, for the latter is often practiced on land that is too poor for profitable milk production. Dairying and arable farming are worked in conjunction with each other on individual farms, sometimes more or less generally over small districts. But dairying and stock-raising are carried on together over fairly wide districts. Competition for use of land for dairying perhaps occurs chiefly with the feeding (i. e. fattening) of cattle".

a/ Board of Agriculture and Fisheries, Wages and Conditions of Employment in Agriculture, Vol. 1. General Report, 1919, page 12.

The proportions and the grade or type of utilization of the land resources of any area can be seen to be influenced directly or indirectly by the degree of industrialization of that area. The extent to which this industrialization has thus far been carried is to be seen by comparison of one country with another and with the total land areas of the earth. See foregoing tables of land areas and utilization. The tendency for the potentially arable lands to be most fully utilized as such in the most industrialized countries is not shown in the case of Great Britain, but this exception is more apparent than real owing to the prevalence of highly productive grass lands that are maintained in grass because of their relative profitability rather than the reverse. Indeed, the notion that grass lands can have only an unimportant place in intensive and highly profitable agriculture is quite a mistaken and superficial one, as may be seen by the foregoing detailed description of English agriculture. In that free-trade country at the very center of competition of the world's agriculture, the best grass lands are not only holding their own, but the area is increasing at the expense of arable acreage.

INTERRELATIONS OF DOMESTIC AND WORLD PRODUCTION OF SELECTED CROPS

Significant trends of the dairy industry in any region cannot be discovered by viewing this particular farm enterprise in isolation. On the principle of the opportunity cost of production not only must the relation of the domestic supply to world supplies be measured, but the similar relation of other lines of our agricultural production must be known as well.

Some light on the question as to why dairy production within the United States has not expanded to the limit of its physical possibilities is afforded by a simple set of figures recently compiled to show the share of the United States in the world's production of various agricultural commodities.^{a/} In the statement which follows, production is indicated as a percentage of the total world production of the commodity exclusive of Russia and China (where statistics leave so much to be desired as to be better left out of consideration in this particular connection). The compiler of the table quoted is not responsible for the estimates added to cover dairy products which take into consideration only those countries of some importance in world trade, but the ratios are believed to be comparable for the purpose they are here intended to serve.

SHARE OF THE UNITED STATES IN THE WORLD'S PRODUCTION OF CERTAIN AGRICULTURAL COMMODITIES, 1922-1925.

Product	: Ratio of United States : to World Production	Product	: Ratio of United States : to World Production
	: Per cent		: Per cent
Corn.....:	68	: Flaxseed...:	18
Cotton.....:	61	: Barley.....:	15
Tobacco.....:	46	: Cheese.....:	13
Milk.....:	40	: Potatoes...:	9
Butter.....:	40	: Rye.....:	8
Oats.....:	37	: Sugar.....:	5
Wheat.....:	24	: Rice.....:	1

^{a/} Stine, O. C., World Production versus American Production of Agricultural Products. Paper read at the Eighth Annual Meeting of the National Association of Marketing Officials in Chicago, Nov. 29, 1926.

While these ratios are approximations only, they doubtless represent with considerable accuracy the relative advantage in world competition afforded to our farmers in these lines of production. An allowance of one or two per cent either way appears generally to be sufficient to cover the inadequacy or inaccuracy of estimates of production so far as this affects the ratios between domestic and total supplies.

What do these ratios signify? No theory of comparative costs of production, whether of labor-time involving and depending upon natural and improved resources, or of alternative or opportunity cost resulting in the survival of that type of farm production most adapted to compete in the world's agriculture under a price economy, could ignore the implications of the relationships here shown.

The above comparisons signify, first of all, the relative advantage of corn (maize) in competing for the land against other products affording an alternative. Dairying as one of these alternatives could be conducted throughout our corn-belt with no mean advantage compared with other dairy lands in this or foreign countries. But the areas so adapted to corn growing are rather definitely limited while, by comparison, potential dairying lands are quite unlimited. The slight commercial importance of dairying in the corn growing areas of southeastern Europe, southern Russia, and parts of the Argentine is quite as fully accounted for as in our own corn belt by the relatively greater profitability of the corn crop rather than by any inherent unsuitableness of the areas to dairy production.

Likewise, cotton and tobacco growers will not occupy lands best suited to these limited-area crops and indulge their longings to milk cows at the expense of a product that can be produced in greater value on account of the more limited competing areas, unless, indeed, and this appears not altogether improbable in the case of cotton, new competition in other lands makes this monopoly tendency less secure. Over against this possibility is the other

of increasing efficiency of labor thru use of machinery in harvesting the American cotton crop.

A point is reached, however, in this relativity of profitable employment of land beyond which the advantage is in favor of dairying in some at least of its branches. Growers of the small grains are apparently in a weaker strategic position so that the expansion of dairying will tend to encroach upon their lands as offering the line of least resistance.

Does this principle operate within the dairy industry itself as between its different branches? This is not meant to be implied in any such thoroughgoing way, since the products into which milk is convertible are interchangeable with comparative facility. It was pointed out above that the relation of dairy production in its entirety in the United States to the total world output can never have such monopoly advantage since dairying is everywhere potentially competitive with so many different lines of agricultural production. Locally, however, the different milk products afford alternative outlets only within economic limits which are in turn more or less influenced by the nature of the developments in competing areas, domestic and foreign. Extensive dairying is peculiarly suitable to butter production and in the United States, outside of fluid milk areas, this form of dairy manufacture predominates.

In the United States a very considerable production of milk is for consumption as such rather than as a raw material for other dairy products. Inasmuch as supplies of fluid milk are necessarily produced in more or less close proximity to the consuming centers, the fluid milk areas acquire a relative advantage in the production of milk such that they cannot be encroached upon by butter and cheese production. Surpluses in fluid milk areas are, of course, utilized in the manufacture of these, (or more generally in butter making alone, since the milk so used is only that unsalable as fresh milk). Obviously these products could be obtained from the fluid milk areas but they can be produced at a lower opportunity cost elsewhere. And since in a country so highly in-

dustrialized and enjoying such general well-being as the United States the consumption of milk is so considerable, these fluid milk areas are extensive.

Similarly, the production of butter does not under existing conditions in this country readily supersede the production of cheese. As to the comparative advantage in production, strictly, the alternative of supplying butter as the finished product rather than cheese is encouraged by the adaptability of butter-making to less painstaking methods except where, as is not too generally the case, the production of the best quality of butter is being undertaken. Cheese making requires the delivery of a comparatively high quality of sweet milk, and the factory accordingly cannot be far distant from the farmer. Butter-making thus appears to be possible where cheese-making is not, although to be sure, at their best both can utilize the pure sweet milk to advantage. Now generally butter-making prevails where dairying has not reached an intensive or highly specialized stage is evident in the predominance of butter in the dairy production of Argentina, Siberia, Australia, the Union of South Africa and the western provinces of Canada as well as in our own central west. In Denmark, where over 80 per cent of the entire milk production is used in butter-making, the methods are all that would be required in the production of the best cheese, with the milk delivered to the factories in a strictly fresh condition, scarcely any cream separators being owned by individual Danish farmers. It is too little emphasized, perhaps, that Denmark is a potential cheese area and that Danish dairy interests regard their possibilities seriously in this alternative line. In New Zealand and the Netherlands, where butter and cheese are alternative lines of production even within the same factory, the butter produced is in much the same class as to quality and price as the Danish product.

Foreign competition in any one commodity or group of commodities as milk and its products is plainly not to be comprehended as a simple quantitative relationship between domestic output on the one hand and foreign

output on the other. Just as the Swiss people may find it increasingly difficult as their prestige in cheese-making weakens to continue to export cheese at a profit while importing butter, so American farmers may conceivably continue with profit to produce comparatively larger quantities of butter than of cheese and not all of it of the highest grade, either. It is a matter of the alternatives open to producers in any section at home or abroad.

When agriculture is studied in its international scope, there is thus more apparent verification than on any local basis of the principle that where two (or more) competing crops which are in general demand can be grown on the same land, prices (at the farm) will tend to be such that the one with the most limited total potential area will have its choice of territory. a/.

a/ Taylor, H. C. Outlines of Agricultural Economics.

DISTRIBUTION OF RESOURCES IN CATTLE.

As far as the physical basis for sustaining the dairy herd is concerned, the existing total numbers of cattle in the various countries afford one of the most valuable indications of their respective dairy resources. On this basis, and taking political divisions for convenience, the actual and potential dairy herds enumerated or estimated, are shown below for the more important countries. While the index thus afforded is crude, the presumably more accurate measure of present milking herds leaves much to be desired as well. The available statistics of comparative numbers of cows or dairy cows may at least be misleading when presented without further explanation as to how far they are comparable as to definition or classification and with no basis of comparison as to producing capacity ^{a/}. Together with the total numbers of cattle, however, as presented below, the relation between the cattle and dairy herds of the United States and those of the rest of the world indicates not only the present position but something of the trend as well.

^{a/} To the student of world agriculture there is encouragement in the hope that the forthcoming world census of agriculture now being planned for the year 1930 will provide more adequate and comparable data than are at present available. The census will be conducted simultaneously by the individual governments although supervised by the International Institute of Agriculture at Rome. Mr. Leon Estabrook, formerly Assistant Chief of the Bureau of Agricultural Economics of the United States Department of Agriculture is officially in charge of arrangements for the census.

NUMBER OF DAIRY COWS AND CATTLE IN SPECIFIED COUNTRIES.

Country	Date of Census or Estimate	Number of Dairy or Milk Cows	Total Number of Cattle	Dairy cows as percentage of total
		Thousands	Thousands	Per cent
United States.....	1927	23,024	57,521	40.0
Russia, (U.S.S.R.)...	1924	a/ 22,680	48,598	a/ 47.1
Germany.....	1925	9,056	17,183	52.7
France.....	1925	b/ 7,590	14,373	a/ 52.8
Italy.....	1926	4,000	7,000	57.1
Argentina.....	1922	3,295	37,065	8.9
Great Britain.....	1925	3,164	7,368	42.9
Canada.....	1921	2,745	8,519	32.2
Australia.....	1923	2,305	14,337	16.1
Union of South Africa:	1922	2,264:c/	5,370	42.2
Sweden.....	1920	a/ 1,739	2,736	a/ 63.6
Denmark.....	1926	1,478	2,840	52.0
Ireland.....	1926	1,421	4,614	30.8
New Zealand.....	1925	1,323	3,504	37.8
Finland.....	1924	1,289	1,864	69.2
Netherlands.....	1921	1,086	2,063	52.6
Norway.....	1925	773	1,157	66.8
Switzerland.....	1921	747	1,425	52.4
Spain.....	1924	612	3,136	19.5

a/ Cows.

b/ On basis of official statement that about 80 per cent of cows are kept for milk, the number of milk cows could be estimated at 6,072,000.

c/ On farms of white settlers.

NUMBER OF DAIRY COWS BY COUNTRIES FOR SPECIFIED YEARS.

Year	United States: Thousands	Great Britain: Thousands	Germany: Thousands	Denmark: Thousands	Netherlands: Thousands	Finland: Thousands	Sweden: Thousands	Switzerland: Thousands	Russia: Thousands	Canada: Thousands	Australia: Thousands	New Zealand: Thousands
1860	8,586	1,625										
1861		1,545										
1862	6,408	1,457										
1863		1,397										
1864		1,349										
1865		1,387					671	1,186				
1866		1,483	1,864					553				
1867		1,521	2,039									
1868		1,476	2,144									
1869		1,606	2,135									
1870	8,935	1,529	2,162		920		687	1,231				
1871		1,545	2,091		909							
1872		1,552	2,165		897							
1873		1,528	2,237	8,961	908							
1874		1,491	2,274		927							
1875		1,530	2,253		923		769	1,361				
1876		1,534	2,226		915			592				
1877		1,523	2,207		921							
1878		1,484	2,208		928							
1879		1,465	2,255		904							
1880	12,443	1,398	2,242		908		796	1,409				
1881		1,392	2,270		885				1,596			
1882	6,588	1,399	2,267		879				26,765			
1883	7,463	1,402	2,306	9,087	877							
1884	7,672	1,357	2,391		890							
1885	6,414	1,417	2,530		901		615	1,525				
1886	6,320	1,419	2,538		908				663			
1887	6,402	1,394	2,535		907				26,005			
1888	6,439	1,365	2,480		899				27,923			
1889	6,459	1,364	2,474		892							

[illegible]

NUMBER OF DAIRY COWS BY COUNTRIES FOR PRECIPITATED YEARS.

Year	United States:	France:	Ireland:	Great Britain:	Germany:	Denmark:	Netherlands:	Sweden:	Switzerland:	Austria:	New Zealand:	Argentina:
1920	19,672:	6,830:	1,581:	2,787:	8,790:	1,196:	1,174:	1,739:	730:	22,052:	2,056:	897:
1921	19,672:	6,830:	1,581:	2,787:	8,790:	1,196:	1,174:	1,739:	730:	22,052:	2,056:	897:
1922	19,672:	6,830:	1,581:	2,787:	8,790:	1,196:	1,174:	1,739:	730:	22,052:	2,056:	897:
1923	19,672:	6,830:	1,581:	2,787:	8,790:	1,196:	1,174:	1,739:	730:	22,052:	2,056:	897:
1924	19,672:	6,830:	1,581:	2,787:	8,790:	1,196:	1,174:	1,739:	730:	22,052:	2,056:	897:
1925	19,672:	6,830:	1,581:	2,787:	8,790:	1,196:	1,174:	1,739:	730:	22,052:	2,056:	897:
1926	19,672:	6,830:	1,581:	2,787:	8,790:	1,196:	1,174:	1,739:	730:	22,052:	2,056:	897:

It cannot be over-emphasized in connection with the study of any statistics of dairy cows or dairy cattle as distinguished from total cattle that in all but the highly specialized dairy sections the comparative numbers shift, often over a rather wide margin, as between beef and dairy uses depending upon relative opportunities in these fields of production. This is notably the case in Argentina, where, at the extensive margin of dairy production cows are rounded up on the large "estancias" to be milked usually once a day with the suckling calf tied in the typical manner to the front leg of the cow. Naturally, the number so utilized as "dairy cows" will vary with the comparative strength of the incentives to dairy or beef production, such as price, conditions affecting labor supply, and like considerations. In many sections where this situation is less extreme than in Argentina, there is nevertheless a most significant tendency to swing from one use to the other of cows such as "the red cow" in our central west which may be found in the milking herd or the beef herd depending upon the comparative profitableness of the two markets. The twenty or more million cows in Russia, and many of those, especially in the western provinces of Canada, in Australia, and even many of the "milking Shorthorns" in Great Britain are notably in this class. It is thus quite generally true that the inadequacy of the statistical data as to numbers and quality of the dairy herds outside of certain highly specialized dairy sections requires that measures of dairy resources be not wholly dependent upon the numbers classified as dairy or milk cows, but upon the total numbers of cattle supported as well. Yield per cow is believed to be of singular importance as a competitive factor and some analysis of comparative yields is attempted in a separate section as a key to cost of production.

COMPARATIVE MILK PRODUCTION.

Turning to statistics of dairy production as a measure of our foreign competition, one is again confronted with inadequacy and indefiniteness of available data. Production statistics for the various countries represent either the total output, in which case there is generally a considerable element of estimation and infrequency of censuses, or, where there is greatest accuracy of data and timeliness in their publication they may represent only the strictly commercial or industrial output. Concerning the production and utilization of milk itself, "paper estimates" are not uncommonly resorted to, with the result that there often is more or less of inexactness in results. For instance, in Germany where domestic production is becoming of increasing importance as affecting foreign demand for dairy products in that country, the total milk production for the country was recently estimated by assuming the average milk yield per cow and multiplying this by the number of milk cows as shown by the census ^{a/}. Even in New Zealand and Denmark no complete official figures are obtainable for the milk production of the entire country, although in these countries the estimates are far from being crude or unreliable for comparative purposes.

In those widely extended areas in which milk production is a local industry, if it can be called an industry at all, it is practically impossible to know its volume and importance. Under such circumstances it must simply be assumed that such production is commercially of little importance in influencing foreign competition with the dairy industry of the United States.

^{a/} Similar prewar estimates of the domestic production of milk by different authorities within Germany varied widely from 46,300 million pounds according to Fleishman to 53,900 million according to Preussisches Landes-Oekonomisches Kollegium, and to 57,400 million pounds, the estimate of Witter. Germany with its rather lately unified government has had peculiarly meager agricultural statistics. This is emphasized by the comparatively short period covered in their most comprehensive treatment in *Die Deutsche Landwirtschaft, Bearbeitet im Kaiserlichen Statistischen Bureau*.

It does not enter directly into the price economy. This does not imply that the industry because it is local is not of importance economically to the peoples maintaining it, nor as a possible future source of competition. India, which is not generally regarded as a dairying country, sustains millions of cows and buffaloes from which no small portion of the livelihood of the masses of its people is derived, (very directly and mostly in the form of a home-prepared curd and melted fat (ghee) and by means of which their standard of living is decidedly bettered even though the returns at present figure slightly if at all in the world's price economy. The following table of the best estimates available as to world production of milk does, nevertheless, afford some helpful conception of the place occupied by domestic production of milk in relation to total world supply.

MILK PRODUCTION IN COMMERCIALLY IMPORTANT DAIRYING COUNTRIES,
ACCORDING TO MOST RECENT AVAILABLE ESTIMATES, AS INDICATED.

Country	Year	Estimated milk production: Cows' milk only: Million pounds:	Source of estimate
United States.....	1925	116,505	Department of Agriculture
Germany.....	1925	38,477	German Statistical Office
Russia (present territory):	1924	36,000	Estimated from reports by Soviet Government
France.....	1923	26,568	Ministry of Agriculture
Great Britain.....	1923	13,935	Ministry of Agriculture and Fisheries.
Canada.....	1920	10,976	Census.
Italy.....	1926	10,215	Official estimate.
Denmark.....	1925	8,974	Official Committee for the compilation of Dairy Statis- tics, Copenhagen.
Sweden.....	1922	8,800	International Institute of Agriculture.
Netherlands.....	1923	7,385	From yield per cow according to Knapp, Agricultural En- gineer, in "Economic Intelli- gence", Netherlands Foreign Office Journal.
Ireland.....	1921	6,362	Commission on Agriculture, Report of April 11, 1924.
New Zealand.....	1924	6,000	Estimated.
Australia.....	1924	6,728	Official Yearbook of the Commonwealth of Australia.
Switzerland.....	1924	5,604	Swiss Milk Commission.
Argentina.....	1924	4,700	Estimated from report of Rural Society of Argentina.
Finland.....	1921	3,796	International Institute of Agriculture.
Union of South Africa.....	1922	3,498	Farmer's Advocate, Bloemfontein.
Norway.....	1924	2,503	Semi-official.
Total, 16 countries.....		317,026	
Percentage produced in:			
United States.....		37%	

^{a/} Average for years 1919-1923, owing to wide fluctuations from season to season.

PRODUCTION OF MILK, TOTAL AND PER COW, IN COMMERCIALLY IMPORTANT COUNTRIES.

Country	Year	Production of cow's milk	Number of dairy cows	Average yield per cow	Milk production per capita
		Million pounds	Thousands	Pounds	Pounds
United States.....	1925	116,505	23,723	4,911	1,013
Germany.....	1925	38,477	8,921	4,313	616
Russia (present territory) :	1924	36,000	a/23,956	1,503	270
France.....	1923	26,568	b/ 5,843	4,547	674
Great Britain.....	1923	13,935	3,070	4,539	316
Canada.....	1920	10,976	2,745	3,999	1,247
Italy.....	1924	10,215	a/ 4,000	2,554	263
Denmark.....	1925	8,974	1,391	6,452	2,639
Sweden.....	1922	8,800	a/ 1,739	5,060	1,467
Netherlands.....	1923	7,385	1,086	6,800	1,026
Ireland.....	1921	6,362	1,471	4,325	1,480
New Zealand.....	1924	6,000	1,292	4,644	4,615
Australia.....	Average:	6,728	2,166	3,106	1,140
Switzerland.....	1924	5,605	810	6,918	1,437
Argentina.....	1924	4,700	3,295	1,426	495
Finland.....	1921	3,796	1,219	3,114	1,116
Union of South Africa.....	1921	3,498	2,264	1,545	552
Norway.....	1924	2,503	773	3,238	963
Total 16 countries.....		317,026	89,764	3,532	639
Exclusive of Russia.....		281,026	65,808	4,270	775

a/ Total cows. b/ Calculated on basis of official statement that about 80 per cent of cows are kept for milk.

The above summary appears to agree essentially with an estimate published by Ris Petersen in the Sept. 21, 1926 issue of *Molkerei-Zeitung*, Hildesheim, Germany, under the caption, "Stehen wir vor einer Ueberproduktion an Butter?" When the limitation of the one summary to the more important commercial areas is considered, it is of interest to compare the results arrived at entirely independently. Petersen's summary follows:

	Milk cows	Milk production	Milk production per capita
		Metric tons	Million pounds
			Pounds
Europe.....	57,000,000	76,000,000	167,580
America.....	31,600,000	53,500,000	117,960
Australia..:	3,500,000	6,600,000	14,563
Africa.....	3,000,000	1,700,000	3,748
Asia.....	4,900,000	2,800,000	6,174
World.....	100,000,000	140,600,000	310,023

COMPARATIVE YIELDS OF MILK AND THE COST OF PRODUCTION.

While, of course, many factors enter into the actual process of intensification of dairying, the control over the natural environment and the economising of land that is indicated so clearly by improvement in productive capacity of the milking herds affords a fairly satisfactory index of the comparative specialisation and intensification of the dairying of any particular dairy section. The following comparative groupings are subject to many inaccuracies, but in the main are believed to represent in broad outline the position of the foreign competing areas relative to those areas within our own country that are what they are largely because of the same type of competition. For convenience, political units must be resorted to largely rather than more truly geographic or economic units.

WORLD PRODUCTION OF MILK CLASSIFIED BY REGIONS ACCORDING TO AVERAGE YIELD
PER COW

Range in Production	Country or Region and estimated average yield per cow		Proportion of Total	
	Foreign a/	Domestic b/	Foreign supply Per cent	Domestic supply Per cent
5,000 lbs. and over.....	a/			
		Pacific Coast States.....		06.7
4,500-5,000 lbs:		Eleven Northeast States..		18.8
4,000-4,500 lbs:	Northwest Europe:		61.0	
	New Zealand		05.0	
	Canada		05.4	
		Twelve Central States.....		52.6
3,500-4,000 lbs:		Eight Western States.....		4.0
3,000-3,500 lbs:	Australia		03.4	
2,500-3,000 lbs:		Fourteen Southern States..		17.7
	Italy		02.1	
Under 2,500 lbs:	Russia			
	Argentina		22.1	
	Union of South			
	Africa			

a/ Recent years. b/ Census of 1925. c/ Switzerland, Netherlands, and Denmark have much higher average yields than any of our states. The 1925 census reports an average yield in the District of Columbia (7,103 lbs.) which alone exceeds that of the average for any foreign political unit.

It is clearly to be seen that in the wide range of yields per cow from around 1,500 pounds annually in Russia, Argentina, and South Africa to nearly 7,000 pounds in the Netherlands, Switzerland and Denmark, and within such the same limits as between the southern states and the fluid milk areas in this country, the bulk of the supply, foreign and domestic, is produced by cows yielding on an average between 4,000 and 5,000 pounds. While the averages work out as if each cow in the 16 countries produced about 3,500 pounds, the modal yield is higher than the mean, and a smaller proportion is below the world average in the United States than in the foreign countries taken together.

In the matter of productivity per unit in dairying as in agricultural production generally, it is readily understood that efficient production requires the utilization of the cheaper factors of production in greater proportion than the scarcer dear factors. Thus in many European countries agriculture is proverbially more "efficient" than in the United States as a whole in the sense that land is utilized more fully by generous application

of labor, with the result that more is produced per acre but less per man than in countries such as ours where labor, the comparatively dear element, is economized relative to land.

In dairy production the same principles apply, and we have labor economized in New Zealand, for example, where it is scarce and pasture abundant, while in Switzerland, Denmark, or European dairy sections generally, land and cows are made more productive by more lavish application of labor. Aided by machinery in milk production, the New Zealand dairyman produces more per man even though less per acre and per cow. Argentina would be found to produce even less per acre and per cow, and still be producing economically. Circumstances alter cases.

The "law of diminishing returns" has been held to apply to production of milk per cow as well as to all other agricultural production, and the statement may be accepted without extended proof that a high milk yield is not, in itself, a guarantee of economical or profitable production. Record yields certainly are not to be held up as the level of production to be sought, for maximum profit. Researches in England "bear out the experience of many leading dairy farmers that very moderate feeding is best in the end" a/.

The same observations appear to have been more satisfactorily put by Davenport in terms of the "law of proportions". The law of diminishing returns is ambiguous unless formulated in terms of the disadvantage from poor combination of factors, each of which affects the other's share. "Disadvantage" as Davenport says, "attends any excess or defect in the supply of productive factors relatively one to another". This applied to dairy pro-

a/ See Report No. 2, Department of Economics, South-eastern Agricultural College, Wye, Kent.

duction for profit, may be taken to explain simply why one level of productivity per cow tends to prevail in one section or at one stage of dairy development, and another level to prove more profitable under a different set of conditions.

It is of interest to follow up Davenport's statement as far as data permit in order to see how universally it points to increasing productivity per cow as the predominant factor in the reduction of costs of production as dairying becomes progressively more specialized.

From the report to the President of the United States by the Tariff Commission in 1926 ^{a/} the following graph is reproduced.

^{a/} United States Tariff Commission, Washington, Butter, Report of the United States Tariff Commission to the President of the United States. Transmitted February 25, 1926.

The graph is based, of course, only upon the number of cows comprised in the study undertaken by the Commission and the full report would need to be referred to in order that the basis of costs per cow and per pound of fat may be understood. However, the graph is self-explanatory for the purpose here intended.

Results of surveys in 1917-1919 in Oxford County, Ontario, by the Ontario Agricultural College included the following. (Oxford county is almost exclusively a dairy section).

"That efforts should be made by dairymen to produce at least 40% of their milk in the six winter months."

"That the best organized farm business for the average dairymen is that which gives about 70% of the total revenue from dairy cattle, degree of specialisation depending, of course, upon individual conditions."

"That the majority of farmers in Oxford County may add to their profits by maintaining larger herds of milk cows on their present acreages."

"That high milk yield per cow is the greatest single factor tending to reduce cost of production."

"That breeding is a slower but much more profitable method of increasing yield per cow (and hence reducing cost of production) than is feeding."

In a comprehensive report by the Imperial Economic Committee of the United Kingdom it is set forth that "whereas, in the case of the commodities dealt with in our previous reports we were mainly concerned with improving the methods of marketing, in this Report our attention must largely be given to those aspects of preparing for market which influence prices" and in explanation of this the following is added: "In milk production certain fixed charges such as rent, wages, and living costs do not vary with the total milk output of the herd nor with the money received for that output. The fact of outstanding importance to the producer is that the total output of milk and

the yield of butter-fat per cow can be greatly increased" a/. The following table is then referred to as supplied by a member of the staff of the National Institute for Dairying at Reading (England).

ENGLAND: Cost of production of 1 lb. butter fat on the basis of assumed costs of £. 325 and £30 for maintaining a cow for a year and on annual yields of from 4,000 to 8,000 lbs. milk.

Butter Fat	Cost of	Annual		Annual		Annual		Annual			
	sheeping	Annual	yield of:	yield of:	yield of:	yield of:	yield of:	yield of:			
	Cow-Per	yield of:	5,000	6,000	7,000	8,000					
	Annual	4,000 lbs	lbs.	lbs.	lbs.	lbs.	lbs.				
Per cent.	£	s.	d.	s.	d.	s.	d.	s.	d.		
3.5	20	2	10½	2	3½	1	10½	1	7½	1	5
	25	3	7	2	10	2	4½	2	0½	2	9½
	30	4	3½	3	5	2	10½	3	5	2	1½
3.75	20	2	8	2	1½	1	10½	1	6	1	4
	25	3	4	2	8	2	2½	1	11	1	8
	30	4	0	3	2½	2	8	2	3½	2	0
4.0	20	2	6	2	0	1	8	1	5	1	3
	25	3	1½	2	6	2	1	1	9½	1	6½
	30	3	0	3	6	2	6	2	1½	1	11½
4.25	20	3	4	1	10	1	6	1	4	1	2
	25	2	10	2	8	1	11½	1	7½	1	5½
	30	3	6	2	10	2	4	2	0½	1	9
4.5	20	2	2½	1	9½	1	5½	1	3	1	1
	25	2	9	2	2½	1	10	1	7	1	5
	30	3	4	2	8	2	2½	1	10½	1	8
4.75	20	2	1½	1	8	1	5	1	2	1	0½
	25	2	7½	2	1½	1	9	1	6	1	4
	30	3	2	2	6½	2	1½	1	9½	1	7
5.0	20	2	0	1	7	1	4	1	1½	1	0
	25	2	6	2	0	1	8	1	5	1	3
	30	3	0	2	5	2	0	1	8½	1	6

a/ Report of the Imperial Economic Committee on Marketing and Preparing for Market within the United Kingdom of Foodstuffs Produced within the Empire, Fourth Report - Dairy Produce, 1926, page 15.

The same report quotes an estimate made in Australia that "if butter production costs 2s a pound on the basis of an average output of 140 pounds of butter-fat per cow, an increase in that output to 260 pounds will lead to a reduction in the cost of production to 1s 1d for each pound of butter made".

Results in New Zealand are cited where herds have been reduced by one-third through cow testing, without their total output of butter-fat having been lessened by the decreased size of the herd. In New Zealand all milk or cream is paid for on a straight butter-fat basis, and it is the butter-fat, not the pounds of milk, to which the dairymen give attention. This emphasis on butter-fat has been responsible for much of the wide-spread interest in cow-testing associations. The butter-fat yield per cow has recently been placed officially at 170 pounds as the average for all New Zealand. Herds are reported that average around 400 pounds, individual "beemon" cows making nearly 500 pounds of butter-fat in a year. Cows usually produce about 70% of the milk supply during their first 6 months of their lactation period.

The following summary a/ compiled from the records of 21,067 of the cows under test will give some idea of the average yield:-

	: Days Under:	Pounds
	: Test :	: Fat
Grand average of all cows.....:	230	: 239.64
Highest association average.....:	298	: 385.49
Lowest association average.....:	166	: 168.43
Highest individual herd.....:	229	: 514.70
Lowest individual herd.....:	100	: 63.00
Highest individual cow.....:	326	: 760.72
Lowest individual cow.....:	104	: 40.62
Average daily production of butterfat per cow...:		: 1.0421

a/ Dairying in New Zealand and Australia by J. A. Ruddick, 1923.

Ireland affords an outstanding example of a section in which the dairy resources as indicated by total numbers of cattle and feed supply give scope for truly vast development of dairying by means both of increasing the ratio of milk cows to total cattle and improving the yield per cow. The number of dairy cows in Ireland has been fairly constant during the last fifty years, being about $1\frac{1}{2}$ millions or about 30 per cent of the total number of cattle. While the average yield of the 1,470,000 milk cows in Ireland in 1921 was estimated at 420 gallons ^a/ per year, individual farmers in Ireland have increased the yield of their herds to 800 gallons per cow. "Only in 1920 did the work of testing of cows receive the attention and financial assistance which it deserved". ^b/.

In 1922, the Argentine Dairy Association conducted an investigation in the Province of Buenos Aires to determine the yield of dairy cows. Out of 495 replies to questionnaires directed to leading dairymen, 239 picked answers showed an average from the 32,651 cows represented of 134.7 gallons of milk or (at 10 lbs. of milk to the gallon) 1,347 lbs. each per year. On the basis of a butter-fat test as high as 4 per cent, only 53.9 lbs. of butter fat is produced yearly per cow ^c/.

"Though it is very likely that the average milk yields obtained in Friesland are not surpassed by those in any other country, it is true that in some countries, notably in the United States and England, a special point is being made of arriving at exceptionally high yields which are later on published as 'world records'. Therefore, if one would gauge the richness of the milk production of the cattle herd of a country by the highest yield

^a/ Imperial gallons. The weight of an Imperial gallon of milk is calculated at 10.3 lbs. on the basis of 8.6 lbs. of milk to the United States gallon.

^b/ Final Report of the Commission of Agriculture, to the University of Agriculture, Dublin, April 11, 1924.

^c/ Quoted by P. S. Battley, Correspondent of the Argentine Dairy Association, writing in the New Zealand Dairymen of Sept. 19, 1925, "Why the Argentine does not overwhelm New Zealand in Dairy Produce".

obtained there, it would appear that Friesland by no means ranks first".

With this explanation, the Netherlands foreign office journal, Economic Intelligence, June 15, 1926, presents the record of an individual Friesland cow that produced 29,821 lbs. of milk in a year, demonstrating that high individual records might be made if similar attempts were made in Friesland.

On the whole, it may be that the "low-pressure areas", those with low milk yields per cow, are of most significance in the current history of the world's dairy developments, since it is there that production is being increased most considerably and most economically. The indications certainly are that the recent expansion in world dairying marks a stage in world agricultural development, - that as areas devoted to grass feeding for meat production have reached their maximum of exploitation, dairying is becoming increasingly widespread. Significant of such a tendency is the development within this century of a substantial dairy industry in Argentina, and Siberia, in the western provinces of Canada and the Baltic states, especially Latvia and Estonia, and less conspicuously, in such new dairying countries as the Union of South Africa and Brazil. At the same time there has been the enormously increased dairy output in Australia and New Zealand. It should appear in the light of such widespread new developments, that in current discussions of the foreign dairy situation there is over-emphasis upon Denmark the Netherlands, and other highly exploited dairy countries. It is not generally realized that as a group the small states on the Baltic Sea - other than Denmark - now provide fully as great a surplus of butter as does the Netherlands.

UTILIZATION OF THE WORLD MILK SUPPLY.

of the total world production of milk as estimated above, it is possible to determine roughly the proportion entering into the manufacture of butter and cheese. A particular difficulty arises in regard to any estimation of condensed, evaporated, and powdered milk on account of any increasing tendency to utilize skimmed milk in these forms. While this difficulty is apparent in the matter of cheese production as well (notably in the Netherlands) the estimated milk equivalent of cheese may be regarded as an average fairly accurate inasmuch as those types to which fat is added tend to balance those in which the fat content is deficient. Leaving out of consideration, therefore, the manufacture of products other than butter and cheese, the proportion of the milk produced that is utilized in the manufacture of these staple dairy products can be compared as between the United States and the other seventeen countries together. In the United States, some 40 per cent of the total milk production is thus utilized, against an average of at least 54 per cent in the other countries. These figures are approximations only, but they serve nevertheless to indicate undeniably that in some such considerable degree the production in this country is more largely for fluid milk consumption than is the case in the foreign countries taken as a unit. In comparatively few countries is milk so freely consumed as a beverage as it is in the United States. A further significant development is disclosed in the relatively greater importance of the foreign production of milk for cheese manufacture. While in the United States, somewhat less than 4 per cent of our milk output is converted into cheese, the percentage so utilized in the foreign group is probably as high as 14 per cent. The perfection of the European's art in cheese-making and the endless variety of his product account largely for the competition of foreign cheese in the markets of the United States. The proportionate

utilization of milk in butter-making is somewhat more than 35 per cent, or about the same in the United States as the general average of 40 per cent.

PRODUCTION AND USES OF MILK IN THE UNITED STATES.

Product	Milk : 1925			
	used per :	Quantity :	Whole milk :	Per cent
	unit of :	of product :	of total :	of total
	product :	manufactured :	used :	milk
	Pounds :	Pounds :	Pounds :	
Greenery butter.....	21	1,361,526,000	28,592,046,000	24.541
Farm butter.....	21	590,000,000	12,590,000,000	10.635
Cheese (all kinds).....	10	1/ 447,514,000	4,475,140,000	3.841
Condensed and evaporated :				
milk.....	2.5	1,757,858,000	4,394,645,000	3.772
Powdered milk.....	8	8,931,000	71,448,000	.061
Powdered cream.....	19	339,000	6,441,000	.006
Salted milk.....	2.2	18,050,000	39,710,000	.034
Sterilized milk (canned)...	1	1,576,000	1,576,000	.002
Milk chocolate.....			228,822,000	.196
Ice cream (gallons).....	13.75	322,729,000	4,437,524,000	3.809
Total whole milk used in :				
manufacturing.....			154,637,352,000	46.697
MILK: For household purposes	2/	54.753	154,325,776,000	46.629
		Per capita :		
Fed to calves 3/		200 lbs. per :	4,047,105,000	3.474
		calf :		
Wasted (estimated) :			3,495,162,000	3.000
GRAND TOTAL.....			116,505,395,000	100.000

United States Department of Agriculture, Bureau of Agricultural Economics,
Division of Dairy and Poultry Products.

1/ Includes 4,000,000 pounds of farm made cheese.

2/ Population according to the Census Bureau estimates for July 1, 1925,
115,378,094.

3/ Calves fed whole milk estimated at 85% of number of dairy cows.

PRODUCTION AND UTILIZATION OF MILK IN CANADA, 1924.

Number of cows milked, est.	3,083,414
Yield per cow, lbs.....	3,995
Total production of milk, lbs.....	12,318,537,907
Milk used in mfg. of factory butter, lbs.....	4,236,181,407
" " " " " dairy " ".....	2,380,600,000
" " " " " factory cheese " ".....	1,646,782,830
" " " " " home made cheese " ".....	4,955,214
" exported as fresh milk, lbs.....	34,781,700
" " " " " cream, est., lbs.....	276,000,000
" " " " " condensed, powdered milk, est. lb.	197,000,000

Total of milk used in manufacturing, lbs..... 8,777,701,151
 Used for direct consumption, feeding, etc. lbs..... 3,540,836,756

Compiled from statement in International Crop Report and Agricultural Statistics,
 March, 1925, International Institute of Agriculture, Rome.

Source: International Institute of Agriculture, Rome, 1925.
 The figures are based on the statement of the Canadian Milk Producers' Association for the year 1924.
 The figures for the production of milk are based on the statement of the Canadian Milk Producers' Association for the year 1924.
 The figures for the utilization of milk are based on the statement of the Canadian Milk Producers' Association for the year 1924.
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PRODUCTION AND UTILIZATION OF MILK IN ENGLAND AND WALES IN THE YEAR
ENDING JUNE 4, 1925.

Excluding whole milk fed to calves and pigs a/

Number of cows and heifers in milk:	:	:
or in calf b/.....	:	2,633,167:
Production of milk in pounds g/ etc:	:	:
Average yield of 4,385 lbs. g/...:	:	11,535,100,000:
Consumption, pounds g/.....	:	:
Milk in farm households.....	721,000,000 :	:
Milk sold off farms as milk.....	8,425,400,000:	:
Total milk consumed on farms and	:	:
sold as milk (80%).....	:	9,146,400,000
Butter in farm households.....	12,680,000:	:
Butter sold off farms.....	50,845,000:	:
Total.....	63,525,000:	:
Total farm butter in terms of milk:	:	:
equivalent g/.....	:	1,715,000,000
Cheese in farm households.....	2,552,000:	:
Cheese sold off farms.....	53,672,000:	:
Total.....	56,224,000:	:
Total farm cheese in terms of milk:	:	:
equivalent.....	:	66,900,000
Total production and consumption g/.....	:	11,535,100,000

a/ "It has been estimated in recent years that such milk represents nearly 10 per cent of the actual total production, but the proportion varies considerably in different districts."

b/ Average of numbers on June 4, 1924 and 1925.

g/ Calculated on basis of imperial gallon as equivalent to 10.3 pounds.

a/ Calculated on basis of 27 lbs. of milk being required to make one pound of butter.

a/ No figures are available as to the quantities of butter, cheese or condensed milk made in factories from milk "sold off farms". Information on this point will be published by the Board of Trade in their forth-coming Report on the Industrial Census of Production.

Data from Ministry of Agriculture and Fisheries, The Agricultural Output of England and Wales, 1925, pages 61-63.

PRODUCTION AND UTILIZATION OF MILK IN IRELAND, 1920

The following official estimate for the year 1920 shows the total

Production of milk and the quantities variously utilized.	
	Pounds
Imperial gallons	
Butter	4,470,200,000
Cheese	148,320,000
Condensed milk	
Dried milk	92,700,000
Cream, etc..	

Adding quantity of milk consumed as such.....1,030,000,000

Estimated total milk production excluding feed

for calves, etc.....5,741,000,000

Report on Dairying and the Dairy Industry. Commission of Inquiry into the Resources and Industries of Ireland, Dublin, March, 1922.

ESTIMATED PRODUCTION AND UTILIZATION OF MILK IN GERMANY, 1924 AND 1925.

	1924	1925
Number of milk cows a/.....	8,334,116	8,921,281
Number of milk goats a/.....	3,116,948	2,906,428
Yield of milk per cow - (pounds).....	3,635	4,317
Yield of milk per goat - (pounds).....	682	795
Total production of cows' milk, - pounds.....	30,296,000,000	38,511,000,000
Total production of goats' milk - pounds.....	2,124,000,000	2,312,000,000
Total production of milk - pounds.....	32,421,000,000	40,823,000,000
Used as fresh milk, 50% - pounds.....	9,726,300,000	13,063,360,000 b/
Used for feeding calves, 10% - pounds.....	3,242,100,000	3,265,840,000 b/
Used for making butter and cheese, 60%, pounds.....	19,452,600,000	24,493,800,000
Total - pounds.....	32,421,000,000	40,823,000,000

Report as forwarded by calves, Nov. 4, 1925, by Mr. Schoenfeld, American Agricultural Commissioner, Berlin, quoting estimates of the German Statistical Office.

a/ Estimates were then based on the numbers of cows and goats as reported by census of preceding year.

b/ Percentages for 1925 were taken as 32 for fresh milk and 8 for feeding.

ESTIMATED PRODUCTION AND UTILIZATION OF MILK IN DENMARK, 1909-13 and 1922.

	1909-13	1922
	Pounds	pounds
Total production of milk.....	7,605,870,000	8,106,314,200
Used for butter making.....	6,882,550,000	6,481,524,000
Used for cheese-making.....	88,184,000	198,414,000
Exported as condensed whole milk.....		33,113,092
Exported as cream.....	385,805,000	7,561,778
Exported as whole milk.....	17,416,340	462,966
Used for feeding calves and pigs.....	308,644,000	440,920,000
Consumed as whole milk.....	559,968,400	668,655,180
Consumed as cream.....	48,501,200	68,342,000
Lost.....	134,701,060	207,320,584

Harold Faber, Agricultural Production in Denmark, Pages 26-27 reprinted from the Journal of Royal Statistical Society, Vol. 87, Part 1 (January, 1924).

It will be noted that the proportion of the total milk production used for butter making is according to the above estimate approximately 80 per cent and it is clear from the statistics of more recent years that butter-production has been absorbing a still larger share of the total milk supply.

ESTIMATED PRODUCTION AND UTILIZATION OF MILK IN THE NETHERLANDS, 1923.

Number of cows in milk and in calf.....	1,000,000
Yield per cow, pounds.....	6,816
Total production of milk, pounds.....	7,497,600,000
Consumed as fresh milk (19.4%) pounds.....	1,454,080,000
Manufactured, pounds.....	6,043,520,000
Butter - value in guilders.....	137,000,000
Cheese - " " ".....	92,000,000
Other milk products.....	51,000,000

W. H. C. Knapp, Agricultural Engineer, The Importance of the Netherlands Agriculture, Economic Intelligence, the Hague, Oct. 1, 1925.

SWITZERLAND: Production and Utilisation of Milk, 1922-1925.

Description	1922	1923	1924	1925
	1,000	1,000	1,000	1,000
	pounds	pounds	pounds	pounds
Milk production.....	15,238,200	5,404,900	5,604,500	5,674,700
DESTINATION OF MILK PRODUCED				
Milk sold for direct consumption.....	1,515,200	1,510,200	1,543,200	1,543,200
used in the raising and feeding of livestock.....	943,000	936,000	938,000	925,900
consumed by producer's household.....	804,700	815,700	826,700	848,800
used for manufacture of milk products.....	1,970,300	2,112,500	2,269,700	2,319,500
for export.....	---	18,500	75,900	37,300
MILK USED IN THE MANUFACTURE OF MILK PRODUCTS				
In the cheese factories and creameries situated in the plains.....	1,496,300	1,594,400	1,665,200	1,702,800
In domestic manufacture.....	165,300	165,300	169,800	187,300
In mountain cheese factories..	165,300	176,400	176,400	2 209,400
In the manufacture of condensed milk, etc.....	143,300	176,300	198,400	220,500
PRODUCTION OF MILK PRODUCTS				
Cheese.....	122,028	125,847	141,420	144,469
Butter.....	28,700	28,700	26,700	27,600
Condensed or powdered milk....	48,800	705,600	73,200	80,500

International Crop Report and Agricultural Statistics, Institute of Agriculture at Rome, November, 1926, quoting Milk Commission of Switzerland.

ESTIMATED PRODUCTION AND UTILIZATION OF MILK IN ITALY, 1908-1914.

	1908	1914
Total production of milk, pounds.....	7,900,000,000	8,600,000,000
Consumed as fluid milk, pounds.....	2,724,000,000	3,584,700,000
Total milk used in manufacture.....	4,515,300,000	5,000,000,000
Cows' milk used in mfg. lbs.....	2,724,000,000	
Sheep's milk used in mfg. lbs.....	1,248,500,000	
Goats' milk used in mfg. lbs.....	340,500,000	
Buffaloes' milk used in mfg. lbs.....	2,300,000	

Estimates of Professor G. Fascetti Based upon the Census of 1908, in Report, P. 35, United States Department of Agriculture, February 1926 on Italy, in series, "The Agricultural Survey of Europe".

ESTIMATED PRODUCTION OF BUTTER IN COMMERCIALLY IMPORTANT
COUNTRIES OF THE WORLD, 1913, 1924 and 1925.

Official Estimates or calculations based on official
reports.

Country	About 1913, Comp- : aus or Official : Estimates : Million pounds	1924, Prelimin- : ary Official Re- : ports & Est. : Million pounds	1925, Prelimin- : ary Official : Reports & Est. : Million pounds
Denmark a/.....	257	309	310
Finland a/.....	31	30	45
France.....	369	340	350
Germany b/.....	770	829	798
Great Britain & Ireland.....	251	291	300
Netherlands.....	148	161	172
Russia.....	914	867	914
Latvia, Estonia & Lithuania :	:	20	35
Sweden a/.....	70	67	71
Norway.....	8	11	12
Switzerland.....	37	27	30
Spain.....	9	9	10
Brazil.....	35	40	40
Argentina a/.....	22	86	73
Union of South Africa.....	11	27	30
Australia a/.....	199	310	325
New Zealand.....	64	171	165
Canada.....	202	263	280
United States.....d/	1,632	1,956	1,952
TOTAL.....	5,019	5,634	5,912

a/ Produced in "Dairies" or factories only.

b/ Estimates in prewar Germany varied widely. As much as 880 million pounds were reported. The figure here given is that of Prussian Ministry of the Interior as the average production during the last peace years. That for 1924 and 1925 is calculated from official estimates of total production of milk and the percentage utilized for "butter and cheese".

a/ Twelve months ending June 30 of the following year.

d/ 1909.

CHEESE: PRODUCTION IN VARIOUS COUNTRIES DURING RECENT YEARS.

Millions of pounds.

Country	1909- 1913	1910	1913	1914	1919	1920	1921	1922	1923	1924
United States.....			8/370	480	8/362	356	375	399	418	
Denmark 1/.....			34				62			
Finland 2/.....	3/	3	5	5	2	5	7			
France.....	499				277	375				
Germany.....	591		4/624							1,066
Gr. Br. & Ireland :			6/ 66		97	103	108			140
Ireland.....	5/									
Netherlands.....		185	6/211			150	215	215	233	244
Norway.....		18				24				18
Sweden.....			344	30	19	33	40	37	38	38
Switzerland.....	7/144	161	175			85	102	122	126	141
Canada.....		201				150	163	136	152	150
Argentina 3/.....		6	13	12	50	53	52	48	47	38
U. of S. Africa 9/:		1	1	2	4	5	5			
Australia 10/.....		16	20	21	26	24	33	24	25	
New Zealand 11/....		53	72	100	118	141	125	142	140	172
Italy.....	355								441	

International Institute of Agriculture, Rome "Statistical Survey of Production and Trade in Milk and Milk Products", 1924, and supplementary sources, principally official.

- 1/ Produced in dairies in 1914; for year ended October 1, 1922, estimated total production.
- 2/ Produced in dairies.
- 3/ 1909.
- 4/ Estimate of prewar average production by Kuczynski and Zuntz.
- 5/ Less than one million pounds were made in factories, 1907-08, according to Census of Production.
- 6/ 1912.
- 7/ 1911.
- 8/ Production in factories only.
- 9/ Year ended April 30, following.
- 10/ Years are not strictly calendar years, as some states report for fiscal years.
- 11/ Year ending March 31 following, except 1913 and 1914, calendar years.

ECONOMY OF HUMAN ENERGY AND THE PRICE ECONOMY

In the entire field of this study outside of the Union of Socialist Soviet Republics, the prevailing regime is one of competitive price economy. It may be observed that under any social system, human energy itself has a value that is dependent upon the availability of resources for its creative functioning, whereas in a price economy, values of goods and services denote scarcity and sacrifice rather than proportionate well-being. The conception of value found most helpful in the progress of this study is that which postulates labor-time or life-time sacrifice as the essence of cost of production and hence of value a/. Emphasis is thus placed, as in a comparative study of dairying it appears that it must be placed, upon the comparative resources, natural and "improved", which determine for any time or place the productivity of labor in dairying on the one hand and in any of the alternative lines of production on the other.

When the movements of the supply and the price of butter in this and other countries are so uniformly seasonal, why, one may ask, does not the supply during the winter increase indefinitely in response to the high price? Or why does not the low price in the summer months discourage production as it would do in the season of "normal scarcity"? One is forced to seek in the conditions determining production some basis, physical and economic together, for producers refraining as they do from adding to the supply at any time under the stimulus of a relatively high price. This seasonal swing of prices coincides with changes in conditions affecting the methods and outlay involved in dairy production. It accordingly illustrates precisely what may occur from year to year or from decade to decade. Costs of production may change as well a/ The theory and its practical applications extending even to price forecasting is perhaps best expounded by Percy and Albert Wallis, "Prices and Wages, An Investigation of the Dynamic Forces in Social Economics," London, 1921.

over the longer period only the movement is then less obvious. It is not implied in this that there is any definite periodicity over the longer periods, but rather that attention is to be given to the importance of any seasonal trend of cost of production. Dairy production is peculiarly stable from year to year with little tendency discoverable toward any definite cyclical movement of supplies or price. A highly seasonal production is normal everywhere yielding, however, to modification to any degree depending upon the extent to which dairying is specialized and industrialized. Danish dairymen long ago adapted their industry to winter production in order to avail themselves of the relatively high prices that prevailed in their markets during the season when supplies from the less developed dairy areas were normally light.

The degree in which dairy production remains seasonal in nature is observed to mark quite accurately the extensiveness or lack of specialization in the industry. Dairy countries or regions may be classified roughly on this basis, and it will be found that they will follow much the same order as if classified according to yield, allowance being made of course for any great differences in the way of favorable or unfavorable climatic conditions.

The stability or uniformity that prevails in the ratios at which various farm products sell from year to year (or whatever period is involved in their production) is an observation that impresses the student of prices as having a basis in something inherent in the commodity itself which alternately determines its value or price. Why is the market value of cheddar cheese so uniformly one-half of the price of butter, pound for pound, in both domestic and foreign markets, when one is predominantly a protein food and the other predominantly fat, one an economy food and the other a prosperity food? Or why is cotton generally about three-fourths of the value per pound of wool, with rye in about that same ratio to wheat?

Of course, any dogmatic statement to the effect that these price ratios cannot because of their nature ever be subject to change would by such over-emphasis upon the static relationships quite completely miss the main point involved. It is just because values are thus intrinsic that the conditions under which any particular commodity is produced at any particular time or place have such weight in the determination of that value.

An example from price statistics of Denmark affords more than a demonstration of the cost of production theory of value. It signifies about all that goes to explain the rise of commercial dairying and its allied industries not only in that country, but in the entire northwest of Europe and elsewhere. The following table covering more than a hundred years of comparative prices received by Danish farmers for wheat and butter discloses a shift in ratios, which, after all due allowance is made for progressive differences as to quality and marketability, epitomizes the history of grain and dairy farming, the changing conditions affecting relative costs of production and hence the intrinsic values and prices involved. In the nature of the case, the prices are not local but rather for the most of the period may be taken to represent international values.

DENMARK: Comparative Trends of Prices ^{a/} of Wheat and Butter, 1821-1926
(Five year running average of yearly average prices).

Center:	Wheat	Butter	Ratio	Center:	Wheat	Butter	Ratio	Center:	Wheat	Butter	Ratio
of 5	: Ore	: Ore	: of	of 5	: Ore	: Ore	: of	of 5	: Ore	: Ore	: of
Year	: per	: Per	: butter	year	: per	: per	: butter	year	: per	: per	: butter
period:	pund	: pund	: to	period:	pund	: pund	: to	period:	pund	: pund	: to
:	:	:	: wheat:	:	:	:	: wheat:	:	:	:	: wheat
1823...	2.79:	25.6:	9.2:	1857	8.30:	61.6:	7.4:	1891	5.90:	94.4:	16.0
1824...	3.02:	26.4:	8.7:	1858	7.48:	69.2:	8.0:	1892	5.56:	94.0:	16.9
1825...	3.08:	28.4:	9.2:	1859	7.74:	66.2:	7.5:	1893	5.28:	94.2:	17.8
1826...	3.84:	29.6:	7.7:	1860	7.80:	55.4:	7.1:	1894	5.14:	93.4:	18.1
1827...	4.18:	29.4:	7.0:	1861	7.70:	54.0:	7.0:	1895	5.07:	92.2:	18.2
1828...	4.92:	29.4:	6.0:	1862	7.26:	54.6:	7.5:	1896	5.17:	91.4:	17.7
1829...	5.23:	29.8:	5.7:	1863	7.14:	58.8:	8.2:	1897	5.35:	93.6:	17.5
1830...	5.40:	30.6:	5.7:	1864:	7.13:	60.6:	8.5:	1898	5.43:	95.2:	17.5
1831...	4.65:	31.0:	6.7:	1865	8.03:	61.4:	7.6:	1899	5.44:	96.4:	17.7
1832...	4.49:	31.0:	6.9:	1866	8.58:	67.4:	7.9:	1900	5.21:	97.4:	18.7
1833...	3.97:	30.0:	7.6:	1867	8.95:	69.2:	7.7:	1901	5.12:	97.6:	19.1
1834...	3.62:	30.8:	8.6:	1868	9.07:	69.6:	7.7:	1902	5.32:	96.4:	18.1
1835...	3.53:	30.0:	8.5:	1869	9.18:	71.6:	7.8:	1903	5.52:	96.2:	17.4
1836...	4.51:	31.6:	7.0:	1870	8.81:	74.0:	8.4:	1904	5.48:	96.8:	17.7
1837...	5.16:	33.2:	6.4:	1871	9.17:	73.8:	8.0:	1905	5.88:	98.0:	16.7
1838...	5.39:	35.0:	6.7:	1872	9.37:	78.4:	8.4:	1906	6.12:	99.4:	16.2
1839...	5.81:	34.8:	6.0:	1873	9.34:	82.0:	8.8:	1907	6.20:	101.6:	16.4
1840...	6.14:	35.0:	5.7:	1874	9.15:	87.4:	9.6:	1908	6.22:	101.4:	16.3
1841...	5.58:	35.8:	6.4:	1875	8.85:	90.0:	10.2:	1909	6.46:	103.8:	16.0
1842...	5.07:	36.2:	7.1:	1876	8.19:	88.2:	10.8:	1910	6.32:	105.4:	16.7
1843...	5.52:	36.4:	6.6:	1877	8.32:	85.0:	10.4:	1911	6.23:	107.4:	17.2
1844...	5.87:	36.2:	6.2:	1878	8.32:	84.6:	10.2:	1912	6.75:	110.6:	16.4
1845...	6.28:	39.2:	6.1:	1879	8.20:	83.8:	10.2:	1913	7.31:	121.8:	16.7
1846...	6.34:	40.0:	8.3:	1880	8.01:	84.8:	10.6:	1914	7.94:	134.8:	17.0
1847...	6.53:	39.6:	6.1:	1881	7.97:	88.2:	11.1:	1915	9.11:	153.2:	16.8
1848...	6.27:	39.0:	6.2:	1882	7.47:	90.8:	12.2:	1916	10.36:	172.2:	16.6
1849...	5.72:	39.0:	6.8:	1883	6.91:	89.8:	13.0:	1917	11.34:	203.2:	17.9
1850...	5.60:	38.0:	6.8:	1884	6.41:	87.6:	13.3:	1918	13.86:	239.4:	17.3
1851...	6.65:	40.5:	6.1:	1885	6.08:	87.4:	13.7:	1919	14.35:	251.8:	17.8
1852...	7.58:	44.0:	5.8:	1886	5.86:	87.6:	14.7:	1920	13.61:	249.2:	18.3
1853...	8.93:	48.6:	5.4:	1887	5.62:	87.4:	15.0:	1921	13.33:	252.5:	18.9
1854...	9.46:	53.4:	5.6:	1888	5.68:	88.6:	15.7:	1922	13.78:	269.8:	19.6
1855...	9.50:	59.0:	6.2:	1889	5.13:	91.2:	14.9:	1923	:	:	:
1856...	8.74:	60.4:	6.9:	1890	6.08:	93.0:	15.5:	1924	:	:	:

Note: 1 ore = .01 Kroner. 1 pund = .5 kilogram. Denmark Statistik: Statistiske Meddelelser Kapitelstatistik for Afgrøden, 1925.

^{a/} While these data cover a period of full century, they are more than ordinarily accurate and comparable. This is explained in the original Danish source (see table), and confirmed by the personal statement of the Danish Agricultural Advisor in this country, Mr. S. Sorensen. It is clear that the series as published represents the prices reported to officials of state and church as actually received by the Danish farmers for the produce of each year. As the various taxes and tithes or fees were based upon the actual incomes of the groups, the result was a more or less strict accounting of produce sold and prices received. Inasmuch as fluctuations in the value of gold affected both series alike and both are reported on the same basis throughout, the ratios may be taken to represent accurately the comparative values of the commodities. Quality is a factor in the butter prices that affects the trend progressively, but it is highly important that this element should not be eliminated even if it were possible to do so.

The pronounced change in the ratio indicated by the comparative prices which began to be marked in the 70's would clearly demand some explanation in terms either of the cheapening of the cost of producing grain or of the increasing cost (or improvement in quality) of the butter. The cheapening of grain-production due to the altogether unprecedented expansion of grain areas on the cheap lands of the continents newly opened to exploitation by machinery during the last quarter of the last century occupies a prominent place in every history of agriculture. Less attention has been given to the period in turn of cheapened dairy supplies following upon that of the grains. The latter development was found to justify a prominent place in the following analysis of factors determining price and consumption of dairy produce in the world markets. There is nowhere a more succinct story of the era of cheapened grain production than is told by the foregoing comparative price table. Sauerbeck's index, although made use of by the Committee on Stabilization of Agricultural Prices in Great Britain ^{a/} to show that British agriculture was more depressed by the falling general price level than by foreign competition such as suggested above, indicates the same general trend as the domestic Danish prices. Between 1871-75 and 1894-98, the average fall in wholesale prices in Great Britain was 40 per cent. This decline was pointed to by the Committee as being primarily monetary, since, to be sure, "it is hardly to be expected that all commodities will simultaneously become scarce or abundant". But it is none the less significant that in the same period (1871-75 to 1894-98) wheat fell 51 per cent in price while butter fell 25 per cent.

^{a/} Report of the Committee on Stabilization of Agricultural Prices in Great Britain, 1925.

The Dane was not alone in turning to dairying under such stimulus of cheap feeds and expanding new markets for dairy produce. For improvements in transportation and in the industrial technique generally of which the ocean steamer was something of a symbol, were then giving rise to the international market for perishables as well as wheat on a scale wholly unprecedented ^{h/}. International trade in dairy products on a modern scale began practically a half century ago.

It would be difficult to devise a more apt illustration of Davenports' theory of opportunity cost of production ^{h/}. The cost of production of dairy products for profit involves certainly a sacrifice of some other line of production ^{g/}.

If, however, it were wholly justifiable to regard the cost of their production anywhere as equivalent to the value of those alternative products the sacrifice of which is entailed in their production, it still would appear best to take another step in coming to terms with the price economy. This step would seem to be taken when the real ultimate cost of any economic good is seen to be the labor-time involved directly and indirectly in its production, and when also, the productivity of labor in obtaining gold is included under the same principle. The implied relativity of values and prices is thus carried out consistently into price-determination in general, - changes in the productivity of labor in gold-mining (which is not to be confused with changes in the supply of quantity of gold) determining the movement of the general price level while differences in the productivity of labor in other lines determine the relative prices of other products.

With this concept as a working basis results were obtained which it is

^{g/} The principle of the centrifuge, invented in 1867 for other purposes was applied to the separation of fat from milk in 1879.

^{h/} Davenport, H. J., The Economics of Enterprise.

^{g/} The keeping of cows and goats on feeding-grounds too poor and rough for other uses might be cited as the exception to this, but there would always be some labor cost involved and some alternative, as sheep or forest growth.

believed show conclusively that over a considerable period of years prior to the late war, the rapidly increasing supplies of dairy products reaching world markets were being produced at a quite steadily lessening cost. Nominal prices tended to rise but the commodity itself was being cheapened. If the truth of this can be established it goes far to explain the rapid increase in the consumption of dairy products in the growing world markets during that period.

To say that value is determined by cost of production and then further to say that while prices of butter were rising costs were falling calls for explanation. Correction for general price level is necessitated, of course, by the most unfortunate circumstance that the yard-stick by which values are at present measured, itself undergoes change, affecting all price quotations accordingly. The method by which price series are deflated or corrected for changes in the general purchasing power of money is so fundamental as to justify a brief explanation and defense of that attempted in this study.

It is believed that the indices of price such as are in general use for this purpose may prove to be seriously misleading especially in this study where competitive advantage is involved. In all of the standard indices it is assumed in their making that a composite of all prices or of those considered to be significant for the construction of the index, especially if properly weighted, will give a trend representing inversely the "value" of money or gold. But this it may or may not do, and under modern conditions as affecting productivity of labor and cost of production per unit of goods it is safe to say, it seldom does when prices quoted are the simple money values of the same units of the same goods. In such case, the movement indicated may be determined by two sets of influences that it is highly important to distinguish. The one is the value or labor cost of gold itself, the yard-stick on which we are seeking to check up. The other is the change in the inherent value of the goods, that is, in the cost determined by the productivity or efficiency of labor in their production. In the ordinary index number of prices any changes

in resources or technique are ignored and the shift in price level attributed entirely to monetary causes. We need to know the effect of monetary influences purely but we do not get that result simply by calling it that.

In accordance with the cost of production theory of value outlined above, the price of butter in Copenhagen - selected as the most representative international market price - was deflated by an index referred to by its compilers Mullis and Vellis, as "normal price". The series as used in part is reproduced in full in the table below. Strict accuracy is not claimed for such an index since the statistical basis is inadequate. It was made such limited use of as its nature permits simply because, although a rough tool, it was the only one found to be adapted to the work in hand. This index of normal price is taken as the best available measure of the change in money value purely. the value of the product per laborer having been taken as the basis for measurement of the monetary influence rather than the value per unit of product regardless of changing productivity of labor. The trend of the value of money, that is was as far as possible isolated from the trend of efficiency in production or the cheapening of the product, if such occurred, by improvements in resources and technique. Then the price of butter was thus corrected by the "normal price" as a deflator. the trend of real price or cost of production of butter was assumed to have been obtained a/. The marked downward trend of such price shown in the following graph is clearly evident and will be referred to together with the effect of real wage trends upon consumption in another connection.

A/ as to the theory and the method outlined thus far, it is believed that the difficulty of securing adequate data is the most serious difficulty involved. The less satisfactory indices of price movement are the more readily at hand. But it is quite generally acknowledged that some of the most vital theory is without statistical evidence for its complete proof.

"NORMAL PRICE" a/ MOVEMENT FOR NORTHWEST EUROPE.

	£		£
1861.....	60	1887.....	80
1862.....	62	1888.....	82
1863.....	60	1889.....	92
1864.....	58	1890.....	110
1865.....	60	1891.....	108
1866.....	64	1892.....	96
1867.....	66	1893.....	92
1868.....	66	1894.....	88
1869.....	68	1895.....	86
1870.....	70	1896.....	88
1871.....	74	1897.....	92
1872.....	90	1898.....	98
1873.....	108	1899.....	110
1874.....	102	1900.....	124
1875.....	90	1901.....	120
1876.....	80	1902.....	110
1877.....	78	1903.....	108
1878.....	76	1904.....	104
1879.....	76	1905.....	106
1880.....	60	1906.....	110
1881.....	88	1907.....	126
1882.....	82	1908.....	122
1883.....	84	1909.....	120
1884.....	82	1910.....	120
1885.....	80	1911.....	122
1886.....	78	1912.....	132

a/ Average value in pounds sterling of production per worker in coal mining in Great Britain, Germany and France representing perhaps the most comprehensive index of the change in the value of money. The index entire is that compiled by Wallis and Wallis as published in graphic form, only, in Prices and Wages, pp. 128 and 131.

As may be seen by reference to the discussion of the volume and direction of international trade in dairy products, aside from milk itself the world trade is highly concentrated in the two great deficit countries, Great Britain and Germany. There appears to be no better current index of total international trade or world production available, in fact. For various reasons the figures published officially by the various foreign countries do not when all are combined result in any close balance of imports against exports for any year (see international trade tables above). Consequently, even if a comprehensive series were worked out there would appear to be little if any greater accuracy than in the use of the import figures for those countries known to absorb the bulk of the exports from the surplus countries. The domestic production of butter in Great Britain and Northern Ireland is probably 17 per cent of the total supply, while of the total German supply it can be estimated that 75 per cent is domestic. In the case of Great Britain, it is possible to disregard any changes in domestic production from year to year and find a fairly accurate index of supply in the imports for consumption. To so regard the German imports would be too great an assumption. It is apparent that German's imports of butter fluctuate in a way that the domestic supply certainly influences. Insofar, however, as imports into world markets are comparable to the receipts on the principal markets of the United States so generally used (together with storage holdings) to indicate domestic market supplies, it should be possible to measure the effects of such supplies upon price.

In the degree that supply alone can be claimed to determine price, the imports and the prices should show this in an inverse correlation, the total values (quantity times price per unit) tending to remain constant from year to year, allowance being made for changes in general price level or the value of money.

Accordingly, calculations were made to demonstrate statistically whether any significant relation exists between the foreign supply and the price of butter in the foreign market or between world supply and the price in the markets of the United States.

The yearly imports into the United Kingdom provide a long-time series representing, it is believed, as nearly the total supply in that market as it is possible to obtain for any market for the same length of time. As stated above, the domestic British production is at present approximately only 17 per cent of the total supply. Over the period of 27 years from 1886 to 1912, covered by the following analysis, this proportion may have changed and doubtless did change to some extent. A larger proportion of the total milk supply of the United Kingdom must have been utilized in butter-making in the years before the concentration of population in the industrial centers had gone so far as in the later years. The tendency toward lessening the proportion may, however, be taken to have been more than compensated for by the growth of the dairy industry ^{a/}. In this study, changes in the volume of the domestic supply in British markets were disregarded and the trend of imported supplies taken to represent the trend of total supplies. If the inaccuracy known to be involved in this assumption could have been eliminated the results would presumably be more favorable to the theory advanced. When the trend of population growth is eliminated by prorating the imported supply to the population from year to year, the resulting supply per capita provides a fairly satisfactory working basis. Apparently nowhere else can the trend of supply be measured more accurately over so long a period, altho as suggested, the increase would be shown to be greater during the later years if the entire supply could be so prorated. The trend of imports for consumption per capita into the United Kingdom is shown in the following table.

^{a/} It is officially estimated that the total production of milk in England and Wales was 1,829 million gallons in 1908 against 1,180 million gallons in 1925, while the yield per cow had changed little if any. (Ministry of Agriculture and Fisheries, The Agricultural Outlook of England and Wales.

UNITED KINGDOM: IMPORTS OF BUTTER AND CHEESE PER CAPITA, ESTIMATED
FOR CONSUMPTION, 1868 - 1926.

Year : ended : Dec. 31 :	Butter : Pounds :	Cheese : Pounds :	Year : ended : Dec. 31 :	Butter : Pounds :	Cheese : Pounds :
1868...	3.99 :	3.19 :	1901.....	9.85 :	6.82 :
1869...	4.52 :	3.52 :	1902.....	19.49 :	6.66 :
1870...	4.15 :	3.67 :	1903.....	10.57 :	6.99 :
1871...	4.69 :	4.25 :	1904.....	10.90 :	6.57 :
1872...	3.90 :	3.65 :	1905.....	10.60 :	6.21 :
1873...	4.39 :	4.69 :	1906.....	10.97 :	6.65 :
1874...	5.51 :	5.03 :	1907.....	10.53 :	5.92 :
1875...	4.92 :	5.45 :	1908.....	10.51 :	5.69 :
1876...	5.54 :	5.03 :	1909.....	10.00 :	5.84 :
1877...	5.34 :	5.37 :	1910.....	10.56 :	5.94 :
1878...	5.82 :	6.37 :	1911.....	10.25 :	5.65 :
1879...	6.57 :	5.74 :	1912.....	9.52 :	5.48 :
1880...	7.42 :	5.66 :	1913.....	9.63 :	5.44 :
1881...	6.36 :	5.77 :	1914.....	9.44 :	5.77 :
1882...	6.73 :	5.21 :	1915.....	9.20 :	6.47 :
1883...	7.21 :	5.54 :	1916.....	5.17 :	6.18 :
1884...	7.54 :	5.88 :	1917.....	4.32 :	7.04 :
1885...	7.21 :	5.83 :	1918.....	3.78 :	5.63 :
1886...a/	4.57 :	5.20 :	1919.....	3.72 :	5.84 :
1887...	4.42 :	5.47 :	1920.....	3.99 :	6.50 :
1888...	4.88 :	5.64 :	1921.....	7.90 :	6.63 :
1889...	5.60 :	5.57 :	1922.....	9.00 :	6.25 :
1890...	5.83 :	6.23 :	1923.....	11.61 :	6.55 :
1891...	6.14 :	5.85 :	1924.....	11.87 :	6.61 :
1892...	6.23 :	5.39 :	1925.....	12.71 :	6.84 :
1893...	6.58 :	5.86 :	1926.....	12.81 :	6.81 :
1894...	7.25 :	6.27 :			
1895...	7.90 :	5.92 :			
1896...	8.43 :	6.20 :			
1897...	8.81 :	7.14 :			
1898...	8.73 :	6.33 :			
1899...	9.17 :	6.39 :			
1900...	9.05 :	7.21 :			

a/ Including margarine, 1868 to 1885 inclusive.

As to butter price trend, the Copenhagen official quotation might be taken to be the most representative series for a long period, inasmuch as this price reflects the northwest European market conditions from week to week as studied by the export price committee as a basis for the determination of a weekly quotation that will clear the Danish supplies. For the purpose of this study, however, the average import values of all butter entering into the supply of the British markets were considered to represent more fully the actual situation as affected by the changing conditions determining cost of production and consumption. It was in this that significant results were sought rather than in the trend of market price as such.

Insofar as the total supply of the market determines the actual price, as in most market comments it is assumed so largely to do, the imports into the United Kingdom should of course, show an inverse correlation with the price as represented either by the Copenhagen quotation or by the import values. The correlation in either case was found to be insignificant. There is no semblance of any "supply curve" on this basis. Over the period of 27 years (1886-1912) the yearly supply per capita over the period likewise failed to show any significant correlation with actual prevailing market prices. See scatter diagram No. 1.

The next step according to usual practice would be to deflate the price by dividing by an index of wholesale prices, to correct for General price movement attributable in small part only to butter prices which constitute but one element in the composite price level. Using Sumnerbeck's index, the deflated prices showed practically no results as to correlation with supply, as shown in diagram No. 21.

Since this was to be expected if the theory outlined above is correct, the procedure was modified in accordance with the cost of production theory of value, and the price of butter was next deflated by the index of "normal price." according to the theory that the price when account is taken of changing value

of money represents the cost of production, changes in the quantities consumed might be expected to arise in part from changes in cost of supply in the market. The reasonable expectation would be that the lower the cost price, other things being equal, the greater the quantity consumed, since there exists some economic cause for the increased consumption.

The increase is believed to be accounted for by the approximately measurable influences of lowered cost prices and increased real income of consumers combined. Diagrams No. 3 and 4 indicate, as the others do not, a measurable relation between price and quantity consumed and the significance appears in rough form as a straight line curve. With quantity consumed per capita taken as the dependent variable the "cost of production" price of all imported butter gives a coefficient of correlation of $-.496$. Since the probable error is $.033$ the correlation although not high is significant. The scatter diagrams No. 3 and 4 indicate even more clearly the heavier consumption at the lower cost levels.

Thus far, then, the measurable influence is found to proceed from conditions determining the cost of producing the butter, the lower the cost the heavier the consumption. Supply and demand have not figured separately in the problem. It does not appear otherwise when the conditions affecting productivity and the creation of wealth or purchasing power in the consuming centers are considered in the same way as were these conditions affecting productivity in the dairy regions of the world. The measurable influence of both together upon butter consumption is increasingly significant.

It was assumed as a working hypothesis in the foregoing analysis that the price at which butter reaching the British market is consumed must represent the ultimate labor cost, direct and indirect, of producing (and marketing) the bulk (not the mythical marginal unit) of the supply. A method found satisfactory within the limitations of available data provided a statistical basis for distinguishing the trend of nominal market prices from that of a value which, for want of a term less likely to be confused

with and disparaged by the classical concept of "intrinsic value" was referred to as inherent value, which, expressed as a gold price strictly was taken to represent the cost of production of the butter supplies. The trend, at least, of this cost was believed to have been determined. The tendency for the quantity consumed to vary inversely with changes in the cost of production was indicated by a significant correlation between the upward trend of consumption and the downward trend of the cost of production.

If demand when it means anything means simple production in some other guise, the full explanation of the increase in consumption of butter over the period would have to be sought in some index of general wealth production of the British butter consumers. The index selected was that of the "purchasing power of wages in five industries in terms of the wholesale prices of twenty-one articles of food", as this index was compiled by Warren S. Thompson ^{a/}. The simple correlation of the trend of consumption with that of real wages over the period of twenty-one years, 1890-1910 inclusive, for which wage data are available, gave a positive coefficient of .807. Since the probable error is .031, the ratio is, highly significant. The accompanying scatter diagram, No. 5, indicates the tendency for the consumption to be heaviest when real wages are highest.

^{a/} Population: A Study in Malthusianism, by Warren S. Thompson, 1915, page 49.

Recent developments in Germany afford an illuminating example on account of the highly abnormal situation that prevailed of what tends to occur under comparatively normal conditions as a result of price movement. By means of the moving picture, normal movements may be slowed up to a degree that makes them appear strange and grotesque, or they may be speeded up to bring out detail and action not ordinarily visible as in the unfolding of a flower. Similarly that which took place within Germany during the post-war period of financial disturbance affords on an exaggerated scale a demonstration of what tends to happen to real income under conditions of changing price level.

With the attainment in the latter part of November, 1923, of comparative stabilization of the German currency there began an improvement in the economic condition of the German wage earners generally. Prior to that time the constant depreciation of the currency was reflected in rising prices with accompanying increase in the cost of living. The cost of living expressed in paper marks tended during this process to increase more rapidly than corresponding increases in money wages could be obtained. That is, wage adjustments lagged behind price changes.

The result was, of course, that the purchasing power of the wage-earner was continuously lessened for in the interval between wage adjustments, prices were invariably revised upward before the wage received could be spent in any orderly manner. The index of such real income or real wages strictly, (of skilled laborers) expressed as a percentage of the 1913 average stood in October, 1923, at 52 or approximately one-half that of the prewar standard. Imports of butter into Germany, which before the war had been second only to those of the United Kingdom in volume, were negligible throughout the post-war period of Germany's financial difficulties. By November, 1924, after a year of stabilization, index of real wages had risen to fully 90. That is, wage increases had caught up with the cost of

living or the general price level, at least to such an extent that buying power of wage earners had become adjusted at nearly its prewar level so far as wages apart from degree of employment were concerned.

In addition to considerations of the actual wage level, however, importance attaches to the condition of the workers as affected by the time actually employed. Unemployment of German laborers was almost unknown during the period of inflation at the same time that unemployment was most serious in Great Britain. This can only be asserted here to have been due to an illusory or false prosperity within Germany that served to obscure the tendency toward impoverishment of wage earners and employers alike until competition was met on a more sound economic basis. On the other hand, when stabilization was attempted, Germany was at once faced with a serious unemployment situation, while improvement in conditions of employment were beginning to be manifested in Great Britain and elsewhere.

Imports of butter into Germany, the removal of which was coincident with stabilization, increased in volume nevertheless, along with the increase in real wages as indicated by the following tabular statement and graph. From imports that one year earlier were negligible, there was a steady increase, allowing for increased seasonal production within Germany, until in August they exceeded and continued larger than in 1913.

A survey study made by the Ontario Agricultural College a/, gave the following significant results as to the direct influence of income upon demand for milk. Canadian figures refer to Imperial measures b/.

DAILY CONSUMPTION OF FLUID MILK IN THE CITY OF HAMILTON.

	Well to do	Moderate	Poor
	Pints	Pints	Pints
Daily per capita consumption.....	.70	.59	.51
Daily consumption per child.....	.90	.65	.42

DAILY CONSUMPTION OF FLUID MILK IN THE CITY OF TORONTO.

	Well to do	Moderate	Poor
	Pints	Pints	Pints
Daily per capita consumption.....	.70	.60	.51
Daily consumption per child.....	.83	.67	.44

Strikingly similar results are shown in a study by the United States Department of Agriculture made in cooperation with the Pennsylvania Department of Agriculture, June 1924.

DAILY CONSUMPTION OF FLUID MILK IN THE CITY OF PHILADELPHIA.

	Well-to-do	Middle	Poor	Suburban	Wealthy
	Pints	Pints	Pints	Pints	Pints
Per Family.....	3.30	2.86	2.56	3.24	4.48
Per Capita.....	.78	.60	.51	.78	.81
Per Capita Drinking..	.50	.45	.39	.54	.39

Still further, the increased consumption of all dairy products within the United States is shown by official statistics from two separate departments of the government working independently to bear an exceedingly close relationship to real wages. The correlation will be obvious from the tables appearing together on the following page and from the following graph.

a/ Report by J. B. Hoodless, B. S.A. in Ontario Agricultural College Bulletin, January, 1924.

b/ The imperial gallon is equal to 1.2003 United States gallons.

INDEX NUMBERS OF PURCHASING POWER OF UNION WAGES AS MEASURED IN FOOD, 1907 TO 1924.
(1913 = 100.0)

Year	Purchasing power (measured by retail prices of food)	
	Of rates of wages per hour	Of rates of wages per week, full time
1907.....	109.4	111.6
1908.....	107.9	109.7
1909.....	103.6	105.2
1910.....	101.6	102.4
1911.....	104.4	104.9
1912.....	100.0	100.2
1913.....	100.0	100.0
1914.....	99.6	99.5
1915.....	101.5	101.0
1916.....	94.2	95.4
1917.....	78.0	76.8
1918.....	78.8	77.0
1919.....	83.1	79.5
1920.....	97.8	92.7
1921.....	134.0	126.2
1922.....	136.4	129.2
1923.....	144.0	135.8
1924.....	156.4	146.9

United States Department of Labor, Bureau of Labor Statistics Bulletin No. 596,
Retail Prices 1890-1924.

PER CAPITA CONSUMPTION OF DAIRY PRODUCTS IN THE UNITED STATES
Certain years, 1849-1925 (revised figures).

Year	Milk	Butter	Cheese	Condensed and evaporated milk	Ice cream
	Gallons	Pounds	Pounds	Pounds	Gallons
1849.....		13.9	4.0		
1859.....		15.1	3.2		
1869.....		13.7	3.3		
1879.....		15.8	2.1		
1889.....		19.5	2.9		
1899.....		19.9	3.7		
1909.....		18.0	3.85		1.04
1914.....		17.0	4.60		1.58
1916.....		15.4	3.04		2.08
1917.....	42.4	14.6	2.89	10.49	2.07
1918.....	43.0	14.0	3.00	12.50	2.12
1919.....	43.0	14.8	3.50	12.30	2.49
1920.....	43.0	14.7	3.50	10.17	2.48
1921.....	49.0	16.1	3.50	11.40	2.28
1922.....	50.0	16.5	3.70	12.69	2.45
1923.....	53.0	17.0	3.90	13.25	2.65
1924.....	54.75	17.25	4.20	14.00	2.50
1925.....	54.75	17.04	4.26	14.87	2.80

United States Department of Agriculture, Crops and Markets, August, 1926.

1/ Including cottage cheese, not included for other years.

2/ For the year 1910.

It might appear that too much importance is attributed to the effects of wages upon the total national consumption of dairy produce either at home or abroad. At least the question as to the portion of the total consumption that would be affected by wage changes one way or another in any consuming center must not be ignored if it is to be claimed that the trend of "real wage" or "real income" is essentially the indicator of such demand.

The question whether wages can rise or fall without limit at once suggests that the wage-earners are somehow very intimately related to an industrial order in which their wage is a share in the distribution of the social income. It is not so generally understood, perhaps, that the share that can be appropriated in the form of wages as over against profits - the other share in economic distribution - has a quite uncanny way of maintaining just about the same ratio to profits wherever they appear. Proof of this cannot be attempted here, but the tendency of real income for employers and employees alike to depend under competition upon the current production or flow of wealth is assumed as a fundamental economic law without the recognition of which there could be no scientific analysis of any market situation.

This is not to imply that no variations occur in the comparative shares owing to the movements of price level. It has been shown above how it is possible for movements in price level with the characteristic lag in wage adjustments behind price changes to affect profoundly the trend of real income and hence of demand a/.

A point, however, that it seems to be exceedingly important to emphasize all along in connection with consumption of dairy products and especially in a/ Comparatively recent developments in Great Britain in the direction of eliminating these maladjustments are noteworthy. Agreements providing for fixing wages in accordance with cost of living indices are reported as having been accepted to apply to several million workers in the last few years. See Lyon, Chas. E., American Trade Commissioner, London: British Wages, Trade Promotion Series No. 42 Department of Commerce, Washington, 1926.

the great world markets, is that there are very effective and ready checks upon either share in the distribution of the current wealth becoming unduly large. Labor organization press for any possible gains that are not afforded by the bidding of profit-foreseeing enterprisers while refusal to employ is generally an effective step toward adjusting earnings to lessening profits. It has even been shown that in British industry specifically and competitive capitalistic industry generally there is a "normal" unemployment - voluntary or involuntary, that something less than full employment is necessary to the maintenance of a competitive labor market ^{a/} With this last hard fact as a seeming possible exception, it justifies reiteration that there is a certain solidarity of industrial society, and that demand either domestic or foreign, for dairy produce is utterly dependent upon it. It was demonstrated in the case of Great Britain, Germany, and the United States that real increases in incomes of wage-earners was accompanied by generally increased consumption and vice versa.

Under a regime of competitive production for profits it should be clear that a demand denoting the power and incentive to pay a price equivalent to the opportunity cost of production is the first essential to any commercial dairying whatever. The mere pressure of population upon the food supply and the resulting necessity of economizing land does not in itself bring about diversification of agricultural production with dairying as an inevitable development. China affords an example of a country in which agriculture is in a way, intensive but not diversified. Dairying anywhere, so far from being an inevitable development is demonstrated again and again in the distribution of the world's dairy industry to be dependent in the highest degree upon wealth-production in the entire field in industry, - to

^{a/} See Wallis, Percy and Albert, "Prices and Wages, An Investigation of the Dynamic Forces in Social Economics", pp. 328-366/

have had its growth almost parallel, in fact, with industrial development.

The explanation of this is to be found in the enormously increased productivity of labor with machine power and improved technique and in the widened market created by mass employment in mass production. This is perhaps no more than a modern version of Mill's statement to the effect that when a workman adds to the supply of goods he "by the same stroke" adds equally to demand. The only difficulty with the statement appears to be that the financial mechanism of a profit-seeking industrial society is so complex that production and consumption are in actuality far from being consummated "by the same stroke." a/. It has been made very clear in the recent history of German finance as will appear from the following analysis, that the consumption of butter can be influenced by the movement of price quite as much as by the level of price.

One is prepared to understand what is implied in diversification in agriculture only when it is seen in its relation to the comparative prices that the market affords. The market anywhere for butter and other such highly concentrated, assimilable and high-priced foods grows out of the current wealth of the community. The quest for demand or for the consumer as a thing apart leads us back to our starting-point in the productivity of labor as determined by its entire setting. Attention is turned back at every point to the productive economy, that is, to the study of resources and technique b/.

For the great masses of toilers in China, India, and other oriental countries the real earnings can be stated without resort to statistical indices of wages and cost of living. Their earnings are ever equivalent

a/ See Foster and Catchings, "Money" and "Profits." Also Percy and Albert Wallis, "Prices and Wages" for lucid analyses of the effects of changes in price level upon profits, wages and employments, and periodicity of prosperity and depression.

b/ Black.

to the mere necessities of existence. Always for these millions of toilers it is a matter primarily of securing above everything else a sufficiency of food, chiefly rice.

Oriental labor cannot under existing conditions be highly productive. In China alone which remains as it always has been, a farmer nation, the agricultural class comprises approximately 80 per cent of the total population of some 440,000,000. Laborers in industry other than agriculture comprise at the most 15 per cent of the Chinese people, according to the International Labour Office, Geneva. The truth is that in such an economic situation too much is demanded of the land. The lack of demand for labor in industry other than agriculture compels resort to the soil by more people than the soil can support. The inevitable consequence is the familiar extreme poverty of the Chinese people.

Under such conditions of industrial organization as prevail in the oriental countries economic pressure is so great as not to provide the margin of time or energy essential to saving and the accumulation of capital with which to make the worker more efficient in production. A sort of direct appropriation of the products of the soil with the crudest of implements and a minimum of returns per worker is about all that the situation provides.

Recognition of the fact that any development of dairying that engers into competition with our own has come to be what it is under a price economy helps to simplify an otherwise hopelessly complex problem. Production whether of dairy produce or other foods is then seen to be a matter not of calories alone but of profits, just as consumption is a matter not of calories alone but of all the satisfactions together for which a price will be paid. The much deplored "decline of arable farming" in England, for instance, has come to be recognized as presenting the alternative of something less than the maximum national production of food on the one hand or a subsidized agriculture on the other. And as to demand, average prices prevailing in

recent years indicate that for the same dollar the consumer in the United States could instead of buying butter have obtained twice the caloric value in oleomargarine or four times as much in the form of lard g.

Developments the world over justify the study of demand in deficit and surplus areas alike with the attempt to discover first and last what is determining the flow of wealth or income since demand for dairy products is so completely a matter of quid pro quo. Until productive efforts have provided something over and above the primary or elemental requirements of subsistence of any group, there has not emerged a demand in any economic sense for the comparatively refined animal foods, especially butter of fine quality. The conviction grows upon one with the study of actual occurrences in both "surplus" and deficit areas that under certain economic conditions the relatively cheap vegetable fats are inevitably substituted for butter (unless as in Canada their manufacture and sale can be made illegal), and that up to a certain point any other procedure on the part of the consumer would be decidedly uneconomic. Certain levels of utility, that is, such as the more indirect forms of consumption in cooking and baking are well provided for by the cheaper forms of fat, vegetable and animal, leaving a unique demand for butter and leaving also the means wherewith to buy it. The approach to the matter by way of attempting to condemn other foods which occupy a legitimate even though humble place in the scale of utilities, and to deprive the consumer of such means as they afford for extending his purchasing power seems idle to say the least. To the writer there has appeared no way open to dairy interests anywhere of side-stepping the pressing necessity of efficiency in production in regard both to cost and quality of product.

2/ Bureau of Labor Statistics, Bul. No. 306 Retail Prices in the United States, 1890-1924.

Perhaps when all is said in regard to the comparative merits of butter and margarine or of good butter and poor butter, the results will be little affected anyway by subtle argument. Annoted psychologist recently conducted a questionnaire to discover why milk was chosen as a beverage. Various reasons were given, but the "reason" predominating was that they liked it. It is rather more than likely that while the fat and sugar in ice-cream make it a suitable winter food, it is principally consumed in summer for the reason that people like it so. However desirable it is that people be educated to live rationally, the fact remains that market values are determined most largely by numberless manifestations of likes and dislikes. Dairy products are no exception. Wherever they are consumed freely, they are first of all liked and at the same time within the buying power of a wide range of consumers. That these likes and dislikes are not necessarily identical with all persons can be especially well demonstrated by reference to cheese for which tastes vary notoriously.

In the degree that the study of the dairy industry and its place in the economic scheme is scientific, the impartial observations lead to much the same conclusion as that expressed in the Report of the Imperial Economic Committee on Marketing of Dairy Products, namely, that, "Bread and meat must remain the staple food of the population of the United Kingdom, but modern science is making more and more evident the special significance of fruit and dairy produce for the health of the community and especially for that of growing children." The universal application of this as stated would appear to be less certain only when due consideration is given to the importance of various forms of cheese and curd in the diet of people with low standards of living and meager choice of foods. Throughout India the whole milk is churned into a form of curd that forms surely a staple food of the masses of rural people.

Widening the market implies not merely supplying the increasing population at the same rate of consumption per capita. It is to be widened by increasing the consumption per capita at the same time that more persons enter the field of potential demand and by appealing on an economic basis to new consumers previously below the scale of butter-consumption.

True increase in consumption per person is not brought about apart from the cheapening of the product or increasing income. If, in the United States, incomes and wealth are to be increased out of proportion to the cheapening of butter and cheese production, then this country will naturally tend to import supplies from countries in which their production involves lower sacrifice cost and in which there is greater advantage in their production relative to alternative products.

Quite conclusive evidence is believed to appear from the above analysis that the more notable increases in consumption of dairy products in various parts of the world have been attributable to (1) the real cheapening of the cost of the product, quality being considered, and (2) increasing income of consumers. It is accordingly, to these factors that the attention of the student is to be given in determining the character of the competition from abroad. From any particular source, there can come an increased quantity or an improved quality without disproportionately increased costs of production. In any area, deficit or surplus, the rate of consumption will be found to be measurable with relation to this cost directly by the real income of the group concerned.

EXTENT AND CHARACTER OF INTERNATIONAL TRADE IN DAIRY PRODUCTS

If all the countries of the world were as nearly complete economic units as the United States or North America, that is, if production and consumption were as equally balanced making each country as nearly sufficient unto itself, the function of international trade would obviously be comparatively insignificant. As it is, in any particular commodity there are certain outstanding surplus and deficit countries. The function of international trade, as of all other trade, is to provide for the deficiency of certain goods and services by the disposal of the surplus of certain others. The far-reaching extent of such specialization in production under the stimulus of competition and modern means of communication and transportation, even after the widespread post-war reaction in the direction of nationalism, is quite inconceivable. For the present purpose and under the necessity of holding as closely as possible to the problem of international competition in a single group of commodities, the altogether unprecedented industrialization of certain areas with all that this implies in the way of production for exchange rather than for use, must be treated simply as a part of the given situation. In fact, the developments in transportation and refrigeration and hence in growth of surplus dairy production in the more favored lands might with appropriateness be taken as the starting point in this report instead of adopting the other approach by way of the present distribution of supplies. Certainly they are inseparably related, as will more clearly appear in the following description and analysis of world trade in dairy products.

Of the world's production of butter and cheese that can be accounted for statistically, the proportion entering into international

trade is as a whole increasing. At about the time of the outbreak of the World War this proportion had reached approximately 14 per cent in the case of butter and 20 per cent in that of cheese. These proportions appear to have increased only slightly by 1924 when the percentages were approximately 15 and 22, respectively. Exclusive of the United States, the importance of international trade relative to production of course appears much greater since our great output enters so comparatively little into foreign trade. Of the foreign production fully 20 per cent of the butter and 25 per cent of the cheese enter into foreign trade. Although the trade in both butter and cheese has received a great impetus since that year, Great Britain and Germany each having been absorbing considerably heavier imports, no particular significance appears to be attached to the variation in the relative volume of world production and international trade. At any rate, the statistical data are too unsatisfactory to disclose any current importance in this relation in itself. The relative stability of the cheese trade during the war period, of course, has significance, but since the trade in both commodities has now well regained the volume indicated by projecting the curve of the prewar rate of growth, the developments with reference to particular areas of surplus and deficit are of chief importance. The following comprehensive tables of international trade serve to indicate the developments in each important exporting and importing country and of the volume of trade as a whole. Since material descriptive of international trade in dairy products is available in such abundance of detail in published form ^{a/} it is presented in this connection

in brief outline only.

^{a/} See International Institute of Agriculture, Rome, Yearbooks, and "Milk and Milk Products, Production and Trade," 1924. For an entire descriptive and quantitative treatment see, also United States Department of Commerce Bulletin, Trade Promotion Series - No. 31, International Trade in Butter and Cheese, by E. A. Wulfert. Also forthcoming bulletin by United States Department of Agriculture providing a comprehensive and detailed compilation of dairy statistics.

BUTTER: International trade, average 1909-1913, annual 1923 - 1925

Country	Year ended December 31							
	Average		1923		1924		1925	
	1909-1913						Preliminary	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
	: 1,000 :	: 1,000 :	: 1,000 :	: 1,000 :	: 1,000 :	: 1,000 :	: 1,000 :	: 1,000 :
	: pounds:	: pounds:	: pounds:	: pounds:	: pounds:	: pounds:	: pounds:	: pounds:
EXPORTING:	:	:	:	:	:	:	:	:
Argentina	113:	6,954:	6:	61,486:	3:	65,437:	6:	59,282
Australia	45:	77,859: ^{a/}	2,368:	53,798:	—:	111,086:	—:	128,497 ^{b/}
Canada	3,388:	3,973:	2,738:	13,174:	1,174:	22,344:	100:	26,647
Denmark	6,241:	195,530:	1,593:	246,157:	2,049:	272,033:	1,741:	270,674
Estonia	—:	—:	217:	5,175:	—:	7,025:	—:	14,208
Finland	2,370:	26,337:	103:	14,476:	14:	18,184:	4:	29,081
Irish Free State ...	—:	—:	—:	—:	8,789:	51,187:	9,476:	44,975
Italy	972:	7,870:	526:	2,905:	1,002:	6,436:	259:	8,010
Latvia ^{b/}	—:	—:	48:	6,399:	—:	8,085:	—:	15,611
Netherlands	4,987:	75,133:	1,687:	52,769:	3,613:	76,570:	5,756:	87,598
New Zealand	47:	38,761:	7:	140,016:	1:	142,179:	—:	139,476
Persia	2,201:	3,059:	463:	648:	451:	775:	—:	—
Russia	2,202:	150,294:	—:	10,978:	—:	149,462:	—:	55,115
Spain	939:	259:	378:	391:	344:	423:	295:	583
Sweden	330:	45,870:	3,499:	5,420:	1,234:	11,827:	410:	20,333
	:	:	:	:	:	:	:	:
IMPORTING:	:	:	:	:	:	:	:	:
Algeria	1,945:	9:	1,271:	35:	1,553:	36: ^{b/}	1,830:	—
Austria	—:	—:	3,600:	1:	3,864: ^{b/}	10:	2,856:	—
Austria-Hungary ...	6,281:	4,267:	—:	—:	—:	—:	—:	—
Belgium	14,024:	3,125:	21,337:	220:	10,318:	643:	9,202:	870
Brazil	4,551: ^{c/}	4:	8:	19:	598:	25:	—:	—
China	1,677: ^{d/}	—:	1,702:	—:	1,621:	—:	—:	—
Cuba	1,459:	—:	2,317:	—:	2,477:	—:	—:	—
Czechoslovakia	—:	—:	7,806:	24:	3,637: ^{b/}	58:	1,230:	—
Dutch East Indies...	4,152:	—:	7,322:	—:	7,092:	—:	—:	—
Egypt	2,350:	165:	1,672:	74:	2,354:	57:	2,384:	56
France	13,713:	40,769:	20,876:	17,314:	7,176:	7,997:	7,405:	9,191
Germany	111,441:	498:	2,903:	147:	117,896:	59:	212,993:	304
Greece	206:	8:	5,677: ^{b/}	6:	10,727:	—: ^{b/}	546:	—
Norway	976:	3,137:	5,826:	26:	1,276:	419:	1,455:	473
Peru	462:	20:	1,337:	12:	1,814:	10:	—:	—
Philippine Islands..	1,665:	—:	853:	—:	1,298:	—:	—:	—
Switzerland	11,106:	44:	14,684:	20:	19,993:	252:	19,092:	177
Trinidad & Tobago...	847:	—:	1,092: ^{b/}	18:	1,049: ^{b/}	21:	—:	—
Union of S. Africa...	3,913:	26:	1,166:	601:	1,579:	411:	705:	793
United Kingdom ^{f/} ...	455,489:	1,179:	554,803:	2,092:	570,761:	2,239:	615,413:	1,445
United States	1,647:	4,125:	23,741:	5,846:	19,405:	8,257:	7,212:	5,343
Other countries	12,373:	37:	13,418:	7,462:	13,479:	6,842:	10,593:	1,737
Total	574,014:	689,293:	707,044:	647,709:	618,642:	870,259:	912,073:	920,479

Division of Statistical and Historical Research, United States Dept. of Agriculture.
 Official sources, except where otherwise stated. Butter includes all butter made from milk, melted and renovated butter, but does not include margarine, cocoa butter or ghee.

^{a/} Year beginning July 1. ^{b/} International Institute of Agriculture. ^{c/} Two-year average
^{d/} Four-year average. ^{e/} Eight months. ^{f/} General imports minus re-exports.

CHINESE: International trade, average 1909-1913, annual 1923-1925.

Country	Year ended December 31							
	Average		1923		1924		1925	
	1909-1913						Preliminary	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds
EXPORTING:								
Argentina	10,447:a/	6:	2,359:	11,670:	2,546:	3,461:	3,402:	657
Australia	350:	799:b/	1,422:b/	3,786:	—:c/	6,678:	—:c/	9,552
Bulgaria	52:a/	5,972:	34:	1,175:	16:	258:	—:	—
Canada	1,054:	157,250:	1,900:	116,202:	909:	121,456:	10,274:	150,743
Czechoslovakia	—:	—:	1,999:	3,917:	1,671:	5,431:	1,777:	8,048
Denmark	1,414:	527:	721:	12,038:	673:	19,489:	853:	18,783
Finland	478:	2,086:	23:	2,944:c/	354:	5,613:	—:	8,421
Hungary	—:	—:e/	—:	1,160:	1:	1,344:	1,923:	1,759
Italy	13,306:	50,560:	10,228:	50,389:	4,156:	74,110:	3,868:	86,228
Netherlands	522:	127,379:	873:	156,646:	888:	170,352:	1,154:	175,711
New Zealand	5:	55,561:e/	—:	161,444:	19:	178,582:	—:	154,196
Russia	3,911:	7,011:	—:	—:	—:	—:	—:	—
Switzerland	7,150:	70,075:	2,543:	39,046:	4,163:	43,776:	3,766:	51,726
Yugoslavia	—:	—:c/	118:	3,309:c/	191:	7,439:	—:of	4,197
IMPORTING:								
Algeria	6,592:	138:	7,415:	189:	7,547:	174:	7,884:	—
Austria	—:	—:	9,847:	517:	10,142:	1,189:	7,970:	581
Austria-Hungary ..	12,298:	966:	—:	—:	—:	—:	—:	—
Belgium	31,771:	354:	39,553:	1,039:	37,643:	1,514:	38,274:	1,794
Brazil	4,178:a/	1:	254:	3:	646:	1:	—:	—
British India	1,314:	—:	1,006:	—:	1,046:c/	4:	1,157:	—
Cuba	4,520:	7:	5,055:	3:	5,697:	3:	—:	—
Dutch East Indies :	757:	—:	1,242:	—:	1,383:	—:	—:	—
Egypt	3,182:g/	48:	6,007:	122:	5,950:	117:	7,157:	155
France	49,056:	25,880:	45,690:	27,908:	32,792:	23,891:	40,559:	35,689
Germany	48,537:	1,967:	24,930:	556:	55,702:	1,239:	48,699:	2,491
Irish Free State ..	—:	—:	—:	—:	2,590:	542:	2,823:	483
Norway	663:	577:	1,962:	697:	1,106:	737:	1,302:	702
Spain	5,032:	55:	5,971:	126:	6,529:	87:	5,307:	133
Sweden	946:	41:	4,189:	114:	2,210:	256:	1,211:	730
Tunis	1,382:	19:c/	1,031:	40:	1,073:	48:c/	1,166:	—
Union of S.Africa :	4,911:	3:	832:	118:	552:	127:	256:	190
United Kingdom h/ :	257,407:	950:	313,280:	946:	318,041:	843:	331,886:	1,950
United States	46,346:	5,142:	64,420:	9,331:	59,176:	4,299:	52,403:	9,190
Other countries ...	12,596:	3,942:	16,176:	2,907:	14,192:	2,906:	4,097:	2,852
Total	535,417:558,124:571,090:593,224:620,366:680,981:689,177:727,071							

Division of Statistical and Historical Research, United States Dept. of Agriculture. Official sources except where otherwise noted. All cheese made from milk, including "cottage cheese." a/Four year average. b/Year beginning July 1. c/International Institute of Agriculture. d/Three-year average. e/Less than 100 pounds. f/ Eleven months. g/ One year only. h/ General imports minus re-exports.

CONDENSED MILK. International trade, average 1909-1913, annual 1923-1925

Country	Year ended December 31			
	Average 1909-1913	1923	1924	1925
Imports: Exports: Imports: Exports: Imports: Exports:	1,000 : 1,000 : 1,000 : 1,000 : 1,000 : 1,000			
pounds; pounds; pounds; pounds; pounds; pounds				
EXPORTS				
Argentina <u>g/</u>	4,488	727 1/2	720 1/2	728
Canada	259	4,575	177	41,056
Denmark	11 5/8	4,724	4	64,969
Italy	565	5,913	987	6,791
Netherlands	39	55	163	127,383
New Zealand <u>g/</u>	261	132	3	1,443
Norway	3	32,106	369	16,969
Switzerland	201	80,539	177	55,827
United States	4,630	10,381	154,264	6,519,206,280
IMPORTS				
Argentina	742	1,016	156	946
Belgium	8,634	668	164	1,399
Brazil	11,235	7,083	217	40,685
Canada	4,484	3,443	9	461
China	28,457	46,948	47	274
Egypt	1,623	1,546	125	1,740
France	8,453	4,140	25,124	7,483
Germany <u>g/</u>	66	12,080	8,872	582
Japan	10,661	12,632	61	12,648
Java and Madura	6/6,136	74	10,752	10,926
Netherlands Islands	12,311	16,635	17	890
Spain	5,605	51	8	43
Sweden	28	92	190	150
Union of S. Africa	21,227 1/2	10,697	1	10,026
United Kingdom	121,176	48,221	248,659	13,625,244,579
				11,023,247,523
				14,299
Total twenty-five countries	240,561	209,570	415,549	645,112
				424,627,656,309
				340,869
				620,859

Division of Statistical and Historical Research. United States Department of Agriculture. Official sources: a/ Includes some preserved milk. b/ Year beginning July. c/ Two-year average. d/ Four-year average. e/ Three-year average. f/ Not separately stated. g/ Twelve months' sea-trade, three months' land-trade. h/ Sea-trade only. i/ One year only. j/ Includes some powdered milk. k/ Five months. l/ Less than 500 pounds.

A helpful focusing of the entire foreign situation is to be gained by observations upon the combined import trade of Great Britain and Germany as the best current index of total international trade and foreign production. Just as receipts on the principal markets of the United States provide a fairly accurate index of domestic production, so the combined imports into Great Britain and Germany, the principal international butter and cheese markets, provide a fairly reliable indication of total international trade and, it may be assumed, of foreign commercial production. Similarly, the total world production would be reflected roughly in the imports of Great Britain and Germany plus the receipts on the principal markets of the United States. a/

With the exception of the war year, 1915, and the period intervening between the war and the resumption of import trade in butter and cheese into Germany, the percentages indicated in the table below are clearly not sufficiently high to account for the bulk of international trade. Other countries were in those years taking abnormal foreign supplies. In other years the ratio is fairly significant of total supplies from the principal surplus areas.

a/ It would appear that a greater degree of accuracy would result from the inclusion of United States import and export trade, so that receipts on our principal markets would be modified by adding imports and subtracting exports. At present only imports by rail from Canada are included in receipts. By comparison, however, with domestic production the volume of our foreign trade is not always of importance commensurate with its price-influencing significance. Hence, the foreign influence is best determined by the foreign situation itself as reflected in supplies on the foreign markets and the prices there recorded.

RECEIPTS OF BUTTER IN IMPORTANT WORLD MARKETS, 1900 - 1926

Calendar year	New York	Chicago	New York and Chicago	Total imports United Kingdom	Total imports Germany	United Kingdom and Germany	New York Chicago United Kingdom and Germany	Variation from 5 year ave.
	Millions of pounds	Millions of pounds	Millions of pounds	Millions of pounds	Millions of pounds	Millions of pounds	Millions of pounds	Millions of pounds
1900	120	87	207	378	37	415	522	
1901	124	83	207	415	40	455	552	
1902	119	92	211	445	37	482	593	- 7
1903	130	98	228	455	54	509	737	+ 4
1904	131	96	227	475	76	551	778	+12
1905	145	105	250	465	81	546	796	+10
1906	140	118	258	486	82	568	826	+31
1907	130	106	236	472	87	559	795	-17
1908	137	115	252	472	76	548	800	-31
1909	135	152	287	455	99	554	841	-12
1910	131	165	316	484	95	577	893	+26
1911	139	189	328	482	124	606	934	+52
1912	141	164	295	449	122	571	865	+ 4
1913	147	145	292	464	120	584	876	+35
1914	154	152	306	446	—	446	752	-20
1915	165	180	345	432	—	432	777	+72
1916	177	170	347	244	—	244	591	-36
1917	186	169	325	202	—	202	527	-53
1918	168	144	312	177	—	177	489	-13
1919	185	154	339	175	—	175	514	-13
1920	136	146	282	191	17	208	490	-127
1921	176	160	336	325	3	328	734	+21
1922	204	176	380	476	2	480	860	+25
1923	207	187	394	571	3	574	968	-28
1924	211	213	424	592	118	710	1,134	+29
1925	207	210	417	656	213	869	1,286	
1926	215	196	411	652	216	868	1,279	

a/ From 1919, receipts are reported as net weight.

These annual "world receipts" indicate the comparative importance of these domestic and foreign markets as to the quantities consumed. Of butter, the proportion is now rather uniformly as one part to two, respectively. Our cheese consumption bears much the same relation to the total "world receipts", although it is clear that in regard to cheese the fact that our competition is more directly with the cheddar and similar types imported chiefly into Great Britain makes more important the relationship with supplies in the British markets alone. Concentrated milk does not find such a "concentrated" world market, while fresh milk is still, in spite of far-reaching developments facilitating its transportation, subject to comparatively local and often monopolistic market conditions rather than to those of world supply and demand.

EXPORTS OF BUTTER FROM CERTAIN COUNTRIES AND IMPORTS INTO UNITED KINGDOM
AND GERMANY

Country	1880:	1890:	1900:	1910:	1915:	1920:	1921:	1922:	1923:	1924:	1925:
	mil-:	mil-:	mil-:	mil-:	mil-:	mil-:	mil-:	mil-:	mil-:	mil-:	mil-:
	lion:	lion:	lion:	lion:	lion:	lion:	lion:	lion:	lion:	lion:	lion:
	lbs :	lbs :	lbs :	lbs :	lbs :	lbs :	lbs :	lbs :	lbs :	lbs :	lbs :
Argentina	27:	—:	—:	6:	10:	47:	57:	54:	72:	65:	59
Australia	40:	3:	34:	88:	54:	39:	92:	127:	79:	65:	145
Baltic States	—:	—:	—:	—:	—:	—:	—:	2:	12:	16:	32
Belgium	—:	—:	6:	4:	—:	35:	1:	(1):	(1):	1:	(1)
Canada	18:	2:	25:	5:	3:	16:	10:	8:	22:	14:	25
Denmark	27:	98:	131:	195:	224:	165:	202:	211:	246:	278:	271
Finland	14:	18:	22:	24:	20:	3:	14:	18:	14:	18:	29
France	68:	90:	45:	48:	50:	4:	3:	7:	17:	9:	9
Germany	—:	—:	6:	(1):	(1):	1:	(1):	1:	(1):	(1):	(1)
Italy	5:	7:	14:	8:	7:	(1):	(1):	2:	3:	6:	8
Netherlands	40:	87:	90:	72:	93:	46:	48:	51:	55:	77:	88
New Zealand	1:	4:	19:	40:	47:	35:	100:	125:	140:	142:	139
Norway	4:	1:	3:	3:	4:	(1):	(1):	(1):	(1):	(1):	(1)
Russia	7:	12:	43:	124:	119:	—:	—:	—:	11:	76:	73
Sweden	18:	33:	42:	48:	42:	(1):	(1):	3:	5:	12:	20
Switzerland	(1):	(1):	(1):	(1):	(1):	(1):	(1):	(1):	(1):	(1):	(1)
United Kingdom	4:	3:	1:	1:	1:	(1):	1:	2:	2:	2:	1
United States	7:	4:	3:	1:	2:	10:	3:	11:	6:	9:	5
Total exports	280:	362:	444:	667:	676:	568:	528:	622:	652:	782:	904
Imports into United Kingdom & Germany :	1:	246:	415:	577:	(a):	202:	398:	480:	574:	710:	748
Percentage of total:	1:	1:	1:	1:	1:	1:	1:	1:	1:	1:	1
accounted for as exports :	1:	68:	93:	87:	—:	57:	76:	77:	84:	91:	83
	1:	1:	1:	1:	1:	1:	1:	1:	1:	1:	1

/ No import statistics available for Germany. United Kingdom imported 446 million pounds of butter and 305 million pounds of cheese.

EXPORTS OF CHEESE FROM CERTAIN COUNTRIES AND IMPORTS INTO UNITED KINGDOM
AND GERMANY

	1889:	1890:	1900:	1910:	1915:	1920:	1921:	1922:	1923:	1924:	1925:
	mil-:	mil-:	mil-:	mil-:	mil-:	mil-:	mil-:	mil-:	mil-:	mil-:	mil-:
	lion :	lion :	lion :	lion :	lion :	lion :	lion :	lion :	lion :	lion :	lion :
	lbs :	lbs :	lbs :	lbs :	lbs :	lbs :	lbs :	lbs :	lbs :	lbs :	lbs :
Argentina	(1):	---	(1):	(1):	14:	14:	14:	15:	13:	32:	1
Australia	---	---	(1):	1:	3:	8:	10:	13:	5:	4:	10
Belgium	---	---	---	---	---	7:	2:	1:	1:	1:	(1)
Canada	40:	94:	186:	181:	159:	129:	134:	180:	115:	117:	127
Denmark	---	---	---	---	9:	21:	28:	20:	12:	19:	18
France	9:	12:	18:	25:	16:	13:	14:	22:	23:	34:	25
Germany	---	---	4:	10:	---	(1):	1:	2:	1:	1:	2
Italy	5:	13:	28:	58:	66:	3:	17:	32:	50:	72:	85
Netherlands	62:	67:	101:	123:	190:	100:	115:	144:	127:	170:	176
New Zealand	(1):	5:	12:	50:	92:	136:	153:	130:	161:	179:	184
Norway	(1):	(1):	(1):	1:	1:	(1):	(1):	1:	(1):	1:	1
Russia	1:	2:	1:	1:	1:	---	---	---	---	---	---
Sweden	---	(1):	(1):	1:	(1):	(1):	(1):	(1):	(1):	(1):	1
Switzerland	---	---	60:	49:	75:	3:	11:	46:	39:	44:	52
United Kingdom	1:	1:	1:	1:	1:	1:	1:	1:	1:	1:	2
United States	128:	95:	48:	3:	55:	15:	12:	5:	8:	4:	9
Total exports	246:	289:	459:	523:	662:	448:	512:	532:	571:	650:	675
Imports into United Kingdom & Germany	256:	340:	321:	a/	358:	376:	360:	343:	420:	496	
Percentage of total accounted for exports	89:	89:	74:	61:	---	80:	73:	60:	60:	65:	73

a/ No import statistics available for Germany. United Kingdom imported 445 million pounds of butter and 300 million pounds of cheese.

As is apparent from the above international trade tables, any particular exporting country may be contributing much or little to world supplies. This is the most obvious though by no means the only form of competition. According to the volume of gross exports alone, the more important countries have ranked in recent years in the order named under each commodity in the table below. Some shifting of position and weight results from seasonal variations, notably in Australia. The numerals indicate the relative importance or weight of the surplus of each country on the basis of average exports in 1924 and 1925.

All dairy pro- ducts in milk equivalent a/	Weight: total : as 100 :	Butter	Weight: total : as 100 :	Cheese	Weight: Total : as 100 :	Concentrated	Weight total as 100
Denmark	27	Denmark	31	Netherlands	27	Netherlands	40
New Zealand	20	New Zealand	16	New Zealand	25	United	
Netherlands	18	Australia	14	Canada	21	States b/	30
Australia	11	Netherlands	10	Italy	12	Switzerland	10
Canada	09	Argentina	07	Switzerland	08	Denmark	10
Argentina	06	Russia	06	France	05	Canada	06
Russia	05	Irish F. State	06	Denmark	02	Italy	02
Irish F. State	05					Norway	02
Italy	04						
Switzerland	03						
Finland	02						
Total,		Total,		Total,		Total,	
11 countries	100	11 countries	100	7 countries	100	7 countries	100

a/ Estimated on the basis of 22 pounds of milk as the quantity required on the average to make one pound of butter, 10 pounds of milk to one pound of cheese and 25 pounds of milk to one pound of condensed or evaporated milk.

b/ Imports somewhat exceed exports.

Our foreign competition in the matter of quality of products is in certain respects of greater importance than the actual quantity entering into international trade. It is to be noted, however, that for any particular country they are not independent on each other. In this relationship it is extremely significant that these producers dependent upon world markets for any large proportion of their income from the sale of their produce are generally led

By this competition and by the purchasing power in the wealthy commercial centers to the exportation of a product that more and more excels in quality. An example of this tendency is evident in the case of Sweden within recent years. Butter exportation from that country to the markets of Great Britain and Germany had brought the average quality of the Swedish butter to a comparatively high level when war conditions interrupted this trade. For years the Swedish butter producers was not subjected to the pressure of competition with the comparatively excellent Danish, New Zealand, Dutch, Irish, French and other foreign butters. Two results, possibly wholly justified economically in both cases, were the production of a "cheaper" butter for his domestic market and much subsequent effort on the part of the Swedish Government and leaders in the dairy industry of that country to recover the lost ground in the matter of quality when exports were resumed. The implication is that since the dairy industry of the United States is not thus dependant upon the foreign markets some degree of competition of the better grades of foreign butter within our own markets may be rather wholesome than otherwise.

While considerable caution needs to be exercised as to the representativeness of the following quotations, they afford the most tangible evidence of the comparative quality of the best grades of butter and cheese from each of the more important exporting countries.

LONDON: Average wholesale prices per 112 lbs. of choicest quality
butter and cheese

Description according to origin	Years ending June 30 -							Average
	1921	1922	1923	1924	1925	1926	1921-26	
	s.-d	s.-d	s.-d	s.-d	s.-d	s.-d	Per cent of price of Danish butter	
Butter -								
Danish	230-5	214-3	201-10	198-11	214-5	197-10	100	
New Zealand ..	222-5	190-4	191-10	186-0	189-7	187-8	95	
Australian ...	288-8	175-9	184-11	177-8	180-8	182-2	90	
Argentine, un-								
salted		169-3	181-1	166-10	182-0	170-2	86	
Russian						168-8	75	
Cheese -								
Canadian	152-10	105-8	107-0	107-6	98-5	110-5		
New Zealand ..	154-0	100-4	111-0	101-4	96-0	102-9		

W. Weddell and Company, Ltd., Thirty-Second Annual Review of the Imported Dairy
Produce Trade for the year ended 30th June, 1926, London.

The quotations above represent merely the comparatively values of the
choicest grades of produce from each of the countries referred to and for this
purpose alone are to be taken as fairly representative. They do not purport
to show the rank of the various countries as to the proportion of their total
exportable surplus, or still less of their total output including that con-
sumed within the country. It makes a difference in this connection whether
the "surplus is of the best or of the lowest grade produced within any partic-
ular country. The frugal Dane consumes his comparatively poor butter (and in-
cidentally large quantities of margarine and skimmed milk) while guarding
jealously the deserved reputation for high quality in his exported butter.
In countries where such relatively high standards of living prevail as in
Canada, Australia and New Zealand, the situation is quite the reverse of that
known to apply to Denmark, for example. The extent to which the home consumption

in such countries drawn upon the finest quality of the domestic output is suggested by the following semi-official analysis of the distribution of butter in Australia and New Zealand.

AUSTRALIA AND NEW ZEALAND: PRODUCTION, TRADE AND CONSUMPTION OF BUTTER IN THE YEAR 1924-25, A PERIOD OF "PEAK PRODUCTION"

	Australia	New South Wales	New Zealand
Population	6,000,000	2,270,000	1,350,000
Butter, production, tons	140,000	52,400	86,000
Butter, imported, "		1,450	
Butter consumption per capita, lbs:	23.0	31.5	25.5
Volume of local trade, tons:	75,000	34,350	16,000
" " export " " :	65,000	19,500	70,000
Quantity and percentages of: Tons :Per cent : Tons :Per cent : Tons :Per cent			
each grade exported, 1924-25:			
Choiceest	37,500 : 57.66	8,500 : 42.90	63,500 : 90.51
First grade	14,500 : 22.52	5,500 : 28.38	
Under first grade	13,000 : 20.00	5,700 : 28.72	6,500 : 9.49

"The Primary Producers' News," July 9, 1926, quoting Mr. MacLennan, Dairy Expert of New South Wales.

The United States has notably failed to acquire any reputation as an exporter of finest butter. Critics have not been wanting to point with humiliation to the poor showing which our exported butter has made as to quality and to the short-sightedness of such a policy (or lack of policy) which resulted in the prejudicing of foreign consumers against our product.

The economic basis for this apparently uneconomic procedure is such, nevertheless, as should dispel any deep concern over the matter. At present, of course, there is no real surplus over which to concern ourselves. When there

was a considerable surplus production of butter in this country, it was during the period when our output was principally off-farm-made butter. When, for instance, in 1880, our exports of butter had reached their peak of 39,237,000 pounds, the production according to the census (1879) included 29,422,000 pounds of creamery butter and 777,250,000 pounds of farm-made butter. Then again during the late war our exportation of butter was revived, the demand was comparatively strongest at home for the high-priced article, while abroad the demand was better met by the comparatively low-priced product. And in recent years the simple fact has been that we could afford to buy our best butter for our own consumption and to buy from abroad each year, more of the best foreign butter in addition than was exported altogether.

While, therefore, it is customary to regard conditions affecting consumption in the great deficit areas as determining foreign demand, the general economic influences affecting consumption within the surplus areas are certainly of no less importance. This is especially evident when it is remembered that of the butter and cheese produced in the foreign countries of commercial importance fully 80 per cent of the butter and 75 per cent of the cheese is consumed within the countries where produced.

There is in most current discussion of foreign competition, if not over-emphasis upon the volume of international trade, at least unduly little emphasis upon the underlying developments that are less conspicuous but more significant. It is worthy to note in this connection that when the United States Tariff Commission was instructed in 1924 to make an investigation of the "trends of production in the United States and in the principal competing foreign country or countries," the determination of the principal competing country was tentatively based on volume of imports into this country but that this test of competition was challenged repeatedly during the hearings and in minority reports to the President.

To make an analysis of the developments, agricultural, industrial, and social, that are determining the trend of production and consumption of dairy products in the various competitive areas would require a separate or supplementary treatment for each, so complex are the local and international influences to be considered. Without attempting to present any detailed historical and statistical basis for the conclusions reached, the following classification is given as a rough outline of the types of competition suggested by this study. The general principles outlined as to the nature of competition and the method used in analyzing it might be further applied to the study of foreign competition and demand in particular areas with fruitful results in the way of effect countermeasures.

Classification of Countries according to Type of International Competition

Quantity of Surplus

Diminishing

Sweden
Switzerland

About Stationary

Netherlands
Denmark
France
Italy
Irish Free State
Australia

Normally Increasing

New Zealand
Baltic Region
Argentina
Russia

Potentially Important

Africa, notably
U. of So. Africa
and Kenya Colony
South America,
outside of
Argentina,
notably Brazil

Deficiency in Volume

Germany (competing
domestic industry)

Great Britain

United States

Quality of Surplus

Improvement not expected

Russia
Irish Free State
U. of So. Africa
Australia

Improvement Expected

Baltic Region
Argentina

Generally High

Denmark
Netherlands
Switzerland
New Zealand
Canada

Demand according to Quality

All grades with premium or highest

Great Britain

High grades principally

Germany

High grades only

United States

The trend of the consumption of imported supplies of butter and cheese in the United Kingdom and Germany as shown below is such that present importations per capita are practically at the point indicated by projecting the curves of prewar importations. An exception is that of the cheese imports into Germany which have been phenomenally increased in the last two years if reports are comparable.

**UNITED KINGDOM: Imports, total and per capita of butter and cheese,
1890 - 1925.**

Year	Population	Butter imports a/		Cheese imports a/	
		Total	Per capita	Total	Per capita
		Thousands : 1,000 pounds	Pounds	Thousands : 1,000 pounds	Pounds
1891.....	37,735	236,930	7.2	239,613	6.4
1901.....	41,459	412,770	10.0	292,653	7.1
1911.....	45,316	471,643	10.4	268,569	5.8
1921.....	47,500	324,683	8.7	315,536	6.5
1925.....	48,450 b/	616,356	12.6	367,441	7.8

These figures are from Agricultural Statistics of Great Britain. Population figures are from Warren S. Thompson's compilation up to 1911; subsequently from Statesman's Year Books and estimates based thereon.

a/ Average of three years centered on year indicated, except for 1921 and 1925 which are actual imports for the single years.

b/ Exclusive of imports from the Irish Free State, which in trade reports prior to April 1, 1925, were not regarded as imports.

**GERMANY: Excess of exports or imports, total and per capita,
of butter and cheese, 1860-1925.**

Year	Popula- tion	Butter				Cheese	
		Total	Per capita	Total	Per capita	Total	Per capita
		Excess of exports c/	Excess of imports c/	Excess of exports c/	Excess of imports c/	Excess of exports c/	Excess of imports c/
		Thousands : 1,000 pounds	Thousands : 1,000 pounds	Pounds	Pounds	Thousands : 1,000 pounds	Pounds
1860	37,611	2,741		.07			
1870	40,085	26,867		.66			
1880	41,076	12,434		.29		1,089	.02
1890	40,241		5,616		.07	15,784	.32
1900	44,046		29,039		.62	32,929	.69
1910	44,926		104,584		1.61	43,946	.63
1920	47,093	a/	17,227		.29	50,171	.84
1925	48,475	a/	212,689		3.40	146,208	2.34

a/ October 9, 1919. b/ Preliminary for June 18, 1925. c/ Average of three years centering on year for which population is given. d/ One year only.

Population figures as quoted in compilation by Warren S. Thompson in his Columbia study of population, 1915. Population for 1919 and 1925 and trade figures throughout from Statistisches Jahrbuch.

SIGNIFICANT TRENDS IN THE FOREIGN TRADE OF THE UNITED STATES IN DAIRY PRODUCTS

Production and consumption of dairy products within the United States are now so closely balanced that a peculiarly delicate adjustment tends to prevail between domestic and foreign market prices. Despite the seemingly high protective tariff now prevailing on dairy products entering this country, it is demonstrated each year that developments affecting world prices determine the limits within which domestic prices may at any time advance or decline. The prevailing import duties make for a degree of price stabilisation in our markets without being prohibitive of importations sufficient to make contacts between foreign and domestic markets and thus to bring about adjustments of prices between them. Furthermore, with dependence upon foreign markets for a part of the concentrated milk output of the United States, at the same time that fresh milk and cream, cheese, and generally butter are being imported, the markets for milk and its products in this country are never wholly free from the influence of foreign price movements. As will be shown in connection with the post-war imports of butter with special reference to competition from New Zealand, the seasonal movements of trade and of costs of production have a predominating influence.

It is a matter of statistical record that the difference in price in domestic markets between high scoring and low scoring butter is materially greater during the winter months and less during the summer. The six-year period, 1921-26 shows an average price margin between 88 score and 92 score butter in New York ranging from 2.5 cents in May to 8.0 cents in November. In some years the difference in price during April, May and June is no more than a cent or a pound while in the same year, during November, December and January the difference is 7 and 8 cents.

The definite seasonal movement of this price difference is shown in the following tables together with the recently developed seasonal movement of our butter imports during the same period.

**Price Margins in Favor of High Grade Butter in New York
and Imports of Butter into United States**

**Margin between monthly average price per pound of
88 and 92 score butter in New York.**

Month	1921	1922	1923	1924	1925	1926	Av. of six years	Percent of year- ly av.
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Percent
January.....	9	4	4	7	5	2	4.8	113
February.....	5	4	3	2	3	2	3.1	74
March.....	5	3	1	2	6	2	3.1	74
April.....	5	3	1	1	4	2	2.6	62
May.....	4	3	1	1	2	3	2.3	55
June.....	4	4	2	2	1	3	2.6	62
July.....	4	4	2	3	2	3	3.0	71
August.....	5	4	4	2	1	4	3.5	80
September.....	6	7	4	3	3	5	4.6	110
October.....	9	9	4	5	5	6	6.5	150
November.....	8	11	7	8	5	9	8.0	190
December.....	7	8	7	7	4	10	7.1	170

Monthly Average Imports of Butter into United States

Month	1921	1922	1923	1924	1925	1926	Av. of six years	Percent of year ly av.
	1,000 lbs.	1,000 lbs.	1,000 lbs.	1,000 lbs.	1,000 lbs.	1,000 lbs.	1,000 lbs.	Percent
January....	5,512	1,556	1,851	4,417	696	2,366	2,400	210
February...	1,897	453	1,824	5,393	417	862	1,600	140
March.....	4,266	174	3,057	3,268	1,938	277	2,200	193
April.....	1,370	73	399	2,595	769	270	900	79
May.....	85	90	1,177	549	331	103	400	35
June.....	34	80	2,933	744	579	100	700	61
July.....	132	144	1,663	1,078	404	159	600	53
August.....	150	75	1,053	257	439	148	400	35
September..	598	89	1,712	105	289	201	500	44
October....	1,858	252	1,202	128	430	256	700	61
November...	1,926	833	3,831	111	49	673	1,200	106
December...	2,602	3,156	3,039	760	565	2,613	2,100	184

The obviously close correlation is attributable to a combination of factors that has the one important effect of setting up the chief competition within our butter market with a limited portion of our output and during the season of highest prices when butter of the best quality is commanding the highest premium. While the imported supplies are competing directly with our higher grades, this does not mean, of course, that they are not competing indirectly with the entire supply, the price of which is influenced so largely by the price of top grades.

In relation to world supply and demand, the present position of the dairy industry of the United States is made somewhat more clear by reference to the broad outlines of the history of our foreign trade in dairy products.

As between net importation and net exportation of dairy produce, the United States has been subject to general shifts both at long and short intervals. Since the early 80's, the total trade has tended steadily, except for the late war period, away from the disposal of an important surplus production toward the supplying of a rather settled though slight deficiency.

Stimulated by the war, however, the excess of exports over imports of all dairy products from the United States amounted in the calendar year 1919 to the equivalent in milk of 1,359,000 short tons. Exportations in that year of concentrated milk, butter, and cheese represent a quantity of milk sufficient to produce about one-half of Denmark's recent annual exports of butter, and more than was ever exported from the United States in any year during the period of our greatest normal surplus production. The previous peak of exportation had been reached in 1879 when the total exports were the equivalent of approximately 1,100,000 tons of milk. Whereas the exports in 1879 represented about 11 per cent of the total milk manufactured in that year, the 1919 exports represented about 6 per cent only, indicating somewhat the expansion of the domestic dairy industry in the meantime.

Notwithstanding such increased domestic production and the development within a comparatively few years during and immediately after the war of such an enormous volume of exports, the United States was soon again importing more of dairy products than were exported. Importation to supplement domestic supplies has now apparently settled back to about the basis reached before the war. Imports in excess of exports during the five years 1909-13 averaged the equivalent of 442,000 short tons of milk. Corresponding importations during the last four years are as follow: 222,000 tons in 1922-23; 404,000 tons in 1923-24; 154,000 tons in 1924-25, and 318,000 tons in 1925-26. It is especially noteworthy that the importation has thus recovered despite increases in the tariff rates to 12 cents per pound on butter and 25 per cent ad valorem on cheese against 2½ cents per pound on butter and 20 per cent ad valorem on cheese in the 1913 schedule.

In relation to the world markets the position of the United States has thus shifted from the exportation of an important part of its dairy production to the importation of cheese and at times of butter while still retaining some ex-

portation, although in lessening quantities, of concentrated milk. Thus, despite an increasing protective tariff on dairy products the foreign trade of the United States in milk and its products has been maintained since 1922 as it had been for a short time just preceding the war, on a net import basis. See graphs.

DAIRY PRODUCTS: Balance of trade for the United States,
average calendar years, 1909-13 and 1918-26

Year	Exports	Imports	Net	Milk equivalent
BUTTER				
	Pounds	Pounds	Pounds	Pounds
1909-1913	4,125,000	1,647,000	2,478,000	52,059,000
1918...	24,194,415	1,655,467	24,538,948	515,317,908
1919...	34,884,485	9,519,368	25,037,117	525,779,457
1920...	17,487,735	37,454,172	19,966,437	419,295,177
1921...	8,014,757	18,558,588	10,543,831	221,416,671
1922...	10,937,519	6,957,159	3,980,360	85,587,560
1923...	5,845,514	23,741,247	17,895,733	375,810,393
1924...	8,255,622	19,404,816	11,148,194	234,112,074
1925...	5,342,750	7,212,013	1,869,263	39,250,323
1926...	5,482,992	8,029,191	2,546,075	53,467,575
CHEESE				
1909-1913	5,142,000	45,346,000	41,204,000	412,040,000
1918...	48,404,672	7,562,044	40,842,628	408,426,280
1919...	14,159,721	11,332,204	2,827,517	28,275,170
1920...	14,231,529	15,993,725	297,804	2,978,040
1921...	11,771,974	26,866,404	15,094,430	150,954,300
1922...	5,006,574	46,573,099	41,566,525	415,665,250
1923...	8,331,321	64,419,788	56,088,467	560,884,670
1924...	4,299,127	59,175,591	54,876,464	548,764,640
1925...	2,190,054	62,401,882	60,211,828	532,118,280
1926...	3,902,597	78,416,823	74,514,226	745,142,260
CONDENSED MILK				
1909-1913	15,760,000	1,406,000	14,354,000	35,885,000
1918...	551,139,754	10,904,998	540,234,756	1,350,586,890
1919...	852,865,414	16,509,239	836,356,175	2,090,890,437
1920...	411,077,962	23,755,780	387,322,202	968,305,505
1921...	288,724,820	8,667,626	281,057,194	702,642,985
1922...	187,436,841	5,293,631	182,203,210	455,508,025
1923...	194,264,371	10,398,001	183,866,370	459,665,925
1924...	206,279,758	6,431,713	199,848,045	499,570,112
1925...	147,762,615	4,621,388	143,141,227	357,853,068
1926...	114,549,063	1,663,462	112,885,601	282,214,003
BUTTER, CHEESE AND CONDENSED MILK COMBINED				
1909-1913				324,096,000
1918...				2,274,331,078
1919...				2,644,945,064
1920...				551,988,368
1921...				330,272,014
1922...				123,430,335
1923...				477,029,138
1924...				283,304,601
1925...				213,515,535
1926...				506,395,832
E/ Exports. I/ Imports.				

It appears the more notable that this country should resume a settled net importation of dairy products while at the same time specifically dairy feeds are being exported yearly. It so happened that in the calendar year 1926 the total value of imported products exactly balanced the total value of exported dairy feeds at \$29,000,000.00. The feeds so calculated did not include the marketable grains as such, but consisted principally of milling offal, oil-meal and oil cakes and other concentrated cattle feeds. (See tables)

Foreign trade of United States in Dairy Products
and in Fodders and Feeds, year ended June
30, 1926.

Item	Imports	Exports
	Value in dollars	Value in dollars
Hay.....	3,795,045	356,783
Oilcake and meal.....	1,940,750	27,359,460
Wheat and middlings.....	5,456,330	101,018
Prepared feeds.....	—	766,494
Beet pulp, dried.....	1,814,542	—
Other fodders and feeds.....	1,338,741	438,325
Total fodders and feeds.....	13,745,408	29,022,080
Butter.....	2,359,581	2,458,293
Cheese.....	17,393,645	1,156,223
Milk and cream.....	9,499,182	17,151,380
Total dairy products.....	29,252,408	20,765,896

Monthly Summary of Foreign Commerce of the United States, June, 1926.

UNITED STATES: Value of Imports and Exports of Dairy Products and Concentrated Feedstuffs, a/ 1907-1926.

Year ended	Dairy Products				Feedstuffs and Feedstuffs			
	Imports	Exports	Excess of Imports	Excess of Exports	Imports	Exports	Excess of Imports	Excess of Exports
Value \$0	Imports	Exports	Excess of Imports	Excess of Exports	Imports	Exports	Excess of Imports	Excess of Exports
1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
dollars	dollars	dollars	dollars	dollars	dollars	dollars	dollars	dollars
1907.....	5,922	6,635	711	302	40,858	40,858		40,356
1908.....	5,770	4,956	815	90	29,204	29,204		29,114
1909.....	6,008	3,900	2,108	61	31,183	31,183		31,092
1910.....	7,352	2,250	5,102	no data	25,847	25,847		23,847
1911.....	10,041	3,264	6,777	"	25,531	25,531		25,531
1912.....	10,039	4,263	5,776	6,473	36,597	36,597		30,124
1913.....	10,638	3,221	7,417	1,514	36,821	36,821		35,307
1914.....	15,403	2,966	12,437	1,654	35,873	35,873		34,239
1915.....	14,704	14,306	438	229	33,154	33,154		31,925
1916.....	9,829	24,258	14,429	679	33,109	33,109		32,450
1917.....	7,071	49,379	42,308	1,183	34,929	34,929		33,746
1918.....	8,500	85,911	77,411	5,193	6,816	6,816		1,623
1919.....	6,330	122,161	115,831	6,262	18,280	18,280		12,018
1920.....	21,043	120,509	106,666	7,341	33,338	33,338		25,997
1921.....	27,356	47,970	20,614	6,149	21,469	21,469		15,320
1922.....	17,522	56,375	38,853	2,510	25,129	25,129		22,619
1923.....	20,216	25,527	4,869	5,715	25,103	25,103		19,388
1924.....	39,702	26,174	11,528	11,752	18,571	18,571		6,819
1925.....	23,008	28,208	2,783	12,304	37,034	37,034		24,730
1926.....	23,252	21,450	7,802	13,743	29,022	29,022		15,279

/ Excluded from Foreign Commerce and Navigation of the United States.

/ Exclusive of the merchantable grains: wheat, rye, corn, oats and barley.

Our imports of cheese are largely of foreign "varieties which cannot as yet be imitated with entire satisfaction. It seems difficult to demonstrate that, while domestic prices are sufficiently high to divert butter periodically from the European butter markets despite our comparatively high protective tariff and to attract fresh milk and cream continuously from Canada, it would be unremunerative for our own dairy farmers to increase the milk yield of their herds by feeding rather than selling abroad this spurious "surplus" of concentrated feeds.

The apparent inconsistency in this perhaps arises from our method of dealing for convenience with political units rather than focusing attention on economic areas in which a price economy is determining local developments and in which utility is necessarily always somebody's utility affected and measured by that producer's particular combination of utilities already employed in his enterprise. It is a national matter, under this price economy, only that the tariff rates are applicable alike to all the competing producers within the nation. In the case of Canada, at least, there is such economic unity with the United States that our importation of fresh milk and cream to the value of six to eight millions of dollars yearly is a matter of natural and quite local competition for our northeastern milk and cream markets by the dairymen on either side of the border.

This tendency relative to our dairy industry is better interpreted in connection with the general tendency in our foreign trade as between grain production on the one hand and animal products on the other. In the rapid agricultural expansion of the last quarter of the nineteenth century and the relatively rapid industrial expansion during the first quarter of this century, net exports of animal products have been more stable than those of grain. In recent years, as just before the war, also, the surplus of grains has outrun the surplus of animal products, or, in other words, the domestic demand for animal feedstuffs has been relatively good. The very apparent tendency is now toward a progressive lessening of the exportable surplus of all feedstuffs from the United States, as evidenced by the following tabular and graphic summaries.

Index Numbers of Net Foreign Trade in Total Foodstuffs and in Animal Products and Grain Products Groups

Year ending June 30	All foodstuffs, net exports	Animal products, net exports	Grains and grain products, net exports
Av. 1910-1914.....	100	100	100
1900.....	355	167	185
1901.....	358	169	185
1902.....	187	110	109
1903.....	187	88	150
1904.....	178	112	109
1905.....	208	113	127
1906.....	175	111	102
1907.....	199	111	135
1908.....	154	108	99
1909.....	177	122	97
1910.....	208	186	136
1911.....	225	188	95
1912.....	320	138	219
1913.....	253	151	172
1914.....	264	165	164
1915.....	235	162	125
1916.....	279	173	157
1917.....	375	202	224
1918.....	526	210	307
1919.....	488	234	275
1920.....	482	229	277
1921.....	488	223	282
1922.....	376	201	204
1923.....	407	165	204
1924.....	282	200	129
1925.....	252	200	86
1926.....	342	235	158
1927.....	297	202	160
1928.....	284	184	153
1929.....	153	144	105
1930.....	95	100	85
1931.....	113	111	87
1932.....	95	123	77
1933.....	165	102	150
1934.....	54	68	102
1935.....	359	112	322
1936.....	378	179	252
1937.....	317	193	216
1938.....	270	234	166
1939.....	524	338	288
1940.....	297	209	225
1941.....	331	146	315
1942.....	365	171	338
1943.....	258	171	256
1944.....	153	177	135
1945.....	172	138	237
1946.....	a/	105	117

a/ In continuing the index at this point, the technical difficulty arises in that the net export of foodstuffs becomes a minus (-14). Index Number of Net Foreign Trade in Foodstuffs by G.B.L. Arner, U. S. Dept. of Agriculture.

Annual Indices of the Physical Volume of Production^{a/} in the
United States and Exports of Feedstuffs^{b/}

(1899-100)

Year	Agriculture	Mining	Manufacture	Transportation	Population	Index of net exports of all feedstuffs
1899.....	100	100	100	100	100	100
1900.....	101	106	101	114	102	99
1901.....	89	115	112	118	104	100
1902.....	114	123	122	127	106	77
1903.....	108	135	124	140	108	83
1904.....	116	156	122	141	110	58
1905.....	116	162	143	151	112	48
1906.....	125	170	152	174	114	70
1907.....	112	186	151	191	117	61
1908.....	119	154	126	176	119	58
1909.....	118	189	155	177	121	31
1910.....	122	208	159	207	123	19
1911.....	115	207	153	205	125	24
1912.....	137	221	177	213	127	19
1913.....	122	237	184	244	130	34
1914.....	137	225	169	233	132	7
1915.....	144	240	189	224	133	74
1916.....	126	269	225	279	135	77
1917.....	134	268	227	314	136	65
1918.....	125	289	225	330	138	55
1919.....	137	257	218	291	140	107
1920.....	150	293	231	334	142	61
1921.....	124	235	179	250	144	68
1922.....	158	254	240	276	145	75
1923.....	158	348	283	333	147	49
1924.....	139	322	262	320	150	27
1925.....						
1926.....						

a/ Samuel E. Day, Review of Economic Statistics, 1921, p. 20 and 1925, p. 215.

b/ United States Department of Agriculture, Division of Statistical and Historical Research.

c/ Revenue ten-miles of freight, computed from Annual Reports of Interstate Commerce Commission.

Viewing together the tendency toward the lessening export trade of the United States in all feedstuffs as well as in dairy products, it is strongly suggested that our parallel development with the earlier industrialized areas of northwestern Europe is being drawn ever more closely. The United States is manifesting marked signs of following in the footsteps of industrialized England and Germany. Canada, it may here be noted, is following only a step behind the United States, say, between a quarter and a third of a century. Australia in turn, although still further behind, is already showing the effects of industrialization in the increasing domestic consumption of its butter and other feedstuffs.

The effects of the progressive industrialization of the United States and Canada are reflected in the following summary of the export trade in cheese from these countries and New Zealand. There is indicated a quite similar rise and decline in the surplus first from the United States and then from Canada. New Zealand then grabs the torch and carries on in the great relay race.

Trend of Exports of Cheese from United States, Canada and New Zealand

Year a/	United States	Canada	New Zealand	Year a/	United States	Canada	New Zealand
Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds
1880.....	10			1890.....	82	106	5
1881.....	7			1891.....	82	118	4
1882.....	4			1892.....	81	134	5
1883.....	7			1893.....	74	155	5
1884.....	5			1894.....	60	146	6
1885.....	9			1895.....	37	165	9
1886.....	6			1896.....	51	164	8
1887.....	8			1897.....	53	197	9
1888.....	7			1898.....	38	190	8
1889.....	15			1899.....	48	186	8
1890.....				1900.....	40	196	12
1891.....	32			1901.....	27	201	12
1892.....	34			1902.....	19	229	8
1893.....	42			1903.....	25	234	8
1894.....	48			1904.....	10	216	9
1895.....	53			1905.....	17	216	10
1896.....	36			1906.....	17	178	15
1897.....	52			1907.....	8	190	27
1898.....	51	6		1908.....	7	165	31
1899.....	40	5		1909.....	3	181	45
1900.....	57	6		1910.....	10	182	51
1901.....				1911.....	6	163	49
1902.....	64	8		1912.....	3	155	65
1903.....	66	16		1913.....	2	144	69
1904.....	60	19		1914.....	55	138	97
1905.....	91	24		1915.....	44	169	92
1906.....	101	32		1916.....	66	181	106
1907.....	98	35		1917.....	44	170	99
1908.....	107	36		1918.....	19	152	99
1909.....	124	38		1919.....	19	126	176
1910.....	142	46		1920.....	11	134	137
1911.....	128	40		1921.....	7	134	153
1912.....				1922.....	8	128	130
1913.....	148	49		1923.....	4	131	161
1914.....	128	51		1924.....	9	142	179
1915.....	99	58		1925.....			
1916.....	113	70		1926.....			
1917.....	112	80					
1918.....	92	78	2				
1919.....	81	74	2				
1920.....	68	84	3				
1921.....	85	88	4				
1922.....	85	94	5				
1923.....							
1924.....							
1925.....							
1926.....							
1927.....							
1928.....							
1929.....							

a/ United States exports are for year beginning July 1; Canadian, year beginning July 1 from 1867 to 1906 including 1906, nine months only, 1907 and thereafter year beginning April 1; New Zealand exports for calendar years.

A recent report of the Department of the Interior of Canada^{1/} confirms an earlier statement of the Secretary of Agriculture of the United States as to the comparative stages of industrialization of Canada and the United States. The statement by the late Secretary Wallace was based largely upon the proportions of rural and urban population and the trend of exports of raw materials and manufactured goods, and drew the conclusion that at least twenty-five years would be required for Canada's development to reach a stage closely comparable to our own at the time. The comparison as drawn by the official Canadian statement emphasizing the numbers of persons per thousand acres of improved land in the two countries concludes that Canada "is ripe for a long upward trend in intensity of development somewhat similar to the trend in the United States since about 1890". The westward expansion of Canadian agriculture has been a belated parallel to that of the United States. "During the past fifty years or more, Canada's area of improved land has increased much more rapidly than the Dominion's population. Between 1871 and 1921 the growth of population was 138 per cent while the growth in the area of improved land amounted to 308 per cent".

Comparison of the Number of Persons in Canada and the United States
per 1,000 acres of improved land. a/

Country	: 1870-71	: 1880-81	: 1890-91	: 1900-01	: 1910-11	: 1920-21
United States.....	205	176	176	183	192	210
Canada.....	212	197	169	178	148	124

a/ Canada as a National Property, Department of the Interior, Ottawa, Canada, 1925, pages 72-75.

1/ Canada as a National Property, Department of the Interior, Ottawa, Canada, 1925, pages 72-75.

When the signs of growing industrialization in the United States are viewed in the light of the history of dairying in the older industrial regions, is it to be concluded that industry and dairying are to grow side by side with consequent diminution in surplus and increasing imports from year to year and decade to decade? It was only in the late 80's that Germany ceased to export more butter than was imported into that country which is now second only to the United Kingdom in the volume of butter imported.

With reference to the industrialization of the United States and the significance of the recent tendency toward our rapidly diminishing surpluses of feedstuffs it is indeed probable that the half has not been told. Since we are being carried along in the process we are at a disadvantage in perceiving the rate at which we are travelling. Dr. David Friday, after intensive comparative studies abroad is led repeatedly to characterize the movement toward improved technique and organization in industry especially within the United States as the "New Industrial Revolution". As plausible as this has seemed, it has always appeared even to Dr. Friday as something more or less intangible that could be sensed but which challenged study to bring it to light and recognition. The revolution appeared to him to consist in the unprecedented facilities for speeding up the process of production and consumption.

"Both in the quantity of power now used and in the energy stored up for future use in lengthening and strengthening the arm of labor, the United States is preeminent. Herein also lies the greatest stimulus to inventive genius. The result has been to make us not only great consumers but great producers as well." ^{2/}

1/ Smith, George Otto, Director, U. S. Geological Survey, in Proceedings of the Academy of Political Science, Columbia University, July, 1926.

Of unusual interest in this connection is a recent attempt at quantitative measurement of the flow of wealth or current income to persons gainfully employed in the United States. According to the National Bureau of Economic Research^{1/}, the total current income^{2/} of the American people rose from \$62,736,000,000 in 1921 to \$89,682,000,000 in 1926. "Although the national income has increased 40 per cent since 1921, this growth is not merely a fictitious quantity resulting from an increase in the price level, for the average price of direct consumption goods was actually slightly less in 1926 than in 1921". In terms of money of constant purchasing power the gainfully occupied person received one-fourth more than in 1917 and about 44 per cent more than in 1909.

Repeated increases during recent years in the import duty on butter have not proven for any considerable length of time to be prohibitive of imports that are of small volume in comparison with our total domestic supplies, but of importance as a factor in our markets not to be measured by their actual volume. As compared with the latest prewar years the increases in the specific import duty on butter have, in fact, been made rather nominal in effect by the rise in prices of butter, since on an ad valorem basis the duty has not been consistently increased. The following summary shows the rates of import duty and their equivalent on an ad valorem basis since recent prewar years when the trade began to swing more or less definitely to an import basis.

1/ News Bulletin of the National Bureau of Economic Research, Inc., Feb. 21, 1927, in which it is officially claimed that "The Bureau seeks not merely to determine facts, but to determine them under such auspices as shall make its findings carry conviction to Liberals and Conservatives alike. It deals only with topics of national importance which are susceptible of quantitative treatment". 2/ "Current income may be defined as the excess of cash receipts over business expenses, plus the money value of income received in the form of commodities. It is estimated by summing (1) wages, salaries and pensions, (2) profits withdrawn from business, (3) dividends, interest, and rent received by individuals, (4) the rental value of homes occupied by their owners, (5) interest upon the sums invested in household furnishings, clothing, and the like, and (6) the value of commodities which families produce for their own consumption."

Butter and substitutes for: Imports for consumption and import
duties, specific and ad valorem, 1909-1926

Year*	Imports 1,000 pounds	Rates of import duty	
		Specific Cents per pound	Equivalent ad valorem Per cent
1909.....	536	6	27.06
1910.....	1,386	6	27.64
1911.....	894	6	23.75
1912.....	1,006	6	25.51
1913.....	1,178	6	22.56
1914.....	224	1/2	21.92
1915.....	7,564	2 1/2	11.26
1916.....	3,696	2 1/2	9.72
1917.....	721	2 1/2	8.32
1918.....	524	2 1/2	6.79
1919.....	1,594	2 1/2	7.35
1920.....	6,962	2 1/2	5.00
1921.....	37,626	2 1/2	5.01
1922.....	11,420	3/4	5.82
1923.....	6,316	4/5	16.82
1924.....	3,026	5/8	18.35
1925.....	4,085	5/8	19.34
1926.....	20,810	8	22.07
1927.....	19,279	8	22.17
1928.....	6,861	8	21.50
1929.....	3,276	7/8	22.66
1930.....	3,451	8	33.59

*Year ending June 30 from 1909 to 1916 inclusive; subsequently calendar years.
1/ July 1 to October 3, 1913. 2/ October 4, 1913 to June 30, 1914. 3/ January 1
to May 27, 1921. 4/ May 28 to December 31, 1921 (Emergency tariff). 5/ January 1
to September 21, 1922. 6/ September 22 to December 31, 1922. 7/ January 1
to April 5, 1926. 8/ April 6 to December 31, 1926.

The Emergency Tariff effective May 28, 1921, which fixed a duty of
six cents per pound on imports of butter, served to check at the time the
importation of butter which had turned from an excess of exports over imports
amounting to nearly 30,000,000 pounds in the year ending June 30, 1919, to an
excess of imports over exports amounting to 26,000,000 pounds in the year end-
ing June 30, 1921. The excess of imports over exports in the first year after
the "Emergency" tariff went into effect amounted to only 2,000,000 pounds.

From 1922 through 1924, however, with a duty of eight cents per pound (effective under the Fordney-McCumber tariff on September 22, 1922), butter imports continually increased. In the year 1923-24 the foreign butter trade of the United States was in practically the same position as before the first post-war tariff went into effect. In the fiscal year 1924-25, notwithstanding heavy foreign production, the net result of our foreign trade in butter was a slight excess of exports over imports. In a very large measure this shift must be attributed to the revival of an unprecedented demand from Germany during 1924 and 1925 following upon financial stabilization in the last quarter of 1923.

The year 1926 began with a margin in favor of New York more than equivalent to the duty plus costs of shipment and some importation had already been resumed when the import duty was again increased by executive order to be effective on April 5, 1926. The increase provided was for the full legal limit of 50 per cent of the then prevailing tariff which made the new duty twelve cents a pound. This new duty was regarded at the time by many, including the Danish Agricultural Adviser, Mr. S. Sorensen, as prohibitive of further importations of butter into this country. It soon developed, nevertheless that our markets were absorbing more foreign butter than in the preceding months. The course of butter importation during the post-war tariff changes can be seen from the following tabular statement.

United States: Imports and exports of butter

Year ending June 30	Imports	Exports	Excess of imports	Excess of exports
	Pounds	Pounds	Pounds	Pounds
1919.....	4,131,469	33,739,960	—	29,608,491
1920.....	20,770,959	27,155,854	—	6,384,875
1921.....	34,343,653	7,829,255	26,514,398	
1922.....	9,551,292	7,511,997	2,039,295	
1923.....	15,772,285	3,753,038	12,019,247	
1924.....	29,468,824	5,425,299	24,040,525	
1925.....	7,189,176	9,385,782	—	1,194,606
1926.....	6,448,000	5,280,000	1,168,000	
1927 (9 mos.)	5,912,055	3,414,149	2,497,906	

Although the tariff has not prohibited imports throughout the period in which it has been effective, it has undoubtedly been a factor in maintaining prices higher than they otherwise would have been, especially in seasons of heaviest foreign production.

The accompanying chart shows that since 1921, New York prices for butter have been generally above London prices. The outstanding exception has been indicated above. It may be noted that as the margin of New York above London increased, imports increased and, as the margin declined, imports were reduced.

IMPROVED RESOURCES

It is a safe assertion that in no other branch of agriculture is there a more general prospect than in the dairy industry of the world of cheapening the product and adding to its value through improvement in quality through technique alone. Technique has been highly developed in the manufacturing of milk products. At the same time the methods generally in use in the production of the raw material, milk, are almost inconceivably crude. It is as if the grain farmer were utilizing the threshing machine while still sowing and reaping his grain by hand.

From the point of view of international competition in an industry comprising such a wide range of efficiency in production, the improved resources count in the same way as favorable natural resources. Natural resources apart from the inherent capacity and social heritage of the human stock are not all that influence the economic welfare of a country in a way to determine its comparative producing or consuming power at any time. In more or less intangible, indiscernible ways these resources, physical and human, get variously organized for creating a flow of satisfaction-yielding wealth. Social organization and technique indicate human resources.

New Zealand has peculiarly favorable natural resources combined with increasingly important "improved resources" in the way of stock, plants, machinery, extension education of dairymen, cow-testing associations, and methods and organization generally for increasing the efficiency of labor in exploiting these resources. In New Zealand as in no other dairy country more than one-half of the cows are milked by machinery. Denmark has no unusually favorable natural resources but highly improved resources of social organization, instruments and technique. Ireland may well be characterized as the opposite of Denmark in that her natural resources are

rich - strikingly similar to New Zealand in their nature - and yet in the present stage of the history of that country, the Irish people are poor in improved resources. Russia is apparently still in a position well below Ireland in dairy resources, both natural and improved. The lack of the latter is the more evident since that country's impoverishment to the point of inadequate capital for current productivity equalling what it had once attained. Russia is accordingly studied to discover any indications as to when it can "come back".

It is highly important in the matter of competition from Denmark, that the costs of production cover not only butter, but beef and bacon as well, whereas in New Zealand the production is more highly specialized. In no other country is labor so exclusively devoted to the production of butter and cheese as in the dairy sections of New Zealand. There is at present practically no income realized even from the veal, by far the greater number of the calves being almost unsalable and the New Zealand bacon industry as yet in an embryonic state. It is significant that the New Zealand farmers are agitating for a subsidy on an export bacon industry in that country along lines represented by the Paterson Scheme for subsidizing the Australian butter industry.

As to the comparative efficiency of Danish agricultural production there is a quite unlimited literature, and students in great numbers are continuously attracted to that little country to probe the secrets of the Danish farming communities. Of those students an increasing number is led now to make the discrimination between high productivity per acre of land and high productivity per man or labor unit, - a distinction that is fundamental to any study of economic competition. But it has not been duly emphasized that the high productivity in Danish agriculture and in

Danish dairying in particular is predominantly a matter of "improved resources". This cannot be over-emphasized. It is reflected by students of their cooperative organization that it is all a matter of growth from within the groups, and not something that can be handed down to them from a benevolent government.

The fact that Danish dairy production has been so thoroughly industrialized and commercialized means that competition from that source must be studied as a problem far different from that presented by a highly localized and comparatively self-sufficient agricultural area such as Russia, the Argentine, or even New Zealand. The significant fact is that with the Danish dairymen drawing so heavily for their concentrated feed supplies upon other areas, especially Russia, Argentina and the United States, their own peculiar geographic setting and their own natural resources are not the determining or limited factors in their development and their cost of production. This means that the cost of production of butter in Denmark translates into Russia and Argentina and the United States.

For Danish agriculture as a whole, the position is that about four times as much grain and feedstuffs are imported as the amount of grain produced by the country itself for home use (human and industrial) and for export.^{2/} It is thus quite exclusively in the matter of social organization and technique that Denmark merits the reputation it has acquired as the premier dairy country. And it is the development of technique and organization in rival dairying regions that are attracting the most serious attention of Danish dairy leaders in their efforts to retain their prestige.

^{2/} "Danish Minister for Foreign Affairs and the Danish Statistical Department in Denmark," 1928.

Competition with the United States in the world markets would accordingly appear to be greatest from the most highly productive and efficiently exploited dairy regions and not from those with low productivity and efficiency and consequent low wages and income. From those countries whose efficiency is so low that their competition in the price economy is scarcely if at all felt, as India, Spain and Brazil, on up to Canada, the Netherlands, Denmark and New Zealand, competition appears, as in international markets it must appear, in its purest form of rivalry. As rivalry it is under present conditions chiefly a healthy stimulus to the greater productivity of dairymen and to greater returns for their labor. It must continue to be increasingly so unless protection is to mean the protection of inefficiency. In a country so vast and diversified in its agriculture as the United States such would appear to be difficult since domestic competition and rivalry exist in forms so nearly identical with the competition and rivalry from outside and without any possibility of tariff protection from within.

CONCLUSION.

The dairy industry of the United States has been on an export basis during by far the greater part of its history. This foreign outlet appears to have had the effect of speeding up the expansion of our dairy industry without having swung it at any time far out of its due course of permanent development on a domestic basis. The war-time growth of an over-large condensed milk industry made necessary the most notable readjustment within the industry to the decline of our export trade.

Our long export history has bred a habit of thought that persists in the search for foreign markets for a surplus of dairy produce after any true surplus has disappeared. At present, the United States is, on the whole not quite self-sufficient in dairy products. On the basis of observable trends in the United States and in the older industrial areas, a settled and growing deficiency in our domestic supplies might be expected. Tariff protection has been strengthened by increases in the rate of import duty. Owing to rising price level these increased duties have been rendered more nominal than real. With tariff protection as a national policy, further increased import duties may bring about adjustments from time to time without its being possible ever to free the domestic industry from foreign influences. In fact in the degree that any tariff involves a comparatively high domestic price level it is clear that our exports of condensed milk must be affected along with imports of milk and cream, butter and cheese.

The United States is not to be expected to develop foreign markets for its dairy produce. Quite the contrary appears to be its role in the world's trade since the stage reached just before the war and resumed as soon as the war was over. Its declining dairy exports are in keeping with its declining food surplus generally. The comparatively high prices of butter and cheese in this country in recent years have notably failed to stimulate any over-production. According to the test of elasticity of

supply and its reaction on price within the protected market, the dairy industry of the United States appears now to be in a peculiarly strong position. How to meet competition from outside areas that have rapidly developing possibilities of cheapening their product is believed to be the American dairyman's concern for the future.

While competition from without and competition from within the political boundaries of the United States are essentially the same in nature, the scope of the geographic and economic influences affecting the production and consumption of dairy produce is found to involve important modifications in the competitive field. It was emphasized in the course of this study that any one farm enterprise as dairying cannot be studied in isolation. Its significant developments are found to be interrelated at every point with the competing crops and products. The domestic output is determined as much by the potential areas of competing crops as it is by competition directly within the dairy industry.

The principle that of competing crops or products, that having the most limited potential area will bring a price such as to give it the choice of territory is demonstrated in the virtual exclusion of dairying from many regions in themselves comparatively favorable to dairying. It is in this sense that competition on a world wide scale is a different matter than the local competition and creates a wholly different competitive field than would otherwise be involved.

Competition in dairying is thus not a matter merely of comparative quantities domestic and foreign. The alternatives open to dairymen or potential dairymen anywhere are quite as important in determining the nature of their competition. The same influences that result in highly specialized dairying, as in New Zealand or Denmark operate to make the dairymen in that region persist as dairy producers. They do not readily become "in-and-outers" as may the Argentine cattle men or the corn-belt farmers with their red cows. There

is the possibility on the other hand that producers in the specialized dairy sections may turn readily from one branch of dairy manufacture to another as from butter to cheese whereas extensive dairying leaves the producers more limited to butter making. Just as in any field the alert enterpriser will find it advantageous to perfect some specialty with which competition is comparatively limited, so it may be that American dairymen may come to avoid some of the competition from extensive butter making areas by further perfecting the arts of cheese-making and take over the enormous demand for "foreign" cheese types.

Yield per cow, while less satisfactory than would be an accurate measure of output per worker, is significant as to the degree of development of technique in dairying. Within limits, - and the yield at which the bulk of the world milk supply is produced falls well between the extremes of low and high productivity per cow - improvement in yield represents cheapening of cost of production, since maintenance is comparatively a fixed cost and increased output tends to be at proportionately low cost per unit.

It was seen that in foreign dairy production along with some highly specialized areas a larger share of the total output was from low-yielding cows under extensive farming methods than in the United States as a unit. It is not implied in the conclusion of such a comparative study of dairying that either a high or a low yield could in itself be claimed to be uneconomic. On the contrary it may be definitely stated that such variations as tend uniformly to appear cannot be the result of chance or be long maintained if fundamentally uneconomic. The fact is that on the whole the tendency is to keep well between the extremes of yield for the bulk of the world's dairy production, domestic and foreign. In the evolution of a highly specialized intensive dairy industry, one level of productivity per cow or per acre or per dairyman is economic under one set of conditions and another level in a different setting. Existing competition is believed to be more

stimulating from countries with high productivity while potential competition may be greatest from low-pressure areas whose costs of production may be proportionately lessened.

Since the influences found to have brought about the enormous expansion of the commercial dairy industry of the world may be summarily stated as (1) cheapened dairy production and (2) increased wealth of consumers, and since these factors ultimately merge into the one basic economic force, productivity of labor, effects within the wider field of demand are not the same as within the local or domestic field alone. Just as production was subject over the total field to conditions variously affecting supply, notably the complementary seasons of the northern and southern hemispheres, so changes not parallel to each other in conditions affecting purchasing power have proven also to be among the significant international influences.

In fact, it is the change or movement that is important whether the coming of a season of flush or low output or of business prosperity or depression. Long-time changes of world scope are less perceptible but no less important such as the progressive lessening of the cost of production over the bulk of the world supply or the rise of a great deficit area and the widening of the market and the increase in the consumption per capita. These developments cannot be parallel in the foreign field or competition to those in the domestic field. While the seasonal movements of low and high cost of production have everywhere within the United States a similar climatic basis, it has been shown how the competition of the southern hemisphere is predominantly during our season of high cost of production.

It is the disturbing influence growing out of the deep-seated economic developments on the one hand, and fortuitous circumstances on the other that our protective policy is aimed to relieve. The former is taken to be competition in the form of rivalry and cannot be permanently escaped from unless at the cost of protecting inefficiency. It is difficult even to see how this

could be very secure protection since every foreign section has so nearly its counterpart within the bounds of the United States. It should be significant for the dairy interests of the United States that such protection is found necessary. It is increasingly evident that they now have the best market in the world for dairy produce. The only possible exception for the future is Germany, where, too, the home market is prized by the dairymen within the country.

It has appeared increasingly clear to the writer in the course of this study that all indications point to a future in which with such a prospect for a comparatively remunerative market, and with improvement in technique pressed upon our dairymen by rivalry from domestic and foreign sources together improvement in resources and technique in the dairy industry of the United States will prove to be economically justified from both the individual and social point of view.