

**INEDIBLE ANIMAL FATS  
IN THE UNITED STATES**

**I. B. ZAPOLEON**

**FATS AND OILS STUDIES**

**No. 3      DECEMBER, 1929**

22655

**Dhananjayrao Gadgil Library**



**GIPE-PUNE-022655**

**INEDIBLE ANIMAL FATS IN THE  
UNITED STATES**

**FATS AND OILS STUDIES**  
**OF THE**  
**FOOD RESEARCH INSTITUTE**

**No. 1. *The Fats and Oils: A General View***  
[February 1928]

**No. 2. *Copra and Coconut Oil***  
[April 1928]

**No. 3. *Inedible Animal Fats in the United States: Considered with Special Reference to Sources of Animal Waste, the Rendering Industry, Municipal Reduction, and Some Effects of Meat Inspection***

[December 1929]

**EUROPEAN SALES AGENTS**

**GREAT BRITAIN: P. S. King & Son, Ltd., Orchard House, 14, Great Smith Street, Westminster, S.W. 1, London**

**CONTINENTAL EUROPE: Martinus Nijhoff, 9 Lange Voorhout, The Hague, Holland**

**FATS AND OILS STUDIES**

**No. 3**     ,     ,     ,     ,     **December 1929**

# **INEDIBLE ANIMAL FATS IN THE UNITED STATES**

**Considered with Special Reference to Sources of  
Animal Waste, the Rendering Industry, Municipal  
Reduction, and Some Effects of Meat Inspection**

**By**

**L. B. ZAPOLEON**

*Economist, Food Research Institute*



**FOOD RESEARCH INSTITUTE**

**STANFORD UNIVERSITY, CALIFORNIA**

# THE FOOD RESEARCH INSTITUTE

was established at Stanford University, California, in 1921, jointly by the Carnegie Corporation of New York and the Trustees of the Leland Stanford Junior University, for research in the production, distribution, and consumption of food.

## DIRECTORS

CARL LUCAS ALSBERG      JOSEPH STANCLIFFE DAVIS  
ALONZO ENGLEBERT TAYLOR

X9(F94)

F9

22655

Copyright, 1929, by the Board of Trustees  
of The Leland Stanford Junior University

PRINTED IN THE UNITED STATES OF AMERICA  
By STANFORD UNIVERSITY PRESS

## PREFACE

Local industry—local in the sense of freedom from the pressure of broad national or international developments—can no longer be said to exist. Controllable internal factors, such as plant efficiency, remain of prime importance; but industrial management finds it increasingly necessary to take into account a complex group of external or environmental conditions—changes in related or competing industries, in materials and trends of demand, tariffs or public regulation, and so forth—that are largely beyond control. In respect to these latter factors the problems of management are those of foresight and rapid adjustment. Furthermore, the relation between government and business is becoming ever closer. Business is affected by innumerable acts of government; and it constantly seeks or opposes some form of governmental action.

Successful adjustment to these external factors requires, on the part of business management, the grasp of a mass of information respecting inter-industry relationships, fundamental trends, social interests, and public regulation that is not readily available to the average management immersed in the immediate problems of production and marketing. At the same time, informed legislation and efficient public administration must usually rest upon an understanding of economic and technological facts that are not readily available to public officials. It is the purpose of this volume to make some contribution toward the co-ordination and interpretation of such a body of facts, bearing upon problems of business and public policy, in relation to a group of animal by-product industries which present such problems to a significantly high degree.



The complexity of these industries, the large measure of local variation, and the scarcity of published information, all unite to make the task a difficult one. Especially in regard to the salvaging industries—the rendering plants, municipal reduction works, and the hog farms feeding municipal wastes—the recorded information is extremely scanty; mainly it is, in the form of fugitive notes in trade periodicals, and incidental notes on the technique of production appearing in books upon the slaughtering, meat-packing, and fats and oils industries. In the course of years, furthermore, federal and local regulations have become so integral a part of the present status of the meat and by-product industries that the influence of these regulations is not easy to discern, nor the relation of such regulation to the radically different conditions existing today. Of necessity, therefore, the method of approach has been in considerable part one of direct observation, extensively supplemented by interviews and correspondence with informed persons. The study is subject to the errors of such an approach.

Without the good offices of the trades here considered, and of allied interests, the present investigation would scarcely have been feasible. For a critical reading of the manuscript before its final revision, and for much information not readily available in published form upon packing-house practice and by-products, we are indebted to the Institute of Meat Packers. For similar co-operation, and for many other courtesies, we are indebted to Dr. R. A. Clemen, Assistant Director of Armour's Livestock Bureau, to Mr. Paul I. Aldrich, Editor of *The National Provisioner*, and to Mr. W. B. Allbright of the Allbright-Nell Company. Acknowledgment is made of generous assistance rendered by Dr. R. P. Steddom, Chief of the Meat Inspection Division of the Bureau of Animal Industry in the United States Department of Agriculture, and by Dr. John R. Mohler, Chief of the same Bureau, who

supplied and explained many details regarding federal meat inspection. Mr. LeVerne Beales, Chief Statistician for Manufactures, Bureau of the Census, supplemented many details of the published census data. Partly through visits to factories or offices, and mainly through correspondence, much information was obtained from interstate and local slaughterers, and from renderers, municipal reduction plants, manufacturers of rendering equipment, soap makers and other processors of fats and oils, city health officials, federal, state, and city meat inspectors, and others. To all of these, too numerous to mention individually, thanks are due for a considerable measure of local or general information.

It should be emphasized that the information obtained from all these sources pertained to matters of industrial fact or details of regulation. To none of those consulted does any responsibility attach, directly or indirectly, for the organization of such facts, for the channels which this investigation has taken, or for the interpretations, conclusions, and remedial suggestions. Since this study deals in part with questions of trade policy, regulation, and the like, which may well be of a controversial nature, it is fair to emphasize this point.

Within the Food Research Institute the author received substantial aid from his associates. Particular acknowledgment is made of the criticism and aid of Dr. C. L. Alsberg. For a critical reading of two drafts of the manuscript the author is indebted to Dr. J. S. Davis. He has also profited from the valuable suggestions and criticisms of Dr. A. E. Taylor.

## CONTENTS

	PAGE
INTRODUCTION .....	1
<b>CHAPTER</b>	
I. MEAT INSPECTION IN THE UNITED STATES.....	6
Federal inspection—State and city inspection— Comparative advantages of federal and state or city inspection—Effect upon production of fats	
II. SOURCES AND VOLUME OF ANIMAL BY-PRODUCT AND WASTE .....	29
Upon farm or range—In marketing livestock—At slaughtering and meat-packing establishments—Sta- tistical note—In marketing and consumption	
III. PRODUCTS, THEIR USES, AND METHODS OF MARKETING	46
Animal by-products—General characteristics of the inedible fats—Greases: description and uses—Tal- lows: description and uses—Tankage and cracklings	
IV. SOURCES OF TALLOW AND GREASE, AND METHODS OF RENDERING .....	62
Slaughterhouse materials—Wastes of meat markets and butcher shops—Household and restaurant wastes —Fallen animals—Miscellaneous animal matter— Yield of rendered fat—Methods of production in gen- eral—Open-kettle rendering—Wet or steam render- ing—Dry rendering—Solvent extraction	
V. VOLUME AND TRENDS OF PRODUCTION IN THE TALLOW AND GREASE INDUSTRY.....	89
Value of annual output—Volume of production— Trends in production of grease, tallow, tankage, and cracklings	
VI. COMPARATIVE OUTPUT OF SLAUGHTERERS AND REN- DERERS .....	103
Summary of available data—Qualifications—Prob- able explanations—Relation of slaughter to fat pro- duction	

CHAPTER	PAGE
VII. PRODUCTION OF INEDIBLE FAT BY MEAT PACKERS . . . .	121
Organization and practices of the industry—Inter- state plants—Local wholesale plants—Retail butchers —Farm slaughter—Custom slaughter	
VIII. TREND OF SLAUGHTER AND MEAT PRODUCTION UNDER FEDERAL AND LOCAL REGULATION . . . . .	154
Bases of official estimates—Slaughter—Meat produc- tion—Conclusions	
IX. THE RENDERING INDUSTRY . . . . .	175
History and development of the industry—Raw ma- terials and products—Trend of production—Organi- zation, labor, plant, and capital—Results of a special census of the industry—Present geographic distribu- tion of renderers—Some economic characteristics of the industry	
X. MUNICIPAL REDUCTION . . . . .	209
The problem of municipal wastes—Duplication in services and unnecessary costs—Garbage—Charac- teristics of municipal reduction—Processes—Some economic problems of reduction—Costs and returns —Trend of reduction, total product, and materials	
XI. FEEDING GARBAGE TO HOGS . . . . .	239
XII. ANIMAL BY-PRODUCTS: MARKETS AND CONSUMPTION	245
The background—Imports, foreign competition, and tariffs—Demand for tankage and cracklings—Indus- trial demand for fats—Fat requirements of soap and other technical industries—Exports and domestic consumption—Prices—Outlook for the future	
XIII. SOME QUESTIONS OF PUBLIC AND BUSINESS POLICY . .	265
Effect of economic changes upon problems of meat inspection—Sanitary aspects of present system of in- spection—Economic consequences of present system —Remedies—Comment on some phases of federal meat inspection—Statistics of slaughter, meat produc- tion, and consumption—Disposal of garbage by re- duction and feeding—Rendering plants	

**CONTENTS**

**xi**

<b>CHAPTER</b>	<b>PAGE</b>
<b>XIV. SUMMARY</b> .....	<b>282</b>
Raw materials—Products—Utilization of inedible fats—Domestic demand—Producing industries—Trends of production—Purpose of regulation of the meat industries—Federal and local regulation—Effect of regulation upon production of fats—Economic losses and wastes—Growth of salvaging industries—The rendering industry—Municipal reduction—Feeding offal and garbage to hogs—Problems of public and business policy	
<b>APPENDIX</b> .....	<b>301</b>
<b>A. Commercial Grades of Inedible Tallow, Grease, and Derivatives, and Methods of Sale.</b> .....	<b>301</b>
<b>B. State Regulations with Respect to Sale of Commercial Feedstuffs</b> .....	<b>304</b>
<b>C. Definitions of Animal Feedstuffs of Animal Origin, Adopted by the Association of Feed Control Officials of the United States.</b> .....	<b>305</b>
<b>D. Methods of Quoting Prices upon Tankage and Cracklings</b> .....	<b>306</b>
<b>E. Distribution and Occurrence of Fats in the Animal Carcass</b> .....	<b>307</b>

## MAP, CHARTS, AND TABLES

### MAP

	PAGE
DISTRIBUTION OF RENDERING ESTABLISHMENTS IN THE UNITED STATES, OCTOBER 1927.....	202-3

### CHARTS

#### CHART

1. TRENDS OF PRODUCTION: ANIMAL GREASES AND INEDIBLE TALLOW, 1912-28.....	94
2. COMPARATIVE TRENDS OF PRODUCTION IN MEAT-PACKING AND ALL OTHER PLANTS: ANIMAL GREASES AND INEDIBLE TALLOW, CENSUS YEARS 1914-27.....	103

### TEXT TABLES

#### TABLE

1. YEARLY LOSSES OF MEAT ANIMALS ON FARM AND RANGE, 1924-27 .....	30
2. ESTIMATED POTENTIAL YIELD OF MEATS AND PACKING-HOUSE BY-PRODUCTS, 1928.....	40
3. VALUE OF ANNUAL OUTPUT OF ANIMAL GREASES, TALLOW, AND THEIR JOINT PRODUCTS, CENSUS YEARS 1914-27 .....	90
4. PRODUCTION OF GREASES AND INEDIBLE TALLOW, 1912, 1914, 1916-28 .....	93
5. PRODUCTION OF PACKERS' AND RENDERERS' GREASES, 1912, 1914, 1916-28.....	101
6. ANIMAL GREASES AND INEDIBLE TALLOW: OUTPUT OF SLAUGHTERING AND MEAT-PACKING ESTABLISHMENTS COMPARED WITH THAT OF RENDERING PLANTS AND REDUCTION WORKS, CENSUS YEARS 1914-27... ..	104
7. TALLOW AND GREASE PRODUCTION BY THE SLAUGHTERING AND MEAT-PACKING, AND RENDERING AND REDUCTION INDUSTRIES, RESPECTIVELY, 1912, 1914, 1916-28 .....	107

*MAP, CHARTS, AND TABLES*

xiii

<b>TABLE</b>	<b>PAGE</b>
<b>8. PERCENTAGES OF TALLOW AND GREASE PRODUCTION BY SLAUGHTERING AND MEAT-PACKING, AND RENDERING AND REDUCTION INDUSTRIES, RESPECTIVELY, CENSUS YEARS 1914-27 .....</b>	<b>108</b>
<b>9. COMPARISON OF SLAUGHTER AND FAT PRODUCTION IN WHOLESALE (INTERSTATE AND LOCAL) SLAUGHTERING AND MEAT-PACKING ESTABLISHMENTS, CENSUS YEARS 1914-27 .....</b>	<b>118</b>
<b>10. ESTIMATED YIELD AND PRODUCTION OF ANIMAL BY-PRODUCTS FROM SLAUGHTER UNDER FEDERAL INSPECTION, 1927 AND 1928.....</b>	<b>129</b>
<b>11. ANIMALS SLAUGHTERED FOR FOOD, CALENDAR YEAR 1909</b>	<b>158</b>
<b>12. MEAT ANIMALS SLAUGHTERED, CENSUS YEARS 1909-27</b>	<b>159</b>
<b>13. ADJUSTED PERCENTAGES OF FEDERALLY INSPECTED TO TOTAL SLAUGHTER .....</b>	<b>162</b>
<b>14. COMMERCIAL MEAT PRODUCTION IN 1909, UNDER AND OUTSIDE OF FEDERAL INSPECTION.....</b>	<b>166</b>
<b>15. WHOLESALE MEAT PRODUCTION UNDER FEDERAL AND STATE OR LOCAL INSPECTION, CENSUS YEARS 1909-27</b>	<b>168</b>
<b>16. OFFICIAL ESTIMATES OF PRODUCTION OF BEEF, VEAL, PORK, MUTTON, AND LAMB, 1909-28.....</b>	<b>170</b>
<b>17. NUMBER OF RENDERING PLANTS IN PRINCIPAL CITIES, 1921 AND 1927.....</b>	<b>184</b>
<b>18. DEVELOPMENT OF ESTABLISHMENTS REPORTING TALLOW AND GREASES AS THE PRODUCTS OF CHIEF VALUE, CENSUS YEARS 1909-27.....</b>	<b>193</b>
<b>19. PRODUCTS OF 157 RENDERING AND REDUCTION PLANTS, 1925 .....</b>	<b>198</b>
<b>20. GEOGRAPHICAL DISTRIBUTION, 1927, OF (A) 1,249 WHOLESALE SLAUGHTERING AND MEAT-PACKING PLANTS, AND (B) 913 RENDERING PLANTS, BY STATES AND GROUPS OF STATES.....</b>	<b>201</b>
<b>21. MUNICIPAL REDUCTION PLANTS: VOLUME OF RAW MATERIAL AND PRODUCTS.....</b>	<b>237</b>

TABLE	PAGE
22. UNITED STATES IMPORTS (FOR CONSUMPTION) OF PRODUCTS FROM ANIMAL OFFALS AND MEAT WASTES, CALENDAR YEAR 1927.....	247
23. CONSUMPTION OF OILS AND FATS IN THE SOAP INDUSTRY OF THE UNITED STATES, 1921-23.....	255

## APPENDIX TABLES

I. MONTHLY PRICES OF TALLOW AT CHICAGO, 1920-28	309
II. MONTHLY PRICES OF GREASES AT CHICAGO, 1920-28	312
III. MONTHLY PRICES OF DOMESTIC AND FOREIGN TANKAGE, 1920-28 .....	315
IV. TESTS SHOWING YIELDS OF FAT AND CRACKLINGS FROM VARIOUS SORTS OF SLAUGHTERHOUSE OFFALS, SCRAP, AND DEAD ANIMALS, ALL RENDERED BY THE DRY-REDUCTION METHOD.....	317
V A. SUMMARY OF COMPARATIVE YIELDS OF CRACKLINGS AND FATS FROM DIFFERENT SORTS OF ANIMAL BY-PRODUCTS, IN PERCENTAGES OF TOTAL WEIGHT OF RAW MATERIAL.....	319
V B. ESTIMATED VALUE OF FINISHED MATERIALS OBTAINED FROM DEAD ANIMALS BY DRY-REDUCTION PROCESS .....	319
VI. UNITED STATES EXPORTS OF ANIMAL FATS, 1922-28	320
VII. UNITED STATES IMPORTS (FOR CONSUMPTION) OF ANIMAL FATS, 1922-28.....	322
VIII. UNITED STATES EXPORTS OF PRODUCTS DERIVED FROM ANIMAL OFFALS (EXCLUDING FATS), 1922-28...	323
IX A. UNITED STATES IMPORTS (FOR CONSUMPTION) OF PRODUCTS DERIVED FROM ANIMAL OFFALS (EXCLUDING FATS), 1922-28 (VOLUME).....	324
IX B. UNITED STATES IMPORTS (FOR CONSUMPTION) OF PRODUCTS DERIVED FROM ANIMAL OFFALS (EXCLUDING FATS), 1922-28 (VALUE) .....	325



*MAP, CHARTS, AND TABLES*

**XV**

<b>TABLE</b>	<b>PAGE</b>
<b>X. COMPARISON OF COMPUTED AND REPORTED DOMESTIC CONSUMPTION OF INEDIBLE TALLOW, 1922-27..</b>	<b>326</b>
<b>XI. PRODUCTION OF GREASE DERIVATIVES, 1922-28.....</b>	<b>326</b>
<b>XII. COMPARISON OF COMPUTED AND REPORTED CONSUMPTION OF PACKERS' AND RENDERERS' GREASES, 1922-27 .....</b>	<b>327</b>
<b>XIII. RATIO OF ANNUAL SLAUGHTER TO LIVESTOCK POPULATION, 1907-28 .....</b>	<b>328</b>
<b>XIV. NUMBER OF ANIMALS SLAUGHTERED UNDER FEDERAL INSPECTION AND ESTIMATES OF OTHER AND TOTAL SLAUGHTER (INCLUDING FARM), 1907-28.....</b>	<b>329</b>
<b>XV. UNITED STATES IMPORT DUTIES AND TARIFF CLASSIFICATIONS: ANIMAL FATS AND PRODUCTS DERIVED FROM ANIMAL OFFALS, ACTS OF 1909, 1913, AND 1922.....</b>	<b>330</b>

## APPENDIX

### A. COMMERCIAL GRADES OF INEDIBLE TALLOW, GREASE, AND DERIVATIVES, AND METHODS OF SALE

For tallow and grease there are no definite, generally accepted standards. The bases on which these products are bought and sold by the largest producers and brokers are here given. These standards apply primarily to the business in Chicago and other important packing centers. Data for tallows and greases were made available through the courtesy of the Institute of American Meat Packers in the form of a memorandum submitted by one of the largest fat-and-oil brokers in Chicago. This has been supplemented by some data from *By-Products of the Packing Industry*, by R. A. Clemen (Chicago, 1927), and by some material obtained by correspondence. Data for stearic acid and red oil are from correspondence with manufacturers.

*M.I.U.*.—Tallows and greases are sold upon the basis of a stated maximum content (1 to 3 per cent) of M.I.U.—moisture, impurities, and unsaponifiable matter. Illustration: A shipment of 60,000 pounds of tallow, bought at 10 cents per pound, 1 per cent M.I.U., is found to contain only 98 per cent of saponifiable fat; i.e., 2 per cent M.I.U. In this case a deduction is made from the purchase price for the 1 per cent excess of the allowance. In the stated case the deduction is 600 pounds at 10 cents, or \$60.00.

*Acid and Titre.*—Adjustments for an excess of free fatty acid, or a titre that is too low (see specifications below), are determined upon the basis of the value of glycerin, stearic acid, and red oil. If stearic acid is high, and "hard" fats are in demand, the adjustment is greater. If glycerin is high, the fat that yields the least glycerin would be lowest in value. The yield of glycerin varies inversely with the percentage of free fatty acids. Ordinarily the precise terms are stated in the contract of sale.

#### INEDIBLE TALLOW<sup>1</sup>

As a class these are always hard in body, 40 degrees titre or higher, and are primarily beef fat, though grease is occasionally mixed with tallow when prices of the latter are higher. Some classes of inedible tallow are comparable, in whiteness of color

<sup>1</sup> See also pp. 49-58.

and lowness of free fatty-acid content, to edible tallow, but are not permitted by federal regulation to go into food uses.

1. *Fancy* is usually sold "maximum 3 per cent acid," 42 to 44 degrees titre, 1 per cent M.I.U.

2. *Prime Packers'* is a standard tallow. The bulk of the packers' product is of this grade. It is sold in the winter "maximum 3 per cent acid," in the summer "maximum 4 per cent acid," runs 42 to 43½ degrees titre, and is sold basis 1 per cent M.I.U. It is light in color, bleaches not to exceed 2.8 red and 25.0 yellow by the Lovibond color test. It is made from the best grade of packers' inedible stock.

3. *Number One* usually runs 8 to 14 or 15 per cent acid, but is sold by most packers on a basis of 10 per cent acid. It may be either a greenish or brownish tallow, or sometimes "yellowish." It is rendered from the less desirable parts of the animal, containing some spoiled fats and being "off" in odor and flavor. It bleaches to about 7.0 red and 31.0 yellow (Lovibond test). This grade is given various names by different producers, but is classed by the trade as "No. One" if it conforms to these specifications. It is sold on a basis of 2 per cent M.I.U.

4. *Number Two* is sold on the basis of 2 per cent M.I.U., and usually contains 25 to 30 per cent acid, but the true "Number Two" is sold on the basis of 40/40 (40 per cent free fatty acids and 40 degrees titre). It is too dark in color to be read by the Lovibond test. This tallow is made from the remaining dark-colored stock and poorest grade offals, such as gut fats, as well as catch-basin skimmings. Frequently catch basins are skimmed and rerendered and this put into Number Two. Some tallow of this grade runs up to 43 degrees titre. This grade is sometimes classed as "B" tallow. It is also sometimes described as brown grease.

5. *City Tallow* is a renderers' product. It is produced from materials that are gathered daily and promptly rendered. It is a product of fairly good and uniform quality.

6. *Country Tallow* is a lower grade of renderers' product than the grade known as "City Tallow." Made from fats and materials collected at intervals and accumulated, it varies greatly in free fatty-acid content and color.

#### GREASES<sup>1</sup>

Primarily hog fats, 37 to 39½ degrees titre, free fatty acids (see below) may run from 1 to 60 per cent. The lower packer

<sup>1</sup> See also pp. 49-58.

grades, yellow and brown, are sometimes designated as "soap stock." When greases are grained and pressed they yield grease oils or lard oils. The latter are usually bleached.

1. *Choice White* is an inedible grease, similar to lard in color, generally 38–39 degrees titre, runs "maximum 4 per cent acid," 1 per cent M.I.U.

2. A *White* is 6 to 7 per cent acid, slightly darker in color than "choice white," 1 per cent M.I.U.

3. *B White* is 8 to 12 per cent acid, sold 1 per cent M.I.U. It is poorer in color, dark or yellowish, "off" in odor and flavor; color is lighter than 2.5 red and 25.0 yellow (Lovibond).

4. *Yellow* runs 15 to 25 per cent acid, sold on a basis of 2 per cent M.I.U. It is yellowish in color, but never brown; made from portions of the animal that yield a darker grease, and is really an offal product. In some small plants all grease materials are rendered together, and the resulting product is known as yellow grease; color is about 30 red and 110 yellow (Lovibond).

5. *Brown* is sold on a basis of 40/40 (40 per cent free fatty acids and a titre of 40 degrees), and 2 per cent M.I.U.; made from all refuse materials, such as catch-basin skimmings, floor sweepings, and so forth.

6. *House* is obtained from the rendering and degreasing of used fats or shortenings from hotels, and similar wastes. A renderers' product, this house grease does not bleach well, but is usually low in acid because it is handled or rendered quickly; sold 3 per cent M.I.U.

7. *Garbage* is grease extracted from garbage, usually by municipal reduction plants; sold 3 per cent M.I.U.

8. *Extraction* is grease extracted from partially degreased tankage, in turn sold for fertilizer. It is very dark in color, 12 to 15 per cent acid; sold 3 per cent M.I.U. The number of such degreasing plants is reported to be increasing.

#### DERIVATIVES

1. *Lard Oil and Grease Stearin*.—A large portion of the grease goes to "lard oil pressers," who grain and press out the softer portions, "lard oil" or grease oil, and obtain a hard-bodied grease, "stearin." The yield is approximately 55 per cent oil and 45 per cent stearin. White greases yield lard oil; yellow grease, and lower grades, yield grease oil.

Choice White grease is rarely pressed, being mainly exported. If pressed, it yields "extra winter strained lard oil" and "choice white grease stearin."

"A White" grease yields "extra lard oil" or "extra winter strained lard oil" (according to the temperature at which it is pressed) and "A white grease stearin."

"B White" grease yields "extra No. 1 lard oil" and "B white grease stearin."

(The better grades of lard oil are sometimes sold as "neatsfoot oil.")

"Yellow" grease yields "No. 1 grease oil" and "yellow grease stearin."

"Brown" grease yields "No. 2 grease oil" and "yellow grease stearin."

2. *Stearic Acid, Red Oil, and Glycerin.*—Large quantities of grease are also processed by stearic acid manufacturers for stearic acid, red oil, and glycerin. Yields of the three products vary with the quality of raw material and the processes employed. One large manufacturer reports a yield, from 100 pounds of fats, of 60 pounds of red oil or oleic acid, 30 pounds of stearic acid, and 8 pounds of glycerin. Another reports 45 per cent each of stearic acid and red oil and 5 per cent of glycerin. The balance is tar, and so forth.

The "distilled" grades of stearic acid are produced from low-grade greases such as brown, extracted, and garbage grease; and the "saponified" from better grades. The main reason for the distillation process is to permit the use of low-grade materials, which are distilled to bring back the original white or yellow color. Oleostearin is occasionally processed in this manner when a high-grade product is desired. These refinements are of importance to manufacturers of candles, cosmetics, and crayons. For certain purposes, notably for rubber compounding, stearic acid is also purified by various degrees of pressure and sold as single-, double-, and triple-pressed. The primary purpose of such pressing is to reduce the content of oleic acid (15 per cent in single-pressed, 10 in double-pressed, and 5 in triple-pressed), because an excess of such acid is detrimental in the aging of certain types of rubber compounds.

## B. STATE REGULATIONS WITH RESPECT TO SALE OF COMMERCIAL FEEDSTUFFS<sup>1</sup>

Specific statutes closely regulate the sale of commercial feeding stuffs in the states where such feeds are extensively used.

<sup>1</sup> *Report of the Federal Trade Commission on Commercial Feeds* (March 29, 1921), pp. 174-77, 185.

These apply to feeds of animal origin as well as to other commercial feeds. In their essential provisions the different state laws are virtually uniform.

1. They require the registry, by name, brand, or trade-mark, of the different products offered or exposed for sale.

2. Such registration must show the guaranteed chemical composition of the commodity in percentages of protein, fat, and fiber, and the common names of the ingredients.

3. The container, or the tag accompanying each package, must show plainly the net weight, name, brand, or trade-mark of the commodity, and also the name and address of the manufacturer or person responsible for placing it on the market.

4. Such container or tag must show the minimum percentage of crude protein and crude fat, and the maximum percentage of crude fiber, and also the name of each ingredient used in its manufacture.

5. A system of analysis and sampling is usually prescribed to insure compliance with the foregoing provisions, and publicity is usually given to the results.

6. Penalty provisions are added for violation of the statutes.

Through the Association of Feed Control Officials of the United States it has been possible to attain a large measure of co-operative and uniform regulation. Federal and state officials meet annually for discussion of problems and recommendations of procedure. This has tended toward uniformity in regulating intrastate and interstate commerce, as well as in administrative and regulatory methods.

#### C. DEFINITIONS OF ANIMAL FEEDSTUFFS OF ANIMAL ORIGIN, ADOPTED BY THE ASSOCIATION OF FEED CONTROL OFFICIALS OF THE UNITED STATES<sup>1</sup>

Cracklings are the residue after partially extracting the fats and oils from the animal tissues. If they bear a name descriptive of their kind, composition, or origin, they must correspond thereto.

Digester tankage is the residue from animal tissues, exclusive of hoof and horn, specially prepared for feeding purposes by tanking under live steam, drying under high heat, and suitable grinding. If it contains more than 10 per cent of phosphoric acid ( $P_2O_5$ ), it must be designated digester meat and bone tankage.

<sup>1</sup> *Report of the Federal Trade Commission on Commercial Feeds* (March 29, 1921), pp. 185-86.

Meat scrap and meat meal are the ground residues from animal tissues, exclusive of hoof and horn. If they contain more than 10 per cent of phosphoric acid ( $P_2O_5$ ), they must be designated meat and bone scrap and meat and bone meal. If they bear a name descriptive of their kind, composition, or origin, they must correspond thereto.

Blood meal is ground dried blood.

#### D. METHODS OF QUOTING PRICES UPON TANKAGE AND CRACKLINGS<sup>1</sup>

Meat residues are valuable for their content of protein, fat, and mineral salts. Formerly products such as tankage were sold at a flat rate per ton. They are now marketed on a guaranteed chemical analysis. It is the present practice to base quotations upon "units of ammonia," with an allowance for the bone-phosphate content. Under this custom the value of the product depends primarily upon the content of nitrogen. It is usual to express this as protein in feeding stuffs and as ammonia in fertilizers. The direct determination is made by the chemist upon the amount of nitrogen present. Nitrogen is multiplied by 1.215 for ammonia, and by 6.25 for protein. Thus 10 per cent of nitrogen is equivalent to 12.15 per cent of ammonia, or 62.5 per cent of protein. The trade, however, uses the term ammonia to designate the content of the material, whether sold for feed or fertilizer. A "unit" of ammonia is 1 per cent per ton, or 20 pounds. In producing feed tankage the addition of hair, hoof meal, and the like is usually forbidden because these possess little feeding value, although they are high in ammonia content.

In addition to ammonia, a flat price of 10 cents per unit of bone phosphate is added. Thus a quotation upon tankage or cracklings of \$4.50 and 10 cents" would mean that the ammonia is sold at \$4.50 for each per cent per ton (or unit of 20 pounds) and the bone phosphate at 10 cents for each similar unit. A tankage analyzing 9 per cent ammonia and 20 per cent bone phosphate would sell for 9 times \$4.50 plus 20 times 10 cents, or \$42.50 per ton. Garbage tankage, however, is usually sold at a flat rate per ton.

Packers usually sell a tankage with a protein content of 60 per cent and 6 to 8 per cent of fat. Since the ordinary packing-house tankage will average only about 33½ to 41½ per cent of protein,

<sup>1</sup> *The Packers' Encyclopedia* (Chicago, 1922), pp. 138-39; R. A. Clemen, *By-Products in the Packing Industry* (Chicago, 1927), pp. 317-26.

various materials such as blood and dried stick are added to bring up the content. Blood will analyze 15 or 16 per cent of ammonia. Tankage from condemned carcasses, or materials containing considerable quantities of bone, also steamed bone tankage, are generally used for fertilizer purposes.

#### E. DISTRIBUTION AND OCCURRENCE OF FATS IN THE ANIMAL CARCASS<sup>1</sup>

On the basis of anatomical and physiological considerations, the fats of the animal body may be divided into three classes, which overlap somewhat but nevertheless display important distinguishing characteristics. The first class may be termed metabolic fats. These are contained in the cells of the various tissues and in other intimate relations to the structures of the body and possess important functional attributes. The metabolic fats are not greatly expanded when the gross fat of the body is increased and the tissues cling to them tenaciously during emaciation. The second class may be termed supporting fats, since they aid in maintaining the position and mobility of certain structures, especially the viscera. These fats are found around the kidneys, in the omentum, and in general are disposed around the organs in the visceral cavities. Also, some of the fats in the trunk and extremities, associated with connective tissues, belong to the supporting fats. These fats are subject to increase in obesity and waste away during emaciation. The third class of fats may be termed reserve fats, representing the storage depots of the body, one disposed over the extremities, in the ventral and dorsal walls of the trunk, and generally through the subcutaneous connective tissues. It is the reserve fats which are most prominently increased in obesity in human beings, and in the fattening of animals for market, and most extensively withdrawn in consequence of emaciation.

These fats display important differences in composition. The metabolic fats vary in composition from species to species and within one body from organ to organ; thus, the fats of the nerve, of the heart muscle, and of the kidney are significantly different. The so-called supporting fats display a less specific composition than the metabolic fats, but are consistently of a firmer texture than these. The composition of the reserve fats depends to a considerable extent upon the diet of the animal: when formed from carbohydrate, they tend to be specific to the species, but

<sup>1</sup> Contributed by Dr. A. E. Taylor.



when formed from the fat of the diet, they tend to resemble the ingested fat. Other things being equal, the reserve fats tend to have a lower melting-point and titre than the supporting fats. This is an important fact, which explains the quality and corresponding price premium of the fat of the caul and around the kidney.

TABLE I.—MONTHLY PRICES OF TALLOW AT CHICAGO, 1920-28\*  
(Cents per pound)

Month	Edible	Prime Packers'	No. 1 Packers'	No. 2 Packers'	No. 1 Renderers'	No. 2 Country
<b>1920</b>						
Jan. ....	18.8	17.6	16.8	13.8	16.4	14.0
Feb. ....	17.1	16.0	14.9	13.0	15.2	13.4
Mar. ....	17.0	16.1	15.0	13.1	14.5	12.6
Apr. ....	16.2	15.6	14.5	13.1	14.2	12.6
May ....	15.0	13.9	13.1	11.4	13.2	11.8
June ....	13.0	12.0	10.5	9.2	10.6	9.5
July ....	13.2	12.4	11.2	9.6	10.5	8.6
Aug. ....	13.1	12.8	11.2	9.0	10.2	8.0
Sept. ....	14.4	13.8	11.8	9.2	10.0	8.5
Oct. ....	12.5	11.2	9.5	6.6	8.2	6.8
Nov. ....	9.6	8.2	6.9	5.0	6.6	4.8
Dec. ....	7.1	6.5	5.6	4.0	5.5	3.9
<i>Average</i>	<b>13.9</b>	<b>13.0</b>	<b>11.8</b>	<b>9.8</b>	<b>11.3</b>	<b>9.5</b>
<b>1921</b>						
Jan. ....	7.4	6.8	5.8	4.6	5.6	4.5
Feb. ....	7.0	6.2	5.2	3.9	5.0	3.6
Mar. ....	6.4	5.9	4.9	3.6	4.5	3.4
Apr. ....	6.2	5.8	4.9	3.2	4.4	2.9
May ....	6.6	6.1	5.0	3.2	4.5	3.1
June ....	6.0	5.5	4.4	3.0	4.0	2.6
July ....	6.4	5.6	4.5	3.0	4.1	2.6
Aug. ....	7.2	6.6	5.2	3.4	4.8	3.1
Sept. ....	8.2	7.2	6.1	3.9	5.6	3.6
Oct. ....	7.8	7.2	6.2	4.0	5.9	4.0
Nov. ....	7.2	6.8	5.9	4.0	5.5	3.5
Dec. ....	7.0	6.6	5.8	4.1	5.1	3.8
<i>Average</i>	<b>7.0</b>	<b>6.4</b>	<b>5.3</b>	<b>3.6</b>	<b>4.9</b>	<b>3.4</b>
<b>1922</b>						
Jan. ....	7.4	6.6	5.8	4.2	5.2	4.1
Feb. ....	8.0	6.9	5.9	4.6	5.9	4.9
Mar. ....	8.0	7.0	6.4	4.8	5.9	4.9
Apr. ....	7.2	6.9	6.2	5.0	6.0	4.9
May ....	7.2	6.6	6.1	5.1	5.9	4.9
June ....	7.6	6.5	6.0	4.9	5.6	4.9
July ....	7.9	6.6	6.1	4.9	5.8	4.9
Aug. ....	8.1	6.9	6.2	5.0	6.0	5.1
Sept. ....	7.6	6.9	6.2	5.2	5.9	5.2
Oct. ....	8.1	7.5	7.1	5.8	6.6	5.9
Nov. ....	8.5	8.2	7.6	6.2	7.8	6.6
Dec. ....	8.8	8.4	7.8	6.9	7.5	7.0
<i>Average</i>	<b>7.9</b>	<b>7.1</b>	<b>6.4</b>	<b>5.2</b>	<b>6.2</b>	<b>5.3</b>

\* Data for the first four columns (for the years 1920-27) computed as means of monthly ranges from a statistical pamphlet issued January 1, 1928, by the Davidson Commission Co., Chicago. For the present purpose these means are serviceable, because the monthly range is usually within three-fourths of a cent per pound.

All other data were compiled from weekly quotations of the *Oil, Paint, and Drug Reporter*. To make the data comparable, the same method was employed.

## INEDIBLE ANIMAL FATS

TABLE I (Continued)

Month	Edible	Prime Packers'	No. 1 Packers'	No. 2 Packers'	No. 1 Renderers'	No. 2 Country
<b>1923</b>						
Jan. ....	9.5	9.0	8.5	7.9	8.2	7.6
Feb. ....	9.3	8.7	8.6	8.1	8.4	8.0
Mar. ....	9.8	9.5	9.1	8.6	8.8	8.6
Apr. ....	10.0	8.9	8.7	7.9	8.6	7.9
May ....	8.8	8.1	7.4	6.6	7.5	6.9
June ....	8.2	7.2	6.8	5.8	6.4	5.5
July ....	7.6	6.9	6.2	5.2	5.9	5.1
Aug. ....	8.1	7.5	6.9	5.6	6.2	5.2
Sept. ....	9.2	8.1	7.5	6.1	6.9	6.0
Oct. ....	9.5	8.5	7.6	6.0	6.8	5.8
Nov. ....	9.6	8.5	7.6	6.0	7.0	5.8
Dec. ....	9.2	8.1	7.4	5.9	6.9	5.6
<b>Average</b>	<b>9.1</b>	<b>8.2</b>	<b>7.7</b>	<b>6.6</b>	<b>7.3</b>	<b>6.5</b>
<b>1924</b>						
Jan. ....	9.4	8.4	7.6	6.2	7.2	5.8
Feb. ....	9.0	8.1	7.5	6.2	7.2	5.9
Mar. ....	8.6	8.0	7.5	6.2	7.0	6.0
Apr. ....	8.2	7.6	7.1	6.2	6.6	5.9
May ....	8.4	7.3	6.9	6.0	6.6	5.9
June ....	8.5	7.1	6.6	5.9	6.5	5.5
July ....	10.0	7.9	7.4	6.2	7.1	6.1
Aug. ....	11.5	8.9	8.1	6.9	7.8	6.6
Sept. ....	10.1	8.9	8.1	6.9	7.9	6.6
Oct. ....	9.6	9.2	8.6	7.2	8.4	6.9
Nov. ....	10.1	9.6	9.2	7.5	8.9	7.4
Dec. ....	10.6	10.3	9.8	8.5	9.2	8.4
<b>Average</b>	<b>9.5</b>	<b>8.4</b>	<b>7.9</b>	<b>6.7</b>	<b>7.5</b>	<b>6.4</b>
<b>1925</b>						
Jan. ....	10.5	9.9	9.8	8.9	9.1	8.6
Feb. ....	9.5	9.4	8.7	8.4	8.8	7.7
Mar. ....	10.2	9.8	9.3	8.8	9.1	8.4
Apr. ....	10.1	9.4	9.1	8.2	8.7	7.9
May ....	9.5	9.2	8.7	7.9	8.5	7.6
June ....	9.9	9.4	8.9	8.2	8.6	8.0
July ....	11.1	9.8	9.4	8.8	9.4	8.5
Aug. ....	10.4	10.0	9.5	8.8	9.2	8.4
Sept. ....	10.8	10.1	9.5	8.4	9.1	8.1
Oct. ....	10.6	10.0	9.5	8.2	9.1	7.9
Nov. ....	10.4	10.0	9.4	8.2	9.1	7.9
Dec. ....	10.4	9.9	9.4	8.3	9.2	8.1
<b>Average</b>	<b>10.3</b>	<b>9.7</b>	<b>9.3</b>	<b>8.4</b>	<b>9.0</b>	<b>8.1</b>

TABLE I (Concluded)

Month	Edible	Prime Packers'	No. 1 Packers'	No. 2 Packers'	No. 1 Renderers'	No. 2 Country
<b>1926</b>						
Jan. ....	10.5	10.2	9.4	8.4	9.3	8.1
Feb. ....	10.2	9.8	9.2	8.2	9.0	8.1
Mar. ....	10.0	9.4	9.0	8.0	9.0	7.9
Apr. ....	9.5	8.6	8.1	7.4	8.1	7.2
May ....	9.6	8.8	8.3	7.4	7.9	7.3
June ....	10.9	9.1	8.5	7.5	8.2	7.4
July ....	10.2	8.4	8.0	7.1	7.9	7.1
Aug. ....	9.5	8.5	7.8	6.9	7.6	6.8
Sept. ....	9.4	8.5	8.0	7.0	7.8	6.8
Oct. ....	8.6	8.4	7.5	6.5	7.4	6.2
Nov. ....	7.8	7.4	6.8	5.7	6.6	5.7
Dec. ....	7.6	7.2	6.7	5.7	6.6	5.4
<i>Average</i>	<b>8.5</b>	<b>8.7</b>	<b>8.1</b>	<b>7.2</b>	<b>8.0</b>	<b>7.6</b>
<b>1927</b>						
Jan. ....	7.9	7.5	6.9	5.5	6.7	5.5
Feb. ....	8.5	7.9	7.4	6.1	7.1	5.9
Mar. ....	8.6	7.9	7.3	5.9	7.2	5.9
Apr. ....	8.0	7.6	7.1	5.8	7.0	5.6
May ....	8.1	7.8	7.2	6.0	7.1	6.0
June ....	8.1	7.8	7.2	6.2	7.1	5.9
July ....	8.2	7.9	7.4	6.1	6.8	6.0
Aug. ....	8.8	8.2	7.5	6.4	7.0	6.1
Sept. ....	9.8	8.5	7.9	6.6	7.4	6.4
Oct. ....	10.1	8.9	8.1	6.8	8.0	6.8
Nov. ....	10.2	9.1	8.3	6.9	8.0	6.8
Dec. ....	9.4	8.5	8.1	6.9	7.8	6.5
<i>Average</i>	<b>8.8</b>	<b>8.1</b>	<b>7.5</b>	<b>6.3</b>	<b>7.3</b>	<b>6.1</b>
<b>1928</b>						
Jan. ....	9.5	9.0	8.2	7.0	8.2	6.5
Feb. ....	9.0	8.4	7.9	7.1	7.8	6.4
Mar. ....	9.2	8.8	8.1	6.8	7.8	6.5
Apr. ....	9.6	8.7	8.2	7.0	7.9	6.5
May ....	9.4	8.7	8.2	7.2	8.1	6.8
June ....	9.0	8.3	7.9	7.0	7.9	6.8
July ....	8.9	8.4	7.9	7.1	7.8	6.6
Aug. ....	9.0	8.4	8.0	7.1	7.9	6.8
Sept. ....	9.6	9.0	8.5	7.4	8.3	7.1
Oct. ....	9.9	9.3	8.7	7.9	8.6	7.3
Nov. ....	9.8	9.4	8.9	7.9	9.0	7.4
Dec. ....	9.7	9.3	8.9	8.1	8.6	7.5
<i>Average</i>	<b>9.4</b>	<b>8.8</b>	<b>8.3</b>	<b>7.3</b>	<b>8.2</b>	<b>6.8</b>

## INEDIBLE ANIMAL FATS

TABLE II.—MONTHLY PRICES OF GREASES AT CHICAGO, 1920-28\*  
(Cents per pound)

Month	Choice A White	Yellow	Brown	House	Garbage	Bone Naphtha
<b>1920</b>						
Jan. ....	17.0	15.0	14.0	14.2	10.8	12.2
Feb. ....	14.6	13.5	12.6	14.2	10.9	11.8
Mar. ....	15.5	14.0	13.0	13.5	10.9	11.5
Apr. ....	14.4	13.5	13.1	13.2	10.6	11.5
May ....	13.4	12.0	11.2	12.4	10.6	11.2
June ....	11.4	9.9	9.4	9.8	8.4	9.4
July ....	11.5	10.1	9.6	9.1	8.1	9.0
Aug. ....	11.8	9.5	8.6	8.8	7.1	7.2
Sept. ....	13.0	9.9	8.5	9.0	6.9	7.1
Oct. ....	12.6	7.8	6.2	7.5	5.5	5.9
Nov. ....	10.1	6.0	4.8	5.0	4.5	4.6
Dec. ....	7.1	4.8	4.0	3.9	3.5	3.8
<i>Average</i>	12.7	10.5	9.6	10.0	8.2	8.8
<b>1921</b>						
Jan. ....	6.1	5.0	4.4	4.6	3.5	4.2
Feb. ....	5.6	4.2	3.5	4.0	3.0	3.5
Mar. ....	5.5	4.0	3.4	3.5	3.0	3.1
Apr. ....	5.4	4.0	3.1	3.0	2.5	2.8
May ....	5.5	4.0	3.2	3.1	2.4	3.0
June ....	5.1	3.6	2.8	2.9	2.2	2.8
July ....	5.4	3.6	2.8	2.9	2.2	2.5
Aug. ....	6.0	4.4	3.1	3.6	2.4	2.6
Sept. ....	6.6	4.4	3.9	3.9	2.6	3.0
Oct. ....	6.6	4.5	4.0	4.2	3.2	3.2
Nov. ....	6.5	4.5	4.0	4.2	3.4	3.4
Dec. ....	6.2	4.6	4.1	4.2	3.5	3.5
<i>Average</i>	5.9	4.2	3.5	3.7	2.8	3.1
<b>1922</b>						
Jan. ....	6.5	4.8	4.2	4.6	3.6	3.8
Feb. ....	7.0	5.2	4.5	5.1	3.9	4.0
Mar. ....	7.4	5.5	5.0	5.0	4.2	4.4
Apr. ....	7.0	5.5	5.0	5.0	4.1	4.5
May ....	7.1	5.5	5.0	5.1	4.2	4.4
June ....	7.1	5.5	5.0	5.1	4.2	4.6
July ....	7.0	5.6	5.1	5.1	4.2	4.9
Aug. ....	7.1	5.8	5.3	4.9	4.4	5.0
Sept. ....	7.1	5.9	5.4	5.2	4.1	4.9
Oct. ....	7.6	6.6	6.0	6.4	5.1	5.5
Nov. ....	8.4	7.6	6.5	7.2	5.9	6.4
Dec. ....	8.5	7.6	7.2	7.2	6.0	6.5
<i>Average</i>	7.3	5.9	5.4	5.5	4.5	4.9

\* For sources and method of computation, see footnote to Table I. Dots (....) indicate no quotations.

TABLE II (Continued)

Month	Choice A White	Yellow	Brown	House	Garbage	Bone Naphtha
<b>1923</b>						
Jan. ....	8.9	8.4	8.1	8.1	6.4	7.0
Feb. ....	9.1	8.6	8.2	8.1	6.6	7.5
Mar. ....	9.3	8.9	8.6	8.2	7.2	8.1
Apr. ....	8.6	8.2	7.9	8.0	6.9	7.6
May ....	7.9	7.0	6.6	6.8	6.1	6.6
June ....	7.1	6.1	5.7	5.7	5.2	5.6
July ....	7.0	5.9	5.2	5.4	4.8	4.9
Aug. ....	7.4	6.0	5.4	5.6	4.6	4.9
Sept. ....	8.5	6.6	6.1	6.2	5.5	5.9
Oct. ....	9.0	5.5	5.8	6.0	5.1	5.6
Nov. ....	9.0	6.2	5.9	5.9	5.4	5.5
Dec. ....	8.8	6.4	5.9	5.6	5.0	5.2
<i>Average</i>	<b>8.4</b>	<b>7.0</b>	<b>6.6</b>	<b>6.6</b>	<b>5.7</b>	<b>6.2</b>
<b>1924</b>						
Jan. ....	8.2	6.8	6.3	6.4	5.3	5.8
Feb. ....	7.8	6.6	6.2	6.4	5.4	5.8
Mar. ....	7.5	6.5	6.2	6.5	5.4	5.8
Apr. ....	7.4	6.5	6.1	6.2	5.2	5.8
May ....	7.0	6.4	5.9	6.1	5.2	5.6
June ....	7.1	6.2	5.8	5.9	5.2	5.4
July ....	7.8	7.0	6.2	6.4	5.2	5.9
Aug. ....	8.5	7.9	6.8	7.5	6.2	6.2
Sept. ....	8.9	7.5	6.6	7.2	5.8	6.4
Oct. ....	9.4	8.3	7.0	8.0	6.0	7.2
Nov. ....	9.9	8.6	7.2	8.4	6.2	7.1
Dec. ....	10.6	9.2	7.9	9.1	6.4	7.1
<i>Average</i>	<b>8.3</b>	<b>7.3</b>	<b>6.5</b>	<b>7.0</b>	<b>5.8</b>	<b>6.2</b>
<b>1925</b>						
Jan. ....	10.6	9.4	8.5	8.9	7.1	7.5
Feb. ....	9.5	8.7	8.2	8.2	7.0	6.8
Mar. ....	10.0	9.2	8.5	8.9	7.2	7.9
Apr. ....	9.8	8.5	8.2	8.1	6.9	7.6
May ....	9.5	8.4	7.9	8.2	6.9	7.5
June ....	9.1	8.6	8.2	8.4	7.1	8.0
July ....	9.8	9.1	8.5	9.0	7.5	8.5
Aug. ....	10.2	9.1	8.5	8.9	7.5	8.5
Sept. ....	10.1	9.0	8.3	8.9	7.2	8.4
Oct. ....	10.0	8.6	8.0	8.6	7.1	8.4
Nov. ....	9.6	8.9	8.2	8.6	7.1	7.9
Dec. ....	9.8	8.8	8.4	8.8	7.1	7.9
<i>Average</i>	<b>9.8</b>	<b>8.9</b>	<b>8.3</b>	<b>8.8</b>	<b>7.1</b>	<b>7.9</b>

## INEDIBLE ANIMAL FATS

TABLE II (Concluded)

Month	Choice A White	Yellow	Brown	House	Garbage	Bone Naphtha
<b>1926</b>						
Jan. ....	9.6	9.0	8.8	8.9	7.1	8.1
Feb. ....	9.4	8.8	8.0	8.6	6.9	8.0
Mar. ....	9.1	8.6	7.9	8.5	6.6	7.7
Apr. ....	8.6	7.9	7.4	8.0	6.4	7.4
May ....	8.5	7.9	7.2	7.6	6.7	7.5
June ....	8.9	7.9	7.2	7.9	6.5	7.4
July ....	8.8	7.7	7.0	7.4	6.3	7.0
Aug. ....	8.2	7.3	6.9	7.2	6.2	6.9
Sept. ....	8.2	7.2	6.8	7.1	6.2	6.9
Oct. ....	8.1	7.2	6.4	6.6	5.9	6.9
Nov. ....	7.4	6.2	5.7	6.1	5.6	6.2
Dec. ....	7.2	6.2	5.6	6.0	4.5	5.6
<i>Average</i>	<b>8.5</b>	<b>7.7</b>	<b>7.8</b>	<b>7.5</b>	<b>6.2</b>	<b>7.1</b>
<b>1927</b>						
Jan. ....	7.2	6.4	5.6	6.1	3.8	5.6
Feb. ....	7.6	6.9	6.0	6.5	4.0	5.6
Mar. ....	7.6	6.9	6.2	6.6	4.1	5.6
Apr. ....	7.2	6.6	5.9	...	4.4	5.6
May ....	7.5	6.8	6.0	...	4.8	5.7
June ....	7.4	6.9	6.0	...	4.9	5.7
July ....	7.4	6.6	6.1	...	4.9	5.7
Aug. ....	7.4	6.9	6.1	...	5.0	5.7
Sept. ....	7.6	7.2	6.8	...	5.4	6.1
Oct. ....	8.9	7.5	6.9	...	5.4	6.1
Nov. ....	8.5	7.5	6.8	7.1	5.4	6.1
Dec. ....	8.2	7.4	6.7	7.1	5.9	6.1
<i>Average</i>	<b>7.7</b>	<b>7.0</b>	<b>6.3</b>	<b>6.7</b>	<b>4.8</b>	<b>5.8</b>
<b>1928</b>						
Jan. ....	8.4	7.6	7.0	7.1	6.1	6.4
Feb. ....	8.1	7.1	6.5	6.8	6.1	6.1
Mar. ....	8.1	7.1	6.4	6.8	6.1	6.1
Apr. ....	8.2	7.5	6.6	7.1	6.1	6.1
May ....	8.2	7.6	7.1	7.2	6.1	6.1
June ....	7.9	7.4	7.0	7.2	6.1	6.1
July ....	7.9	7.5	7.1	7.2	6.2	6.1
Aug. ....	8.0	7.4	7.1	7.2	6.1	6.1
Sept. ....	8.5	7.9	7.4	7.7	...	6.1
Oct. ....	8.9	8.0	7.7	7.8	...	5.9
Nov. ....	8.8	8.1	7.9	8.2	...	5.9
Dec. ....	8.8	8.4	8.1	8.2	...	6.1
<i>Average</i>	<b>8.3</b>	<b>7.6</b>	<b>7.2</b>	<b>7.4</b>	<b>6.1</b>	<b>6.1</b>

TABLE III.—MONTHLY PRICES OF DOMESTIC AND FOREIGN TANKAGE, 1920-28\*

(A) DOMESTIC CONCENTRATED, CHICAGO (14 TO 15 PER CENT AMMONIA) (dollars per unit) <sup>a</sup>									
Month	1920	1921	1922	1923	1924	1925	1926	1927	1928
Jan. ....	6.25	2.65	2.88	3.88	3.12	3.00	3.20	3.50	3.80
Feb. ....	6.25	2.58	3.25	3.76	3.12	3.00	3.20	3.50	3.80
Mar. ....	6.25	2.25	3.75	3.63	3.12	3.00	3.05	3.50	3.80
Apr. ....	6.25	2.25	3.12	3.12	2.75	3.00	3.05	3.50	3.80
May ....	6.75	2.25	2.38	2.75	2.50	2.95	3.05	3.25	3.88
June ....	7.12	2.00	2.50	2.62	2.52	2.90	3.12	3.08	4.12
July ....	7.12	1.88	3.25	2.62	2.75	3.00	3.38	3.50	4.25
Aug. ....	7.12	1.88	3.75	2.62	2.88	3.12	3.50	3.75	4.25
Sept. ....	7.00	2.00	3.50	3.25	3.00	3.25	3.50	4.00	4.25
Oct. ....	6.00	2.25	3.25	3.88	3.00	3.25	3.50	4.00	4.37
Nov. ....	3.98	2.25	3.38	3.88	3.00	3.20	3.50	4.00	4.38
Dec. ....	2.95	2.62	3.88	3.50	3.00	3.20	3.50	3.80	4.37
<i>Average</i>	<i>6.08</i>	<i>2.24</i>	<i>3.24</i>	<i>3.29</i>	<i>2.90</i>	<i>3.07</i>	<i>3.30</i>	<i>3.62</i>	<i>4.09</i>

  

(B) SOUTH AMERICAN, TO ARRIVE NEW YORK (dollars per unit) <sup>b</sup>					
Month	1924	1925	1926	1927	1928
Jan. ....	.....	3.80 & .10	4.12 & .10	3.95 & .10	4.89 & .10
Feb. ....	.....	3.60 & .10	4.08 & .10	4.08 & .10	4.75 & .10
Mar. ....	.....	3.55 & .10	3.75 & .10	4.25 & .10	4.62 & .10
Apr. ....	.....	3.50 & .10	3.62 & .10	4.42 & .10	4.45 & .10
May ....	.....	3.62 & .10	4.00 & .10	4.35 & .10	4.58 & .10
June ....	.....	3.80 & .10	4.12 & .10	4.25 & .10	4.75 & .10
July ....	.....	4.02 & .10	4.48 & .10	4.55 & .10	4.88 & .10
Aug. ....	.....	4.30 & .10	4.60 & .10	4.70 & .10	5.00 & .10
Sept. ....	3.82 & .10	4.40 & .10	4.50 & .10	4.62 & .10	5.00 & .10
Oct. ....	4.00 & .10	4.48 & .10	4.38 & .10	4.75 & .10	4.97 & .10
Nov. ....	4.00 & .10	4.38 & .10	4.30 & .10	4.75 & .10	4.95 & .10
Dec. ....	3.90 & .10	4.12 & .10	4.15 & .10	4.75 & .10	4.92 & .10
<i>Average</i>	.....	<i>3.95 &amp; .10</i>	<i>4.18 &amp; .10</i>	<i>4.45 &amp; .10</i>	<i>4.81 &amp; .10</i>

\* Based on spot quotations at close of business Saturday noon from *Oil, Paint, and Drug Reporter*. Figures are the means of high and low of these quotations for the month. Yearly averages are simple averages of means for twelve months. Dots (....) indicate that data are not available.

<sup>a</sup> Unit is 1 per cent (20 lbs.) of ammonia in 1 ton of tankage.

<sup>b</sup> First figure refers to the price per unit of ammonia contained in tankage, and second figure to the price per unit of bone phosphate; e.g., if tankage analyzed 10 per cent ammonia and 20 per cent bone phosphate, assuming quotation \$4.00 & .10, it would sell for  $(10 \times \$4.00) + (20 \times .10)$ , or \$42 per ton.



## INEDIBLE ANIMAL FATS

TABLE III (Continued)

(C) GARBAGE TANKAGE, CHICAGO (dollars per ton)									
Month	1920	1921	1922	1923	1924	1925	1926	1927	1928
Jan. ....	.... <sup>o</sup>	8.00	4.12	6.25	5.88	5.88	6.75	5.50	5.50
Feb. ....	.... <sup>o</sup>	8.00	4.00	6.38	5.88	5.88	6.75	5.50	5.50
Mar. ....	.... <sup>o</sup>	5.50	4.00	6.38	5.88	6.38	5.50	5.50	5.50
Apr. ....	.... <sup>o</sup>	5.50	4.00	6.12	5.88	6.75	5.50	5.50	5.50
May ....	.... <sup>o</sup>	5.50	4.00	6.38	5.88	6.75	5.50	5.50	5.50
June ....	.... <sup>o</sup>	5.50	5.62	6.00	5.88	6.75	5.50	5.50	5.50
July ....	.... <sup>o</sup>	5.00	6.12	5.62	5.88	6.75	5.50	5.50	5.50
Aug. ....	.... <sup>o</sup>	5.00	6.62	5.12	5.88	6.75	5.50	5.50	5.50
Sept. ....	.... <sup>o</sup>	5.00	6.62	5.50	5.88	6.75	5.50	5.50	5.50
Oct. ....	.... <sup>o</sup>	6.00	6.25	5.75	5.88	6.75	5.50	5.50	5.50
Nov. ....	.... <sup>o</sup>	4.00	6.38	5.25	5.88	6.75	5.50	5.50	5.50
Dec. ....	.... <sup>o</sup>	4.12	6.25	5.12	5.88	6.75	5.50	5.50	5.50
Average	.... <sup>o</sup>	5.59	5.33	5.82	5.88	6.57	5.71	5.50	5.50

<sup>o</sup> Data for 1920 are not satisfactory.

**TABLE IV.—TESTS SHOWING YIELDS OF FAT AND CRACKLINGS FROM VARIOUS SORTS OF SLAUGHTERHOUSE OFFALS, SCRAP, AND DEAD ANIMALS, ALL RENDERED BY THE DRY-REDUCTION METHOD**  
(Data adapted from information made available through the courtesy of W. B. Allbright, of The Allbright-Nell Company, Chicago.)

EDIBLE CUTTING FATS, KILLING FATS, AND SWEET PICKLE FATS AND BONES		INEDIBLE OFFAL FROM 22 POOR-GRADE COWS	
Sweet pickle fats.....	1,808	Head bones .....	1,036
Sweet pickle ham bones.....	393	Feet .....	90
Fresh hog blade bones.....	536	Lungs with trachea.....	332
Hog heads stripped.....	1,080	Pecks hashed and washed.....	176
Caul fats .....	624	Rennets hashed and washed.....	196
Fat backs, with skin on.....	1,143	Rejected livers .....	247
Fat trimmings from cutting room	440	Caul fat .....	216
Gullets .....	460	Gut ends .....	274
Hog stomachs washed.....	320	Condemed viscera .....	241
Bung trimming fats.....	780	Bones .....	70
		Miscellaneous .....	107
<b>Total .....</b>	<b>7,584</b>	<b>Total .....</b>	<b>2,985</b>
<b>Yield of</b>	<b>5,346</b>	<b>Yield of</b>	<b>945</b>
Lard: 70.5%, or.....	773	Grease: 31.7%, or.....	1,036
Pressed cracklings: 10.2%, or...		Pressed cracklings: 34.7%, or...	
EDIBLE CUTTING FATS, ETC., WITHOUT BONES		MIXED CATTLE AND HOG INEDIBLE OFFAL	
Cutting room fats.....	6,492		<i>Pounds</i>
Back fats with skin on.....	865		<i>Hog</i>
Caul fats .....	434		<i>Beef</i>
Ears .....	120	Lungs .....	250
Head trimmings .....	160	Hashed black guts.....	202
		Head and jaw bones....	1,162
<b>Total .....</b>	<b>8,071</b>	Floor scraps .....	187
<b>Yield of</b>	<b>6,214</b>	Beef tallow—guts .....	581
Lard: 76.0%, or.....	490	Beef tallow—lungs and feet .....	196
Pressed cracklings: 6.1%, or...		Calf lungs and feet....	76
		Pigs' feet .....	112
		<b>Total .....</b>	<b>1,451</b>
		<b>Yield of</b>	<b>1,134</b>
		Grease: 33.6%, or ....	1,125
		Pressed cracklings:	
		33.4%, or .....	
BEEF, INEDIBLE		INEDIBLE HOG OFFAL	
Knuckle bones .....	545		<i>Pounds</i>
Tongue gullets .....	242	Lungs .....	424
Sinews and udders .....	304	Rejected livers .....	100
Beef guts .....	353	Stomachs .....	504
Wind pipes and weasands .....	250	Catch-basin skimmings .....	558
Pizzles, rennets, and condemned bruises .....	394	Hog hair and toes.....	360
Market bones .....	120	Hog casings .....	236
Kidneys and flank skin .....	255	Hashed and washed trimmings...	645
Tripe and tripe trimmings .....	484	Head bones .....	495
Broken guts and gut fats .....	135	Pigs' feet .....	550
Caul and gut fats .....	258	Condemed entrails .....	400
Windpipes, hearts, and livers .....	118	Bones from cooked pigs.....	90
Neck bones, vertebrae .....	645	<b>Total .....</b>	<b>4,361</b>
<b>Total .....</b>	<b>4,001</b>	<b>Yield of</b>	<b>575</b>
Tallow: 13%, or .....	720	Grease: 13%, or.....	1,005
Pressed cracklings: 25.7%, or..	1,023	Pressed cracklings: 23%, or.....	

## INEDIBLE ANIMAL FATS

TABLE IV (Continued)

DEAD ANIMALS							
Item	Horses	Hogs	Pigs	Cows	Steers	Sheep	Dogs
Number of animals .....	6½	28	39	10	8	68	125
Total (pounds) .....							
Weight* .....	4,909	4,836	2,700	4,239	4,528	2,989	3,500
Yield of fat.....	437	2,107	604	332	630	620	620
Yield of pressed cracklings...	1,315	765	425	1,000	1,150	781	845
Average per animal (pounds)							
Weight .....	755	173	69	424	566	44	28
Yield of fat.....	67	75	16	33	69	9	4
Yield of pressed cracklings..	202	27	11	100	144	11	7
Percentage of weight							
Yield of fat.....	8.9	43.5	22.4	7.8	11.7	20.7	14.8
Yield of pressed cracklings...	26.5	15.8	15.7	23.5	25.4	26.1	24.1
Analysis of cracklings (per cent)							
Moisture .....	7.2	9.7	....	....	7.1	....	6.7
Ammonia .....	11.8	12.8	....	....	12.0	....	13.0

  

BONES		DEAD-ANIMALS AND SHOP SCRAP	
Total .....	3,792	Bones from butcher shops (39% of total) .....	144,000
Yield of		Scrap fats and trimmings from butcher shops (15% of total)...	60,000
Grease: 18.6%, or .....	514	Suet (9% of total) .....	36,000
Pressed cracklings, 50.6%, or	1,920	Dead stock, mostly cattle and horses (40% of total) .....	160,000
		Total .....	400,000
		Yield of	
		Grease: 20%, or .....	84,888
		Pressed cracklings: 29.5%, or...	118,200
		Bones and dead animals: 8 to 10% of fat and 23 to 30% of pressed cracklings	
		Shop fats: 50% of fat and 18% of pressed cracklings	
		Suet: 75% of fat and 7% of pressed cracklings	

\* Except for dogs, the viscera of the dead animals were removed, and the weights reported for horses and cattle are exclusive of hides as well as viscera.

TABLE V A.—SUMMARY OF COMPARATIVE YIELDS OF CRACKLINGS AND FATS FROM DIFFERENT SORTS OF ANIMAL BY-PRODUCTS\*  
(Percentage of total weight of raw material)

Product	Pressed cracklings	Grease	Tallow	Lard
<i>Packing-house products</i>				
Edible cutting fats, killing fats, and sweet pickle fats and bones .....	10.2	....	....	70.5
Edible cutting fats, etc., without bones	6.1	....	....	76.9
Inedible hog offal .....	23.0	13.0	....	....
Inedible offal from 22 poor-grade cows .....	34.7	31.7	....	....
Beef, inedible .....	25.7	....	18.0	....
Mixed cattle and hog inedible offal ...	33.3	33.7	....	....
<i>Dead animals and shop scrap</i>				
Bones and dead animals .....	23.30	....	8.10	....
Shop fats .....	18.0	....	50.0	....
Suet .....	7.0	....	75.0	....
Average .....	29.5	20.5	....	....
<i>Bones</i>	50.6	13.6	....	....
<i>Dead animals</i>				
Horses .....	26.5	8.9	....	....
Hogs .....	15.8	43.5	....	....
Pigs .....	15.7	22.4	....	....
Cows .....	23.5	7.8	....	....
Steers .....	25.4	11.7	....	....
Sheep .....	26.1	....	20.7	....
Dogs .....	24.1	14.8	....	....

\* For source, see Table IV.

TABLE V B.—ESTIMATED VALUE OF FINISHED MATERIALS OBTAINED FROM DEAD ANIMALS BY DRY-REDUCTION PROCESS\*

Per animal	Horses and cows	Calves	Hogs	Dogs, cats, poultry
	WEIGHT (pounds)			
Grease .....	50	3%	70	....
Cracklings .....	225	18%	32	....
ESTIMATED VALUE (dollars)				
Grease @ 7c.....	3.50	.26	4.90	....
Cracklings @ \$65.00 per ton.....	7.21	.60	1.04	....
Hides .....	5.00 <sup>a</sup>	1.00	....	....
<i>Total</i> .....	15.71	1.86	5.94	....
Estimated value per 100 pounds, unrendered .....	....	....	....	2.00

\* Source as for Table IV.

<sup>a</sup> Horsehides with tail and mane.

## INEDIBLE ANIMAL FATS

TABLE VI.—UNITED STATES EXPORTS OF ANIMAL FATS, 1922-28\*

Product	1922	1923	1924	1925	1926	1927	1928
	(A) VOLUME (million pounds)						
<b>GRAND TOTAL</b> .....	<b>1,031.2</b>	<b>1,288.1</b>	<b>1,217.7</b>	<b>928.0</b>	<b>923.8</b>	<b>897.5</b>	<b>937.3</b>
<i>Edible animal fats, total</i> ....	925.5	1,178.8	1,092.3	819.3	833.5	796.5	857.0
Lard .....	787.4	1,059.5	971.5	707.7	717.1	701.7	783.5
Oleo stock .....	15.6	10.3	13.8	12.2	12.2	11.9	6.8
Oleo oil .....	109.4	99.0	99.4	92.0	96.9	78.8	62.8
Oleo and lard stearin....	10.7	8.8	6.6	7.4	7.3	5.6	3.9
Tallow, edible .....	2.4	1.2	1.0	..... <sup>a</sup>	..... <sup>a</sup>	..... <sup>a</sup>	..... <sup>a</sup>
<i>Inedible animal fats, oils, greases, and derivatives, total</i> .....	105.7	109.3	125.4	108.7	90.3	99.5	80.3
Greases and derivatives, total .....	72.7	72.5	89.2	88.4	77.8	90.7	73.8
Stearic acid .....	5.0	2.9	2.2	1.9	1.0	2.4	2.3
Oleic acid or red oil....	3.6	1.7	2.7	.5	.9	2.2	6.3
Grease stearin .....	8.4	3.5	3.0	2.6	2.4	3.4	1.5
Lard oil .....	.7	.7	.5	..... <sup>b</sup>	..... <sup>b</sup>	..... <sup>b</sup>	..... <sup>b</sup>
Other animal oils.....	2.5	2.3	1.4	2.1	.7	.9	.7
Other animal fats, oils, and greases .....	57.5	61.4	79.4	81.3	72.8	81.8	63.0
Tallow .....	29.0	33.9	33.0	17.5 <sup>a</sup>	10.6 <sup>a</sup>	6.6 <sup>a</sup>	3.2 <sup>a</sup>
Neatsfoot oil .....	1.1	1.1	1.8	1.4	1.1	1.5	1.2
Glycerin .....	2.9	1.8	1.4	1.4	.8	.7	2.1

\* Data for 1922-27 from *Foreign Commerce and Navigation of the United States*, for 1928 from *Monthly Summary of Foreign Commerce of the United States*. As officially reported, data prior to 1922 are of little value owing to frequent shifts in classification and changing combinations of the several items.

<sup>a</sup> Edible tallow reported under "tallow" after 1924. The great bulk of this item is evidently of the inedible grade.

<sup>b</sup> Lard oil included in "other animal oils" after 1924.

TABLE VI (Continued)

Product	1922	1923	1924	1925	1926	1927	1928
(B) VALUE (thousand dollars)							
GRAND TOTAL .....	116,343	157,280	158,085	146,405	134,615	115,691	118,980
<i>Edible animal fats, total...</i>	108,303	147,389	146,416	135,941	125,738	106,612	111,505
Lard .....	94,072	138,333	129,761	121,638	111,648	96,038	101,926
Oleo stock .....	1,523	1,173	1,711	1,528	1,481	1,378	982
Oleo oil .....	11,465	11,841	14,113	11,814	11,786	9,699	8,281
Oleo and lard stearin.....	1,060	942	753	961	874	597	436
Tallow, edible .....	198	100	88	..... <sup>a</sup>	..... <sup>a</sup>	..... <sup>a</sup>	..... <sup>a</sup>
<i>Inedible animal fats, oils, greases, and derivatives, total .....</i>	8,040	9,901	11,669	12,464	8,877	9,079	7,475
Greases and derivatives, total .....	5,420	6,585	8,343	10,305	7,529	8,136	6,713
Stearic acid .....	481	868	255	233	139	240	257
Oleic acid or red oil....	290	145	226	51	86	191	547
Grease stearin .....	277	333	803	296	270	337	114
Lard oil .....	80	88	56	..... <sup>b</sup>	..... <sup>b</sup>	..... <sup>b</sup>	..... <sup>b</sup>
Other animal oils.....	243	197	174	281	80	102	82
Other animal fats, oils, and greases .....	4,049	5,464	7,329	9,394	6,964	7,266	5,718
Tallow .....	2,018	2,789	2,511	1,624 <sup>a</sup>	958 <sup>a</sup>	563 <sup>a</sup>	287 <sup>a</sup>
Neatsfoot oil .....	176	198	277	253	196	236	216
Glycerin .....	426	319	238	282	192	144	269

TABLE VII.—UNITED STATES IMPORTS (FOR CONSUMPTION) OF ANIMAL FATS, 1922-28\*

Product	1922	1923	1924	1925	1926	1927	1928
(A) VOLUME (thousand pounds)							
GRAND TOTAL .....	31,069	36,319	32,610	35,560	68,011	51,257	38,602
<i>Edible, total</i> .....	293	226	1,058	939	2,043	2,887	2,249
Lard .....	..... <sup>a</sup>	4	49	38	83	6	3
Oleo stearin .....	293	216	1,009	901	1,960	2,064	1,622
Oleo oil .....	.....	6	.....	.....	..... <sup>a</sup>	817	624
<i>Inedible, total</i> .....	30,776	36,093	31,552	34,621	65,968	48,370	36,353
Tallow							
Beef .....	} 1,831	10,823	} 2,272	1,773	18,022	10,885	12,861
Mutton .....							
Greases and derivatives							
Stearic acid .....	35	470	266	1,266	1,770	1,022	2,008
Oleic acid or red oil.....	19	11	37	33	31	79	46
Wool grease							
Crude .....	13,364	8,310	11,633	9,112	10,498	9,010	8,298
Refined and improved...	500	1,121	1,111	856	1,299	1,917	2,371
All other animal oils, fats, and greases .....	11,262	223	136	216	225	145	262
Glycerin							
Crude .....	3,604	14,549	14,427	19,268	27,659	14,944	4,916
Refined .....	161	586	1,501	2,044	10,839	8,315	4,218
(B) VALUE (thousand dollars)							
GRAND TOTAL .....	1,519.7	2,718.4	2,481.6	3,359.8	8,479.9	5,650.1	2,743.2
<i>Edible, total</i> .....	25.8	21.5	118.9	112.8	225.0	255.5	222.5
Lard .....	..... <sup>a</sup>	.6	9.1	7.6	9.2	1.0	.7
Oleo stearin .....	25.8	20.4	109.8	105.2	215.7	187.6	144.4
Oleo oil .....	.....	.5	.....	.....	.1	66.9	77.4
<i>Inedible, total</i> .....	1,484.9	2,696.9	2,362.7	3,247.0	8,254.9	5,394.6	2,520.7
Tallow							
Beef .....	} 125.4	831.5	} 196.8	177.7	1,164.5	787.2	1,001.9
Mutton .....							
Greases and derivatives							
Stearic acid .....	8.9	52.8	31.6	156.0	223.3	105.8	226.3
Oleic acid or red oil.....	2.1	1.8	4.2	4.6	5.1	7.1	5.9
Wool grease							
Crude .....	341.1	214.0	298.9	296.7	373.1	279.5	202.6
Refined and improved...	24.7	77.3	78.9	50.3	96.1	150.4	156.8
All other animal oils, fats, and greases .....	612.3	18.3	13.3	14.6	15.0	10.8	18.3
Glycerin							
Crude .....	347.1	1,429.7	1,490.6	2,236.4	3,996.2	2,215.1	335.9
Refined .....	28.8	77.0	229.9	305.8	2,328.9	1,100.8	450.2

\* Data from *Foreign Commerce and Navigation of the United States*. Dots (....) indicate that data are not available.

<sup>a</sup> Imports negligible.

TABLE VIII.—UNITED STATES EXPORTS OF PRODUCTS DERIVED FROM ANIMAL OFFALS (EXCLUDING FATS), 1922-28\*

Product	1922	1923	1924	1925	1926	1927	1928
(A) VOLUME (thousand pounds)							
<i>Total</i> .....	35,307	29,394	48,968	47,165	40,390	40,637	42,469
Bones, hoofs, and horns, unmanufactured .....	5,927	6,389	4,434	3,775	1,996	1,806	2,370
Boneblack and lampblack..	2,057	3,019	1,972	3,805	3,529	3,016	3,751
Gelatin .....	259	262	422	461	282	307	244
Sausage casings .....	24,355	17,214	39,997	36,678	32,120	33,156	33,067
Glue of animal origin.....	2,709	2,510	2,173	2,546	2,463	2,352	2,547
All other animal products, inedible .....	.....	.....	.....	.....	.....	.....	.....
(B) VALUE (thousand dollars)							
<i>Total</i> .....	7,042	5,808	9,101	10,969	10,889	9,830	10,005
Bones, hoofs, and horns, unmanufactured .....	261	339	201	149	79	72	112
Boneblack and lampblack..	117	181	123	250	242	189	219
Gelatin .....	176	180	297	299	214	198	159
Sausage casings .....	5,647	4,312	7,711	9,135	8,104	6,826	6,780
Glue of animal origin.....	419	386	348	385	381	384	426
All other animal products, inedible .....	423	402	421	754	1,869	2,161	2,309

\* Data for 1922-27 from *Foreign Commerce and Navigation of the United States*; for 1928 from *Monthly Summary of Foreign Commerce of the United States*. Dots (.....) indicate that data are not available.



## INEDIBLE ANIMAL FATS

TABLE IX A.—UNITED STATES IMPORTS (FOR CONSUMPTION) OF PRODUCTS DERIVED FROM ANIMAL OFFALS (EXCLUDING FATS), 1922-28\*

VOLUME (thousand pounds)

Product	1922	1923	1924	1925	1926	1927	1928
<b>GRAND TOTAL</b> .....	499,831	576,681	463,778	554,803	621,108	618,701	761,310
<i>Feeds and fertilizers, total.</i>	365,550	395,478	302,604	395,928	424,158	400,816	561,057
Dried blood .....	20,523	28,542	16,117	22,823	25,563	26,864	19,022
Tankage .....	.....	.....	48,646	67,334	55,032	49,284	86,833
Other nitrogenous material, including fish scrap, hoof meal, etc...	52,604	168,497	106,075	163,050	124,291	120,124	165,222
Bone phosphates (bone ash, dust, and meal) and animal carbon....	72,294	121,280	49,822	55,957	104,642	122,273	164,920
Other substances used only for manure .....	220,129	77,159	81,944	86,764	114,630	82,271	125,060
<i>Bones, glue, gelatin, and similar products, total.</i>	117,200	159,981	141,288	138,037	177,729	196,601	182,175
Bones, crude, steamed, or ground .....	76,725	110,973	98,440	94,496	118,008	138,368	117,665
Hoofs, horns, horn strips and tips .....	3,405	4,360	1,760	1,247	841	744	1,124
Bone black, bone char, and blood char.....	236	723	568	2,434	1,694	481	1,017
Glue stock, hide cuttings, etc. ....	27,390	32,329	27,983	29,757	45,856	43,372	48,567
Glue and glue size.....	6,097	6,607	7,422	5,175	6,905	9,145	9,183
Manufactures of glue and glue size .....	1	11	32	90	18	17	37
Gelatin, edible .....	639	2,918	3,272	3,171	2,385	2,479	1,962
Gelatin, inedible .....	2,525	1,656	1,456	1,532	1,827	1,431	1,468
Manufactures of gelatin, inedible .....	182 <sup>a</sup>	504	355	136	196	504	1,152
<i>Other products, total.....</i>	17,081	21,222	19,886	20,838	19,221	21,284	18,078
Bladders, intestines, integuments, and tendons.	823	962	1,087	1,126	521	890	53
Sausage casings .....	15,997	19,984	18,639	19,516	18,533	20,755	17,916
Rennets .....	261	328	160	196	167	139	109

\* Data from *Foreign Commerce and Navigation of the United States*. Dots (...) indicate that data are not available.

<sup>a</sup> Partially estimated.

TABLE IX B.—UNITED STATES IMPORTS (FOR CONSUMPTION) OF PRODUCTS DERIVED FROM ANIMAL OFFALS (EXCLUDING FATS), 1922-28\*

VALUE (thousand dollars)

Product	1922	1923	1924	1925	1926	1927	1928
<b>GRAND TOTAL</b> .....	<b>18,913</b>	<b>25,081</b>	<b>22,023</b>	<b>30,813</b>	<b>27,958</b>	<b>26,995</b>	<b>27,179</b>
<i>Feeds and fertilizers, total.</i>	<i>4,798</i>	<i>5,331</i>	<i>3,450</i>	<i>5,196</i>	<i>5,173</i>	<i>4,947</i>	<i>8,153</i>
Dried blood .....	568	841	404	588	707	696	667
Tankage .....	...	...	676	1,018	1,009	847	1,286
Other nitrogenous material, including fish scrap, hoof meal, etc...	710	1,918	1,085	1,941	1,425	1,195	2,502
Bone phosphates (bone ash, dust, and meal) and animal carbon.....	861	1,691	707	725	1,380	1,541	2,567
Other substances used only for manure.....	2,664	881	578	924	652	668	1,181
<i>Bones, glue, gelatin, and similar products, total.</i>	<i>4,241</i>	<i>5,362</i>	<i>4,738</i>	<i>4,636</i>	<i>5,492</i>	<i>5,948</i>	<i>6,349</i>
Bones, crude, steamed, or ground .....	837	1,387	1,046	1,002	1,350	1,686	1,161
Hoofs, horns, horn strips and tips .....	259	304	186	117	84	64	65
Bone black, bone char, and blood char.....	82	18	45	50	82	8	35
Glue stock, hide cuttings, etc. ....	1,068	1,303	1,053	1,401	1,767	1,845	2,341
Glue and glue size.....	737	568	574	437	528	692	800
Manufactures of glue and glue size .....	2	2	6	11	7	6	5
Gelatin, edible .....	198	844	695	655	494	494	442
Gelatin, inedible .....	928	489	805	830	1,040	759	815
Manufactures of gelatin, inedible .....	184	447	330	133	140	404	685
<i>Other products, total.....</i>	<i>9,874</i>	<i>14,368</i>	<i>13,835</i>	<i>20,981</i>	<i>17,293</i>	<i>16,100</i>	<i>12,577</i>
Bladders, intestines, integuments, and tendons.	206	755	1,076	1,668	668	180	42
Sausage casings .....	9,574	13,546	12,699	19,006	16,493	15,832	12,585
Rennets .....	95	87	60	107	132	88	50

\* For source and footnotes see Table IX A.

## INEDIBLE ANIMAL FATS

TABLE X.—COMPARISON OF COMPUTED AND REPORTED DOMESTIC CONSUMPTION OF INEDIBLE TALLOW, 1922-27\*

(Million pounds)

Item	1922	1923	1924	1925	1926	1927
Production .....	362.8	384.0	388.3	378.5	425.2	404.2
Stocks on hand, Jan. 1 .....	94.6	63.3	69.0	61.4	51.9	84.1
Imports for consumption .....	1.8	10.8	2.4	1.8	13.6	12.9
<b>Total available for consumption..</b>	<b>459.2</b>	<b>458.1</b>	<b>459.7</b>	<b>441.7</b>	<b>490.7</b>	<b>501.2</b>
Stocks on hand, Dec. 31 .....	63.3	69.0	61.4	51.9	84.1	77.0
Exports .....	29.0	33.9	33.0	17.5 <sup>c</sup>	10.6 <sup>c</sup>	6.6 <sup>c</sup>
<b>Total deductions .....</b>	<b>92.3</b>	<b>102.9</b>	<b>94.4</b>	<b>69.4</b>	<b>94.7</b>	<b>83.6</b>
Computed domestic consumption ..	366.9	355.2	365.3	372.3	396.0	417.6
Reported domestic consumption ....	463.9	465.9	516.4	479.0	507.2	574.0
<b>Apparent understatement of domestic production<sup>b</sup> .....</b>	<b>97.0</b>	<b>110.7</b>	<b>151.1</b>	<b>106.7</b>	<b>111.2</b>	<b>156.4</b>

\* Data for production, stocks, and "reported consumption" from U.S. Bureau of the Census, *Animal and Vegetable Fats and Oils*; imports and exports from *Foreign Commerce and Navigation of the United States*.

<sup>c</sup> Includes edible tallow of which the proportion is small (see Table VI).

<sup>b</sup> The actual understatement is probably still larger because of the exclusion of the output of small producers in the official data on production.

TABLE XI.—PRODUCTION OF GREASE DERIVATIVES, 1922-28\*

(Million pounds)

Product	1922	1923	1924	1925	1926	1927	1928
<b>GRAND TOTAL<sup>a,b</sup> .....</b>	<b>126.5</b>	<b>172.0</b>	<b>154.1</b>	<b>151.7</b>	<b>147.0</b>	<b>148.3</b>	<b>161.2</b>
<i>Red oil and stearic acid, total .....</i>	<i>68.1</i>	<i>73.1</i>	<i>69.3</i>	<i>78.3</i>	<i>82.6</i>	<i>92.0</i>	<i>108.7</i>
Red oil .....	44.3	45.2	45.0	50.4	49.9	55.7	64.4
Stearic acid .....	23.8	27.9	24.3	27.9	32.7	36.3	44.3
<i>Oil and stearin, total.....</i>	<i>58.4</i>	<i>98.9</i>	<i>84.8</i>	<i>73.4</i>	<i>64.4</i>	<i>56.3</i>	<i>52.5</i>
Lard oil .....	26.0	34.3	29.2	35.4	28.6	26.7	22.2
Tallow oil <sup>c</sup> .....	12.0	36.3	30.4	11.9	12.8	12.5	11.2
Inedible animal stearin <sup>b</sup>	20.4	28.3	25.2	26.1	23.0	17.1	19.1

\* Data from U.S. Bureau of the Census, *Animal and Vegetable Fats and Oils*, 1922-28.

<sup>a</sup> Includes a small proportion of tallow derivatives. Most of the so-called "tallow oil" is stated by the trade to be in fact produced from grease.

<sup>b</sup> The quantity of grease used in the production of derivatives is somewhat larger than the total production of such derivatives, because of a small by-product of glycerin, tar, and loss of moisture.

TABLE XII.—COMPARISON OF COMPUTED AND REPORTED CONSUMPTION OF PACKERS' AND RENDERERS' GREASES, 1922-27\*  
(Million pounds)

Item	1922	1923	1924	1925	1926	1927
Production <sup>a</sup> .....	860.0	886.8	376.5	840.6	846.7	869.1
Stocks on hand, Jan. 1.....	76.8	37.6	53.2	37.8	38.2	46.1
Imports for consumption .....	11.3	.2	.1	.2	.2	.1
Total available for consumption..	447.1	424.6	429.8	378.6	885.1	415.3
Stocks on hand, Dec. 31.....	37.6	53.2	37.8	38.2	46.1	48.3
Exports .....	57.5	61.4	79.4	81.3	72.8	81.8
Total deductions .....	95.1	114.6	117.2	119.5	118.9	130.1
Computed domestic consumption ...	352.0	310.0	312.6	259.1	266.2	285.2
Reported domestic consumption ....	232.0	251.4	231.4	227.4	225.9	204.9
Apparent understatement of domestic production <sup>a</sup> .....	120.0	58.6	81.2	31.7	40.3	80.3

\* Data for production, stocks, and "reported domestic consumption" from U.S. Bureau of the Census, *Animal and Vegetable Fats and Oils*; imports and exports from *Foreign Commerce and Navigation of the United States*, showing (see Tables VI and VII) "all other animal fats, oils, and greases." Since other animal fats except grease are specifically enumerated, it is inferred that this catch-all item consists almost entirely of grease.

<sup>a</sup> These reports were inaugurated in 1919, and in later years a more comprehensive list of consumers was obtained by the Census Bureau. Nevertheless, the data on production do not include the output of numerous small producers. The reported domestic consumption is certainly understated, as may be shown by the following figures in million pounds for consumption by the soap industry and manufacturers of grease derivatives:

	1922	1923
Consumption by the soap industry (see Table 20).....	142.0	140.3
Consumption by producers of grease derivatives (see Table XI) .....	126.5	172.0
Total .....	268.5	312.3
Reported domestic consumption.....	232.0	251.4

Substantial quantities are also exported, used in lubricants, in dressing leather, and in many other products.

## INEDIBLE ANIMAL FATS

TABLE XIII.—RATIO OF ANNUAL SLAUGHTER TO LIVESTOCK POPULATION, 1907-28\*

Year	Cattle and calves			Sheep and lambs			Hogs		
	Number of animals (Millions)	Number slaughtered (Millions)	Percentage slaughtered	Number of animals (Millions)	Number slaughtered (Millions)	Percentage slaughtered	Number of animals (Millions)	Number slaughtered (Millions)	Percentage slaughtered
1907.....	68.2	19.5	28.6	42.7	13.4	31.4	61.3	54.1	88.3
1908.....	66.0	18.9	28.6	43.5	13.5	31.0	64.2	60.5	94.2
1909.....	64.8	20.1	31.0	44.8	14.7	33.2	63.4	58.2	83.9
1910.....	62.0	20.1	32.4	44.8	14.8	33.0	57.2	47.1	82.3
1911.....	60.7	19.2	31.6	45.7	18.1	39.6	63.7	56.6	88.9
1912.....	58.2	18.3	31.4	44.6	19.2	43.0	62.7	55.6	88.7
1913.....	56.8	16.8	29.6	43.7	18.5	42.3	57.9	57.0	98.4
1914.....	56.8	15.7	27.6	42.2	18.3	43.4	55.0	55.5	100.9
1915.....	58.6	15.5	26.5	42.2	15.8	37.4	59.6	62.0	104.0
1916.....	62.2	17.8	28.6	41.1	15.4	37.5	61.7	67.6	109.6
1917.....	64.9	20.8	32.0	40.2	12.1	30.1	60.7	56.9	93.7
1918.....	67.8	23.3	34.4	40.9	13.4	32.8	63.0	64.8	102.9
1919.....	69.0	23.3	33.8	41.1	16.3	39.7	65.3	65.2	99.8
1920.....	68.8	22.3	32.4	40.7	14.2	34.9	62.5	61.9	99.0
1921.....	67.4	20.0	29.7	39.1	16.7	42.7	61.3	63.0	102.8
1922.....	67.7	21.5	31.8	36.6	14.1	38.5	62.0	63.1	109.8
1923.....	65.7	22.7	34.6	36.6	14.9	40.7	71.5	79.8	111.6
1924.....	64.7	23.9	36.9	37.3	15.4	41.3	68.8	79.6	115.7
1925.....	63.5	24.8	39.1	38.5	15.5	40.3	58.2	68.3	117.4
1926.....	60.5	24.5	40.5	40.2	16.7	41.5	54.4	65.8	121.0
1927.....	58.2	23.0	39.6	42.3	16.6	39.2	56.8	69.2	121.8
1928.....	57.4	21.1	36.7	45.1	17.3	38.4	63.1	76.6	121.4

\* Data for number of animals from *Agriculture Yearbook, 1928*, pp. 902, 921, 939, 973; estimates of slaughter from U.S. Department of Agriculture, Bureau of Animal Industry, *Meat Production, Consumption, and Foreign Trade in United States, 1900-1928*. Data for number of animals are as of January 1. Percentages are computed. As previously stated (pp. 154-74), official estimates of slaughter outside of federal inspection are rough approximations.

TABLE XIV.—NUMBER OF ANIMALS SLAUGHTERED UNDER FEDERAL INSPECTION AND ESTIMATES OF OTHER AND TOTAL SLAUGHTER (INCLUDING FARM), 1907-28\*

(Thousand animals)

Year	Estimated total slaughtered	Federally inspected	Other	Percentage federally inspected	Estimated total slaughtered	Federally inspected	Other	Percentage federally inspected	
CATTLE					CALVES				
1907	13,287	7,638	5,654	57.4	6,211	2,024	4,187	32.6	
1908	12,852	7,279	5,573	56.6	6,048	1,958	4,090	32.4	
1909	13,611	7,714	5,897	56.7	6,516	2,189	4,327	33.6	
1910	13,541	7,807	5,734	57.7	6,553	2,238	4,315	34.2	
1911	12,958	7,619	5,339	58.8	6,264	2,194	4,080	34.9	
1912	11,979	7,253	4,726	60.5	6,348	2,278	4,070	35.9	
1913	11,478	6,978	4,500	60.8	5,225	1,902	3,323	36.0	
1914	11,004	6,757	4,247	61.4	4,661	1,697	2,964	36.4	
1915	10,822	7,158	3,669	66.1	4,640	1,819	2,821	39.2	
1916	12,027	8,310	3,717	69.1	5,774	2,367	3,407	41.0	
1917	13,724	10,350	3,374	75.4	7,031	3,143	3,888	44.7	
1918	15,750	11,829	3,921	75.1	7,514	3,456	4,058	46.0	
1919	14,838	10,091	4,747	68.0	8,445	3,909	4,476	47.0	
1920	13,885	8,609	5,276	62.0	8,455	4,058	4,397	48.0	
1921	12,271	7,608	4,668	62.0	7,771	3,806	3,963	49.0	
1922	13,148	8,678	4,470	66.0	8,363	4,182	4,181	50.0	
1923	13,883	9,163	4,720	66.0	8,324	4,500	4,324	51.0	
1924	14,400	9,593	4,807	66.6	9,466	4,935	4,531	52.1	
1925	14,706	9,853	4,853	67.0	10,009	5,353	4,746	53.0	
1926	14,971	10,180	4,791	68.0	9,542	5,153	4,389	54.0	
1927	14,000	9,520	4,480	68.0	9,030	4,876	4,154	54.0	
1928	12,452	8,487	3,985	68.0	8,667	4,680	3,987	54.0	
SHEEP AND LAMBS					SWINE				
1907	13,360	10,252	3,106	76.7	54,058	32,885	21,173	60.8	
1908	13,528	10,304	3,222	76.2	60,515	38,643	21,872	63.9	
1909	14,725	11,342	3,383	77.0	53,220	31,395	21,825	59.0	
1910	14,797	11,408	3,389	77.1	47,076	26,014	21,062	55.3	
1911	13,657	14,020	4,037	77.6	56,646	34,133	22,513	60.3	
1912	19,247	14,979	4,268	77.8	55,564	33,053	22,511	59.5	
1913	18,520	14,406	4,114	77.8	57,046	34,199	22,847	59.9	
1914	18,290	14,229	4,061	77.8	55,501	32,532	22,969	58.6	
1915	15,756	12,212	3,544	77.5	62,017	38,381	23,636	61.9	
1916	15,408	11,941	3,467	77.5	67,613	43,084	24,529	63.7	
1917	12,149	9,345	2,804	76.9	56,901	33,910	22,991	59.6	
1918	13,359	10,320	3,039	77.3	64,796	41,214	23,582	63.6	
1919	16,317	12,691	3,626	77.8	65,190	41,812	23,378	64.1	
1920	14,180	10,982	3,198	77.4	61,890	38,019	23,871	61.4	
1921	16,710	13,005	3,705	77.8	62,967	38,982	23,976	61.9	
1922	14,112	10,929	3,182	77.4	68,106	43,114	24,991	63.3	
1923	14,862	11,529	3,333	77.6	79,843	53,334	26,509	66.8	
1924	15,441	11,991	3,451	77.7	79,631	52,373	26,758	66.4	
1925	15,454	12,001	3,453	77.7	68,294	43,043	25,251	63.0	
1926	16,689	12,961	3,728	77.7	65,779	40,636	25,143	61.8	
1927	16,589	12,833	3,756	77.7	60,250	43,633	25,617	63.0	
1928	17,348	13,488	3,860	77.7	76,593	49,795	26,798	65.0	

\* Data from U.S. Department of Agriculture, Bureau of Animal Industry, *Meat Production, Consumption, and Foreign Trade in United States, 1920-1928*. Percentages are computed. Official estimates of total and non-federally inspected slaughter are rough approximations, subject to a wide margin of error (see pp. 154-74).

## INEDIBLE ANIMAL FATS

TABLE XV.—UNITED STATES IMPORT DUTIES AND TARIFF CLASSIFICATIONS: ANIMAL FATS AND PRODUCTS DERIVED FROM ANIMAL OFFALS, ACTS OF 1909, 1913, AND 1922\*

Product	Act of	Paragraph	Included under	Rate of duty
Tallow	1909	290	"tallow"	½ cent per lb.
	1913	622	"tallow"	Free
	1922	701	"tallow"	½ cent per lb.
Oleo oil	1909	8	"expressed oils, n.s. p.f."	25% ad valorem
	1913	44	"all other animal oils, n.s.p.f."	15% ad valorem
	1922	701	"oleo oil"	1 cent per lb.
Oleo stearin	1909	640	"oleo stearin"	Free
	1913	562	"oleo stearin"	Free
	1922	701	"oleo stearin"	1 cent per lb.
Lard	1909	288	"lard"	1½ cents per lb.
	1913	528	"lard"	Free
	1922	703	"lard"	1 cent per lb.
Red oil or oleic acid	1909	1	"oleic acid or red oil"	1½ cents per lb.
	1913	1	"all other acids, n.s. p.f."	25% ad valorem
	1922	1	"all other acids, n.s. p.f."	15% ad valorem
Stearic acid	1909	1	"stearic acid"	1½ cents per lb.
	1913	1	"all other acids, n.s. p.f."	25% ad valorem
	1922	1	"all other acids, n.s. p.f."	15% ad valorem
Animal greases; neatsfoot oil, grease oils, and grease stearin	1909	580	"grease, fats, and oils (except fish oils) such as are commonly used in soap-making or in wire-drawing or for stuffing or dressing leather, and which are fit only for such uses, n.s.p.f."	Free
				1913
	1922	53	"all other animal oils, fats, and greases, n.s.p.f."	20% ad valorem

\* U.S. Tariff Commission, *Comparison of Tariff Acts, 1922*.

TABLE XV (Continued)

Product	Act of	Para- graph	Included under	Rate of duty
Tankage, cracklings, meat meal	1909	581	"all substances used only for manure"	Free
	1918	499	"all substances used only for manure"	Free
	1922	1589	"all other substances used chiefly for fertilizer, n.s.p.f."	Free
Bones, bone meal, animal carbon	1909	515	"Bones, crude, or not burned, calcined, ground, steamed, or otherwise manufactured, and bone dust or animal carbon, and bone ash, fit only for fertilizing purposes"	Free
	1913	423	"Bones, crude . . . . ground, steamed . . . . and bone dust or animal carbon, bone meal, and bone ash"	Free
	1922	1526	"Bones: crude, steamed or ground; bone dust, bone meal, and bone ash; and animal carbon suitable for fertilizing purposes"	Free
Bone black or bone char	1909	43	"Bone char, suitable for use in decolorizing sugar, and blood char"	20% ad valorem
	1918	447	"Blood char, bone char, or bone black, not suitable for use as a pigment"	Free
	1922	71	"Bone black or bone char, blood char, and decolorizing and deodorizing chars or carbons"	20% ad valorem



## INEDIBLE ANIMAL FATS

TABLE XV (Continued)

Product	Act of	Para-graph	Included under	Rate of duty
Sausage casings, intestines, bladders, tendons, etc.	1909	512	"Bladders, and all integuments, tendons and intestines of animals . . . . crude, dried or salted for preservation only, and unmanufactured, n.s. p.f."	Free
	1913	419	"Bladders, and all integuments, tendons and intestines of animals . . . . crude, dried, or salted for preservation only, and unmanufactured, n.s. p.f."	Free
	1922	1655	"Sausage casings, weasands, intestines, bladders, tendons, and integuments, n.s.p.f."	Free
Blood, dried	1909	257 and 513	"Blood, dried, n.s. p.f."	1½ cents per lb. when soluble; otherwise free
	1913	420	"Blood, dried, n.s. p.f."	Free
	1922	1524	"Blood, dried, n.s. p.f."	Free
Rennets	1909	662	"Rennets, raw or prepared"	Free
	1913	688	"Rennets, raw or prepared"	Free
	1922	1652	"Rennets, raw or prepared"	Free
Glue stock	1909	584	"Hide cuttings, raw, with or without hair, and all other glue stock"	Free
	1913	504	"Hide cuttings, raw, with or without hair, and all other glue stock"	Free
	1922	1587	"Hide cuttings, raw, with or without hair, osseon, and all other glue stock"	Free

\* Under the Act of 1913, beef weasands were held to be dutiable as non-enumerated, unmanufactured articles at 10 per cent ad valorem, and not free of duty under paragraph 419 as "integuments, tendons, and intestines of animals."

TABLE XV (Continued)

Product	Act of	Para- graph	Included under	Rate of duty
Hoofs	1909	587	"Hoofs, unmanufactured"	Free
	1913	508	"Hoofs, unmanufactured"	Free
	1922	1591	"Hoofs, unmanufactured"	Free
Horns	1909	589	"Horns and parts of; including horn strips and tips, unmanufactured"	Free
	1913	511	"Horns and parts of; including horn strips and tips, unmanufactured"	Free
	1922	1592	"Horns and parts of; including horn strips and tips, unmanufactured"	Free
Hides	1909	450	"Hides of cattle, raw or uncured, whether dry, salted or pickled"	Free
	1913	506	"Hides of cattle, raw or uncured, or dry, salted, or pickled"	Free
	1922	1589	"Hides of cattle, raw or uncured, or dried, salted, and pickled"	Free
Skins	1909	676	"Skins of all kinds, raw (except sheep skins with the wool on), and hides n.s. p.f."	Free
	1913	608 and 604	"Skins of all kinds, raw, and hides, n. s. p. f."	Free
	1922	1666	"Skins of all kinds, raw, and hides, n. s. p. f."	Free

## INEDIBLE ANIMAL FATS

TABLE XV (Concluded)

Product	Act of	Para-graph	Included under	Rate of duty
Gelatin, glue, glue size	1909	23	"Gelatin, glue, . . . glue size"	Glue size 25% ad valorem. Gelatin and glue dutiable at rates varying with value of the product <sup>b</sup>
	1913	34	"Gelatin, glue and glue size"	Dutiable at rates varying with value of the product <sup>c</sup>
	1922	42	"Edible gelatin. . . ; gelatin, glue, and glue size"	Dutiable at varying rates, according to value of product <sup>d</sup>
Glycerine	1909	24	"Glycerine, crude, not purified"	1 cent per lb.
			"Glycerine, refined"	3 cents per lb.
	1913	35	"Glycerine, crude, not purified"	1 cent per lb.
			"Glycerine, refined"	2 cents per lb.
	1922	43	"Glycerine, crude"	1 cent per lb.
			"Glycerine, refined"	2 cents per lb.

<sup>b</sup> Act of 1909: Gelatin, glue . . . valued at not above 10 cents per lb., 2½ cents per lb.; valued at 10 to 35 cents per lb., 25 per cent ad valorem; valued above 35 cents per lb., 15 cents per lb. and 20 per cent ad valorem.

<sup>c</sup> Act of 1913: Gelatin, glue, and glue size, valued at not above 10 cents per lb., 1 cent per lb.; valued at 10 to 25 cents per lb., 15 per cent ad valorem; above 25 cents per lb., 25 per cent ad valorem.

<sup>d</sup> Act of 1922: Edible gelatin, valued at less than 40 cents per lb., 20 per cent plus 3½ cents per lb.; at 40 cents or more, 20 per cent ad valorem plus 7 cents per lb. Gelatin, glue, glue size, 20 per cent plus 1½ cents per lb. when valued at less than 40 cents per lb.; 20 per cent plus 7 cents per lb. when valued at 40 cents and over.

## INDEX

- Abattoirs, centralization of, to facilitate inspection, 272-73, 299; municipal or co-operative, 151-52; see Meat packing**
- Acids, free fatty: content of, in inedible animal fat, 49; in tallow and greases, 50-51; in house grease, 187**
- Adulteration and misbranding, 18-19; federal regulations, effect on trade, 273-76; of lard and substitutes, 144; see Labeling**
- Ammonia:**  
content of tankage, affected by processing, 81; increased by "stick" and blood, 72  
loss, in decomposing fats, 50  
ratios of, to nitrogen and protein, 60  
in tankage and cracklings, 59, 83-84
- Argentina:**  
imports of by-products from, 249, 257  
quarantine on meats from, 268
- Bakers, utilization of lard and shortenings by, 140**
- Baltimore, municipal reduction at, 230; contract for reduction at, 230; garbage treated at and yields of product, 237; number of renderers at, 184**
- Beef:**  
on an import basis, 265  
production of, 170, 172  
meat, bone, and fat, in average, 65-66  
"Big Five," 177, 181  
"Big Four," 122
- Blood:**  
as a fertilizer and feed, 38  
products from, 46  
yield of, per animal, 38, 40, 41
- Bone char, 47 n.**
- Bones:**  
in cracklings, 60; as poultry feed, 252  
degreasing of, 36, 54, 63  
demand for, 252  
imports of, duty free, 250  
phosphate from, 249  
steam bone, 54, 83  
utilization of, 36, 46-47, 63, 71-72, 73, 190
- Boston: digester process of municipal reduction at, 230; garbage collection, 218; garbage treated and yields of product, 237; number of renderers at, 184**
- Bridgeport: municipal reduction at, 231; garbage treated and yields from, 237**
- Buffalo, number of renderers at, 184**
- Bureau of Animal Industry, 160, 167, 169; see Meat inspection, federal**

**Butchers:**

co-operative organization of, 273

definition of, 37

retail, 146-48, 179

shops of, increase in, 114;  
use of wastes in, 67-68;  
waste meats in, 62, 64-66,  
188-89

Butter fat, refining of, 76, 274-75

By-products of the meat industry:

classifications of, 46-47

co-operative processing, 145-46

demand for, increasing, 245, 262-63, 285-86

economic position, betterment of, 261

food specialties, 186

foreign competition in, 251

imports: for consumption, 247-50, 285; countries of origin of, 249-50; European, 251-52; tariffs and free list for, 250-51

industries producing, 46-47, 286

mass production, 34-35

summary of facts concerning, 245-47

used in almost every article of commerce, 294; in edible fat, 62-63; in inedible fat, 62-67

utilization varying in different classes of plants, 123; in co-operative plants, 144-45; in local plants, 22-27, 144

value of dead animals, 179

volume of, 39-43

world trade in, 247

yield from slaughter under federal inspection, 129

**Calves:**

adjusted percentages of federally inspected, to total slaughter, 162, 163

immature, 14

inedible tallow from, 63

losses, yearly, on farm and range, 30

potential yield of meat and by-product from, 40-42; yield of inedible tallow and animal grease per head, 63

shrinkage, 40-41

slaughter, statistics on, 162

weight, average live, 41, 155; total, 40

Capital investment, higher in official plant, 18; large, for by-product manufacture, 37

Casings, yield of, 40-41

Catch-basin equipment, 70, 128; see Grease traps

**Cattle:**

condemnations of, 131-32

kill, non-federally inspected, 117, 136; retail and wholesale, 27, 115

losses, on farm and range, 30, 268; condemnations, under federal inspection, 29, 133-34, 162, 163

offal, edible from, 28

shrinkage, 40-41

slaughter of, 40, 162

tuberculosis, transmissible to man, 268

weight, average dressed, 154; live, 155; total, 40; per animal, 41

- Cattle (Continued):**  
 yield: of fat, total, 74; potential, of meat and by-product, 40-42; of inedible tallow and animal grease, per head, 63, 143 n.
- Census, bureau of:**  
 biennial census, 167, 299; supplement to, on rendering industry, 197-99  
 preliminary report of 1927 on "grease and tallow industry," 110  
 reliability of statistics presented by, 109, 149, 164
- Census of manufactures, 192-95, 199**
- Census of meat packing, inadequate, 122 n., 158-59**
- Chicago:**  
 animals received at stockyards of, 1928, 181  
 average yearly wholesale price of tallow and grease at, 259; of palm oil, 259-60  
 cost of garbage collection at, 212  
 garbage treated and yields, 237  
 number of renderers at, 184  
 quotations for "butchers' offal" at, 68  
 solvent method of municipal reduction at, 223-24
- Cholera, see Hogs and pigs**
- Cincinnati:** garbage treated at, 237; contract for garbage reduction at, 230; number of renderers at, 184
- Cleveland:** cost of garbage collection at, 212; garbage treated and yields, 237; number of renderers at, 184
- Coconut oil, use of, in soap, 255-56**
- Color, of grease: reading of, by Lovibond glasses, 50; restrictions on use of bleaching materials, 70, 274-76**
- Condemnations:**  
 of livestock, 32-33, 129-31  
 losses from, of official and unofficial plants, compared, 15, 17, 137-38  
 of sheep, lambs, and cattle, under federal inspection, 133-34  
 source of packers' inedible fat, 64, 118, 129-30  
 for tuberculosis, 33, 134, 268  
 of viscera, 130-31  
 "Consent Decree," 181, 183
- Consumption: of fats, 257-59; of meats, 266-67**
- Cracklings:**  
 description and uses, 59-61  
 from dry-rendering, 86  
 edible and inedible, 69, 284  
 imports, duty free, 250  
 lard, 59  
 as a poultry feed, 252  
 production of, 98, 198-99; trends in, 287  
 protein content, 60, 86, 188  
 quotations on, methods of calculation, 60  
 sold to compounders, 60, 190  
 yield from various sources, 74, 283-84  
*See also Appendix Tables*
- Dayton:** cost of garbage collection at, 212; garbage treated and yields, 237
- Dead-animal business, 30-31, 178, 181-82, 215**

"Degras," 73

Denaturing, 24-25, 135, 292-93  
 Department of Agriculture, on  
 slaughter not subject to  
 federal inspection

Detroit: contract for garbage  
 reduction at, 230; cost of  
 garbage collection at, 212;  
 garbage treated and yields,  
 237; number of renderers  
 at, 184

Digester method, *see* Rendering

Diseases, animal:

condemnations, proportion  
 of, 6-12, 33, 63, 130-31

dissemination of, as a result  
 of divided responsibility  
 for inspection, 14, 138-39,  
 267-69, 291-92

expenditure for control of, 31  
 farm losses from, 29-31

problem of regulation, 8-9,  
 268-69

transmission of, and regula-  
 tory controls, 267-68

District of Columbia, municipal  
 reduction in, 231, 237

Division of Crop and Livestock  
 Estimates, 164

"Dress," for sheep, hogs, and  
 cattle, 126; trade customs,  
 64-66; dressed weights, 40 ff.

Edible fats: supply of, 3-4; *see*  
 Lard, Oleo, and Tallow

Exporting: of meats, 266; of  
 animal by-products, 257-  
 58, 285-86; of meats and  
 food fats, limited to feder-  
 ally inspected plants, 10-  
 11

Expression of vegetable oils, 77,  
 275-76

Fats:

beef and sheep, edible, 23,  
 132-33, 285

commodity by-products of, 46  
 competition of, with substi-  
 tutes, 261-62, 285

consumption of, per capita,  
 257, 258

decomposition, effect of, 49  
 demand for, industrial, 3-4,  
 253-57, 285-86

difference between food and  
 industrial, 4-5, 48-49; shift  
 in use, 253

edible, kinds and uses of, 63;  
 yields of, 133

in Europe, 253

exports, 258

extraction, 222; processes of,  
 76-88; *see* Rendering, Mu-  
 nicipal reduction

hog, edible, 132; market, 23

hydrogenation process, 254

imports, inedible, 249, 285

industries producing, 47

inedible (rendered)—

defined, 48-49

denaturing of, 24-26

factors in commercial  
 grades, 51

free fatty acids in, 49

kinds and uses of, 4-5, 284-  
 85

methods of sale of, 51-52

uses of, 51

labeling of, 273-74

meat inspection, effect on  
 utilization of, 21-24, 124-  
 25, 138; effect on methods  
 of extraction, 75-76, 273-  
 76

mixing or blending hog and  
 beef fats, 116

- Fats (Continued):**  
 prices: developments in, 94-95, 259-61, 262; effect on utilization of, 127-28; of trimming and shop, 67  
 production: effect of inspection on, 21-28, 291-93; relation to slaughter, 117-20; trend of, 89, 262, 286-88  
 production methods, contrasted with vegetable oils, 75-76  
 quality of, for soap making, 254  
 ratio of, to tankage, feeds, fertilizers, etc., 97, 197-99  
 raw materials, rendered for, 63, 127-28  
 refining, restrictions on, 274, 291-93  
 regulation, effect on, 4-5, 124-26  
 relation of production of edible and inedible to spread in prices, 127  
 relationship to food industries, 1-3  
 rendered, yield of, 74-75  
 shop, 64-66, 74, 117, 135-36  
 in soap industry, 255; *see* Soap, Lubricants  
 sources of, 282  
 specifications in contracts of sale, 50-52  
 in tankage, 60  
 trade practices in United States, and other countries producing, 74-88  
 in unofficial plants, 25-27, 142-45  
 value of, annual, 90-92  
 volume of, 282-83  
 world supply, 253-54  
 yields of rendered, from various sources, 73-74, 135, 262-63, 283-84, 287-88  
*See* Greases, Tallow
- Federal Trade Commission**, report on changes in the rendering industry of, 180-83; Act of, 269
- Feeds:**  
 imports of, 247-48  
 mixed, constituents of, 60, 83-84; demand for, 190  
 poultry, 252  
 tankage and cracklings in, 59-61
- Fees**, for local meat inspection, 19
- Fertilizer and feeds**, 59-61, 92, 97, 190, 284; imports of, 249; agricultural demand for, increasing, 252; *see* Tankage
- Fills**, sanitary, 213
- Fish**, oil obtained from, 73
- Food:**  
 changing habits of consumption of, 294  
 effect of custom on demand for, 253-54  
 and meats, comparison of regulatory problems, 269  
 waste of, 218 f.
- Food and Drugs Act**, 12-13, 269
- Foods of animal origin in the dietary**, 2
- Garbage:**  
 composition of, 210-11, 217-18  
 dry tankage from, 221  
 dumping, 219  
 hog feeding of, 219, 227, 238, 242, 246



- Garbage (Continued):**  
 moisture and fat content, 74  
 per capita production, 296  
 quality and quantity of, factors influencing, 227  
 recoverable materials, 213  
 utilization of, 69  
 value of: as a feed to hogs, 239-44; as a fertilizer, 241  
 volume and composition, 217-19, 236-38  
 yield, annual, of greases and fertilizer or tannage from, per capita, 44, 244  
*See* Reduction, municipal; Rendering; Hogs and pigs
- Gelatin**, 91, 135; tariff on, 251
- Glue**, 71-72, 91, 135, 190; tariff on, 251
- Glycerin**, 50-51; imports of, 249
- Grades of fats**, determined by process, 75-77
- Grease:**  
 bone—  
   by-product of glue and gelatin, 54  
   materials for, 54  
   production statistics on, 101  
 brown—  
   defined, 53  
   production statistics on, 101  
 garbage—  
   characteristics of, 52, 220-21  
   production statistics on, 101  
   raw materials for, 68-69  
 house—  
   processes for extraction of, 187-88  
   production statistics on, 101  
   quality of, 68  
   raw material for, 52, 68-69, 187  
   white—  
     defined, 53  
     raw materials for, 53-54  
   yellow—  
     defined, 53  
     production statistics on, 101  
     raw materials for, 53-54  
*See also* Appendix
- Grease oil**, description and uses of, 55
- Grease traps (interceptors)**, description of, 69-70
- Greases, general:**  
 consumption of, per capita, 258  
 denaturing of, 21-24  
 distinction of, from tallow, 49-50  
 establishments producing, development of, 183-94  
 export trade in, 55, 257, 284  
 garbage, 44, 52, 68, 108, 113, 199, 220-21, 236, 244, 256, 259, 288  
 grades, affected by meat inspection, 54  
 hog, in soap, 256, 258  
 house, 52, 68-69, 108, 113, 187-88, 199, 288  
 kinds of, 52-54  
 lard oils, made from, 55  
 level of prices, 260; affected by competitive substitutes, 262  
 naphtha or extraction, 52  
 in official plants, 131-32  
 packers' and non-packers', 52, 287-88  
 packing-house, grades of, 52-54, 118; bone, 54; prices of, 259; production of, 101; source of, 131

- Greases (Continued):**  
 production of, data on, 93,  
 101, 104, 107, 108, 140-41,  
 191-92; trends of, 94, 100,  
 103  
 renderers', production of, 101,  
 191, 200; value of, 259  
 from sewage, 69-70  
 sources of, 62, 69-73, 131,  
 132, 283  
 stearin, 55, 190  
 tariff on, 250  
 titre test of, 50  
 in unofficial plants, 21-24,  
 142  
 used by "pressers" and stea-  
 ric acid manufacturers, 54-  
 55, 284; for food, 24; for  
 soap, 254-56  
 value of annual output, 90  
 volume, as a factor in grades,  
 54  
 wool, 73  
 yield per head, from sound  
 animals, 63, 163 n.  
*See* Oils, Lard, Lubricants
- Hides and skins:**  
 free entry of, 250  
 imports of, 249  
 market for, 22, 194  
 output of, by rendering in-  
 dustry, 190  
 products derived from, 46  
 return from, 35
- Hogs and pigs:**  
 average live weight of, 155  
 cholera and tuberculosis, pre-  
 valence of, 11, 32, 118, 204;  
 condemnations for, 132,  
 139, 268, 291; preventive  
 treatment for, 243  
 condemnations of, 131-32  
 garbage fed to, 44, 113, 219,  
 227, 239-44, 284, 297  
 live weight, total, 40; per  
 animal, 41  
 losses (excluding pigs), 29;  
 on farm and range, 29, 30  
 meat residue fed to, 252  
 shrinkage, 40-41  
 slaughter, 40, 162-166; trend  
 of, 168-69  
 yields: of fat, total, 74; po-  
 tential, of meat and by-  
 product, 40-42; of inedible  
 tallow, and animal grease,  
 per head, 63, 119, 141
- Horses:**  
 consigned to grease tank, 71,  
 72  
 dead, in cities, 70-71  
 extension of inspection to  
 slaughter of, 6  
 inspected slaughter of, 9  
 number of, 70  
 oil from, 71  
 wild, rendered, 72  
 yearly losses, on farms, 30  
 yield of fat, total, 74
- Hotels, see** Restaurants
- Hydrogenation, limitations and  
 use, 254**
- Importing: of meats, 266; of  
 packing-house by-prod-  
 ucts, 247-49**
- Incineration, extent of, 234; of  
 municipal refuse, 212-13,  
 215-16**
- Indianapolis, municipal reduc-  
 tion successful at, 224-26,  
 232; number of renderers  
 at, 184; costs and returns  
 at, 232; garbage treated  
 and yields, 237**

- Inspection, *see* Meat inspection  
 Inspectors, federal, 10; requirements of, 17
- Iowa, rendering industry in, 204-5
- Kansas City, animals received at stockyards of, 1928, 181; number of renderers at, 184; garbage feeding at, 241
- Labeling, 273-74, 289
- Labor, in meat packing, 34
- Lamb, production of, 170; *see* Sheep and lambs
- Lard:  
 "barometer," of fat and oil prices, 95, 262  
 butchers', 79, 140  
 country-style, 79, 273-74  
 dry-rendered, 87  
 "Dutch," 135  
 Liverpool grades, 76  
 in local plants, 23-24  
 output of official and unofficial plants, 141  
 production of, overestimated, 39, 41 f.  
 refining of, limitations on, 273-76  
 soft, stiffened by lard stearin, 55-56  
 yield of: as affected by fat backs, 39; per animal, 41; total, 40
- Lard oil, description and uses, 55
- Lard substitutes and compounds:  
 made from uninspected fats, 23, 26  
 meat inspection of, 12  
 new process for using inferior animal fats for, 145
- Livestock:  
 collection of, by renderers, 188  
 dead, in cities, 70-71, 215; number of, 30; permit for entry into packing plant of, 33; prices of, 190  
 diseased, slaughter of, 15, 33  
 regulations on interstate shipment of, 32-33  
 shipping losses on, 31-32
- Lorain, Ohio:  
 abandonment of reduction at, 235 f.  
 contract for garbage reduction at, 230  
 garbage treated and yields, 237
- Los Angeles, feeding of garbage to hogs at, 243-44; number of renderers at, 184; cost of collection at, 212
- Losses and wastes:  
 average yearly, of meat animals on farm and range, 29-30, 38, 268, 293-94  
 causes of preventable, in production, 1, 37  
 condemnations, 17  
 in consumption, 44  
 in dressing, 126-27  
 economic, 293-94  
 on farms, 29-31  
 by local packers, 138  
 magnitude of, 1-2, 268  
 in marketing, 31-33, 44  
 municipal, 209, 210-11  
 in restaurants and hotels, 68-70  
 in shipping, 32-33  
 in slaughtering, 38, 66-67

- Losses and wastes (Continued) :**  
 sources of, 178-79, 187-88, 288  
 trade customs, 65-67  
 in utilization, 44, 99-100  
*See* Condemnations
- Lubricants, fats selected for,**  
 256, 284; function of grease oils in, 55; tallow selected for, 57; competition of fats and mineral oils in, 261-62
- Marketing of meats, retail, 15-16; zoning, 290**
- Meat consumption :**  
 percentages of fresh and cured, to total, in rural and urban communities, 145-46, 172  
 reduction in intake of fats, 187  
 relation of, to rendering business, 207  
 total domestic, 266-67
- Meat inspection :**  
 economic consequences of separate administrations of, 17-19, 265-67, 270-71, 279  
 effect of, on production of fats, 21-28, 289; on meats, 273; on packing-house practice, 124-26, 274-76  
 enforcement of, in intrastate trade, 25, 138  
 evasion of, 14, 138  
 federal—  
 admittance of outside wastes by, 134-35  
 advantages of, 19  
 costs of, 17-19, 272, 298  
 description of, 9-13  
 disadvantages to plants from, 17-19, 24-26, 138 f.  
 effect on grades of grease, 53-54  
 exemption of farmers and retail slaughterers from, 16  
 need of reconsideration, 268, 273-76  
 size of plants using, 121-22  
 foreign, 8  
 of horses, 9  
 for peddlers, 15  
 of poultry, 8, 9  
 purposes of, 7-8, 289  
 remedies suggested for, 271-72, 298-99  
 sanitary consequences from separate administrations of, 267-70; remedy for, 272-73  
 state and municipal—  
 character of, 13-16, 267  
 inadequacy of, 15-16, 137-38, 272  
 proportion of, 162  
 tends to maintain present stratification of industry, 270
- Meat Inspection Act, 6, 9-13, 19-20, 33, 147, 150, 263, 265-66, 268, 270, 298**
- Meat Inspection Service, 13, 125, 129-30, 157**
- Meat packers :**  
 local and unofficial—  
 business of, 21-23, 35-36, 123  
 by-products of, 35-36  
 grease output of, 140-41  
 growth of business of, 136-37, 179, 267  
 limitations on, 14, 37  
 losses of, less than official packers, 138

- Meat packers (*Continued*):**
- local and unofficial (*Cont.*)—
    - may not ship beyond state lines, 13-14
  - national or international, 123-24
  - production of, 1927, 106
  - regional, 122-23
  - relation of rendering business to, 184-85, 208
  - shipping practices of, 263 f.
  - specialization of, 124
  - stockyards' renderers owned by, 182
  - See* "Big Four," "Big Five"
- Meat-packing industry:**
- by-products of, 34-43
  - decentralization in, 36, 172
  - defined, 37
  - economic characteristics of, 34-36, 177
  - geographical distribution of, 201
  - labor specialization in, 34
  - modern aspects of, 34-38
  - municipal abattoirs, 272-73
  - organization of, changes in, 180-81
  - production: comparison of slaughter and fat, 118, 207; of tallow and grease, 107, 108; trends of, 103-4
  - regulation of, 269, 289-91; effect of, 291-93; *see* Inspection, Quarantines
  - subsidiaries of, 194
  - utilization of by-products by, 123
  - value of total product, 39
  - wholesale, total dressed weight of classes of stock in, 146
  - See* Packers
- Meat-packing plants:**
- capital investment of federal and local inspected, 18
  - co-operative, 144-45
  - data on, from census of manufactures, 193-94
  - federally inspected, 121-22, 124-25, 128
  - handicaps and advantages of federal and local inspection, 17-21, 123, 138
  - increase in number withdrawing from federal inspection, 20-21, 136
  - interstate, 16, 142
  - local or unofficial, 14, 16, 139-40, 142, 268
  - production of fats, trends in, 103-4
  - slaughtering, 200-201
  - variations in by-product utilization of, 123-24
  - wholesale, 121, 136-46, 164
  - See* "Big Four"; "Big Five"; Meat-packing industry; Reduction, municipal; Reduction works; Rendering industry; Slaughtering business
- Meat production:**
- commercial, 1909, 166
  - custom slaughter, 152
  - data on total, 169-70
  - farm, 277
  - sources and limitations of basic data, 156
  - trend of, 167-68, 277, 287
  - yields: estimated, of meats and packing-house by-products, 1928, 40-42; percentage of wholesale under federal inspection, 136; total, 168; trend of, 262

- Meat specialties, 63, 133
- Meats:
- certification of, for export, 10
  - condemnation of, 10-11
  - consumption of, underestimated, 42-43; of fresh and cured, 145-46
  - decline of exports of, 266-67
  - exports, as affected by foreign embargoes, 8-9, 266 green, 37
  - inspection of, *see* Meat inspection
  - interstate trade in, limited to official plants, 11-12, 22
  - marketing zones for, 13-16, 269-70
  - production statistics of, inadequate, 169-73
  - wholesomeness of, 7-8
  - See* Marketing of meats, Meat production
- Melting, 77-78
- Michigan City, municipal reduction at, 232
- M.I.U., defined, 50; effect on grades, 50
- Moisture, effect of, on rendering, 74; on fats, 83
- Motor transportation:
- effect on meat packing, 145, 179
  - influence upon rendering industry, 112-13, 189-90
  - reduces shipping losses, 32
  - relation to meat inspection, 267
- Municipal Index, 212, 234
- Municipal reduction, *see* Reduction, municipal
- Mutton, production of, 169; on an import basis, 266
- National Provisioner, The*, 183, 185, 200
- Neatsfoot oil, description and uses, 57
- New Orleans, slaughtering in, 151
- New York, quotations for "butchers' offal" at, 68; number of renderers at, 184
- Nitrogen, *see* Ammonia
- Offals:
- amount from cattle, calves, and sheep in local plants, 142
  - butchers', quotations on, 68
  - co-operative processing of, 144
  - definition of, in American trade, 62-63
  - edible, per cent of, per animal, 128
  - "fancy meats," 62-63
  - fed to hogs, 115, 240, 297
  - increase in use of, 139
  - kinds of, used in different grades of grease and tallow, 54
  - quotations on, Chicago and New York, 68
  - rough or killing, 43, 46
  - slaughterhouse, 118, 186, 294-95
  - tallow from, 117
  - treatment of, in inspected plants, 10, 131-35
  - volume of, 282; as a factor in disposal, 22, 123-25
  - waste of, 177
  - yield of, in official plants, 10
  - See* By-products
- Oilcakes, effect of, upon tankage prices, 262-63

- Oils:**  
 coconut, 255, 258  
 competition of, with substitutes, 261-62  
 copra, 276  
 cottonseed, 255, 262  
 in Europe, 253  
 fish, 258  
 horse, 71, 199; tariff on, 250  
 imports of inedible, 249  
 industrial demands for, 253-54  
 lard, 55, 116, 190, 197  
 mineral—  
   competition of, with vegetable, 253-54, 261-62  
   replacement of vegetable oils by, in lubricants, 256-57  
 neatsfoot, 57; tariff on, 250  
 oleo, growing use of, in bakers' products, 23  
 palm, 256; wholesale prices at Chicago of, 259-60  
 per capita consumption of, 258  
 processes of extraction, 76-88  
 red, 55, 116, 190, 255  
 restrictions on, for food use, 274-75  
 in soap industry, 255  
 tallow, 197  
 vegetable—  
   consumption of, 257-59  
   grade and quality, how determined, 273  
   imports of, 4, 285  
   methods of extraction, contrasted with animal fats, 75-76  
   palm oil, 256; per capita consumption of, 258  
   restrictions on, 273-76  
   use of, in soap, 255-56  
   world production of, 253; European, 253
- Oleo:**  
 materials for, 56-57, 58  
 packing-house yield of (potential), total, 40; per animal, 41-42  
 in unofficial plants, 22-24  
 Oleo stock, 56, 57-58, 78, 137  
 Oleomargarine, 58; animal materials for, 77; meat inspection for, 12; tax on, 272; use of inspected fats in, 22-23
- Omaha, animals received at stockyards of, 1928, 181; feeding garbage to hogs at, 243**
- Packers and Stockyards Act, 164, 183**
- Peddlers, meat, 147-48; absence of inspection for, 15**
- Pharmaceuticals, made from animal by-products, 47**
- Philadelphia:**  
 cost of garbage collection at, 212  
 costs and returns of reduction at, 233  
 disposal of garbage at, 235 f.  
 garbage treated and yields, 237  
 number of renderers at, 184
- Pittsburgh:**  
 contract for garbage reduction at, 230  
 cost of garbage collection at, 212  
 garbage treated and yields, 237  
 number of renderers at, 184

- Pork, production of, 170; exports of, 266; retailers, practices of, 65-68; quality, from garbage, 239-44; raw, affected by trichinosis, 242
- Poultry, inspection of, 9; avian tuberculosis, 8
- Pressers, processing of greases by, 51, 54-55
- Prices: of greases, 259; of palm oil, 259; of tallow, 259; of tankage, 259-61; *see also* Appendix Tables
- Processes of production or extraction of animal or vegetable fats and oils, 76-88
- Production, distribution, and consumption of meat, 29
- Prosecutions, for sale of diseased meats, inadequacy of law, 269
- Quarantines:
  - foreign, on meats and live-stock, purpose of, 9, 266 n.
  - import, 8
  - stockyard, 32, 266
  - as a substitute for tariffs, 266
- Railroads: livestock claims against, 31-32; 28-hour law, 32; relation to enforcement of meat inspection of, 10, 25, 290
- Red oil:
  - description and uses of, 35
  - made by renderers, 190
  - used in soap, 255
- Reduction, municipal:
  - at Baltimore, 230
  - at Boston, 230
  - at Bridgeport, 231
  - capital investment for, 210
  - causes of failure, 227-29
  - characteristics of, 220; trends, 232-38
  - classes of wastes for, 210-11; volume of, 211
  - contracts with renderers, for fallen animals, 71, 189, 211, 215
  - contractual vs. municipal operation, 230-31, 233
  - costs: true cost of, 220; profits and losses, 230-33
  - defined, 209, 219
  - digester method for, 222 f., 230
  - in District of Columbia, 231, 237
  - fats and fertilizer from, 246
  - financial results from, 219 f.
  - garbage grease, 220-21, 236
  - indicated changes in, 278-79
  - methods and machinery, 222
  - at Michigan City, 232
  - need of research, 278-79
  - odors, elimination of, 213
  - plants: in various cities, 224-26, 230-33; costs of, 214, 229-31; design and equipment, 228-29; inefficient management of, 227-28; profits from, 220, 232
  - politics, rôle of, 227-28
  - problems of, 219-22, 227-29
  - processes, 222-26
  - at Rochester, 212
  - solvent method, 87, 222, 223 f.
  - statistics on, 235-38
  - tankage recoverable through, 221-22, 236
  - trend of, 233-35
  - volume of raw material and products for, 237
- See* Reduction works, Refuse, municipal



- Reduction works:**  
 output of, comparative, 1914-27, 104; of tallow and grease, 107, 108, 191-92, 199, 288; of tankage and cracklings, 198-99  
 volume of garbage processed by, 219  
*See* Reduction, municipal
- Refining:**  
 advances in, 253-54  
 of fats, limitation on, 48-49, 264  
 of oils and fats, contrasted, 76-77, 273-76  
 in soap industry, 254
- Refuse, municipal:**  
 assessments for, 212  
 character, volume, and disposal of, 209-17, 239-44  
 cost of collection, 211-15  
 disposal methods for, 212-14, 227, 239-44  
 duplication of functions, 211, 214  
 garbage: factors affecting, 227; recoverable value for, 219; separation from rubbish, 220; volume of, 235-36; *see* Garbage  
 handling of, 211, 296  
 incineration, 212, 213, 214, 215-16, 219, 229-30, 246  
 solutions to the problem, 215-17, 229
- Regulation:**  
 affecting future of rendering industry, 262-64  
 catch-basin equipment, 70  
 of food, feed, and fertilizers, 5, 269, 274-76  
 of rendering industry, 279  
*See* Meat inspection
- Rendering:**  
 definition of, 175  
 dry, 84-87  
 economic characteristics of, 75-76  
 as a machine process, 194  
 melting, 77-78  
 open-kettle, 78-80  
 solvent extraction, 87-88  
 steam or pressure, 77  
 as a sterilization process, 26  
 tanks used in, 125  
 wet or steam, 80-84
- Rendering industry:**  
 advantages of small over large plants in, 182-83  
 by-products of, 190  
 "chains," 207  
 characteristics of, 175, 194-96, 205-8  
 contracts with municipalities, 189  
 defined in modern usage, 175-76  
 dissociation of, with meat-packing industry, 207  
 distribution of, geographical, 201-5, 295-96  
 economic and regulatory problems of, 279-81  
 expansion of, 183, 295  
 future of, affected by status of meat inspection, 263-64  
 history of, 176-85  
 immediate problems of, 263; indicated changes, 279-81  
 location and ownership of plant of, in different cities, 184-85; packer control, 182, 208  
 methods of paying for materials for, 188-89  
 mixing practices of, 116, 192

- Rendering industry (*Cont.*):  
 output, comparative, 1914-27, 104, 106; of tallow and grease, 107, 108, 191-92; of house and garbage grease, 108, 192; of beef fat, 111  
 plant value of, in relation to product, 194-96, 197  
 production: of tankage, feeds, and fertilizer, 197-98; of tankage and cracklings, 198-99; diversity of, 199; for 1927, 199-200; growth of, 106-10, 190-91  
 products of, 186, 190, 192, 198  
 raw materials for, 62-74, 186-89  
 regulation of, municipal, 196-97  
 rising prices of products of, 259-61  
 sources of grease of, 69, 111, 112-13, 114, 288  
 source of raw materials of, 186-90, 192, 263  
 specialization in, 188-89, 195, 206  
 standardization of grades in, 279  
 statistics on wages, labor, products, etc., 193-94  
 suited to development of cooperative marketing organization, 280, 299-300  
 trends toward larger scale of production and utilization of capital, 195-96, 262-63  
 Rendering plants, number of, in principal cities, 184; control of, 184-85; general distribution, 201-5; indicated changes, 279-81
- Restaurants and hotels:  
 as affecting success of reduction, 227  
 methods of preparing meats in, 69  
 patronage of, 113-14  
 wastes in, 69-70, 186-87
- Rochester, data on municipal reduction in, 212; cost of garbage collection at, 212; costs and returns of reduction at, 233; garbage treated and yields, 237
- St. Louis: cost of garbage collection at, 212; garbage feeding at, 241; number of renderers at, 184
- Salvaging:  
 factors of demand influencing, 247, 262  
 of farm and range animals, 30-31  
 growth of, 178-79, 294-95  
 industries, *see* Salvaging industries  
 problems of, 297-98  
 products of, 284  
 quantitative data on, 92-98  
 of rejected animals, 33  
 trades engaged in, 2, 286
- Salvaging industries:  
 growth of, 294-95  
 outline of, 1-2  
*See* Rendering; Meat-packing industry; Reduction, municipal; Garbage
- San Francisco, garbage feeding at, 243; number of renderers at, 184
- Sanitary restrictions, 123, 124, 267-70; *see* Quarantines, Regulation

**Sanitation:**

of garbage hogs, 242-43  
 of unofficial plants, inadequate, 17-18

slaughterhouse, a prime need in regulation, 10-11, 17

Sausage, demand for, 22; shortage in lean beef for, 115

Schenectady: costs and returns of reduction in, 233; garbage treated and yields, 237

**Sheep and lambs:**

adjusted percentages of federally inspected to total slaughter, 162

average live weight of, 155; dressed weight, 154

condemnations of, 133-34

"dress" of, 67, 126-27

losses, average yearly, under federal inspection, 29, 133; on farm and range, yearly, 30

shrinkage, 40-41

slaughter of, 40, 164

yields, potential, of meat and by-product from, 40-42; of inedible tallow and animal grease, per head, 63

Shipping of carcasses, trade customs of, 64-65, 126; from farms, 150

Shop fats, 67-69, 83, 178, 189

Shortening, homemade, 23, 69, 187; by retail butchers, 67; *see* Lard

Shrinkage of livestock in dressing, 40-42

**Slaughter:**

adjusted percentages of federally inspected to total, 162

annual, 29

concentration of, 121-22  
 custom, 121, 150-53; receipts from, 161

decentralization of packing plants, 267

extent of, not subject to federal regulation, 27, 171, 267

farm, 149-50, 165

for food, 1909, 158; 1909-27, 159-60

hog, trend of, 168-69

local—

functions and problems of, 21-22

retail, extent unknown, 38, 147-48, 172-73; difficulty of inspection of, 147

sources and limitations of basic statistical data on, 156

statistics on, bases of, 154-60; inaccuracy of, 157-65; need of revision, 276-77

trend toward decentralization, 267

wholesale and retail, 142, 148, 164, 269

Slaughterers, local or "unofficial":

custom, 151-52

group classification of, 121

growth of, 115

municipal abattoirs, 272-73, 299

rendering by, 175; sale of offals to renderers, 186

restrictions needed for, 298-99

retail, 147-49, 172

scale of operations of, 21-24, 35-36, 137, 145-46, 270-71

wholesale, 152

- Slaughtering business:**  
 census on, *see* Statistics  
 effects of varying regulations on, 270-71  
 a manual process, 35  
 output of, 106, 107, 108, 119;  
 comparative, 1914-27, 104  
 plants of, locations, 200-201  
 profit, margin of, reduced by  
 condemnations, 269  
 relation of, to fat production,  
 117-20  
 source of inedible animal fat,  
 62-64, 114, 287  
 zoning of markets for, 271  
*See* Cattle, kill
- Soap, demands of the industry,**  
 254-57, 284; sources of fat  
 supply of, 51, 55, 57, 188,  
 190; use of fats in, 55, 57,  
 254-55; made by render-  
 ers, 190; kinds of, produced  
 by different fats and oils,  
 254-56
- Solvent extraction, applied to**  
 hide and bone tannage, 71-  
 72; *see* Rendering, Muni-  
 cipal reduction
- Statistics, official, appraisal and**  
 criticism of:  
 census, in general, 109-10  
 condemnations, of Meat In-  
 spection Service do not in-  
 clude large number of re-  
 jected viscera, 130-32  
 lard, overestimate of, by Bu-  
 reau of Animal Industry,  
 39, 41 f.
- meats, census of manufac-**  
 tures; dressed weight of  
 carcass not a measure of  
 meats actually produced  
 154-55
- pork, Bureau of Animal In-**  
 dustry, 41 f.
- procedure suggested for im-**  
 provement of essential data,  
 172-73, 276-77
- rendering industry, census**  
 on, misleading, 192-93
- slaughter census, wholesale,**  
 omits custom kill, 157-58
- tallow and grease, understatement**  
 of, by census, 90, 96,  
 141
- total slaughter and meat pro-**  
 duction, Bureau of Animal  
 Industry, a rough approxi-  
 mation based on untenable  
 assumptions, 158-73
- Stearic acid, 55, 116, 190**
- Stearin, grease, description and**  
 uses, 55; lard, description  
 and uses, 55-56; tallow, in  
 lubricants, 57
- Steers, value of, for fat, feed,**  
 and fertilizer, 30; of fallen,  
 to by-product industry, 179
- "Stick," 72, 82**
- Stockyards, methods of han-**  
 dling shipments to, 32-33;  
 animals received at, 1928,  
 181; dead animals at, 178
- Suet, 64, 144**
- Swine; *see* Hogs and pigs**
- Syracuse: contract for garbage**  
 reduction at, 230; garbage  
 treated and yields, 237
- Tallow:**  
 beef, 56  
 butchers' scrap, 188  
 defined, 49, 56  
 derivatives of, 57  
 development of establish-  
 ments producing, 193-94

**Tallow (Continued):**

distinction from grease, 50

edible—

description and uses of,  
55-56

materials for, 57

exports of, 257

grades of, 56

inedible—

denaturing of, 21-24

grades of, 56-57

production of, 89-96

used for food, 24; for soap,  
254-56

raw material for, 63-72

yield per animal, 63, 143

level of prices, 260; affected  
by competitive substitutes,  
262

mutton, 56

neatsfoot oil stock, 57

in official plants, 21-24

oleo stock, 56, 57-58

output of renderers, 191, 200;  
prices of, 259, 260

packers', 259, 260

per capita consumption of,  
258

production of, data on, 93,  
104, 107, 108, 115, 191, 257;  
trends of, 94, 99-100, 103

quality of, 116

in soap, 254-55, 258

sources of, 49, 62, 114, 133-  
34, 186, 283, 287-88

tariff on, 250

titre test of, 50, 116, 117, 186,  
255

uses for, 284

value of annual output, 90,  
259

volume of, per head, in local  
plants, 143

yield, per head, of inedible,  
from sound animals, 63;  
from various sources, 74,  
287-88

Tallow oil, description and uses,  
57

**Tankage:**

ammonia content of, 83-84

Argentina, 261

content of bone phosphate, 83

defined, 59-60

demand for, 252

digester, 84

domestic concentrated, prices  
for, 260-61

dry, 221

fat content of, 252

fertilizer: diverted to feed  
use, 252; from renderers,  
200; non-packer product,  
84; price of, 60; produc-  
tion of, 98; yield, per cap-  
ita, from garbage, 44

garbage, 59, 187, 221-22, 260

imports of, duty free, 247-48,  
250

from municipal reduction  
plants, 221, 236

nitrogenous, 60

production of, 90, 97-98, 237;  
per pound, to inedible fat,  
by renderers and reduction  
works, 197-99, 261; trend  
of, 287

protein content of, 60, 83-84,  
188, 221, 252

prices of, 260

quality of, 83-84

quotations on, 60

sources of, 131, 283-84

uses for, 59, 60, 284

yield of, in packing house,  
40-41, 143

- Tankwater**, 223; in garbage reduction, 226; treatment of, in steam rendering, 82-84
- Tariffs:**  
upon animal by-products, 250-51  
problems, in animal by-products, 250-52  
quarantines, 8-9, 266
- Titre test**, 50, 51
- Toilet preparations, greases used** in, 55, 257, 284; *see* Soap
- Tuberculosis:**  
avian, 8  
bovine, detection of, 33  
control of, 268  
in dairy cattle, 137  
eradication, cost of, 31  
freedom of horses from, 9  
slaughter of reactor cattle with, 114 n.
- United States Food Administration**, 218
- Urbanization**, effects of, on food habits, 187-79, 267, 294
- Veal**, 150; production of, 170, 172
- Vessels**, certification of meats carried for sale or export, 10
- Wastes**, municipal, character, volume, and methods of disposal of, 209-17; *see* Losses and wastes
- Zones**, marketing, of livestock and meats, a result of present method of regulation, 13-14, 270-71

**CHECKED**  
**2003-04**

---

**THE FOOD RESEARCH INSTITUTE  
STANFORD UNIVERSITY  
CALIFORNIA**

**Established in 1921 jointly by the Carnegie Corporation of New York and the Trustees of Leland Stanford Junior University, for research in the production, distribution, and consumption of food.**

***DIRECTORS***

**CARL LUCAS ALSBERG  
JOSEPH STANCLIFFE DAVIS  
ALONZO ENGLEBERT TAYLOR**

---