

Pet Food Production and Ingredient Analysis



Prepared
for:



Prepared
by:



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Table 1, Acronym

Name or Entity	Acronym
Institute for Feed Education and Research	IFEEDER
Pet Food Institute	PFI
North American Renderers Association	NARA

Executive Summary

The pet food manufacturing industry is an increasingly important partner in the agricultural industry. The production of animal and plant-based protein and energy sources for use in pet food is tremendously diverse, providing nearly countless opportunities for creating recipes for the nation's pets. This research has sought to quantify the influence, from a volume and value standpoint, of the pet food manufacturing industry on the broader agriculture community. Consider the following findings from sales in 2018:

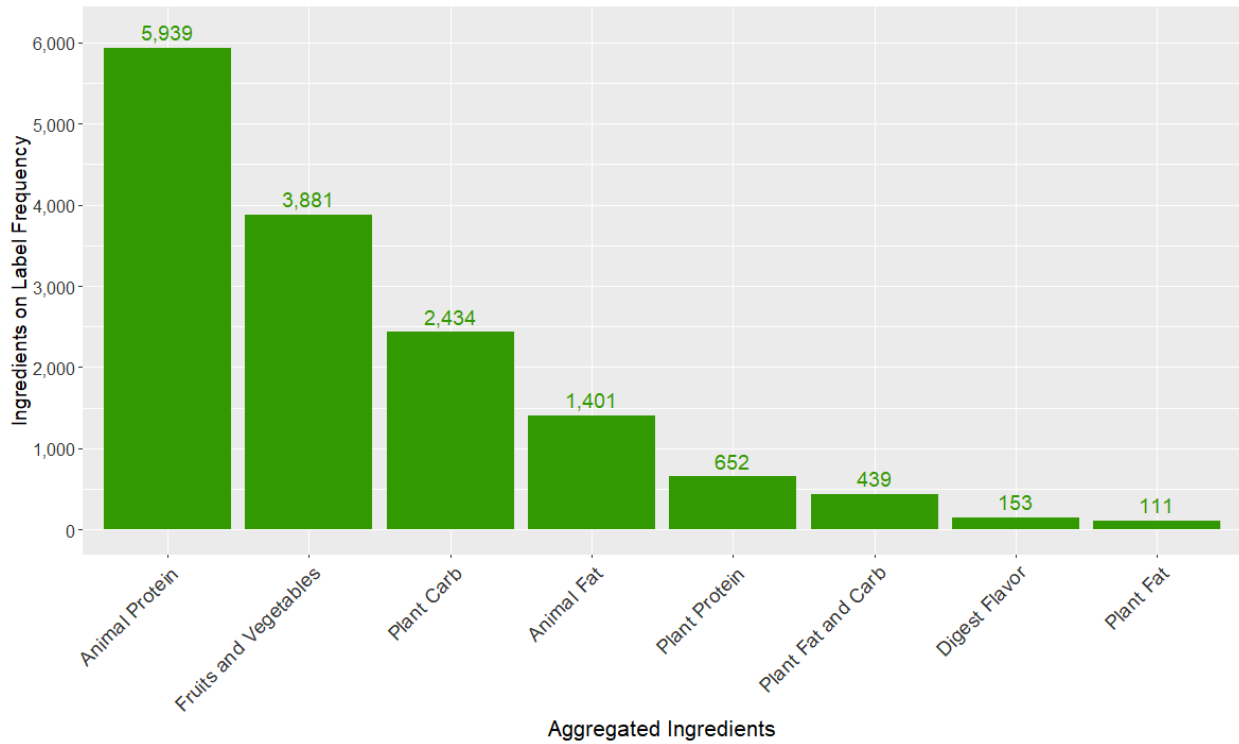
- Farmers and farm-product processors sell \$6.9 billion worth of products to pet food manufacturers every year that are used as ingredients.
- Sales made by farmers and processors of farm products to pet food manufacturers stimulates further upstream economic activity, leading to the purchase of \$5.3 billion of materials and services from farm suppliers providing necessary inputs such as seed, fertilizer, fuel, labor, machinery and repairs to produce high quality products that are used as pet food ingredients.
- In addition, farm suppliers buy \$4.1 billion in materials and services such as fuel, fertilizer, equipment and labor that they in turn sell to suppliers of farmers.
- The data analyzed indicates that 2018 U.S. retail dog and cat food sales were estimated to be \$30.3 billion from 9.8 million tons of product sales.
- Among all pet food products, the lead product was dry dog food by both volume and value, with 5.6 million tons (57% of total) and \$11.2 billion dollars (37% of total).
- Pet foods use a wide variety of ingredients. The “reverse engineering” of the pet food ingredients from the retail product labels identified 542 standardized food ingredients used in dog and cat foods. These ingredients were further categorized into 353 similar or combined ingredient classifications for which quantities and prices were determined.
- There are 164 ingredients shared by both cat and dog foods.
- There were 8.65 million tons of food ingredients used in U.S. dog and cat food manufacturing with an ingredient value of \$6.9 billion¹.
 - There were 4.0 million tons of farm and farm-product processor ingredients valued at \$1.4 billion.
 - There are more than 3.8 million tons of animal-based products with a value of \$4.6 billion used in dog and cat foods.
 - There were 1.83 million tons of meat and poultry products valued at \$3.1 billion.
 - Rendered protein meals contributed 1.5 million tons with a value of \$563 million.

¹ See Appendix D for additional information regarding comparison to total reported volumes.

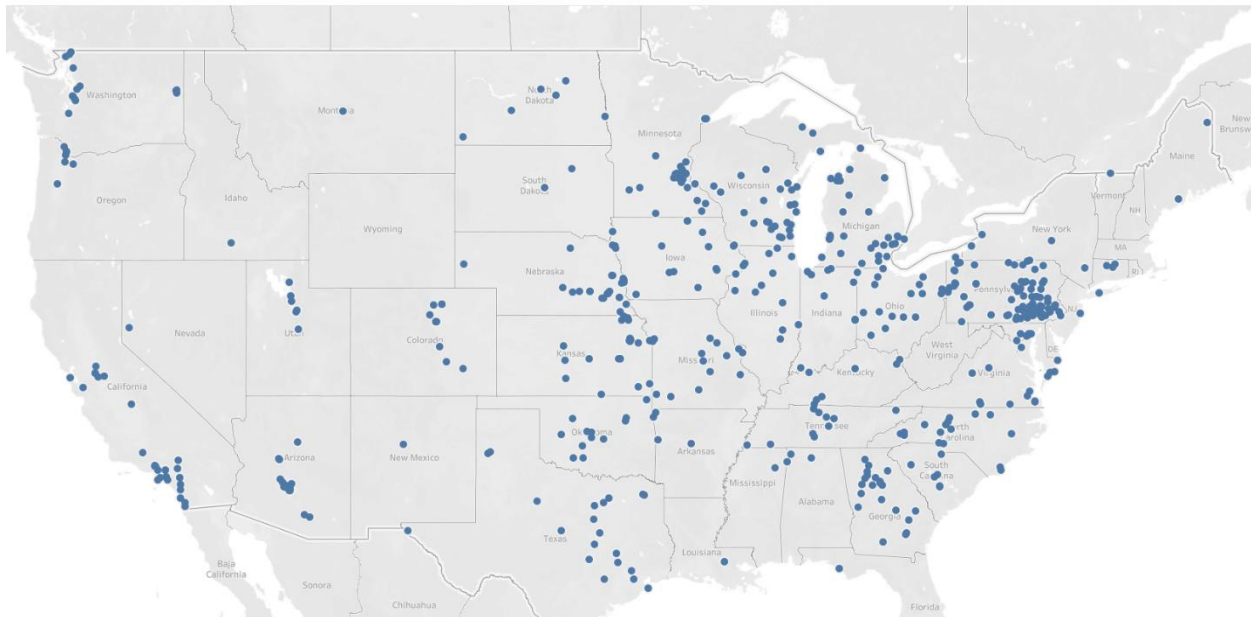
- There were 289,037 tons of animal and poultry fats with a value of \$153 million.
- Broth ingredients account for 166,851 tons with a value of \$834 million.
 - Fishery ingredients contributed 198,671 tons with a value of \$893 million.
 - Water and minerals contributed 571,164 tons with a value of \$13.7 million.
- By weight, whole grains (1,869,087 tons) are the most used ingredients in dog and cat foods. This is followed by chicken (854,988 tons), meat and bone meal (635,652 tons), corn gluten meal (476,599 tons) and soybean meal (437,251 tons).
- By value, beef (\$1.22 billion), lamb (\$691 million), chicken (\$650 million), salmon (\$430 million) and chicken broth (\$353 million) are the top five ingredients.
- Among all the 542 standardized food ingredients, 280 of them were aggregated into nutrient groups such as animal protein, animal fat, plant protein, plant carbohydrate, fruit and vegetable crop ingredients, etc. Animal protein ingredients comprised a majority of the total number of ingredients, followed by fruit and vegetable crop ingredients such as apples, blueberries, peas, spinach, etc.

Introduction

As shown in the following map, there are pet food manufacturing facilities in 42 of 50 states. The pet food produced throughout these facilities is diverse in quantity, type and the inclusion and prevalence of many types of ingredients. In many ways, the production and marketing of pet food is not all that different than the food sold to pet owners.



Pet Food Manufacturing Facilities



There have been numerous efforts to quantify the volumes and value of pet foods sold. To meet the needs and expectations of pet owners, maintain profitability and still provide nutritionally-balanced food for dogs and cats, substantial efforts are routinely conducted by pet food manufacturers to better understand trends in consumer preferences and their ability and willingness to pay for diverse ingredients.

Understanding pet food ingredient composition and consumption is uniquely complicated when compared to livestock and poultry feed consumption because of at least the following:

- Pets can be considered “family” – pet food is marketed and produced similarly to human food and health trends find their way to pet food.
- Ingredient inputs can include both human grade as well as other ingredients deemed suitable for use in animal food.
- Consumption of pet food is not necessarily close to points of production. It’s not a stretch to say that pet food produced in Missouri can be purchased in Washington, California, Texas, Maine or Florida. Likewise, pet food ingredients are sourced locally, regionally and nationally. Pet food ingredients are also sourced through a variety of purchasing channels: direct from farm, through brokers, direct from farm-product processors, from renderers, etc.
- There are many breeds and sizes of cats and dogs, each with unique nutritional requirements.
- While certain minimum nutritional standards need to be met, these standards can be met in a variety of ways and pet food manufacturers do not generally share their formulations.

This effort seeks to overcome the above challenges in drawing conclusions about pet food ingredients by creating and then adopting a thorough methodological framework, which utilizes multiple, large data sources (purchased and publicly-available), extensive online research, the use of scripting, statistical and data manipulation software, industry experience and a wide variety of technical skills offered by the DIS team.

A few notes for reference that readers will find useful:

- By virtue of the nature of the purchased Nielsen dataset, for the purpose of this report, “pet food” is defined as dog and cat food only. This includes all forms of dog and cat food such as dry/kibble, moist, wet/canned, treats, etc.
- The Nielsen data used to do the reverse ingredient analysis is not the complete “universe” of pet food sales but assumed to be a representative sample. According to the Petfoodindustry.com 2018 Industry Report, total pet food sales in 2018 reached \$30.3 billion. Thus, the data purchased for this analysis represents approximately 68.3%

of national sales. Topline numbers have been “factored up” to estimate total U.S. sales of cat and dog food. The factor used is 1.465 which is 1 divided by 0.683.

- The Nielsen data represents retail sales and therefore does not seek to quantify “upstream” volumes and values. The DIS team has used a variety of data sources, software and industry experience to estimate the upstream volumes and values.

Results

Using methodology outlined in Appendix A, the following results are presented here:

1. Total national pet food retail volume and sales (total, cats and dogs)
2. Upstream volume and sales
3. Sales analysis (total, cats and dogs)
4. Ingredient analysis (total, cats and dogs)

While there are many charts and maps included in this section as images, we point readers to [this link](#) for an interactive visualization tool to gain additional insight into ingredient quantities included in cat and dog foods by species (dogs and cats), aggregated food type, commodity type and state.

Total National Pet Food Retail Volume and Sales

As stated by Nielsen, the pet foods analyzed for this study directly represented about 68.3% of national retail pet food sales. Total U.S. pet food volume and sales, and the upstream volumes and values presented here, have been factored up by 1.4648 which is 1 divided by 0.683. Thus, the tables and charts in this section reflect values for the U.S. pet food industry as a whole and not just the Nielsen data directly analyzed.

Table 2 shows total 2018 U.S. retail dog food and cat food sales which is estimated to be more than \$30 billion from 9.8 million tons² of product sales.

Table 2, Total U.S. Retail Pet Food Volume and Sales

Total U.S. Retail Pet Food Volume and Sales - 2018		
Pet Food Category	Tons	Value
Dog Food Dry	5,566,057	\$11,200,781,260
Dog Food Moist	83,294	\$189,536,920
Dog Food Wet	934,143	\$3,442,725,642
Dog Treats	547,046	\$6,219,381,116
Cat Food Dry	1,761,347	\$4,216,919,904
Cat Food Wet	884,848	\$4,054,279,323
Cat Treats	60,914	\$1,061,199,978
Total	9,837,648	\$30,384,824,143
Note: Data factored up from Nielsen Data to represent National Data		

² Where data are reported in terms of weight throughout this report, "ton" is used, which is 2,000 pounds.

Summary of Total Ingredient Analysis

Nielsen data were obtained for U.S. retail pet food sales. This data was analyzed for its standardized ingredient content by both ingredient and weight of the ingredients in those pet foods. In total, there were 542 standardized food ingredients found to be used in the pet foods analyzed. These 542 standardized food ingredients were further categorized into 353 similar or combined ingredient classifications. These 353 ingredients were then used to quantify total ingredient weight. Representative wholesale prices for these ingredients were obtained from a variety of public data sources and from internet searches on wholesale markets. Total ingredient values were determined by multiplying the quantity of each ingredient (tons) by its associated price per ton.

Upstream Volumes and Values

For summary presentation, the major pet food ingredients were categorized into the following primary categories: farm and mill-based ingredients (ingredients from grains and oilseeds, processed grain and oilseed products, dairy products, egg products, forages, fruits, herbs, nuts, root crops, sweeteners, tree oils and vegetables), fresh or frozen meat and poultry products, rendered protein meals, water, fishery products and ingredients, broth from animal and poultry products, and minerals and other additives. The summary of the ingredient product-types and commodity-types are listed in Appendix B.

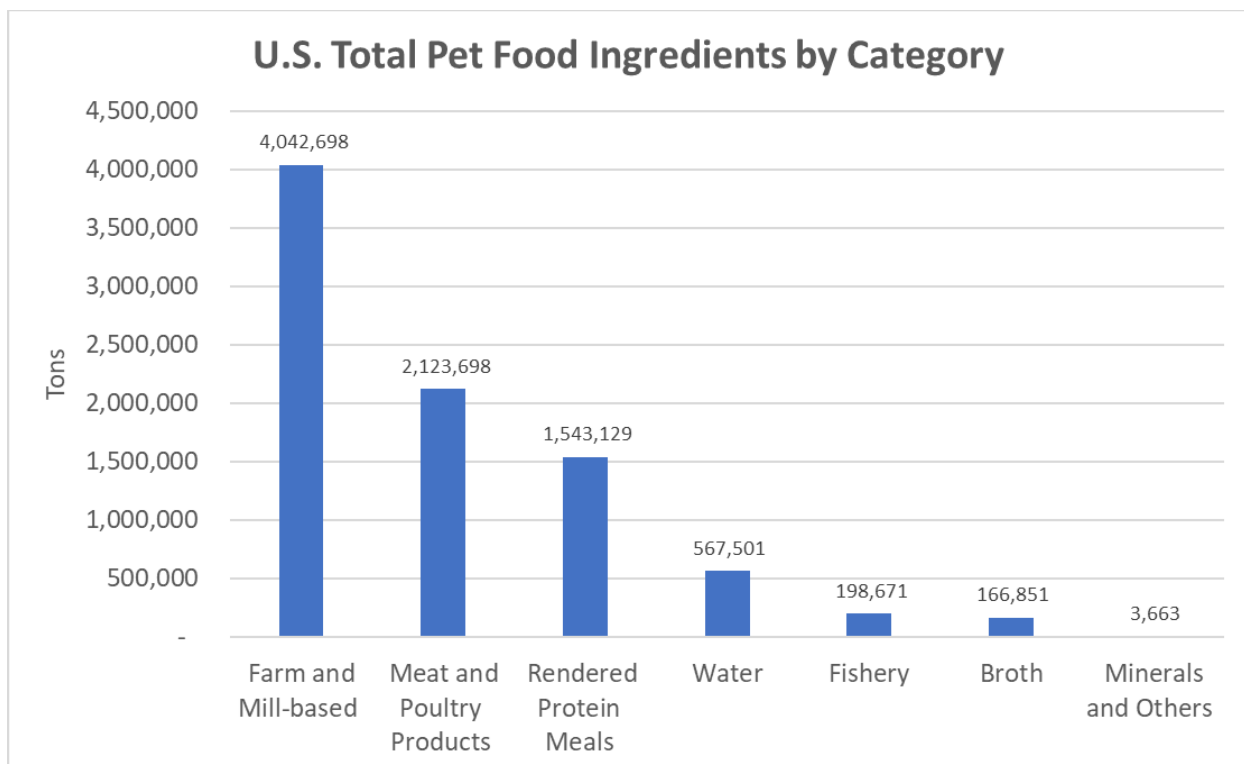


Figure 1, Pet Food Ingredients by Category

Farm and mill-based products make up 46.8% of the ingredient tonnage, but only 20.1% of the ingredient value (see Table 3). Similarly, fresh and frozen meat and poultry products, which includes fresh meat and poultry by-products and organ meats, make up 24.6% of tonnage and 46.7% of ingredient value. Rendered protein products are 17.8% of tonnage but 8.1% of ingredient value. Fishery ingredients make up 2.3% of ingredient tonnage but 12.9% of ingredient value. Broth makes up 1.9% of tonnage and 12.0% of ingredient value.

Total food ingredients used in U.S. pet food manufacturing was 8.65 million tons with an ingredient value of \$6.9 billion. Meat and poultry products are 2.1 million tons valued at \$3.2 billion. Farm and mill-based ingredients are 4.0 million tons valued at \$1.39 billion. Rendered protein meals are 1.5 million tons with a value of \$563 million. Water as an ingredient is 568,000 tons with a value of \$1.13 million. Fishery ingredients are 198,671 tons with a value of \$893 million and broth ingredients accounts for 166,851 tons with a value of \$834 million. Not all minerals nor all minor additives were included in the analysis, but for the major minerals and other ingredients calculated, there are 3,663 tons with a value of \$12.5 million. The estimated total weight of all non-food ingredients such as minerals, additives and preservatives is 13% of total ingredient weight and explains the difference between the 9.84 million tons of pet food sold at retail versus the 8.65 million tons of pet food “food” ingredients analyzed in this study.

Table 3, U.S. Total Pet Food Ingredients by Category

U.S. Total Pet Food Ingredients by Category		
Commodity Type	Tons	\$ Value
Meat and Poultry Products	2,123,698	\$3,242,773,275
Farm and Mill-based	4,042,698	\$1,394,879,026
Fishery	198,671	\$893,153,404
Broth	166,851	\$834,255,514
Rendered Protein Meals	1,543,129	\$562,588,878
Minerals and Others	3,663	\$12,520,150
Water	567,501	\$1,135,003
Grand Total	8,646,211	\$6,941,305,251
Note: Data factored up from Nielsen Data to represent National Data		
Note: Commodity Type of all ingredients Items are listed in the Appendix		

Because of the prominence of animal-based ingredients in pet foods, a summary of the animal-based ingredients is shown. Animal-based products account for 3.83 million tons of ingredients with a total U.S. value of \$4.64 billion (see Table 4, Figure 2 and Figure 3). Animal-based

ingredients include the fresh and frozen meat and poultry, broth, meat and poultry by-products and organ meats, rendered protein meals (poultry meal, animal meal, fish meal) and animal fats and poultry fats.

Table 4, U.S. Total Pet Food Animal-based Ingredients

U.S. Total Pet Food Animal-based Ingredients		
Commodity Type	Tons	\$ Value
Meat and Poultry	1,333,248	\$2,794,604,543
Broth	166,851	\$834,255,514
By-Product and Organ Meat	501,413	\$294,733,555
Poultry Meal	768,949	\$276,747,695
Animal Meal	715,130	\$211,345,820
Animal Fat	232,174	\$125,003,968
Fish Meal	59,050	\$74,495,363
Poultry Fat	56,862	\$28,431,210
Total Animal-based Ingredients	3,833,678	\$4,639,617,668
Note: Data factored up from Nielsen Data to represent National Data		
Note: Commodity Type of all ingredients Items are listed in the Appendix		

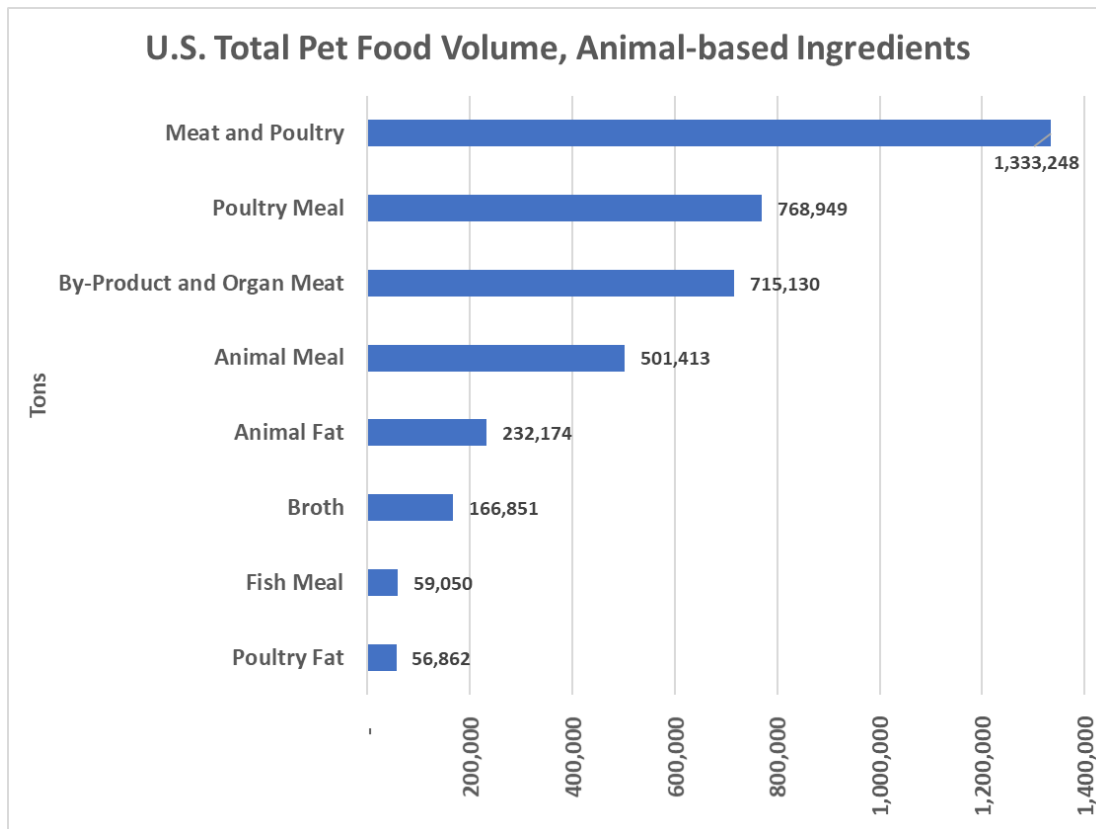


Figure 2, U.S. Total Pet Food Animal-based Ingredients

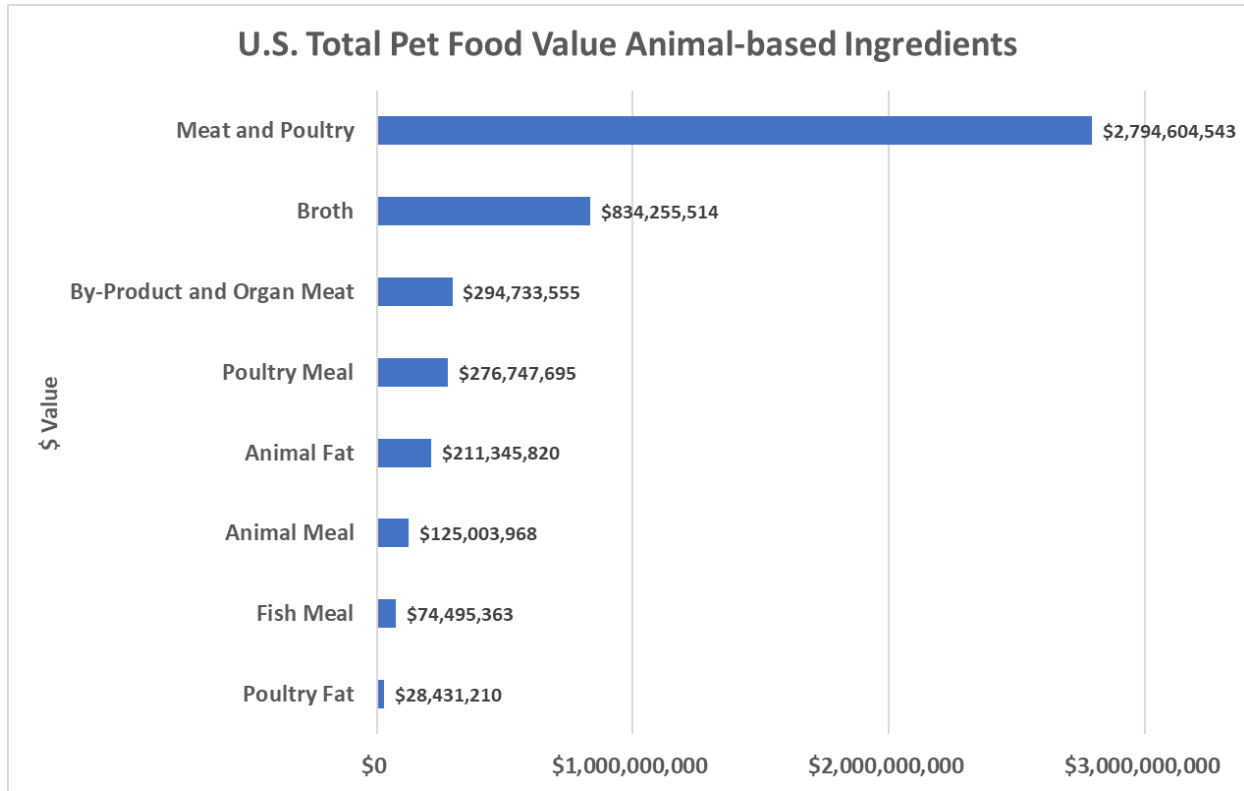


Figure 3, U.S. Total Pet Food Value Animal-based Ingredients

Rendered protein meals are made primarily from by-products of beef, pork, lamb, chicken and turkey production. The rendering processing takes a variety of nutritious animal and poultry by-products of with relatively low value and makes them into sustainable, higher-value feed products with relatively high protein content. There are 1.5 million tons of rendered protein meals in pet foods with a value of \$563 million (see Table 5, Figure 4 and Figure 5).

Table 5, U.S. Total Pet Food Rendered Protein Meal Ingredients (Aggregated)

U.S. Total Pet Food Rendered Protein Meal Ingredients		
Item	Tons	\$ Value
Poultry Meals	768,949	276,747,695
Meat and Bone Meals	714,921	211,057,665
Fish Meals	59,050	74,495,363
Bone Meal	209	288,155
Total Rendered Protein Meals	1,543,129	562,588,878
Note: Data factored up from Nielsen Data to represent National Data		
Note: Commodity Type of all ingredients Items are listed in the Appendix		

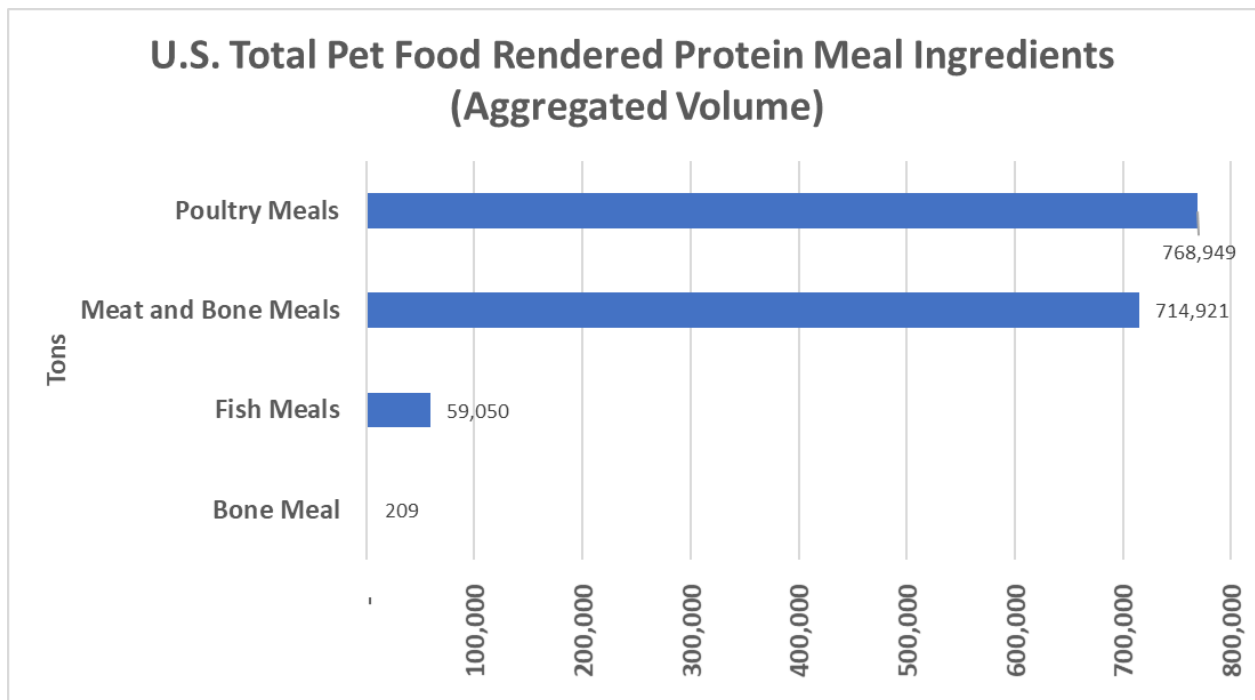


Figure 4, U.S. Pet Food Rendered Protein Meal Ingredients (Aggregated)

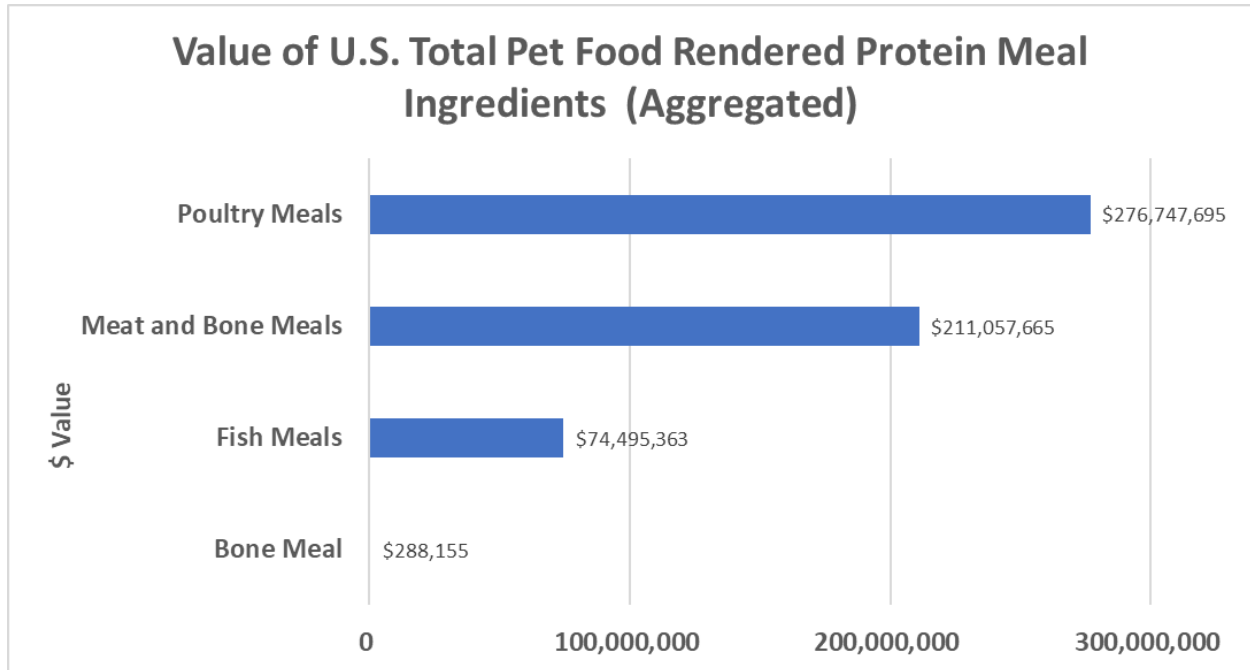


Figure 5, Value of U.S. Total Pet Food Rendered Protein Meal Ingredients (Aggregated)

Meat and bone meal is the most used rendered protein ingredient in pet foods at 635,652 tons, valued at \$184.6 million (see Table 6, Figure 6 and Figure 7). Other significant rendered protein ingredients include chicken by-product meal (353,608 tons, \$126.9 million value), chicken meal (192,370 tons, \$69.1 million value) and poultry by-product meal (190,023 tons, \$68.2 million value). Volumes and values from other protein meals can be found in Table 6.

Table 6, U.S. Total Pet Food Rendered Protein Meal Ingredients

U.S. Total Pet Food Rendered Protein Meal Ingredients		
Item	Tons	\$ Value
Meat and Bone Meal	635,652	\$184,581,405
Chicken By-product Meal	353,608	\$126,933,164
Chicken Meal	192,370	\$69,054,065
Poultry By-product Meal	190,023	\$68,211,595
Fish Meal	35,245	\$62,030,697
Lamb Meal	40,649	\$18,443,414
Salmon Meal	17,893	\$10,716,376
Turkey Meal	17,578	\$7,031,267
Turkey By-product Meal	15,371	\$5,517,604
Beef Meal	26,011	\$3,901,628
Meat Meal	8,669	\$3,343,249
Shrimp Meal	3,161	\$932,324
Pork Meal	3,940	\$787,969
Tuna Meal	1,981	\$449,420
Crab Meal	769	\$366,546
Bone Meal	209	\$288,155
Total Rendered Protein Meals	1,543,129	\$562,588,878
Note: Data factored up from Nielsen Data to represent National Data		
Note: Commodity Type of all ingredients Items are listed in the Appendix		

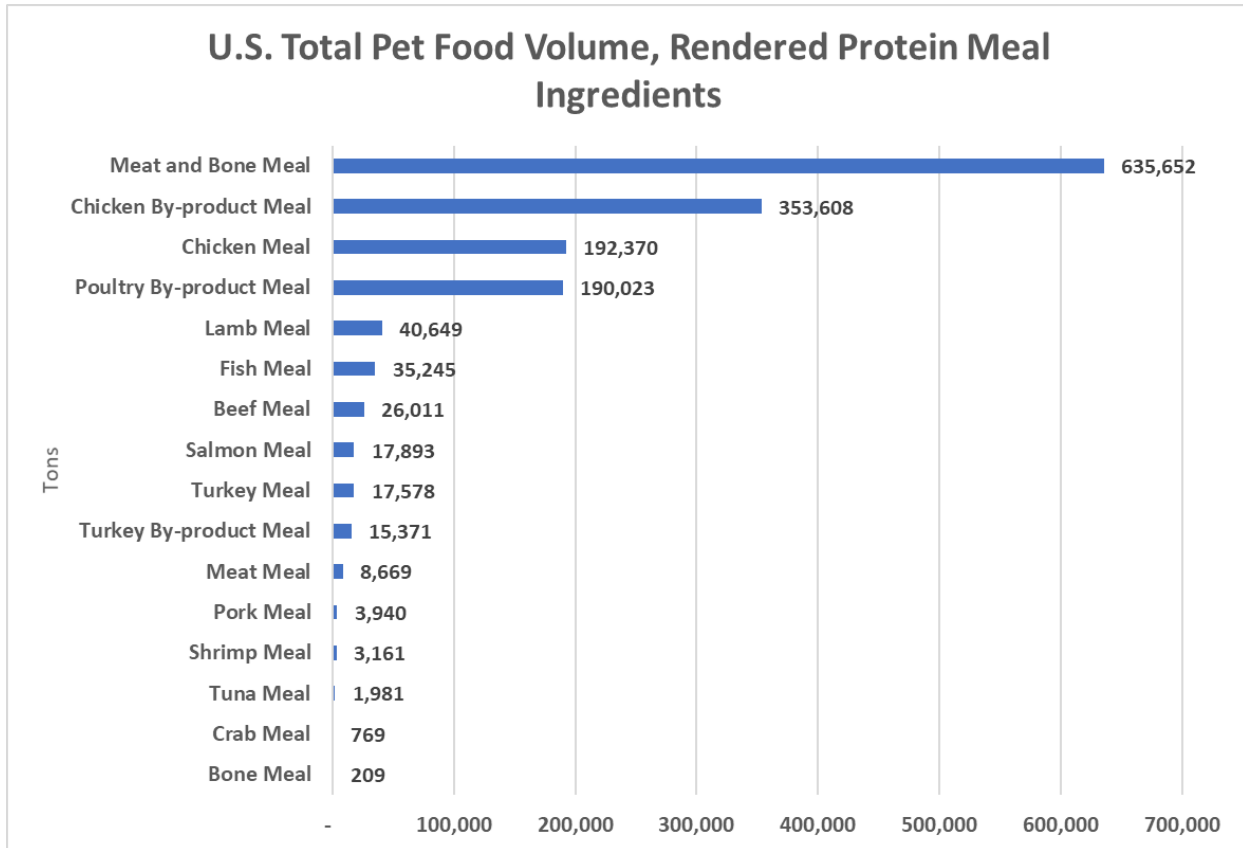


Figure 6, U.S. Total Pet Food Rendered Protein Meal Ingredients

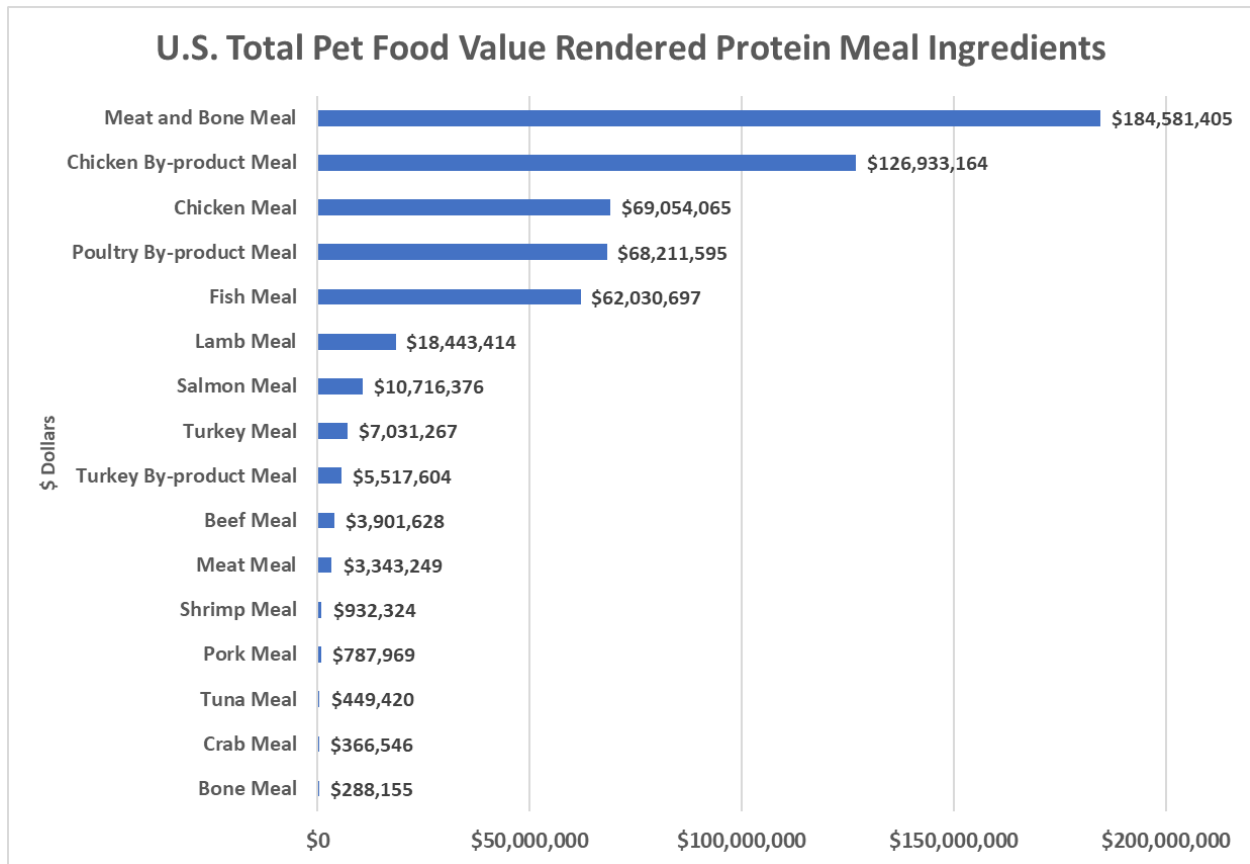


Figure 7, U.S. Total Pet Food Value Rendered Protein Meal Ingredients

Referring to Table 7, Figure 8 and Figure 9, there are 31 ingredient groups from animal and poultry processing and/or rendering that are used in pet foods. The title “slaughter/rendering” is used for this category since some of the products can be sourced directly from animal and poultry processing facilities and some of the same products can be sourced from rendering facilities. The leading ingredients by value are beef (244,113 tons, \$1.2 billion value), lamb (86,375 tons, \$690 million value) and chicken (854,988 tons, \$650 million value). Volumes and values from other “slaughter/rendering” can be found in Table 7.

Table 7, U.S. Total Pet Food Ingredients from Slaughter/Rendering

U.S. Total Pet Food Ingredients from Slaughter/Rendering		
Item	Tons	\$ Value
Beef	244,113	\$1,220,567,238
Lamb	86,375	\$690,998,965
Chicken	854,988	\$649,791,168
Turkey	74,734	\$119,574,657
Organ Meat	149,673	\$89,803,719
Digest Flavor	88,146	\$88,146,296
Beef Fat	132,456	\$72,850,575
Animal Fat	98,147	\$51,409,408
Meat By-products	137,684	\$49,153,149
Pork	14,437	\$43,311,698
Poultry	34,332	\$27,063,577
Other Animal By-products	31,445	\$25,156,160
Chicken Fat	43,778	\$21,888,996
Chicken By-products	31,909	\$13,596,616
Beef By-products	29,320	\$12,959,231
Bacon	1,891	\$12,401,893
Poultry By-products	25,622	\$10,917,502
Bison	3,589	\$10,049,177
Duck	10,221	\$8,346,179
Venison	7,734	\$7,017,703
Poultry Fat	13,084	\$6,542,213
Wild Boar	802	\$5,450,693
Gelatin	657	\$3,400,241
Pork By-products	5,913	\$792,329
Animal Plasma	695	\$520,973
Pork Fat	1,186	\$480,157
Bacon Fat	386	\$263,828
Hydrolyzed Chicken Liver	246	\$246,148
Animal Liver Flavor	103	\$41,190
Pheasant	27	\$22,385
Ham	6	\$9,212
Total Slaughter/Rendering Ingredients	2,123,698	\$3,242,773,275
Note: Data factored up from Nielsen Data to represent National Data		
Note: Commodity Type of all ingredients Items are listed in the Appendix		

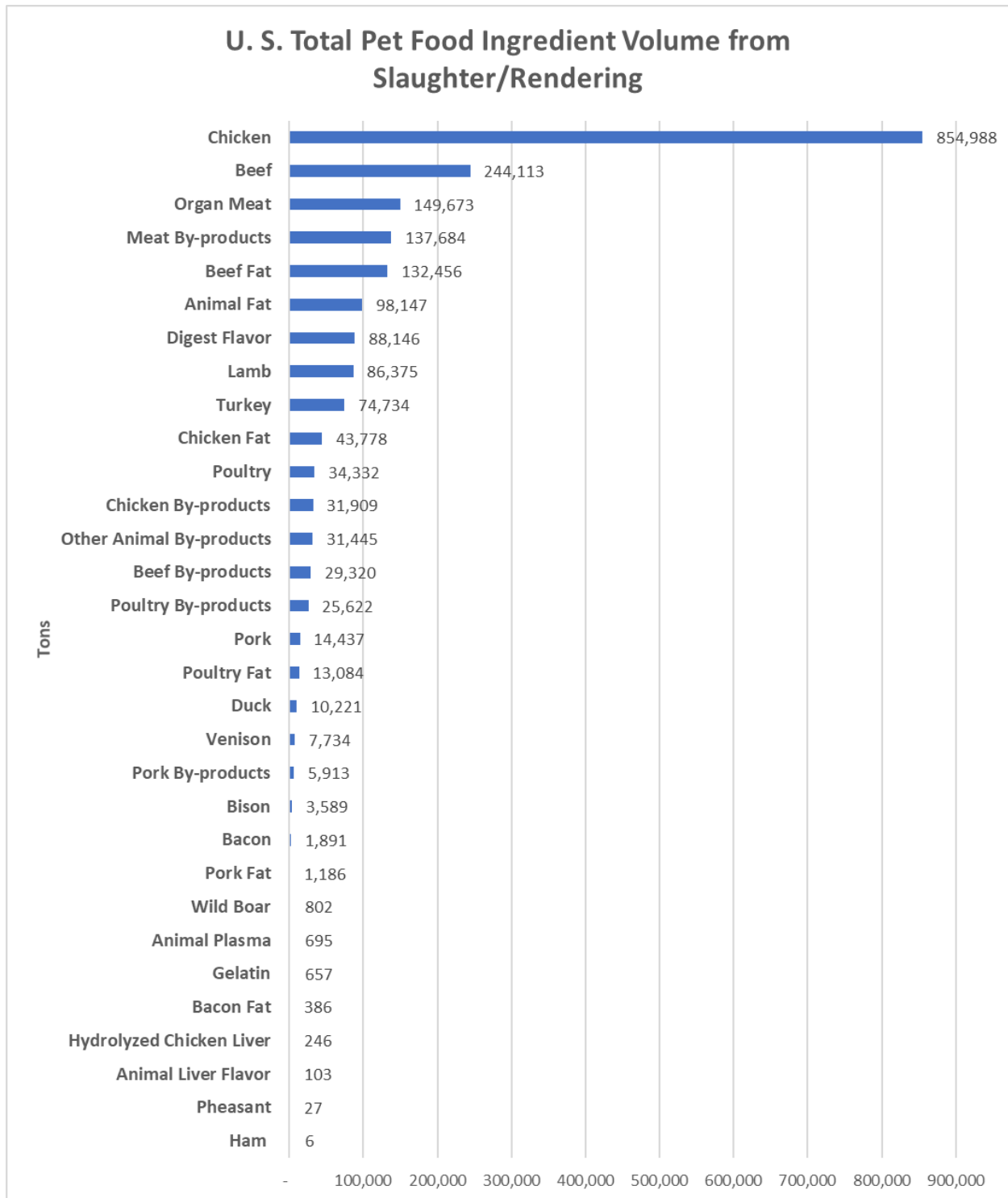


Figure 8, U.S. Total Pet Food Ingredients from Slaughter/Rendering

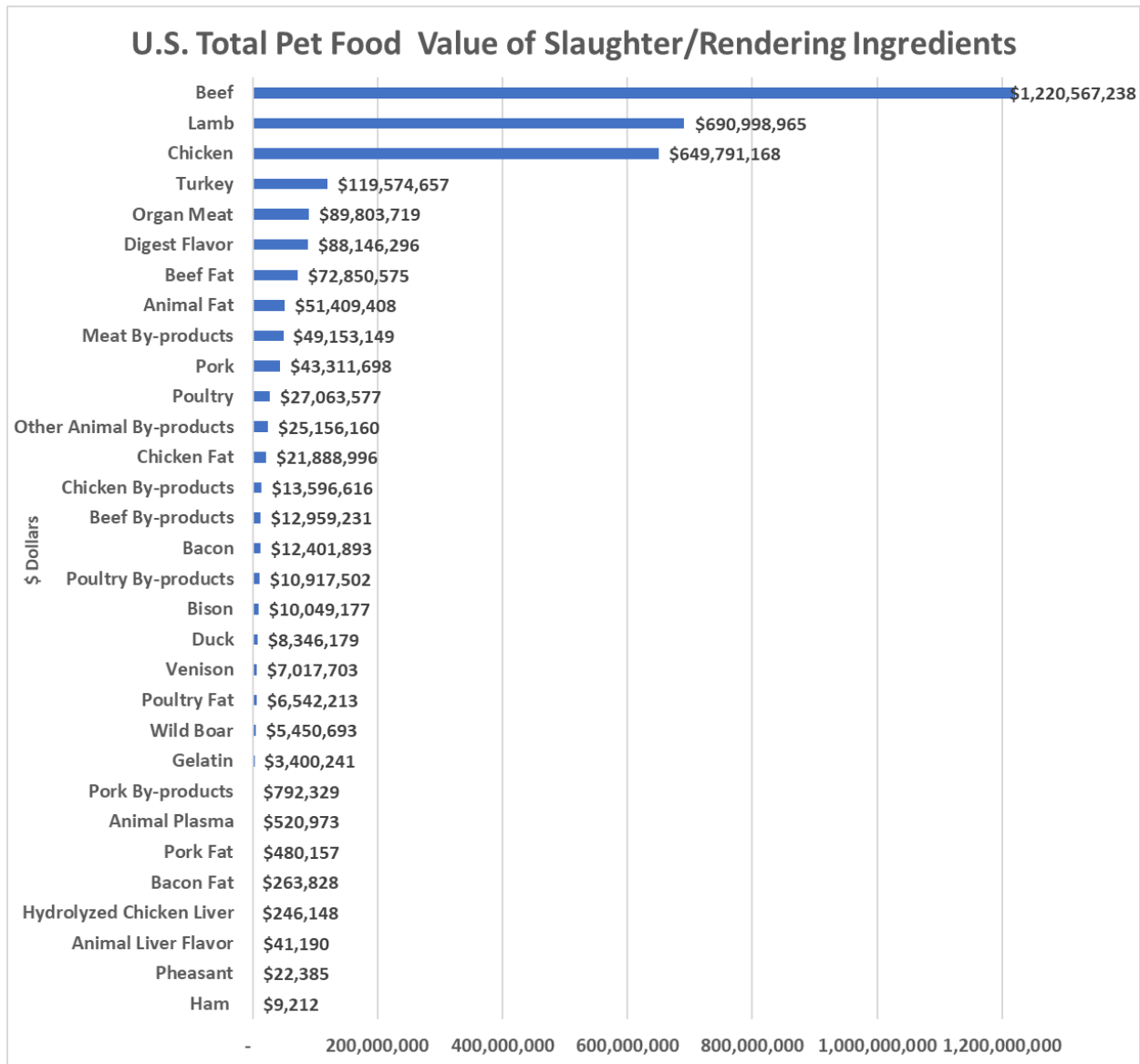


Figure 9, U.S. Total Pet Food Value of Slaughter/Rendering Ingredients

Referring to Table 8, Figure 10 and Figure 11, 4.0 million tons of farm and mill-based ingredients used in pet foods are valued at \$1.4 billion. This category includes unprocessed ingredients sourced directly from the farm such as whole grains (barley, corn, oats and wheat), mill feeds (malted barley, corn gluten feed, corn meal, rice flour, etc.), soy products (soybean meal, soy protein concentrates, etc.), fruits and vegetables (dried beans carrots, green beans, celery, tomatoes, squash, etc.), dairy and egg products, root products (peanuts, peanut butter, chicory root, etc.), vegetable oils (soybean oil, canola oil, coconut oil, etc.) and sweeteners (sugar, corn sugar, etc.).

In the mill feed product category, there are five alfalfa products, nine barley products, four coconut/palm products, 16 processed corn products and six milled oat products. Vegetable

products include beets, broccoli, carrots, celery, pumpkin, tomatoes and yams, to name a few. The full list of all farm and mill-based ingredients is in Appendix B, Ingredient List and Categorization Used for Upstream Analysis.

Table 8, U.S. Total Pet Food Ingredients from Farm and Mill-based

U.S. Total Pet Food Farm and Mill-based Ingredients		
Ingredient Category	Tons	\$ Value
Mill Feed	1,164,019	\$612,764,471
Whole Grain	1,869,087	\$297,429,027
Soy Product	534,069	\$182,024,067
Fruit and Vegetable	346,434	\$160,579,975
Dairy and Egg	95,151	\$112,467,832
Root	15,728	\$15,888,767
Vegetable Oil	12,206	\$10,304,888
Sweetener	6,004	\$3,419,998
Farm and Mill-based Total	4,042,698	\$1,394,879,026

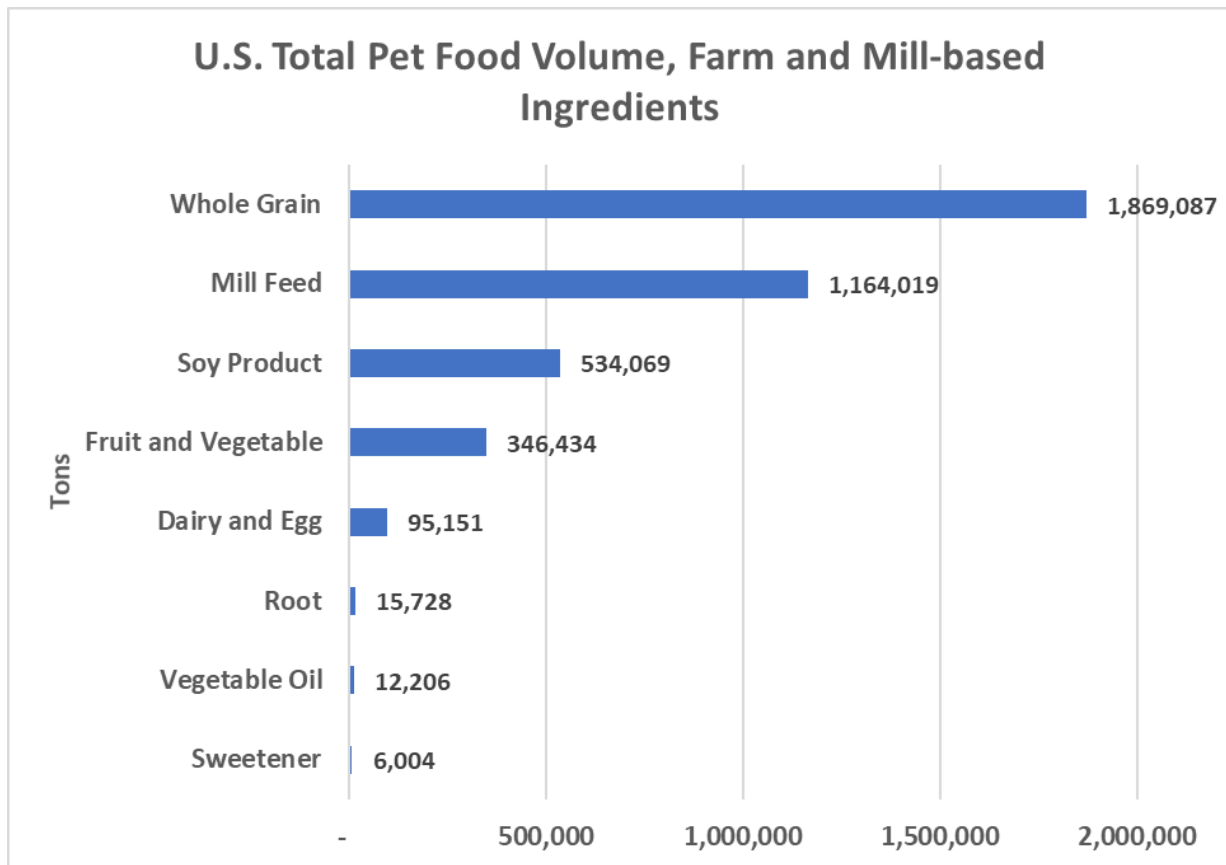


Figure 10, U.S. Total Pet Food Ingredients from Farm and Mill-based Products

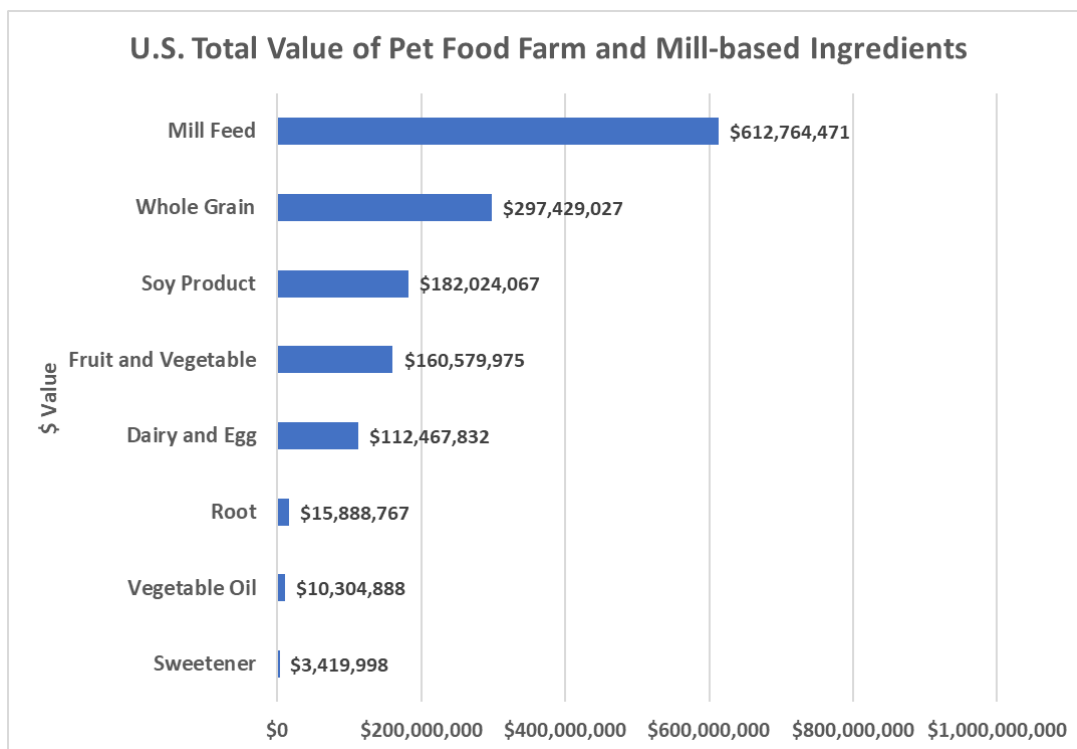


Figure 11, U.S. Total Value of Pet Food Farm and Mill-based Ingredients

Referring to Table 9, Figure 12 and Figure 13, there are 198,671 tons of fishery ingredients in pet foods with a value of \$893 million. Fishery ingredients include a variety of fish and fish products such as salmon, tuna, whitefish, cod, etc., fish oil products, anchovies, crab and mussels. Kelp, kelp meal, algae and seaweed meal, while not fish products, are included in this category.

Table 9, U.S. Total Pet Food Ingredients from Fishery

U.S. Total Pet Food Ingredients from Fishery		
Item	Tons	\$ Value
Salmon	87,495	\$429,521,196
Other Fish	49,072	\$123,634,040
Tuna	14,472	\$101,301,814
Cod	10,270	\$88,692,469
Whitefish	29,052	\$85,416,069
Fish Oils	5,104	\$54,406,300
Shrimp	3,206	\$10,181,473
Total Fishery Ingredients	198,671	\$893,153,362
Note: Data factored up from Nielsen Data to represent National Data		
Note: Commodity Type of all ingredients Items are listed in the Appendix		

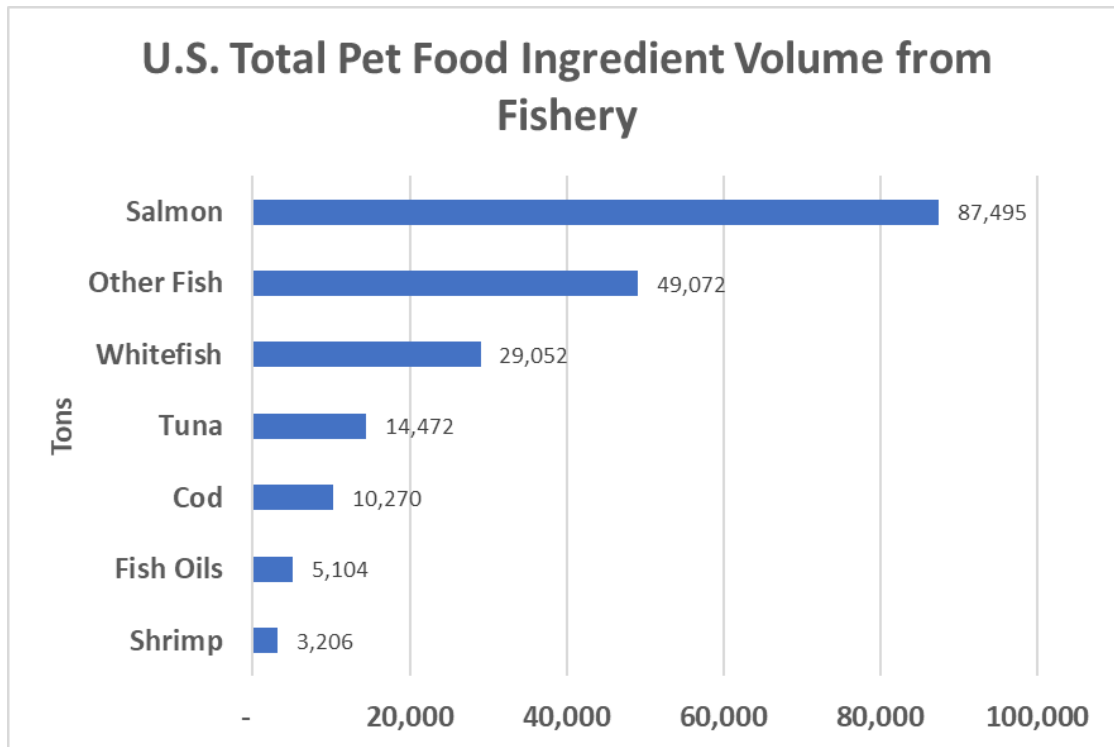


Figure 12, U.S. Total Pet Food Ingredients from Fishery

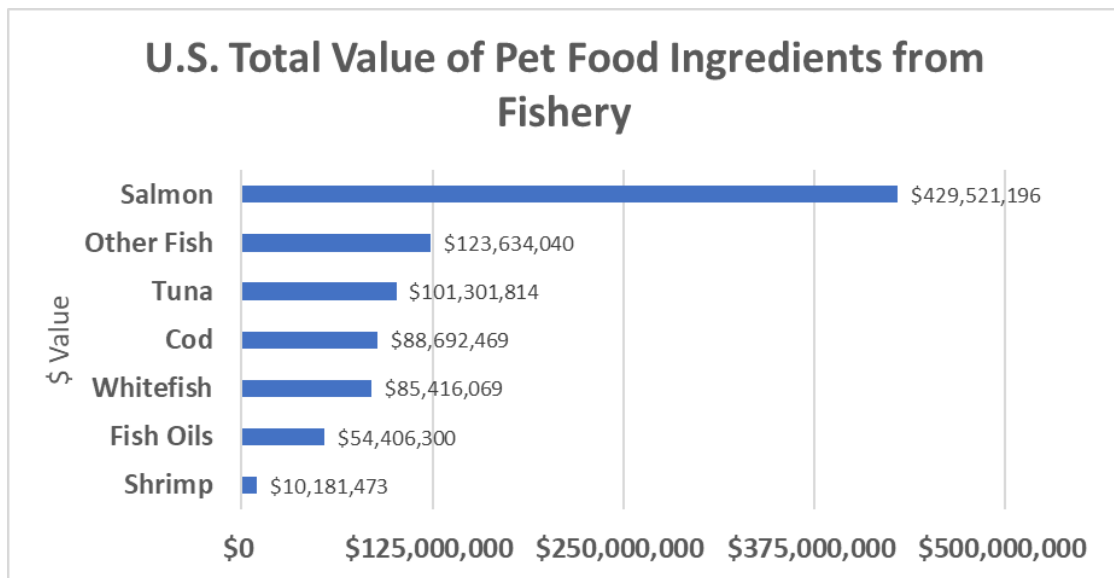


Figure 13, U.S. Total Value of Ingredients from Fishery

Referring to Table 10, Figure 14 and Figure 15, there are 166,851 tons of broth ingredients in pet foods with a value of \$834 million. Wet broth ingredients tend to be used in wet dog and cat foods and a dried broth ingredient in dry dog and cat foods. The leading broth ingredient is chicken broth (70,563 tons, \$353 million value), beef broth (39,580 tons, \$198 million value) and unspecified poultry broth (27,046 tons, \$135 million value). Other broths used include fish

broth, bacon broth, chicken and turkey broth, meat broth, turkey broth, tuna broth, lamb broth, lamb and chicken broth, vegetable broth, pork broth and liver broth.

Table 10, U.S. Total Pet Food Ingredients from Broth

U.S. Total Pet Food Ingredients from Broth		
Item	Tons	\$ Value
Chicken Broth	70,563	\$352,812,987
Beef Broth	39,580	\$197,900,124
Poultry Broth	27,046	\$135,229,749
Fish Broth	15,018	\$75,091,496
Other Broths	14,644	\$73,221,158
Total Broth Ingredients	166,851	\$834,255,514
Note: All broth valued at \$250/cwt		
Note: Data factored up from Nielsen Data to represent National Data		
Note: Commodity Type of all ingredients Items are listed in the Appendix		

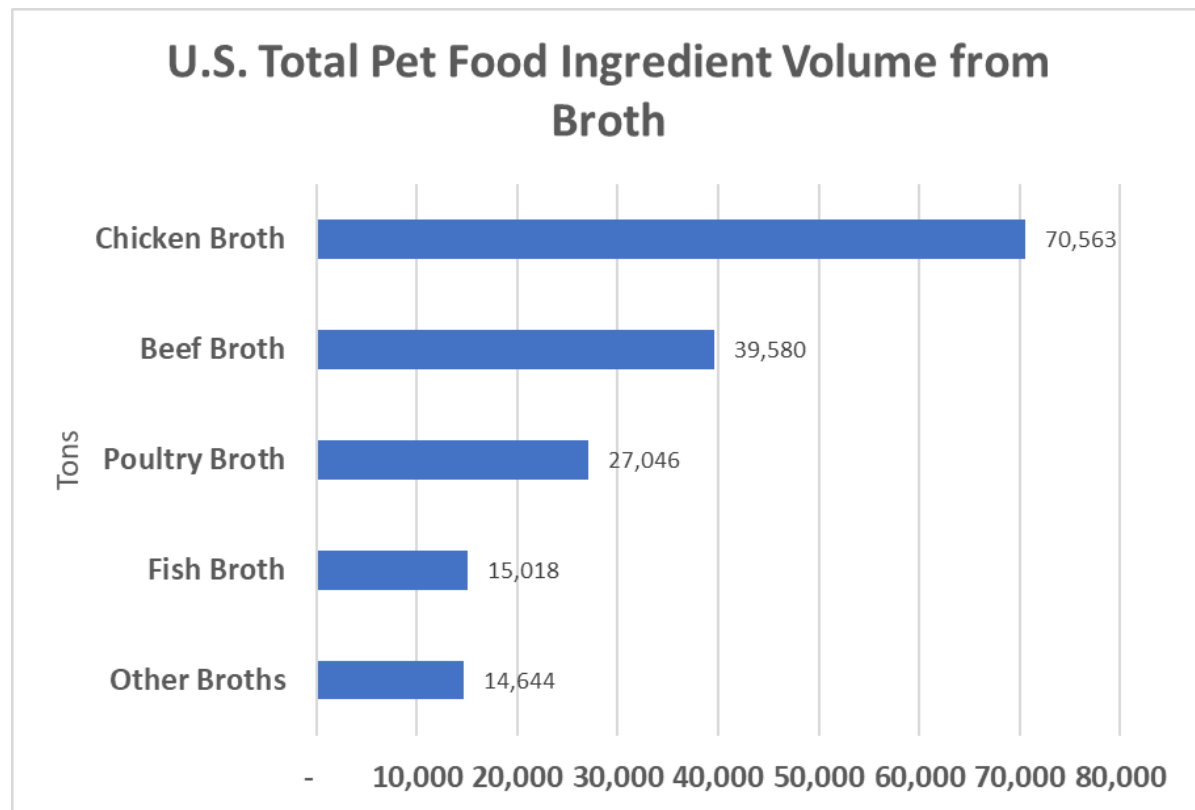


Figure 14, U.S. Total Pet Food Ingredients from Broth

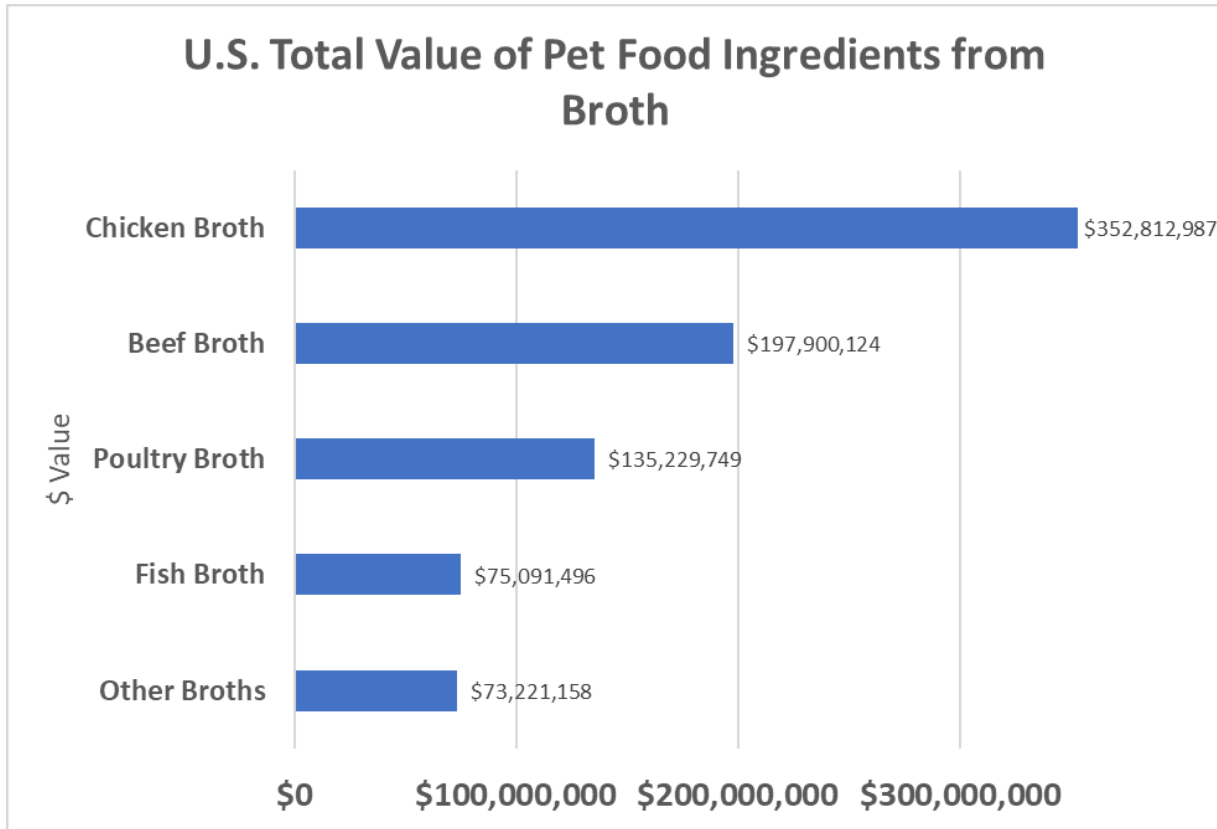


Figure 15, U.S. Total Value of Pet Food Ingredients from Broth

Upstream Impacts of Ingredient Purchases by Pet Food Manufacturers

Pet food ingredients are sourced from a wide geographic and often multi-state area and while there are eight states that do not have pet food manufacturers registered in that state, there are crops and livestock produced in these states that are used as pet food ingredients. A full tracing of pet food ingredients to their sourcing was beyond the scope of this study; therefore, the value of ingredients processed in each state was the basis for allocation of upstream values.

Farmers and farm product processors sell \$6.9 billion worth of products to pet food manufacturers that they use as ingredients. These sales by farmers and processors of farm products stimulate further upstream economic activity. Farmers buy \$5.3 billion of inputs and services from **farm suppliers** (seed, fertilizer, fuel, labor, machinery, repairs, etc.) to produce the products that are used as pet food ingredients. In addition, these farm suppliers buy \$4.1 billion in materials and services (fuel, fertilizer, equipment, labor, etc.) that they sell to farmers in order to produce the products for pet food ingredients.

Table 11 shows a summary of the ingredient purchases by pet food manufacturers, by state, with the number of Food and Drug Administration (FDA)-registered pet food manufacturing facilities, pet food ingredient purchased (tons) and resulting farm and farm-product processors sales (dollars), farm input purchases (dollars) and farm-supplier input purchases (dollars) that occur due to ingredient purchases by pet food manufacturers. Purchases of pet food ingredients are allocated to the state in which the processor resides. Farm input purchases and farm input supplier purchased are driven by the state-level allocation of the pet food ingredient purchases.

The leading states for farm and farm-product processing sales to pet food manufacturers are Missouri (\$999 million), Kansas (\$574 million), Pennsylvania (\$571 million), Iowa (\$422 million), and Ohio (\$367 million). Other states with more than \$100 million in purchases of ingredients from farmers and farm-product processors by pet food manufacturers are: Alabama, Arkansas, California, Colorado, Georgia, Illinois, Indiana, Nebraska, New Jersey, New York, Oklahoma, South Carolina, Tennessee, Texas, Utah, Virginia and Wisconsin.

Farm input suppliers are also positively impacted by the purchase of pet food ingredients. In economic terms, these are indirect impacts in that the sales of farm-based products, whether fresh or processed, require inputs be purchased to support the production of those products. U.S. farm input purchases that happen due to pet food ingredient purchases total \$5.3 billion. The leading states that drive farm purchases to support the production of pet food ingredients are Missouri (\$674 million), Kansas (\$478 million), Pennsylvania (\$448 million), Iowa (\$340 million) and Ohio (\$243 million). Other states where ingredient purchases by pet food manufacturers drive more than \$100 million in farm input supply sales are: Alabama, Arkansas,

California, Colorado, Illinois, Indiana, Nebraska, New Jersey, New York, Oklahoma, South Carolina, Texas, Utah and Wisconsin.

The production of farm-based products for pet food ingredients also results in purchases of supplies by the farm-suppliers. In the U.S., this totals \$4.1 billion. The leading states for purchases by farm-input suppliers due to pet food ingredient purchases are Missouri (\$530 million), Kansas (\$378 million), Pennsylvania (\$344 million), Iowa (\$269 million) and Ohio (\$177 million). Other states with more than \$100 million in purchases driven by farm-input suppliers to support the production of pet food ingredients are: Alabama, Arkansas, California, Colorado, Nebraska, New York, Oklahoma, South Carolina, Texas, Utah and Wisconsin.

Table 11, Impacts of Pet Food Ingredient Purchases on Farms, Farm Product Processors and Farm Suppliers

Impacts of Pet Food Ingredient Purchases on Farms, Farm Product Processors and Farm Suppliers					
State	Pet Food Facilities	Pet Food Ingredients Purchased (Tons)	Pet Food Processor Purchases of Farm and Farm Product Processor Ingredients (Dollars)	Farm Input Purchases Resulting from Pet Food Ingredient Purchases (Dollars)	Farm Supplier Input Purchases Resulting from Pet Food Ingredient Purchases (Dollars)
Alabama	3	209,996	\$180,401,509	\$146,360,138	\$124,818,675
Alaska	0	*Insufficient Data			
Arizona	4	102,369	\$87,942,042	\$64,691,310	\$51,971,042
Arkansas	16	218,037	\$187,308,829	\$145,859,999	\$119,325,288
California	27	360,066	\$309,321,531	\$247,831,261	\$165,030,188
Colorado	10	231,501	\$198,875,121	\$159,556,047	\$112,802,518
Connecticut	3	11,878	\$10,203,735	\$8,167,790	\$6,714,554
Delaware	0	*Insufficient Data			
Florida	1	44,304	\$38,060,029	\$35,646,960	\$27,964,483
Georgia	21	140,723	\$120,890,650	\$97,187,008	\$74,205,829
Hawaii	0	*Insufficient Data			
Idaho	1	38,211	\$32,826,051	\$22,182,456	\$18,123,962
Illinois	11	196,664	\$168,948,071	\$140,191,850	\$99,456,794
Indiana	10	181,848	\$156,219,664	\$122,208,718	\$99,415,814
Iowa	20	491,033	\$421,831,333	\$340,102,101	\$268,636,095
Kansas	21	667,796	\$573,682,880	\$477,893,881	\$377,790,076
Kentucky	6	71,534	\$61,452,474	\$51,425,081	\$43,112,750
Louisiana	1	8,557	\$7,351,281	\$6,784,974	\$5,633,207
Maine	2	1,052	\$903,813	\$755,714	\$646,035
Maryland	9	50,735	\$43,585,080	\$28,107,502	\$23,129,898
Massachusetts	0	*Insufficient Data			
Michigan	35	46,066	\$39,574,119	\$28,471,902	\$22,860,540
Minnesota	29	84,855	\$72,895,908	\$60,782,953	\$42,737,404
Mississippi	1	44,496	\$38,225,144	\$22,442,125	\$19,209,547
Missouri	15	1,162,612	\$998,764,390	\$673,943,870	\$530,455,666
Montana	1	8,124	\$6,978,795	\$6,185,740	\$5,180,463

<u>State</u>	<u>Pet Food Facilities</u>	<u>Pet Food Ingredients Purchased (Tons)</u>	<u>Pet Food Processor Purchases of Farm and Farm Product Processor Ingredients (Dollars)</u>	<u>Farm Input Purchases Resulting from Pet Food Ingredient Purchases (Dollars)</u>	<u>Farm Supplier Input Purchases Resulting from Pet Food Ingredient Purchases (Dollars)</u>
Nebraska	23	379,394	\$325,925,841	\$266,924,385	\$198,474,861
Nevada	1	39,966	\$34,333,211	\$25,157,509	\$21,281,306
New Hampshire	0	*Insufficient Data			
New Jersey	2	149,009	\$128,009,313	\$106,068,931	\$81,656,981
New Mexico	1	1,584	\$1,360,486	\$1,309,859	\$1,167,505
New York	6	251,827	\$216,337,057	\$181,822,368	\$142,817,912
North Carolina	16	103,554	\$88,960,086	\$74,981,982	\$59,016,515
North Dakota	6	48,742	\$41,872,772	\$37,114,441	\$31,082,775
Ohio	18	427,674	\$367,401,178	\$242,915,139	\$176,704,471
Oklahoma	12	235,619	\$202,412,757	\$162,738,881	\$129,696,711
Oregon	3	14,062	\$12,080,349	\$11,068,966	\$8,873,900
Pennsylvania	83	664,966	\$571,251,589	\$448,478,652	\$344,262,657
Rhode Island	0	*Insufficient Data			
South Carolina	6	183,456	\$157,601,289	\$122,652,016	\$103,030,871
South Dakota	3	79,392	\$68,203,606	\$64,672,811	\$52,683,375
Tennessee	10	133,645	\$114,810,338	\$79,765,579	\$63,735,474
Texas	20	226,853	\$194,882,556	\$161,905,019	\$107,005,349
Utah	6	217,445	\$186,800,101	\$145,567,579	\$111,979,292
Vermont	1	7,569	\$6,501,933	\$6,370,069	\$5,622,758
Virginia	12	150,955	\$129,681,053	\$86,250,302	\$68,382,553
Washington	18	74,858	\$64,308,193	\$55,126,633	\$40,930,220
West Virginia	0	*Insufficient Data			
Wisconsin	25	259,613	\$223,025,450	\$174,685,417	\$131,156,886
Wyoming	0	*Insufficient Data			
United States	519	8,022,241	\$6,891,659,850	\$5,342,053,032	\$4,118,529,550

Notes: 1) There was insufficient data to allocate pet food ingredient purchases and upstream impacts to: Alaska, Delaware, Hawaii, Massachusetts, New Hampshire, Rhode Island, West Virginia and Wyoming; 2) Dollar denominated data in this table are not additive.

This allocation of ingredient purchases and values to individual states was done based on each state’s share of direct output from pet food manufacturing sales (from the 2016 analysis that DIS conducted for IFEEDER) multiplied times the U.S. total ingredient purchases as factored up to U.S. totals.

Farm and farm-product processor sales due to ingredient purchases by pet food manufacturers is the sum of all pet food ingredients sold to pet food manufacturers either directly by farmers or through farm-product processors. **Farm input purchases** is a measure of the materials and services that farmers purchase to produce the products that are sold to pet food manufacturers as ingredients. **Farm-supplier input purchases** is a measure of the materials and services that farm-input suppliers buy as they provide materials and services to farmers to produce the

products that are sold to pet food manufacturers as ingredients. Figure 16 through Figure 19 refer to data in Table 11. The amounts credited to each state are driven by pet food ingredient purchases in that state and do not necessarily reflect the amount of inputs sourced specifically within that state.

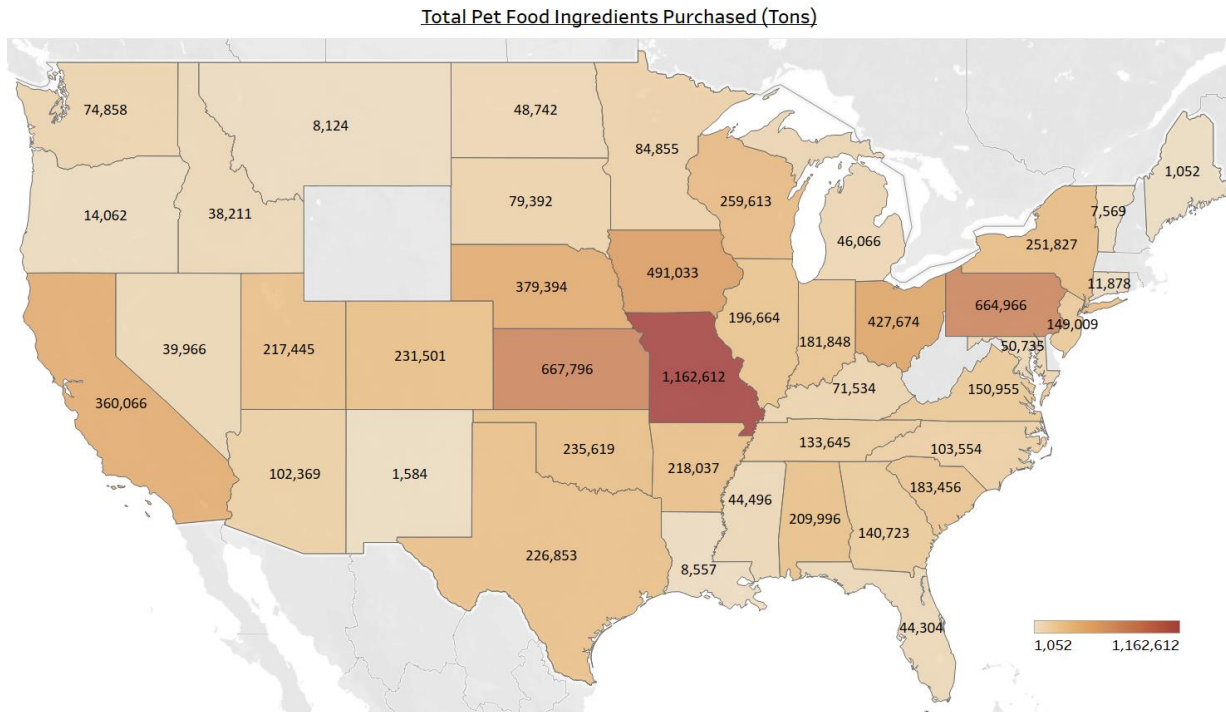


Figure 16, Total Pet Food Ingredients Purchased (Tons)

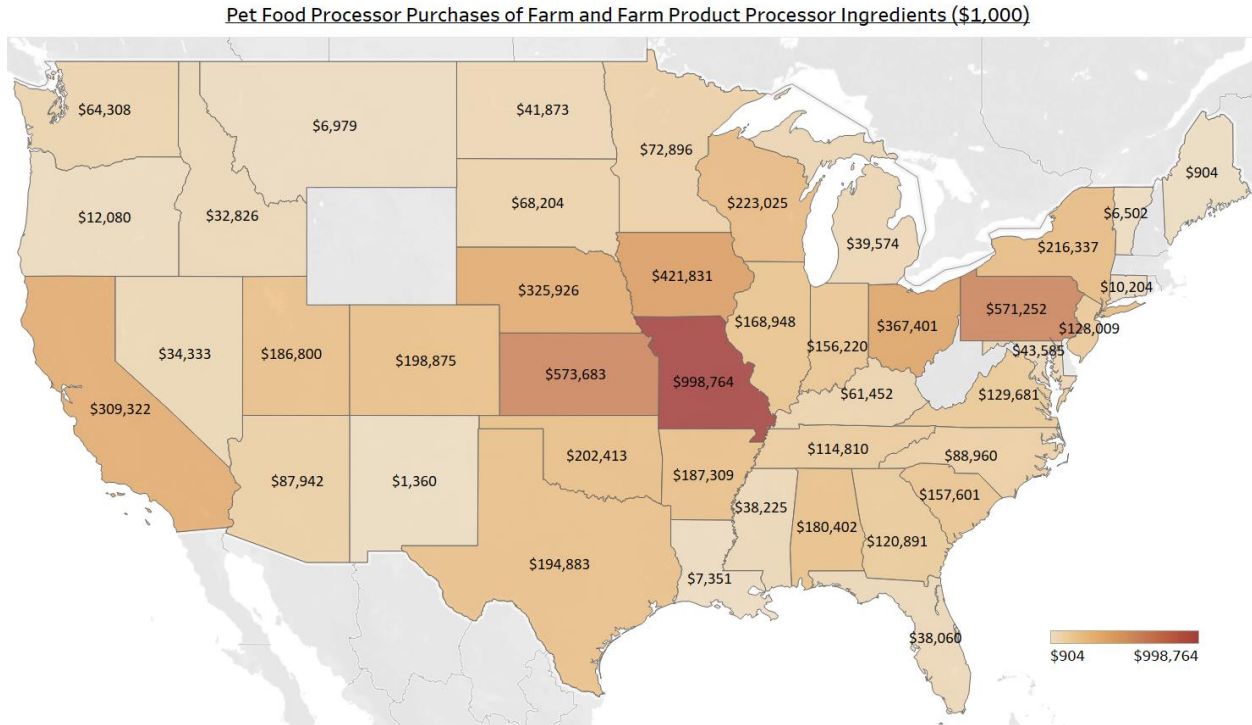


Figure 17, Pet Food Processor Purchases of Farm and Farm Product Processor Ingredients (\$1,000)

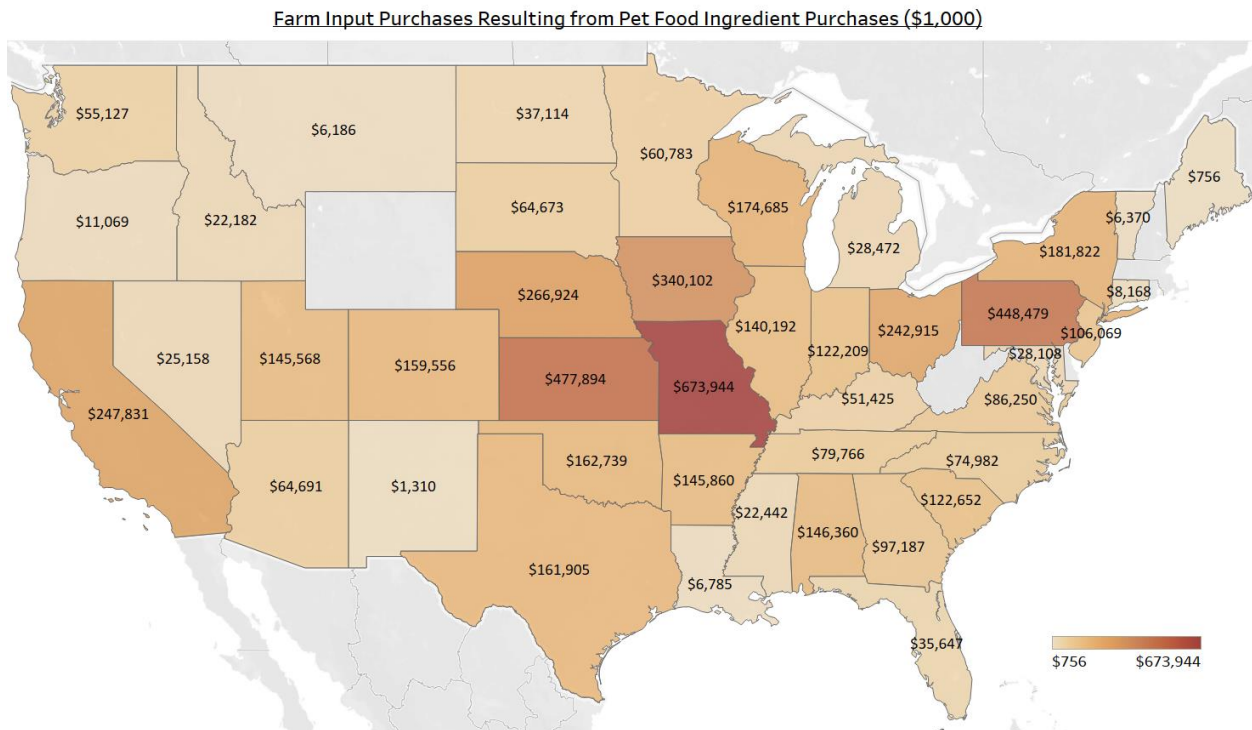


Figure 18, Farm Input Purchases Resulting from Pet Food Ingredient Purchases (\$1,000)

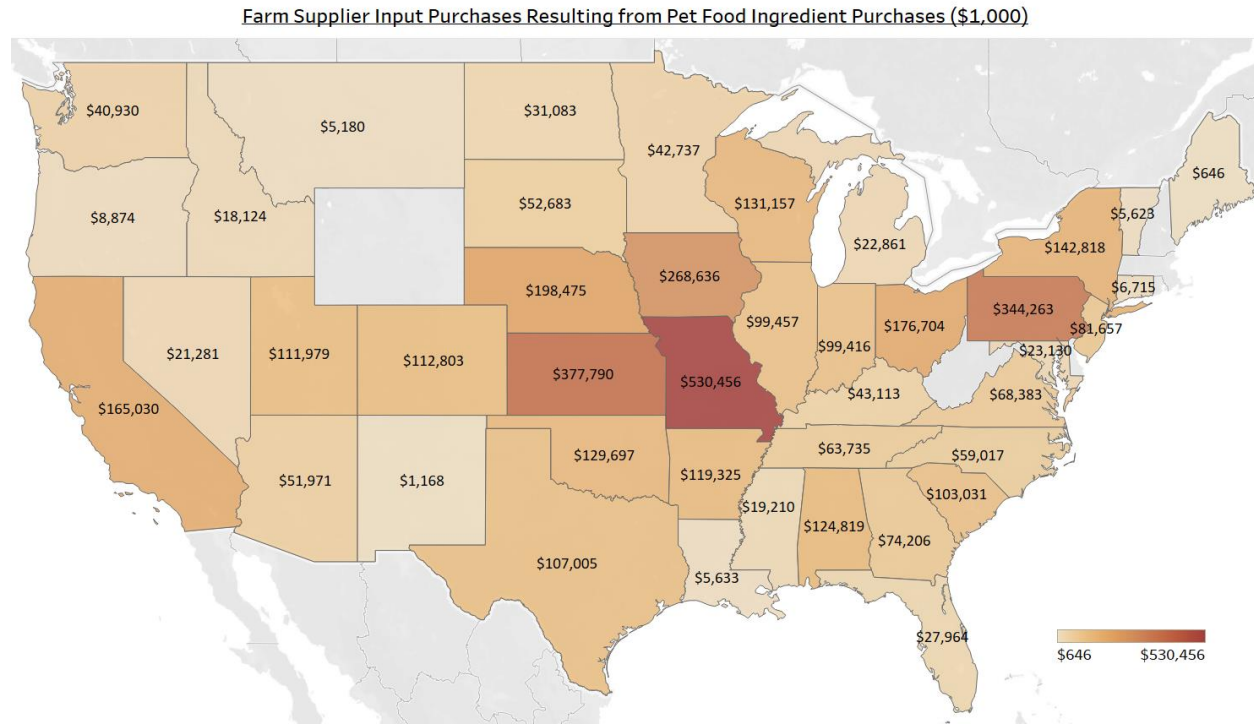


Figure 19, Farm Supplier Input Purchases Resulting from Pet Food Ingredient Purchases (\$1,000)

In the U.S., there are 519 FDA-registered pet food manufacturing facilities that may vary greatly in size and production. Referring to Table 12, on average, a pet food manufacturing plant buys 15,457 tons of ingredients worth \$13.3 million from farmers and farm-product processors. The pet food ingredient purchases for each national-average plant results in \$10.2 million of farm input purchases across the country and results in \$7.9 million in farm-input supplier purchases of materials and services.

Missouri (\$66.6 million) and New Jersey (\$64 million) have the largest average per plant pet food ingredient purchases. Other states with average per-plant purchases of ingredients greater than the national average (\$13.3 million) are: Alabama, Arizona, Colorado, Florida, Idaho, Illinois, Indiana, Iowa, Kansas, Mississippi, Nebraska, New York, Ohio, Oklahoma, South Carolina, South Dakota and Utah.

In Table 12, state-level average impacts per pet food manufacturing facility in the respective states are shown. The averages are calculated by dividing the quantities or dollar impacts in Table 11 by the number of pet food manufacturing plants in each respective state. The averages provide more information about the relative size and scale of the pet food manufacturing industry in each state. For example, Pennsylvania is the third largest state with regards to overall pet food manufacturing, but that is due to the number of facilities in Pennsylvania (83) even though the average size of a pet food manufacturing facility in

Pennsylvania is below the national average in size. On the other hand, Idaho only has one pet food manufacturing facility, but it is more than twice as large as the national average.

Table 12, Average Impact Per Facility to Farms, Farm Product Processors and Farm Suppliers for Pet Food Ingredient Purchases

Average Impact Per Pet Food Manufacturing Facility to Farms, Farm Product Processors and Farm Suppliers Due to Pet Food Ingredient Purchases				
<u>State</u>	<u>Average Pet Food Ingredients Purchased (Tons)</u>	<u>Average Farms and Processors Sales Resulting from Pet Food Ingredient Purchases (Dollars)</u>	<u>Average Farm Input Purchases Resulting from Pet Food Ingredient Purchases (Dollars)</u>	<u>Average Farm Supplier Input Purchases Resulting from Pet Food Ingredient Purchases (Dollars)</u>
Alabama	69,999	\$60,133,836	\$48,786,713	\$41,606,225
Alaska	*Insufficient Data			
Arizona	25,592	\$21,985,510	\$16,172,827	\$12,992,761
Arkansas	13,627	\$11,706,802	\$9,116,250	\$7,457,830
California	13,336	\$11,456,353	\$9,178,936	\$6,112,229
Colorado	23,150	\$19,887,512	\$15,955,605	\$11,280,252
Connecticut	3,959	\$3,401,245	\$2,722,597	\$2,238,185
Delaware	*Insufficient Data			
Florida	44,304	\$38,060,029	\$35,646,960	\$27,964,483
Georgia	6,701	\$5,756,698	\$4,627,953	\$3,533,611
Hawaii	*Insufficient Data			
Idaho	38,211	\$32,826,051	\$22,182,456	\$18,123,962
Illinois	17,879	\$15,358,916	\$12,744,714	\$9,041,527
Indiana	18,185	\$15,621,966	\$12,220,872	\$9,941,581
Iowa	24,552	\$21,091,567	\$17,005,105	\$13,431,805
Kansas	31,800	\$27,318,232	\$22,756,851	\$17,990,004
Kentucky	11,922	\$10,242,079	\$8,570,847	\$7,185,458
Louisiana	8,557	\$7,351,281	\$6,784,974	\$5,633,207
Maine	526	\$451,906	\$377,857	\$323,018
Maryland	5,637	\$4,842,787	\$3,123,056	\$2,569,989
Massachusetts	*Insufficient Data			
Michigan	1,316	\$1,130,689	\$813,483	\$653,158
Minnesota	2,926	\$2,513,652	\$2,095,964	\$1,473,704
Mississippi	44,496	\$38,225,144	\$22,442,125	\$19,209,547
Missouri	77,507	\$66,584,293	\$44,929,591	\$35,363,711
Montana	8,124	\$6,978,795	\$6,185,740	\$5,180,463
Nebraska	16,495	\$14,170,689	\$11,605,408	\$8,629,342
Nevada	39,966	\$34,333,211	\$25,157,509	\$21,281,306
New Hampshire	*Insufficient Data			
New Jersey	74,505	\$64,004,657	\$53,034,466	\$40,828,490
New Mexico	1,584	\$1,360,486	\$1,309,859	\$1,167,505
New York	41,971	\$36,056,176	\$30,303,728	\$23,802,985
North Carolina	6,472	\$5,560,005	\$4,686,374	\$3,688,532
North Dakota	8,124	\$6,978,795	\$6,185,740	\$5,180,463
Ohio	23,760	\$20,411,177	\$13,495,285	\$9,816,915
Oklahoma	19,635	\$16,867,730	\$13,561,573	\$10,808,059

<u>State</u>	<u>Average Pet Food Ingredients Purchased (Tons)</u>	<u>Average Farms and Processors Sales Resulting from Pet Food Ingredient Purchases (Dollars)</u>	<u>Average Farm Input Purchases Resulting from Pet Food Ingredient Purchases (Dollars)</u>	<u>Average Farm Supplier Input Purchases Resulting from Pet Food Ingredient Purchases (Dollars)</u>
Oregon	4,687	\$4,026,783	\$3,689,655	\$2,957,967
Pennsylvania	8,012	\$6,882,549	\$5,403,357	\$4,147,743
Rhode Island	*Insufficient Data			
South Carolina	30,576	\$26,266,882	\$20,442,003	\$17,171,812
South Dakota	26,464	\$22,734,535	\$21,557,604	\$17,561,125
Tennessee	13,365	\$11,481,034	\$7,976,558	\$6,373,547
Texas	11,343	\$9,744,128	\$8,095,251	\$5,350,267
Utah	36,241	\$31,133,350	\$24,261,263	\$18,663,215
Vermont	7,569	\$6,501,933	\$6,370,069	\$5,622,758
Virginia	12,580	\$10,806,754	\$7,187,525	\$5,698,546
Washington	4,159	\$3,572,677	\$3,062,591	\$2,273,901
West Virginia	*Insufficient Data			
Wisconsin	10,385	\$8,921,018	\$6,987,417	\$5,246,275
Wyoming	*Insufficient Data			
United States	15,457	\$13,278,728	\$10,292,973	\$7,935,510

Notes: 1) There was insufficient data to allocate pet food ingredient purchases and upstream impacts to: Alaska, Delaware, Hawaii, Massachusetts, New Hampshire, Rhode Island, West Virginia and Wyoming; 2) Dollar denominated data in this table are not additive.

Figure 20 through Figure 23 refer to Table 12. The average values in Table 12 were calculated by dividing the values for each of the variables in Table 11 by the number of **pet food manufacturing facilities** in each state.

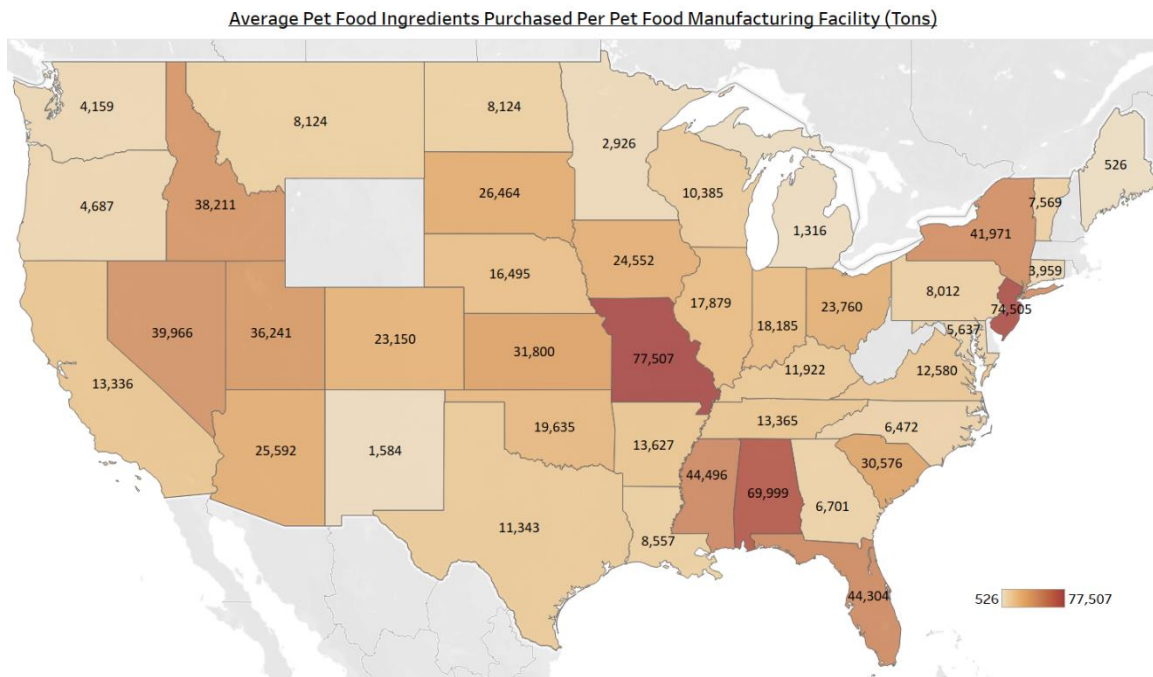


Figure 20, Average Pet Food Ingredients Purchased Per Pet Food Manufacturing Facility (Tons)

Average Farms and Processor Sales Resulting from Pet Food Ingredient Purchases Per Pet Food Manufacturing Facility (\$1,000)

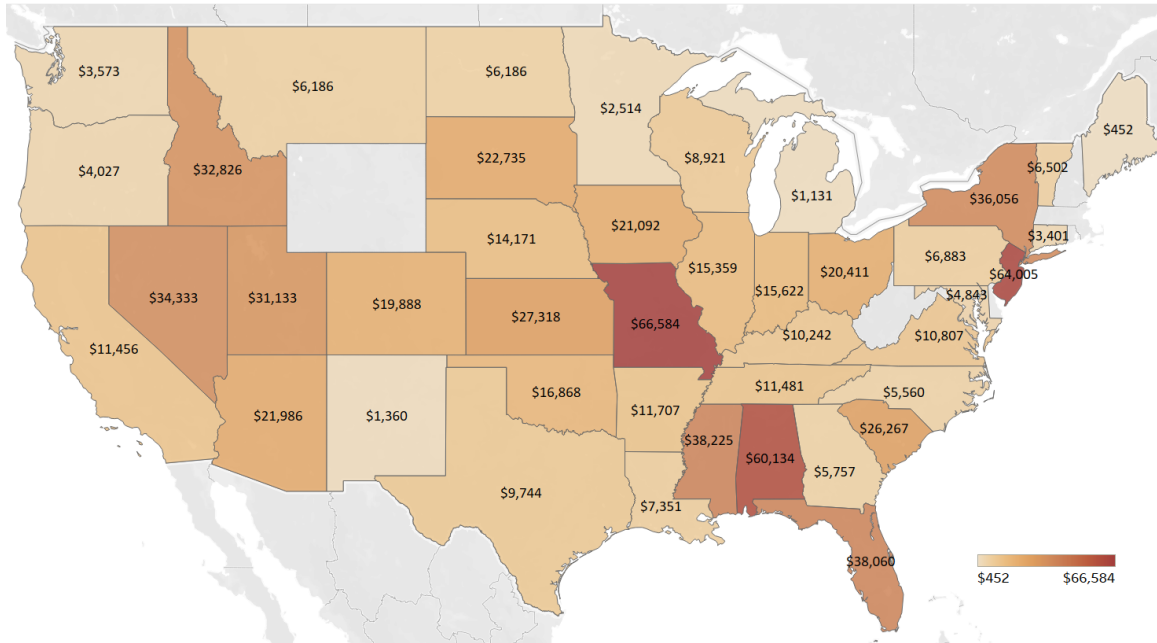


Figure 21, Average Farms and Processors Sales Resulting from Pet Food Ingredient Purchases Per Pet Food Manufacturing Facility (\$1,000)

Average Farm Input Purchases Resulting from Pet Food Ingredient Purchases Per Pet Food Manufacturing Facility (\$1,000)

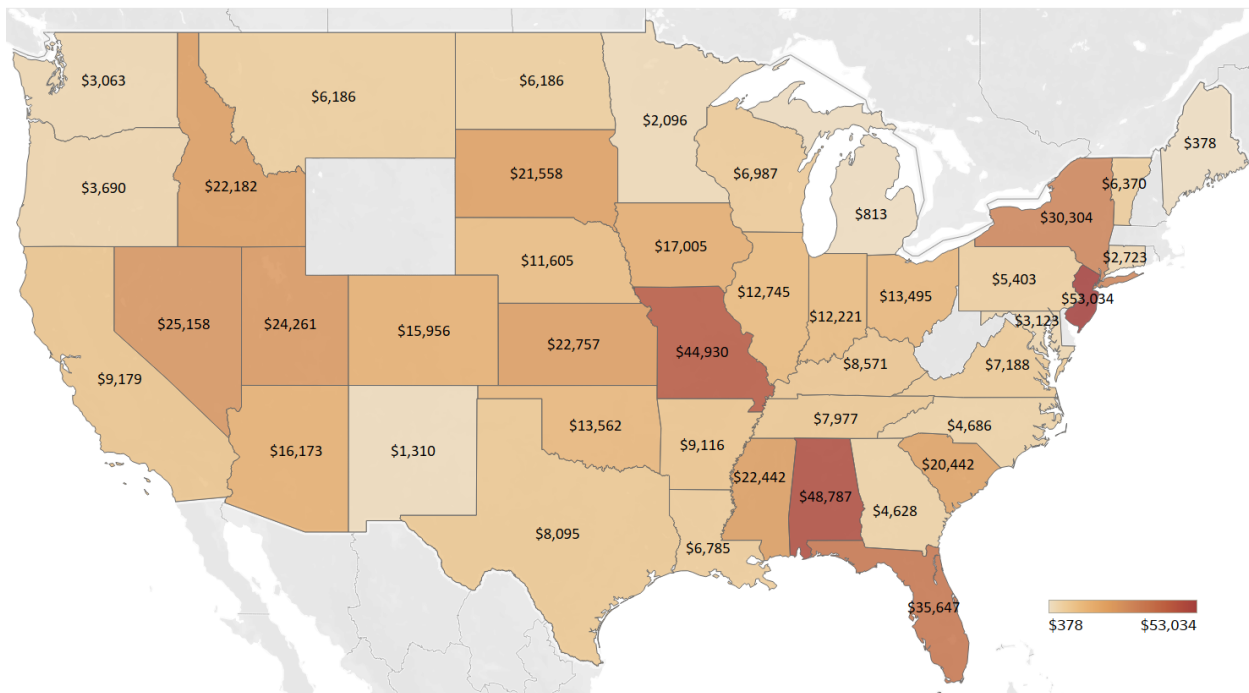


Figure 22, Average Farm Input Purchases Resulting from Pet Food Ingredient Purchases Per Pet Food Manufacturing Facility (\$1,000)

Average Farm Supplier Input Purchases Resulting from Pet Food Ingredient Purchases Per Pet Food Manufacturing Facility (\$1,000)

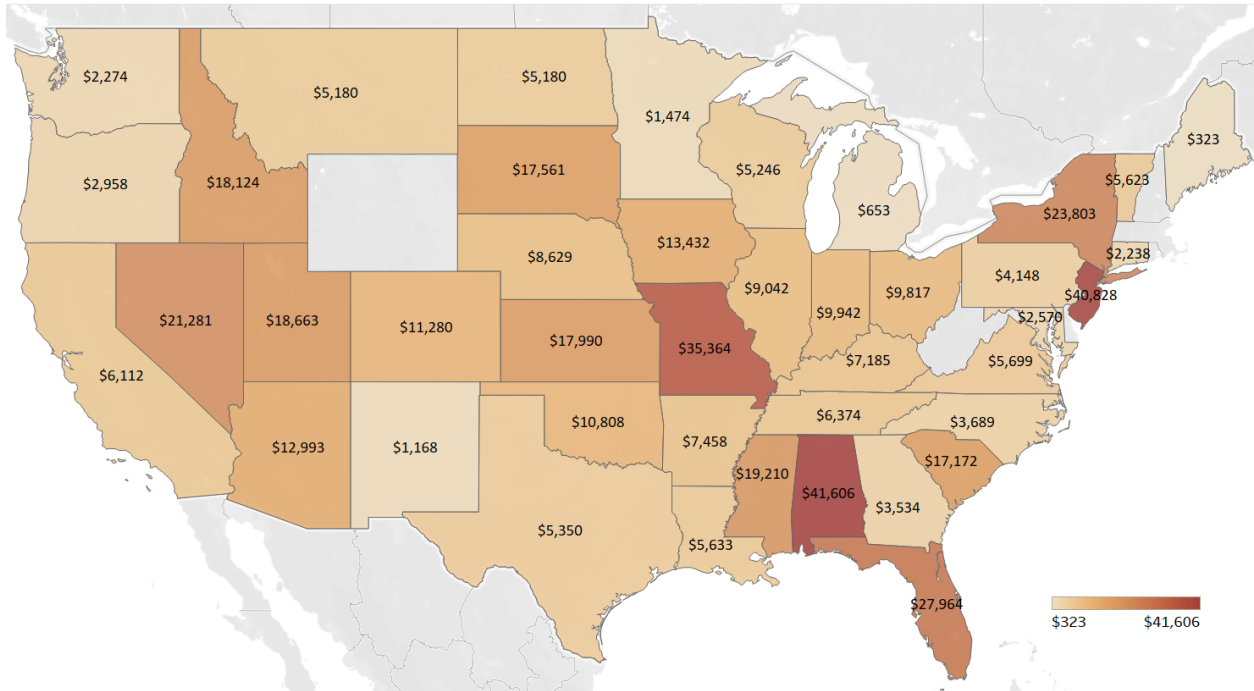


Figure 23, Average Farm Supplier Input Purchases Resulting from Pet Food Ingredient Purchases Per Pet Food Manufacturing Facility (\$1,000)

Sales Analysis

The sales analysis results included here are based upon the purchased Nielsen data³. Data are summarized according to “sub-category” for:

- Total volume and value of cat and dog foods
- Total volume and value of cat foods
- Total volume and value of dog foods

Total

The Nielsen data covered 6.7 million tons of pet food sales with a value of \$20.7 billion. This represents 68.3% of U.S. pet food sales.

Table 13, Total Pet Food Volume and Sales

Pet Food Category	Tons	Value
Dog Food Dry	3,799,875	\$7,646,628,386
Dog Treats	373,461	\$4,245,890,986
Cat Food Dry	1,202,449	\$2,878,836,636
Cat Food Wet	604,074	\$2,767,804,016
Dog Food Wet	637,727	\$2,350,304,234
Cat Treats	41,585	\$724,467,489
Dog Food Moist	56,864	\$129,394,402
Total	6,716,035	\$20,743,326,148

Table 13 and Figure 25 show the volume and value of total (both cat and dog) pet food products, by different food types (sub-category). Among all pet food products, the lead product was dry dog food by both volume and by value, 57% and 37%, respectively. This suggests, that while dry dog food comprises the majority of total cat and dog food sold by volume, its value per pound is less than other sub-categories of cat and dog foods.

The inverse of the volume to value comparison for dry dog food is also true. For example, both cat and dog treats comprise a small portion of total volume (0.6% and 5.6%, respectively), yet make up a much larger share of the total when summarized by value (3.5% and 20.5%, respectively).

³ Data contained in Table 13 and all other results in this “Sales Analysis” section of the report, represents the total volumes and values included in the purchased Nielsen data. Nielsen claims this data represents 68.3% of the industry total. If one were to estimate the national total, it could be calculated by dividing results by 0.683 or multiplying them by 1.465 (1/0.683). See Appendix B, Ingredient List and Categorization Used for Upstream Analysis for adjusted “top line” estimates.

Total Pet Food Sales -- By Volume (Tons)

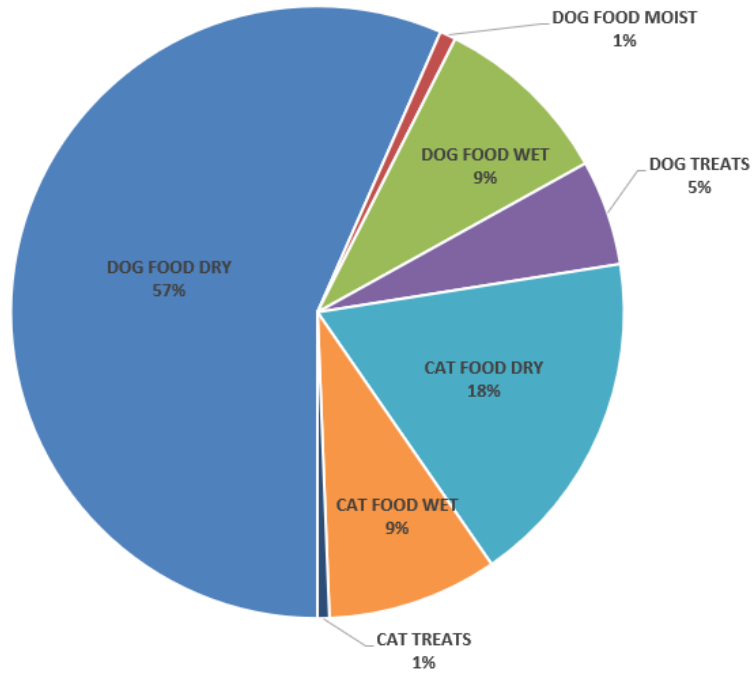


Figure 24, Total Pet Food Sale Analysis -- By Volume (Tons)

Total Pet Food Sales -- By Value

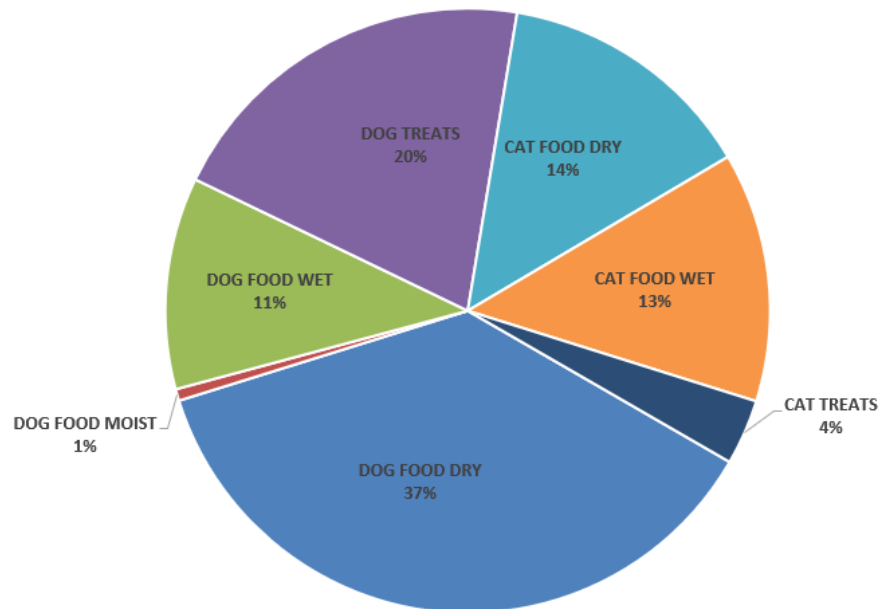


Figure 25, Total Pet Food Sale Analysis -- By Value

Cats

Total cat food sales were 1.85 million tons with a value of \$6.37 billion, covered by the Nielsen data. Figure 26 and Figure 27 show volume and value of cat food products by sub-category. By volume, the lead sub-category is dry cat food, 65% of total volume. By value, dry cat food and wet cat food are similar, occupied 45% and 44%, respectively.

Cat Food Sales -- By Volume (Tons)

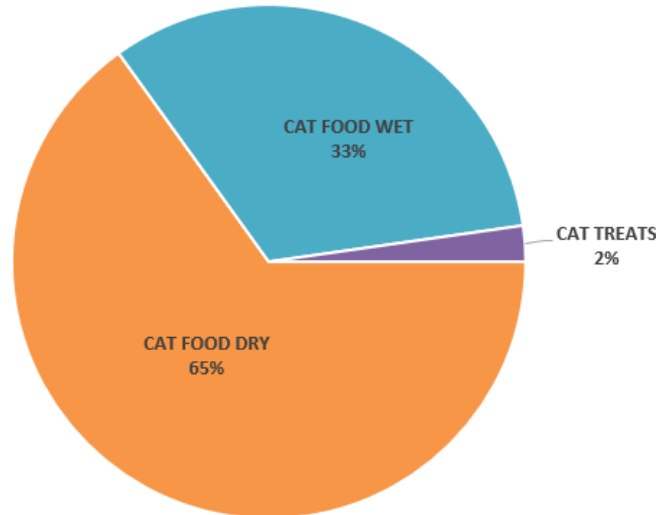


Figure 26, Cat Food Sales – By Volume (Tons)

Cat Food Sales -- By Value

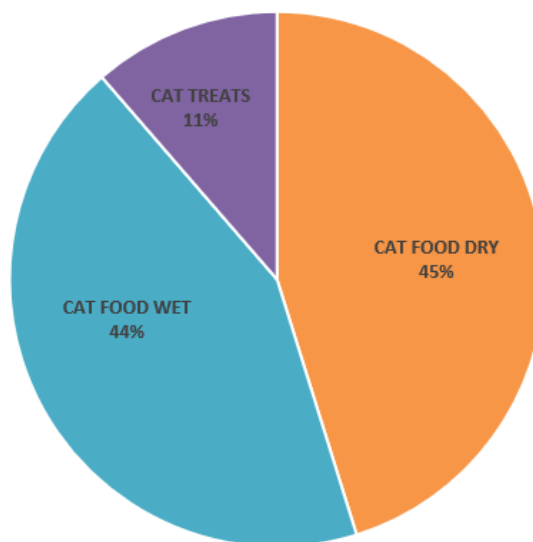


Figure 27, Cat Food Sales – By Value

Dogs

Total dog food sales were 4.87 million tons with a value of \$14.37 billion, covered by the Nielsen data. Figure 28 and Figure 29 show volume and value of dog food products by sub-category. By volume, the lead sub-category is dry dog food, with 78% of total volume. By value, dry dog food accounted for 53%.

Dog Food Sales -- By Volume (Tons)

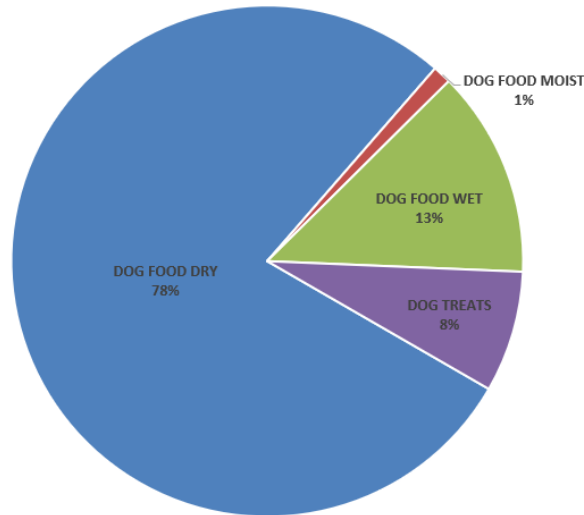


Figure 28, Dog Food Sales – By Volume (Tons)

Dog Food Sales -- By Value

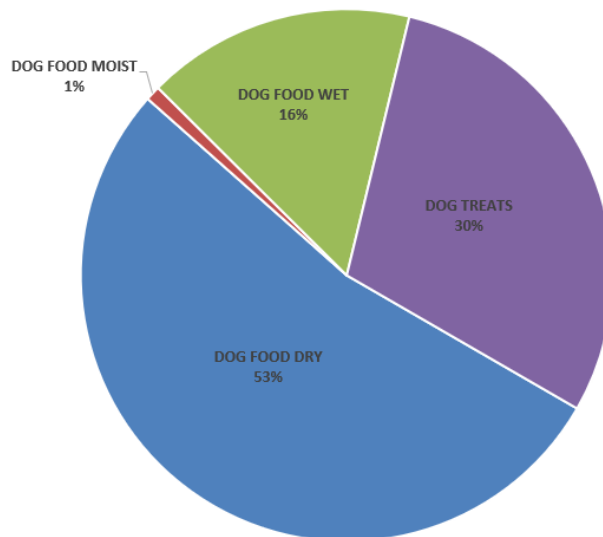


Figure 29, Dog Food Sales – By Value

Ingredient Analysis

From the purchased Nielsen data, there were 18,197 cat food records and 40,966 dog food records – 59,163 in total. However, some of them shared the same Universal Product Code (UPC) and some had identical ingredients, form, etc., but are packaged in different sizes or quantities. Controlling for UPC and size, among all pet food products, 633 unique cat food products and 1,369 unique dog food products were selected for further analysis, which accounts for 95% by volume of total pet food products in the Nielsen data. Thus, these unique pet food products were assigned as our “study objects.”

Among the study objects, 19.6% of cat food products and 24.9% of dog food products were identified as “private label” according to the raw data from Nielsen. Those products didn’t have enough information, such as ingredient labels, guaranteed analysis and calorie information to evaluate ingredient quantities based on the recipe reverse engineering procedure. By following the methodological framework (step 4) described in the methodology in Appendix A, there were 65 and 177 products that were found to have approximate matches with non-private label food products for cat and dog food products, respectively. Therefore, the size of study objects for cat and dog food products went down to 574 and 1,235, which caused the estimated coverage by volume to be reduced from 95% to 88% and 95% to 90% for cat and dog food products, respectively.

Standardizing of Pet Food Ingredients

To have a good understanding of pet food ingredients, some associated ingredients were combined, and names were standardized. For example, “apple” and “apples,” “beefhide” and “beef hide,” and “soybean oil” and “soy oil,” etc. Then, a statistical method, called text mining was applied to visually extract patterns and prevalence. This process demonstrates the frequency with which each standardized food ingredient shows up on product packages.

As shown in Figure 30 and Figure 31, the larger the font size of the words or phrases the more frequently (not necessarily total use of) an ingredient shows up on the product ingredient panels. Chicken and chicken related food ingredients, such as “chicken meal,” “chicken fat,” and “chicken by-product meal,” etc., are present most often for both cat and dog food products.

Chicken, meat by-product meal and liver are the top three commonly used animal related food ingredients; and corn gluten meal, wheat gluten and brewers rice are the top three most commonly used plant related food ingredients for cat food products.

For dog food products, chicken, chicken fat and chicken meal are the top three most commonly used animal ingredients; and flaxseed, peas and carrots are the top three most commonly used plant ingredients. Of note, while these “word clouds” indicate the frequency of these items showing up in various products, they do not necessarily represent volumes.

Major Relevant Food Ingredients for Cats



Figure 30, Major Food Ingredients for Cats, by Mention on the Ingredient Label

Major Relevant Food Ingredients for Dogs



Figure 31, Major Food Ingredients for Dogs, by Mention on the Ingredient Label

Among all the 542 standardized ingredients, 280 of them were aggregated into nutrient groups such as animal protein, animal fat, plant protein, plant carbohydrate, specialty, etc. These nutrient groups were defined by the three organizations and the distribution of nutrient groups are shown in Figure 32. Animal protein related ingredients made up the majority of the total ingredients, followed by specialty crop ingredients, shown as Fruits and Vegetables in Figure 32, such as apples, blueberries, peas, spinach, etc.

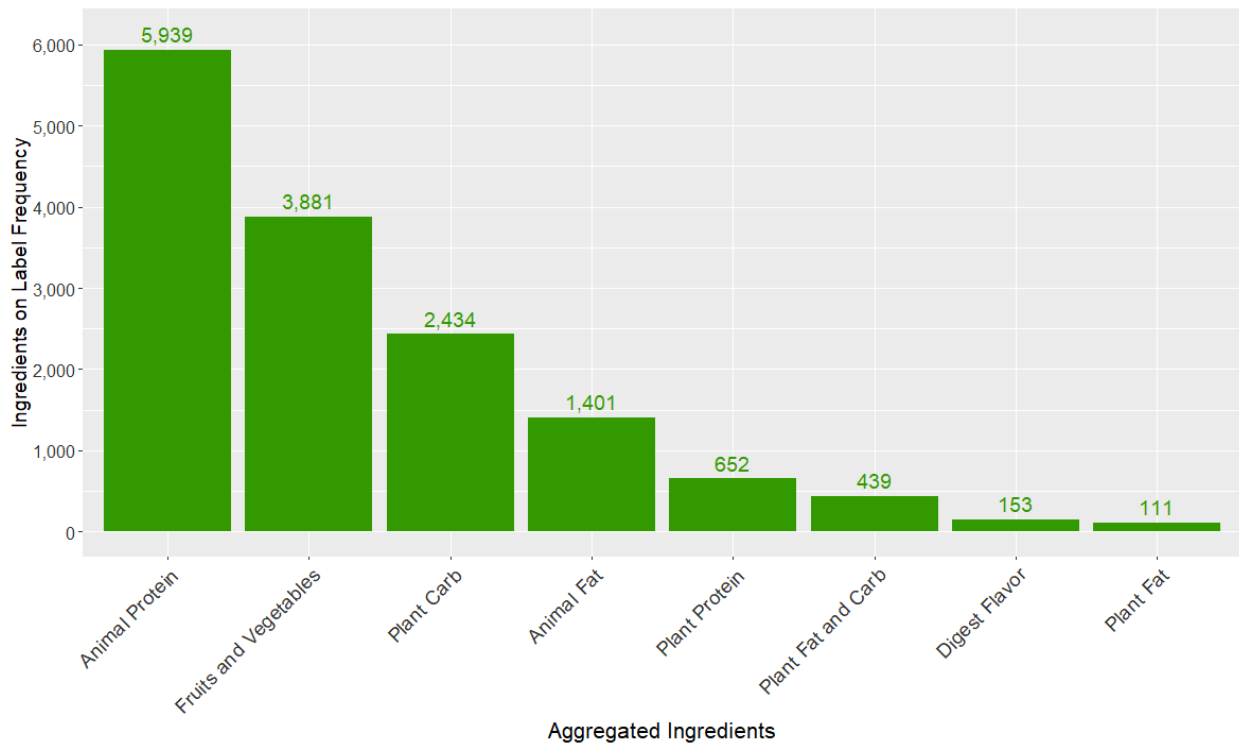


Figure 32, Distribution of Food Ingredients in Nutrient Groups

Ingredient Quantities

After the recipe reverse engineering was applied to all sampled products, the prevalence distributions of ingredients’ inclusion rates, based on the corresponding placements, for all **subsegments** were calculated. According to the distributions, approximate recipes for the non-sampled products under each subsegment were estimated. After all the recipes were reverse engineered, the equivalent sales data from Nielsen were utilized to determine the quantities of each ingredient for a given pet food product.⁴

⁴ Data contained in all results in this “Ingredient Analysis” section of the report, represents the total volumes and values in U.S total, which was factored up from the purchased Nielsen data (by multiply 1.4648). Nielsen claims this data represents 68.3% of the industry total. See Appendix B, Ingredient List and Categorization Used for Upstream Analysis for adjusted “top line” estimates.

Tree map charts, such as shown in Figure 34, and bar charts (i.e., Figure 35) show the summary of pet food ingredient quantities under different nutrient groups. In a tree map chart, a larger size of the squares/rectangles represents a higher amount of the corresponding ingredient. There are 164 ingredients shared by both cat and dog foods. Total pet foods, cat foods and dog foods are denoted using orange, blue and green colors in the bar charts, respectively. The complete version of cat and dog food ingredient quantities for all aggregated ingredient groups can be explored with an interactive, online visualization tool [here](#).

Total

Shown below in Figure 33, total cat and dog food ingredient allocations are based on the number of pets by state which shows the distribution of pet food ingredients **as consumed**. Due to large pet populations, the leading states for pet food consumption include Texas, California and Florida. Individual ingredients by state can be seen in the online visualization tool.

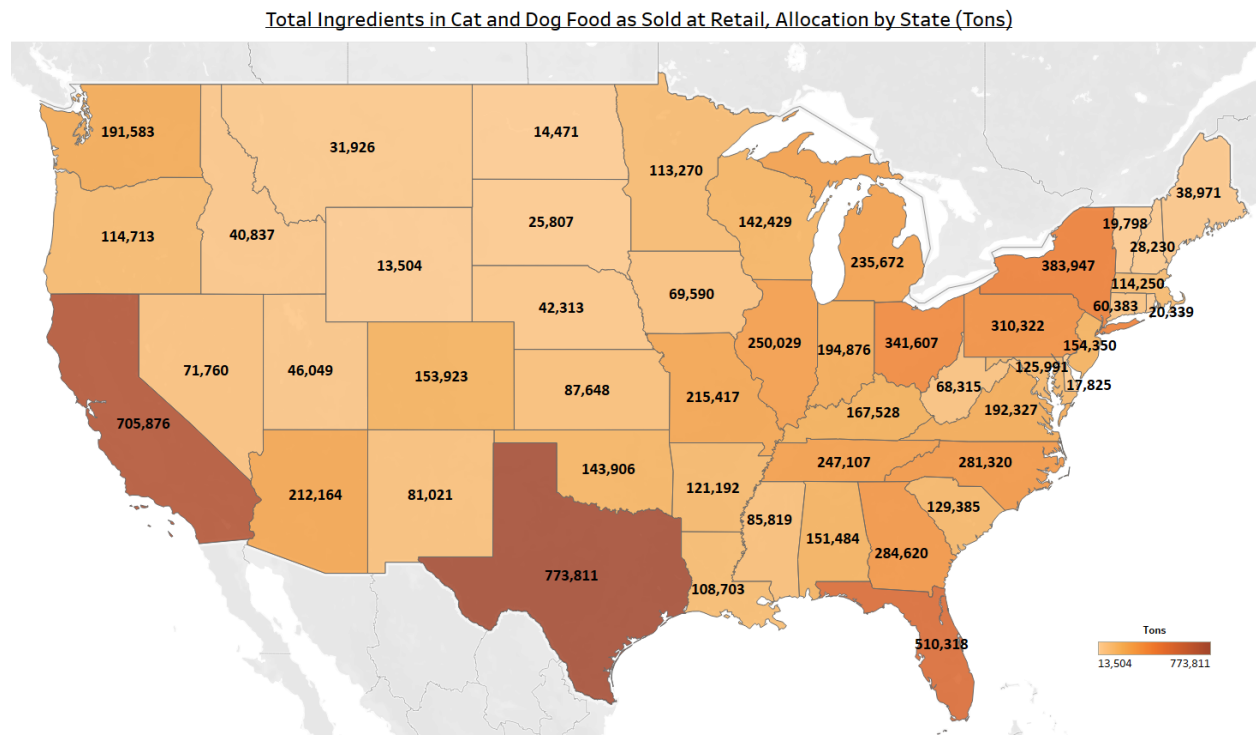


Figure 33, Total Ingredients in Cat and Dog Food as Sold at Retail, Allocation by State

Furthermore, these ingredients can be broken down by various nutrient groups. Figure 34 and Figure 35 show summary quantities of total pet food ingredients that belong to the “animal protein” nutrient group. Chicken is the lead ingredient with 584,098⁵ tons used for total pet food products during the study period, followed by meat and bone meal, and chicken by-product meal, with 533,253 tons and 362,828 tons, respectively.

⁵ This tonnage here is different than the chicken ‘as bought’ volume, 854,988 tons, under the upstream analysis section, due to the water content changing during food manufacture processing. Note that the 854,988 tons of chicken is the raw chicken as purchased. While the 584,098 tons of chicken is the “chicken” as an ingredient exists in finished pet foods as sold at retail, i.e. the moisture has been removed during the manufacture processing. Therefore, Ingredients such as chicken, and other meats and grains are purchased at higher moisture contents than the finished product, the ingredient quantities ‘as bought’ need to be adjusted for the moisture that is removed in the process of making the finished pet food product.

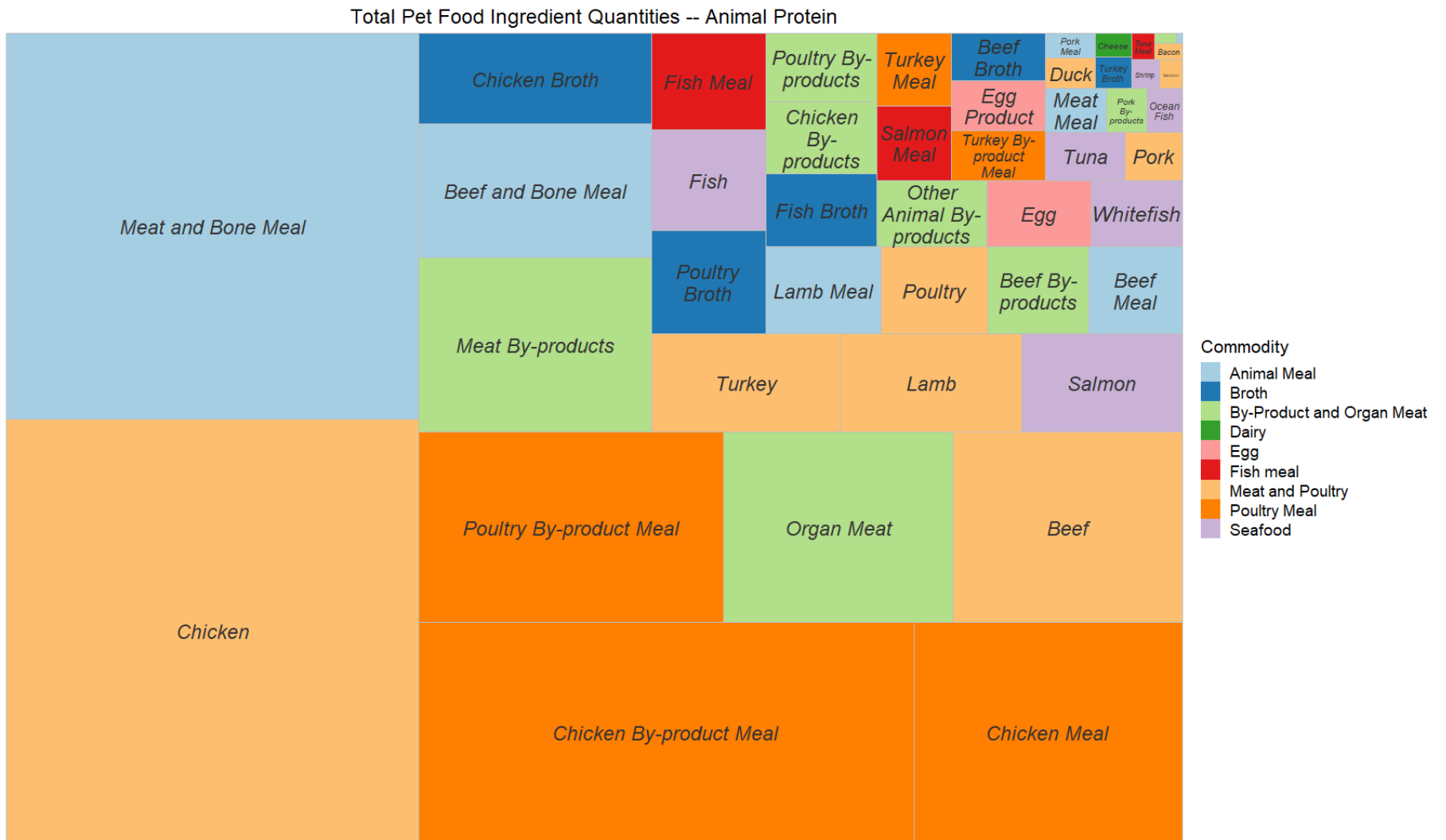


Figure 34, Animal Protein Quantities by Commodity Type (Total)

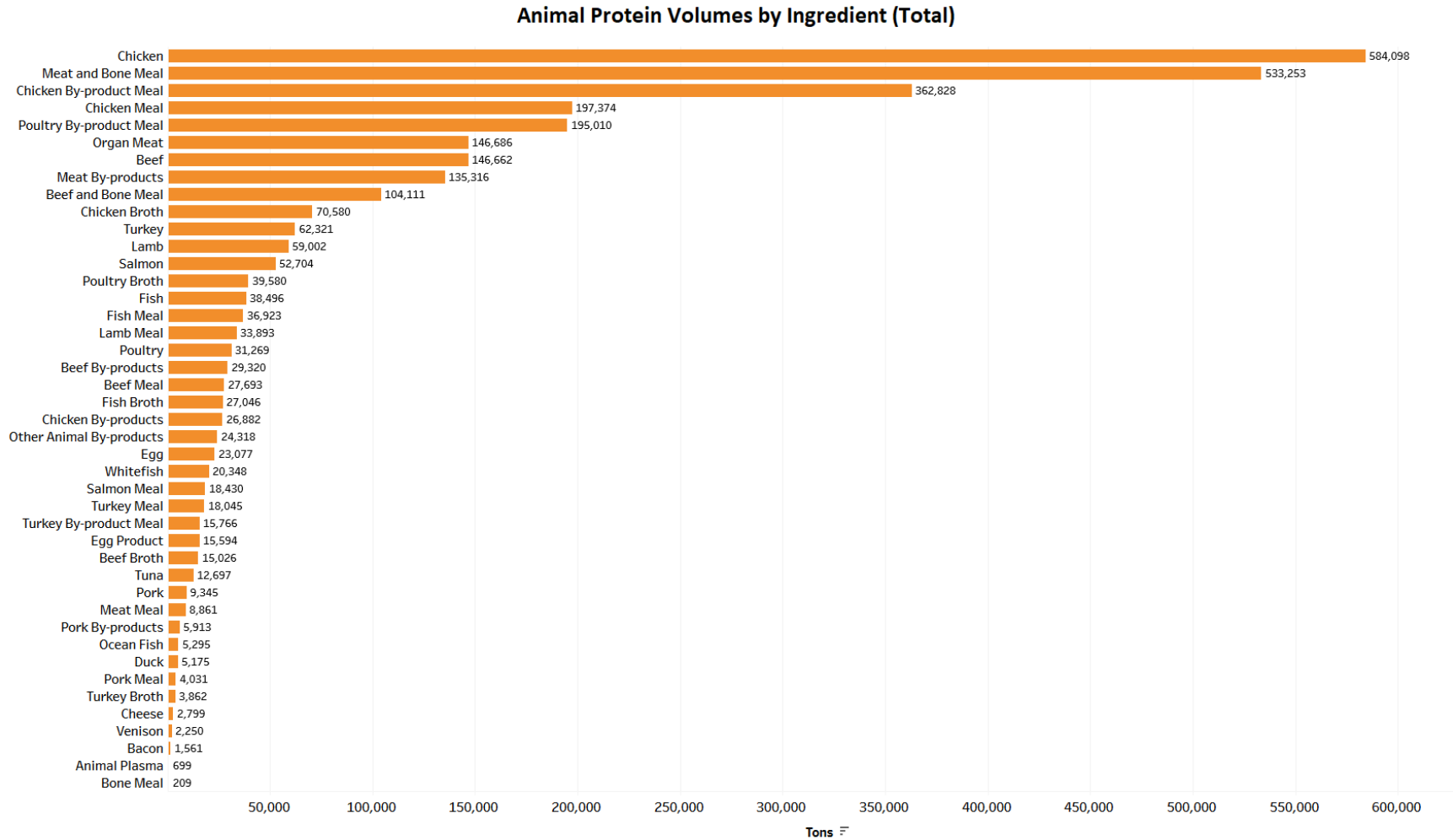


Figure 35, Animal Protein Volumes by Ingredient (Total)

Figure 36 and Figure 37 show summary quantities of total pet food ingredients that belong to the “animal fat nutrient” group. Beef fat is the main animal fat ingredient used in pet foods with 147,456 tons used during the study period, followed by animal fat ingredients and chicken fat, with 104,509 tons and 48,569 tons, respectively.

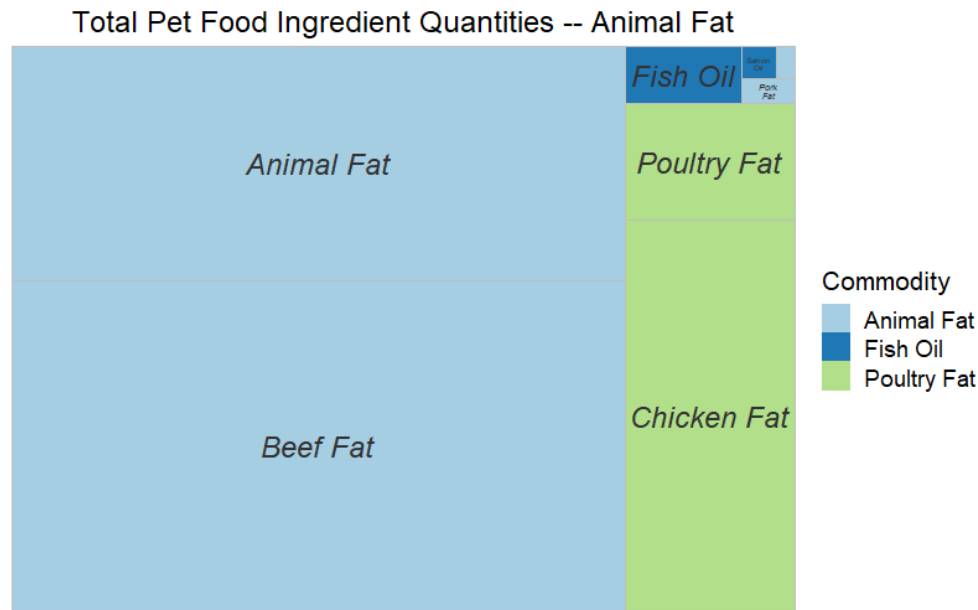


Figure 36, Animal Fat Quantities by Commodity Type (Total)

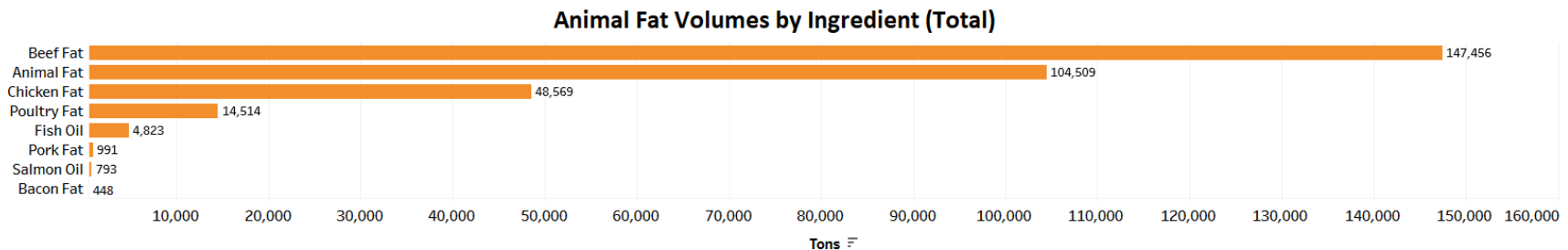


Figure 37, Animal Fat Volumes by Ingredient (Total)

Figure 38 and Figure 39 show summary quantities of total pet food ingredients that belong to plant related nutrient groups, which are “plant carbohydrates” and “plant protein.” Corn is the dominant ingredient, with 1,283,674 tons used for pet food products. Corn gluten meal and soybean meal are the second and third largest ingredients, with 476,649 tons and 427,155 tons, respectively.

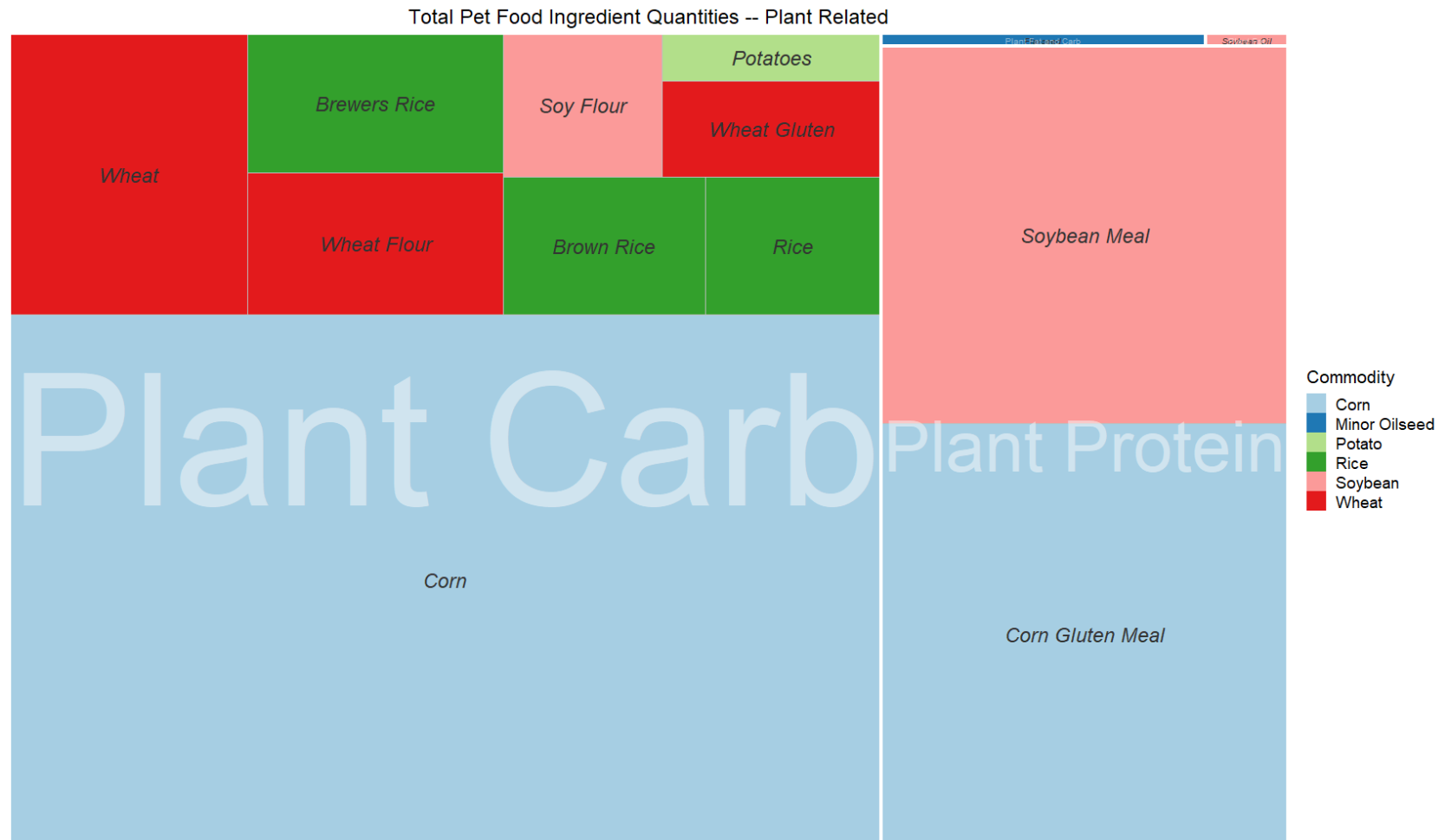


Figure 38, Plant Related Aggregations Quantities by Commodity Type (Total)

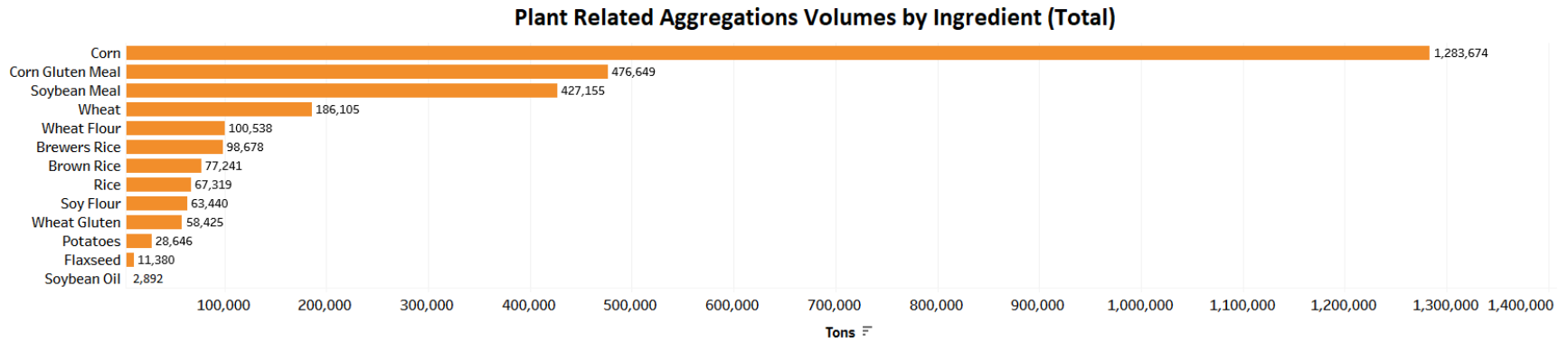


Figure 39, Plant Related Aggregations Volumes by Ingredient (Total)

Figure 40 and Figure 41 show the summary quantities of total pet food ingredients that belong to the “specialty crop” category, as defined by the participating organizations. Peas are the leading ingredient with 101,273 tons used for pet food products during our study period, followed by beet pulp and sweet potatoes, with 41,655 tons and 22,818 tons, respectively.

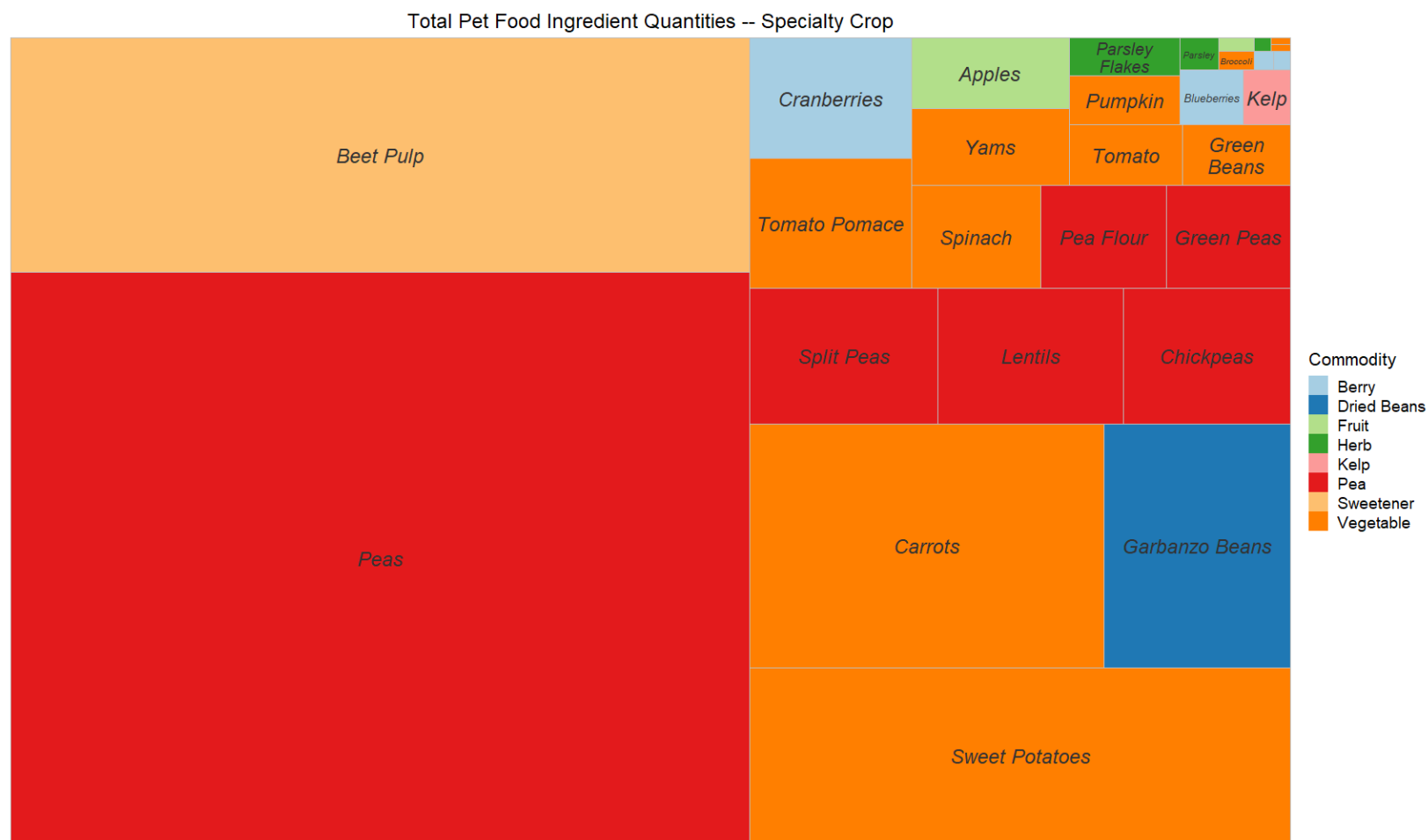


Figure 40, Specialty Crop Quantities by Commodity Type (Total)

Specialty Crop Volumes by Ingredient (Total)

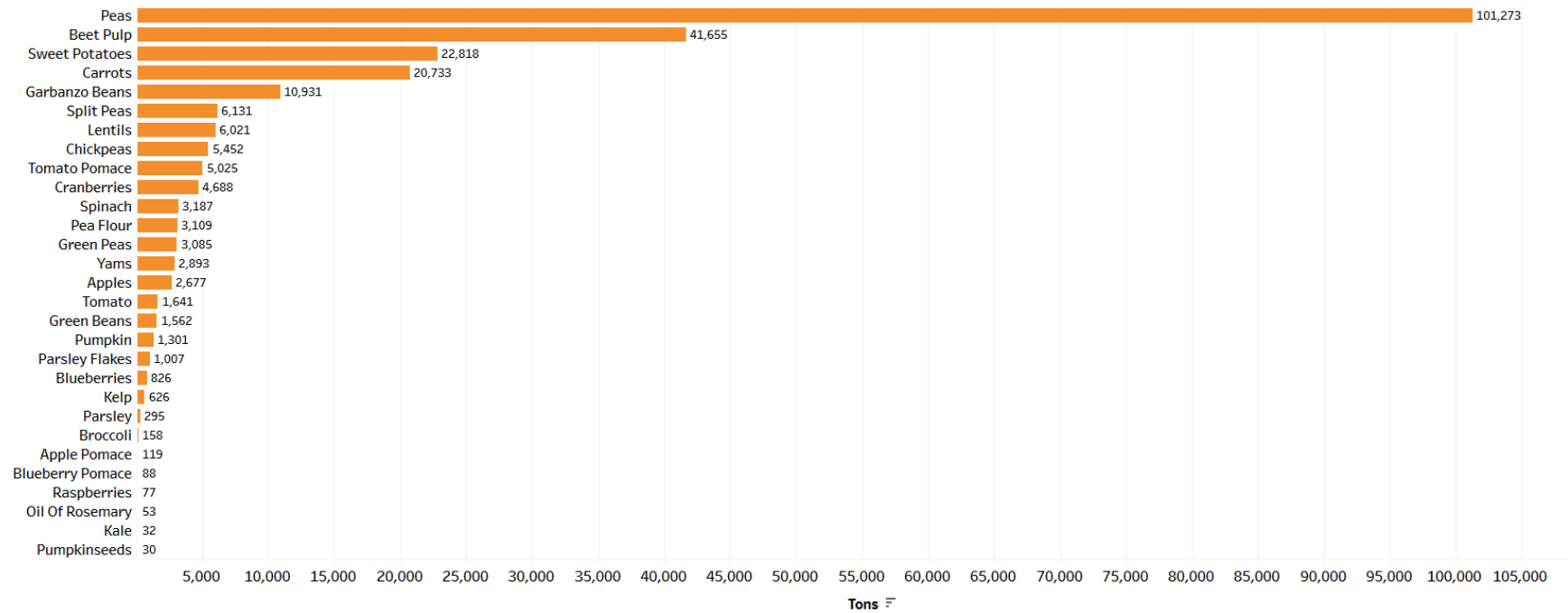


Figure 41, Specialty Crop Volumes by Ingredient (Total)

Cats

Shown below in Figure 42, total cat food ingredient allocations are based on the number of cats by state which shows the distribution of pet food ingredients **as consumed**. Due to large pet populations, the leading states for cat food consumption include Texas, California and Florida. Individual ingredients by state can be seen in the online visualization tool [here](#).

Cat Food Ingredient Allocation by State

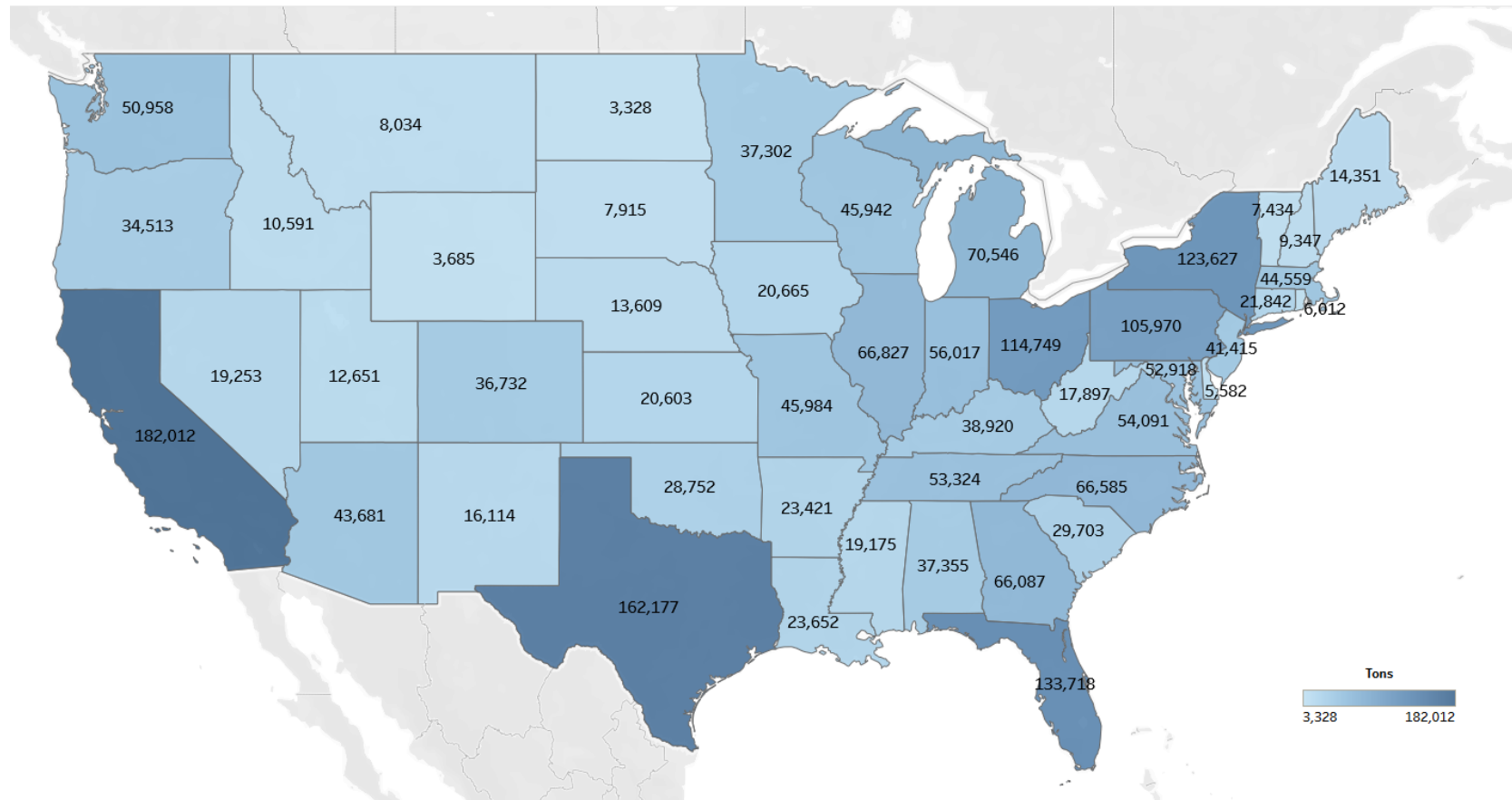


Figure 42, Total Ingredients in Cat Food as Sold at Retail, Allocation by State

Furthermore, these ingredients can be broken down by various nutrient groups. Figure 43 and Figure 44 show summary quantities of cat food ingredients that belong to the “animal protein” nutrient group. Chicken by-product meal is the lead ingredient with 161,028 tons used for cat foods during the study period, followed by chicken and poultry by-product meal, with 113,731 tons and 103,207 tons, respectively.

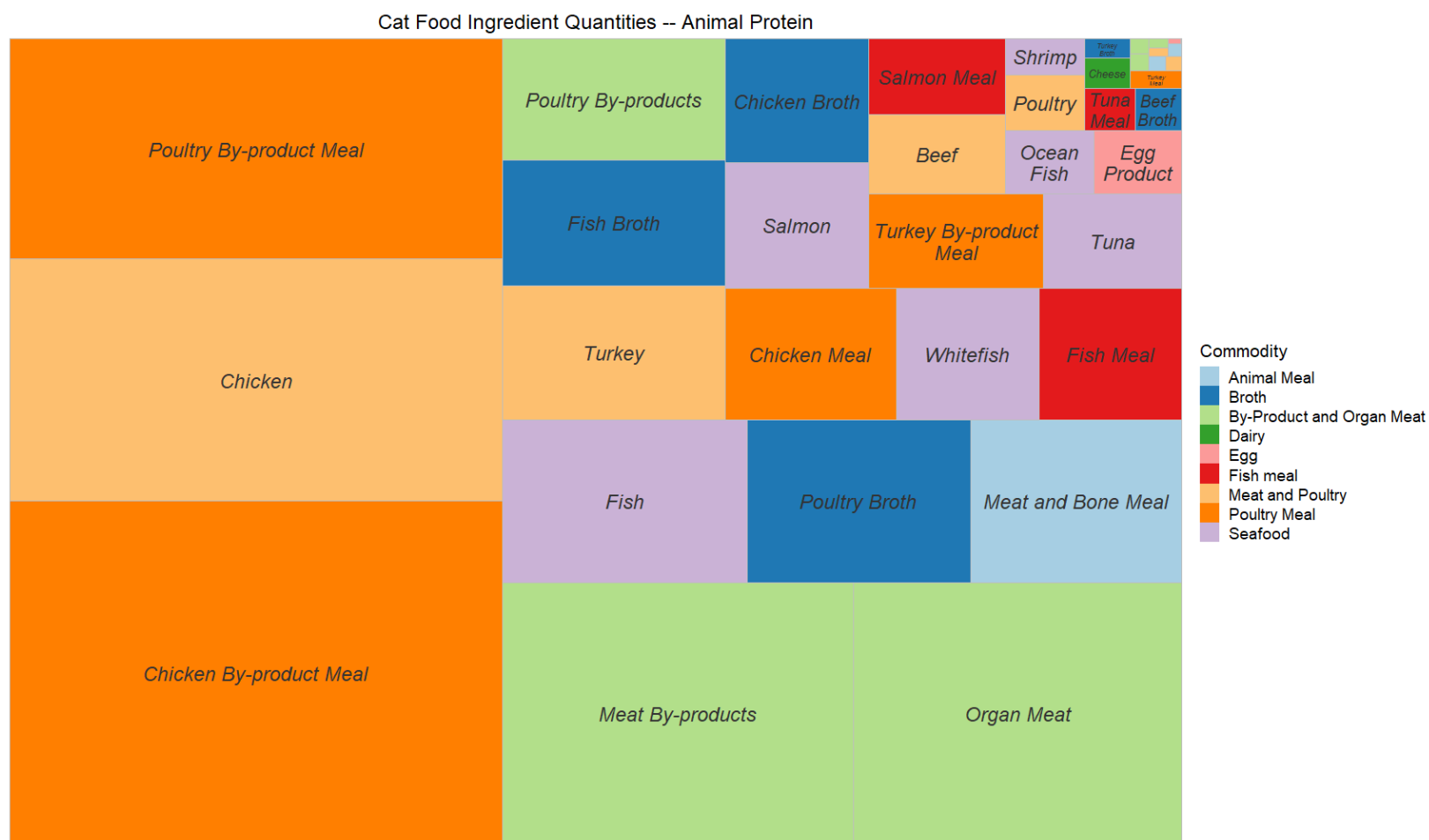


Figure 43, Animal Protein Quantities by Commodity Type (Cats)

Animal Protein Volumes by Ingredient (Cats)

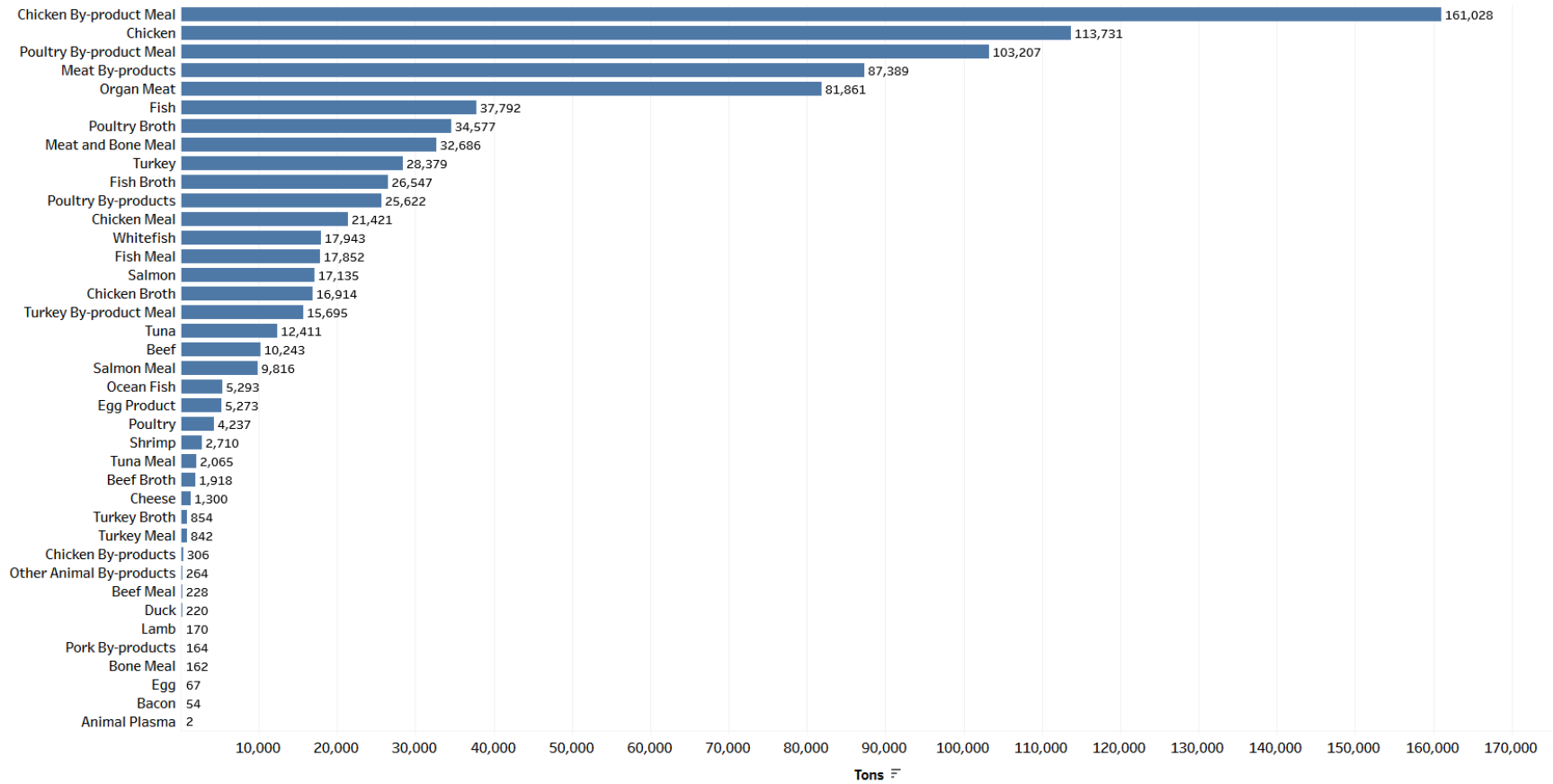


Figure 44, Animal Protein Volumes by Ingredient (Cats)

Figure 45 and Figure 46 show summary quantities of cat food ingredients that belong to the “animal fat” nutrient group. Generic animal fat is the top animal fat choice used in cat foods with 24,992 tons used during the study period, followed by beef fat and chicken fat, with 23,851 tons and 6,301 tons, respectively.

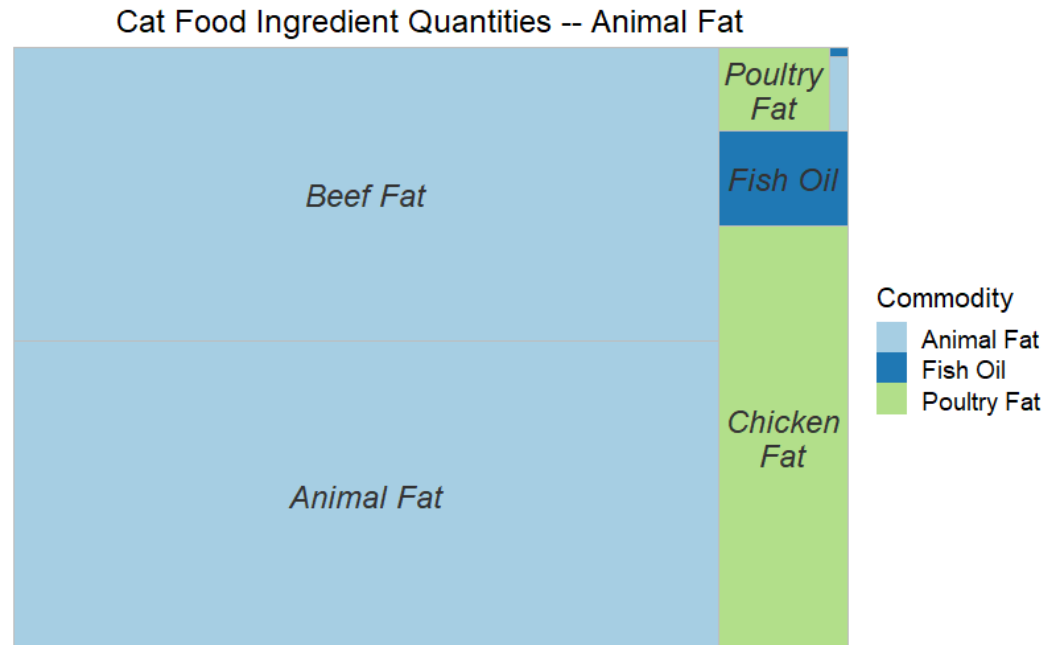


Figure 45, Animal Fat Quantities by Commodity Type (Cats)

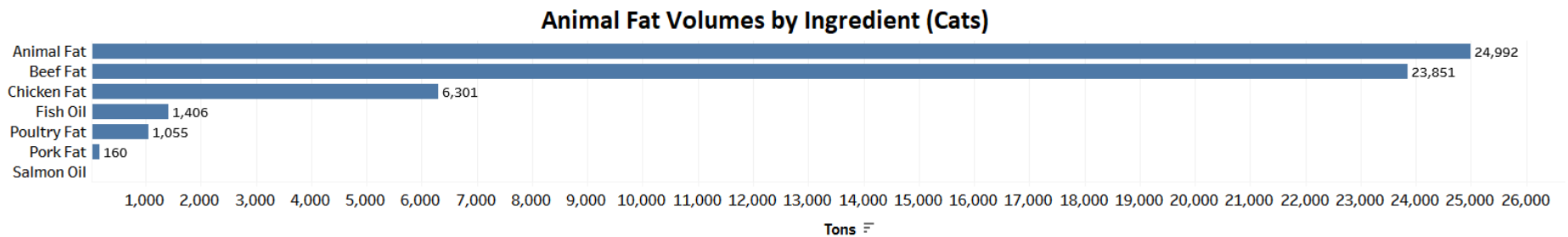


Figure 46, Animal Fat Volumes by Ingredient (Cats)

Figure 47 and Figure 48 show summary quantities of cat food ingredients that belong to plant-related nutrient groups, which are “plant protein” and “plant carbohydrate”. Corn is the top ingredient under all plant related nutrient groups, with 291,858 tons used for cat foods. Corn gluten meal and soybean meal are the second and third largest ingredients under “plant protein” and “plant carbohydrate” nutrient groups, with 241,296 tons and 82,404 tons, respectively.

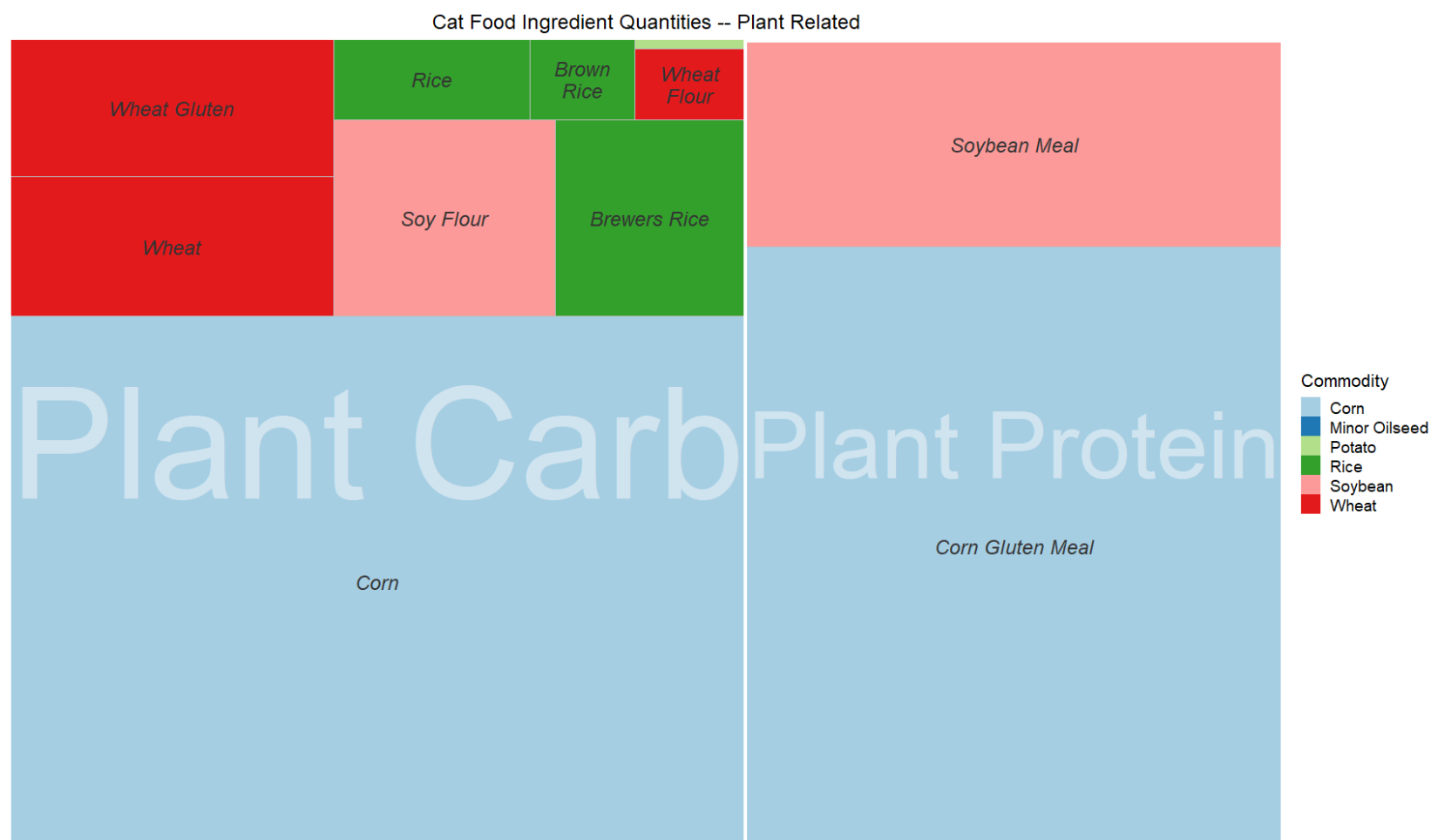


Figure 47, Plant Related Aggregations Quantities by Commodity Type (Cats)

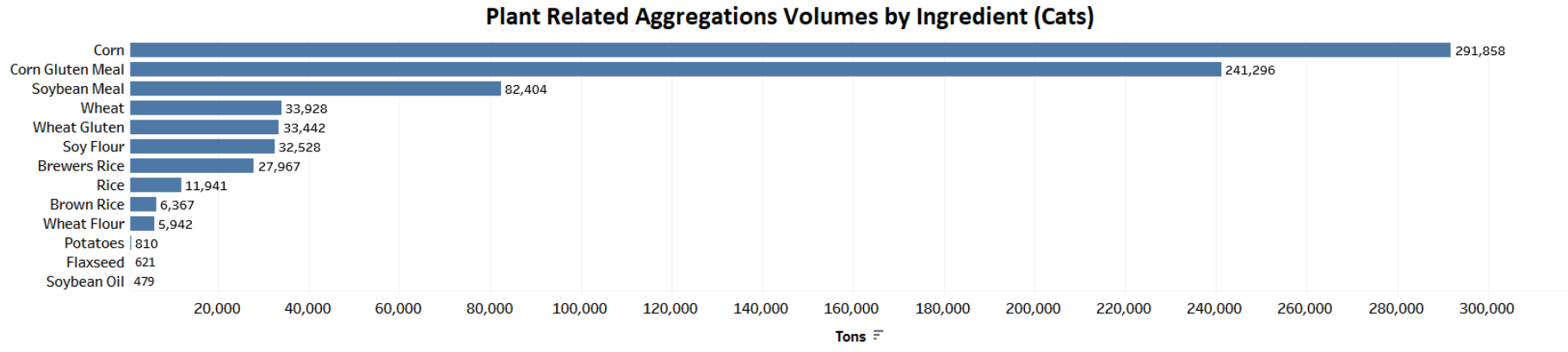


Figure 48, Plant Related Aggregations Volumes by Ingredient (Cats)

Figure 49 and Figure 50 show summary quantities of cat food ingredients that belong to the “specialty crop” category, as defined by organizations. Peas are the leading ingredient with 5,569 tons used for cat foods during the study period, followed by beet pulp and carrots, with 4,199 tons and 1,278 tons, respectively.

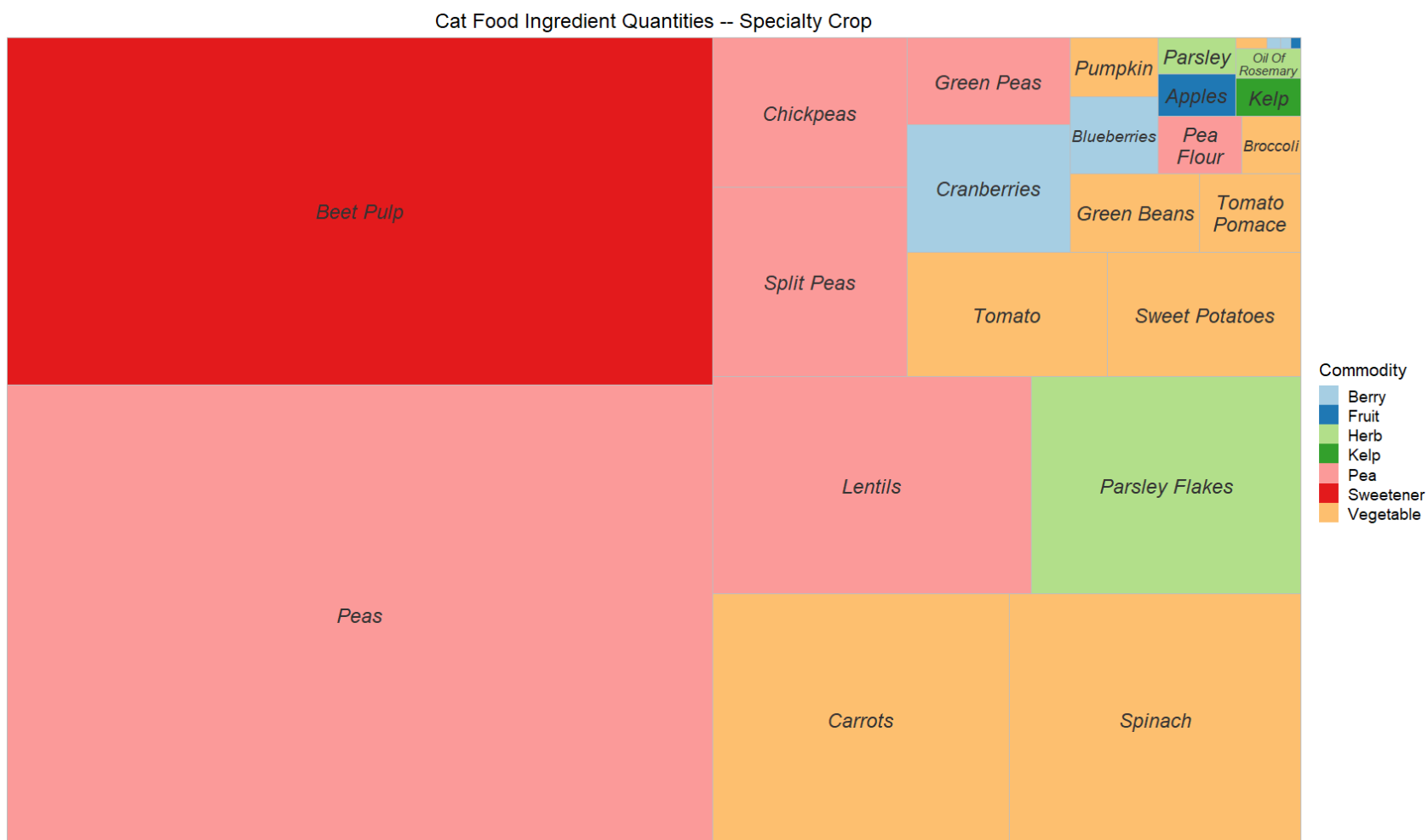


Figure 49, Specialty Crop Quantities by Commodity Type (Cats)

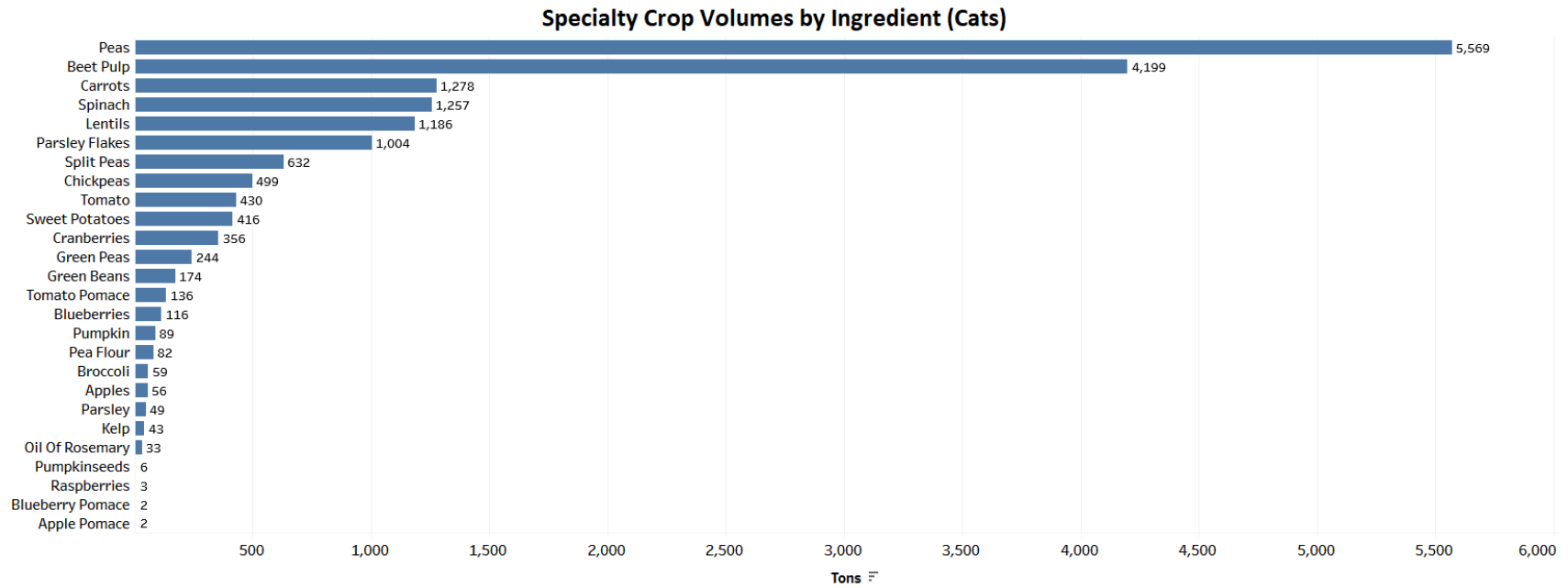


Figure 50, Specialty Crop Volumes by Ingredient (Cats)

Dogs

Shown below in Figure 51, total dog food ingredient allocations are based on the number of pets by state which shows the distribution of pet food ingredients **as consumed**. Due to large pet populations, the leading states for dog food consumption include Texas, California and Florida. Individual ingredients by state can be seen in the online visualization tool [here](#).

Dog Food Ingredient Allocation by State

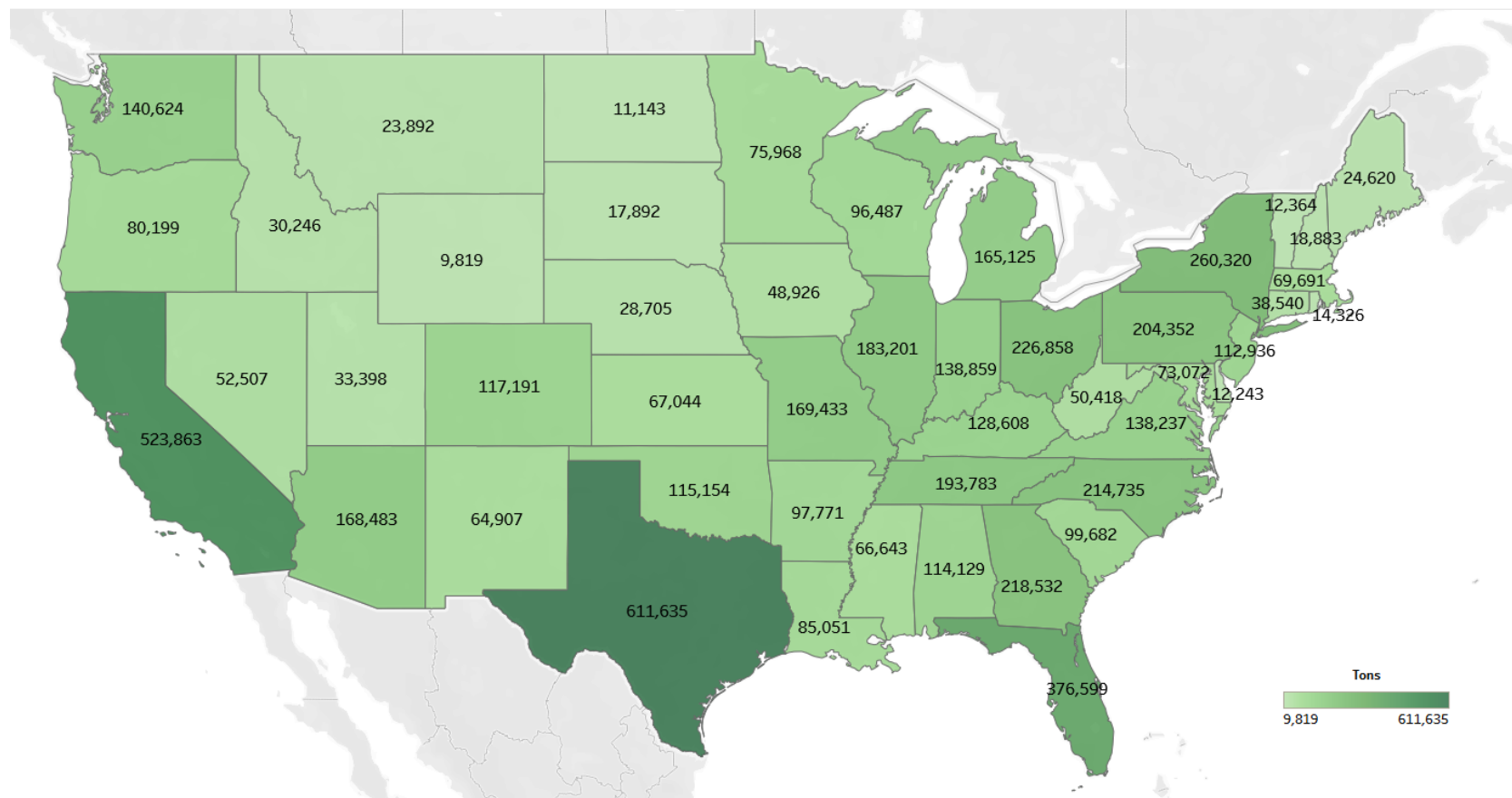


Figure 51, Total Ingredients in Dog Food as Sold at Retail, Allocation by State

Furthermore, these ingredients can be broken down by various nutrient groups. Figure 52 and Figure 53 show summary quantities of dog food ingredients that belong to the “animal protein” nutrient group. Meat and bone meal is the lead ingredient with 500,567 tons used for dog food products during our study period, followed by chicken and chicken by-product meal, with 470,367 tons and 201,800 tons, respectively.

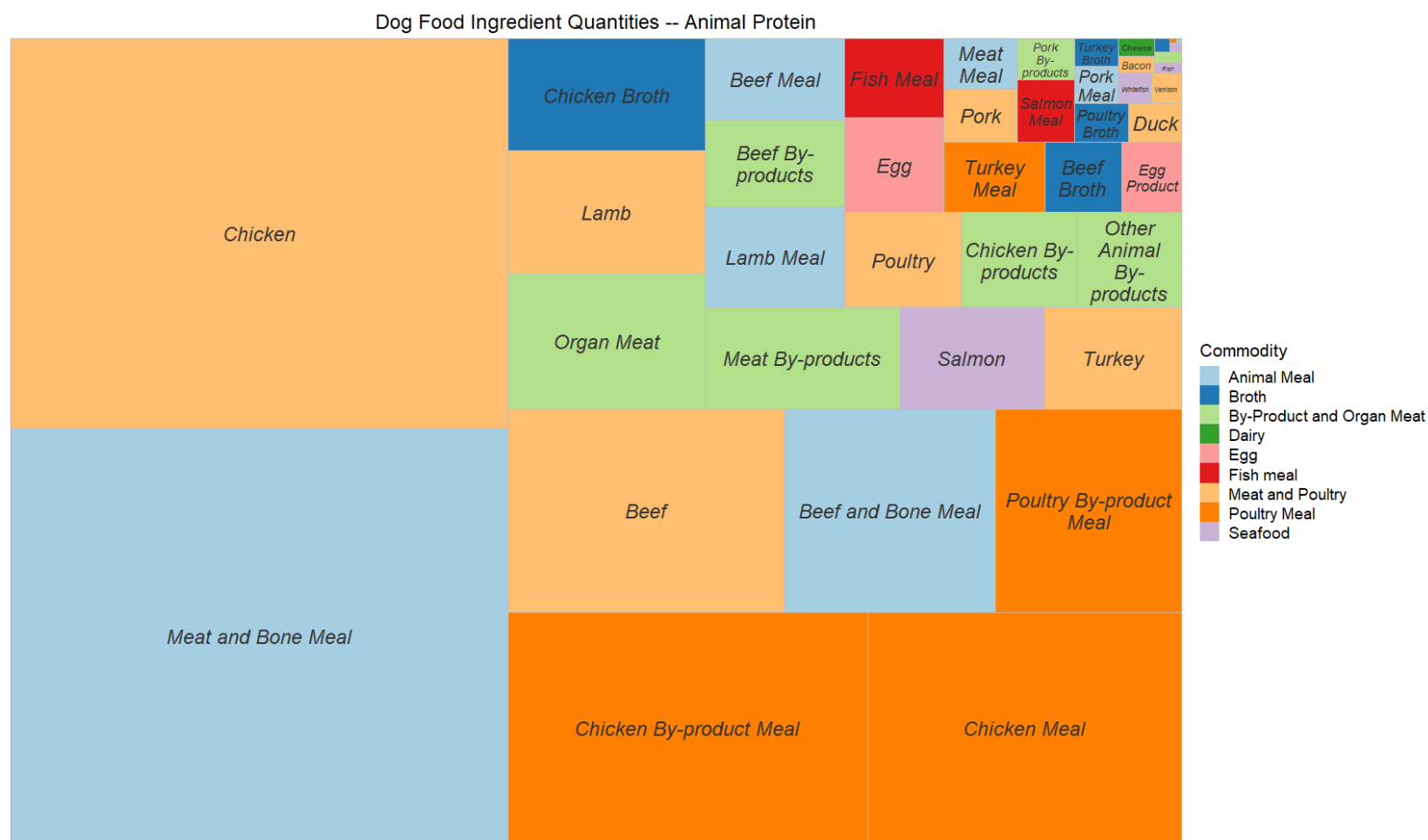


Figure 52, Animal Protein Quantities by Commodity Type (Dogs)

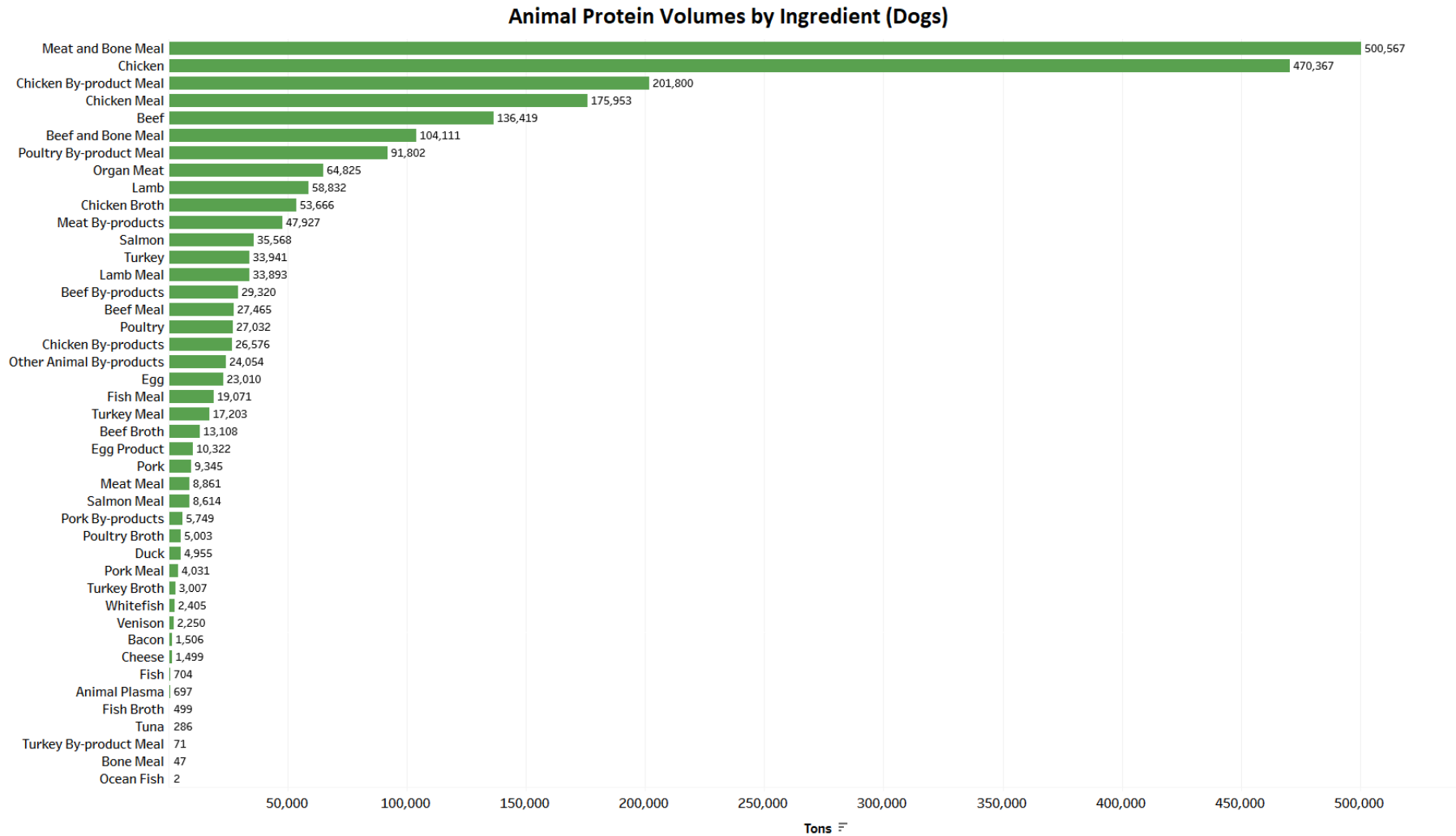


Figure 53, Animal Protein Volumes by Ingredient (Dogs)

Figure 54 and Figure 55 show summary quantities of dog food ingredients that belong to the “animal fat” nutrient group. Beef fat is the lead ingredient, with 123,605 tons used for dog foods, followed by animal fat, with 79,518 tons, and chicken fat, with 42,268 tons.

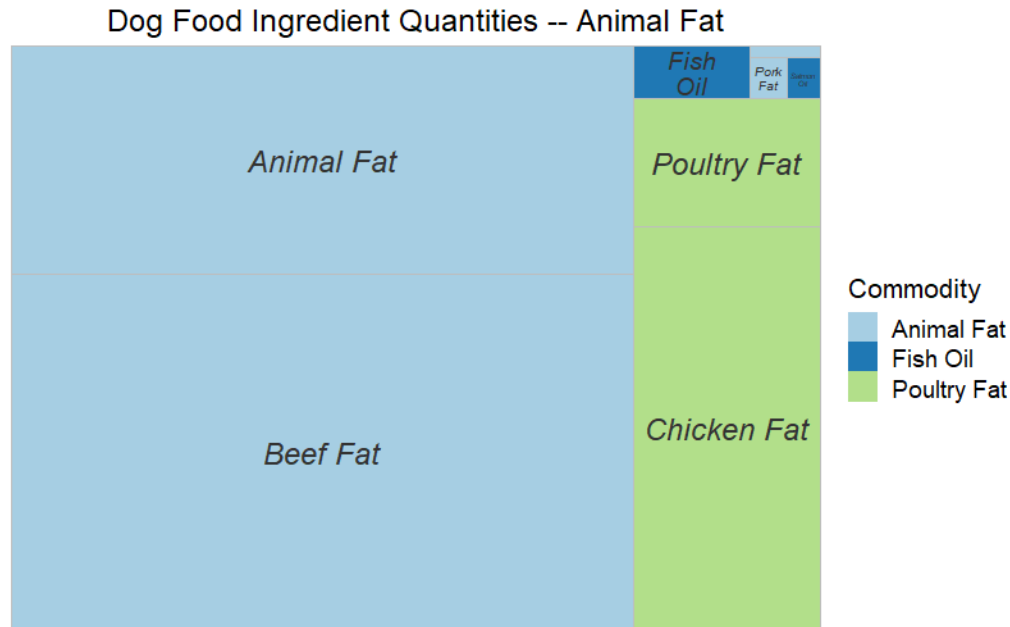


Figure 54, Animal Fat Quantities by Commodity Type (Dogs)

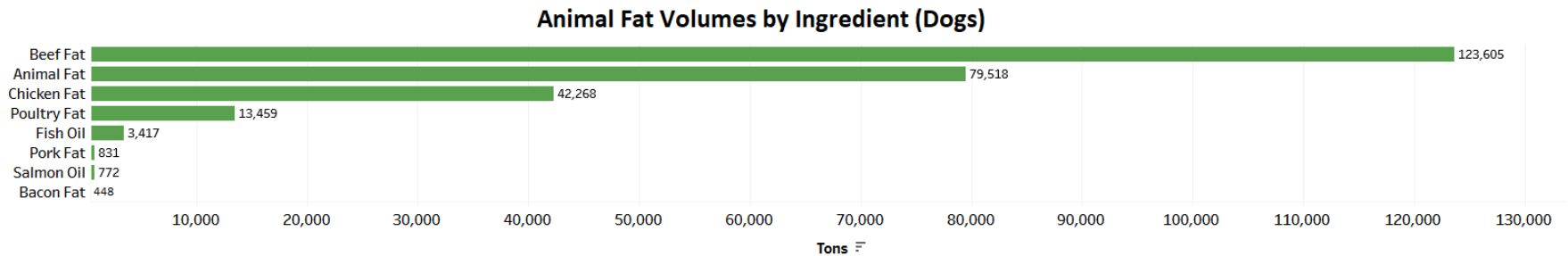


Figure 55, Animal Fat Volumes by Ingredient (Dogs)

Figure 56 and Figure 57 show summary quantities of dog food ingredients that belong to the plant related aggregation nutrient groups (plant carb and plant protein groups). Corn is the top ingredient under all plant related aggregated nutrient groups and it is the largest ingredient compared with all food ingredients for dog food products. There are 991,816 tons of corn used for dog foods, followed by soybean meal and corn gluten meal, with 344,751 tons and 235,353 tons, respectively.

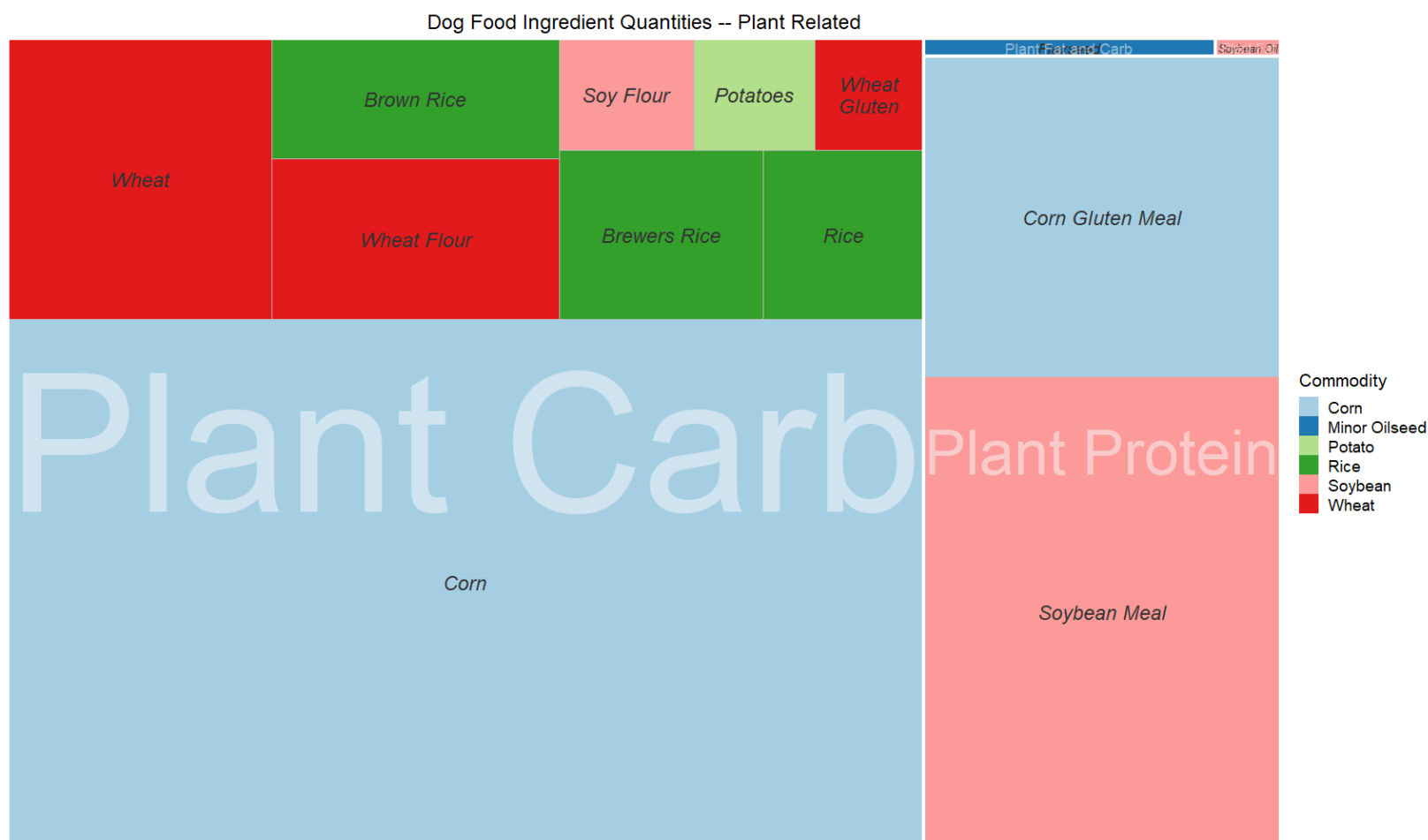


Figure 56, Plant Related Aggregations Quantities by Commodity Type (Dogs)

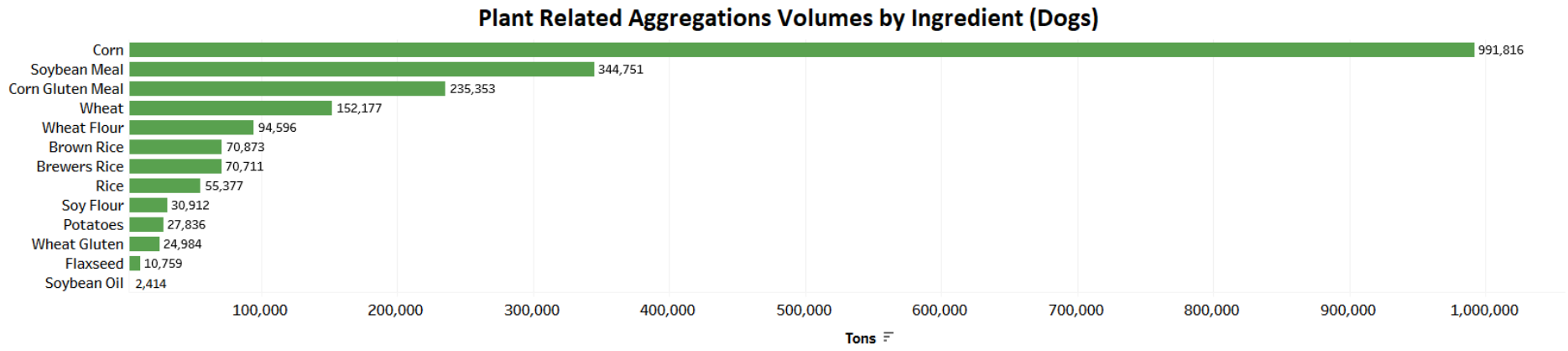


Figure 57, Plant Related Aggregations Volumes by Ingredient (Dogs)

Figure 58 and Figure 59 show summary quantities of dog food ingredients identified as specialty by organizations. Peas are the top ingredient under this category, with 95,704 tons used for dog foods, followed by beet pulp, with 37,456 tons, and sweet potatoes, with 22,403 tons.

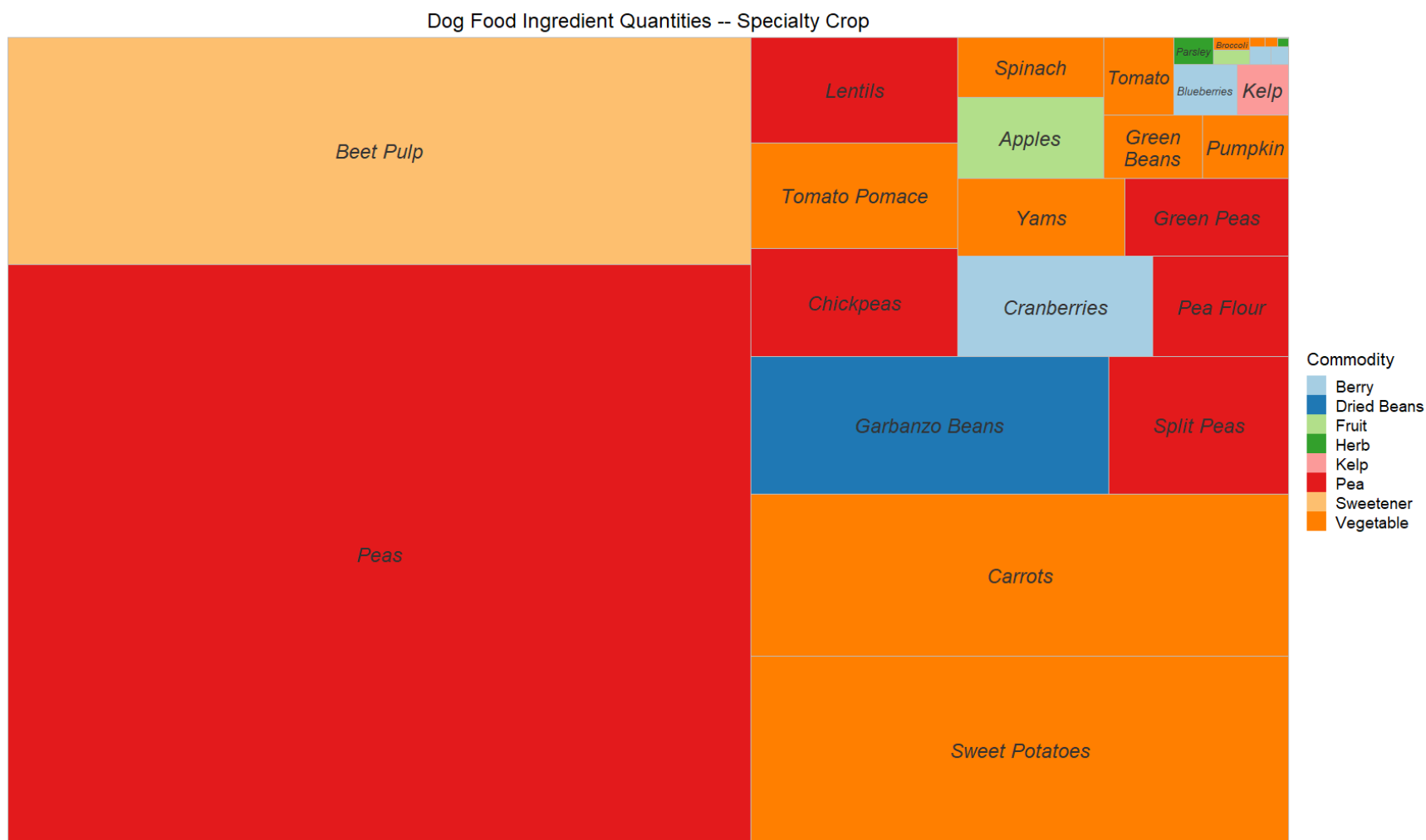


Figure 58, Specialty Crop Quantities by Commodity Type (Dogs)

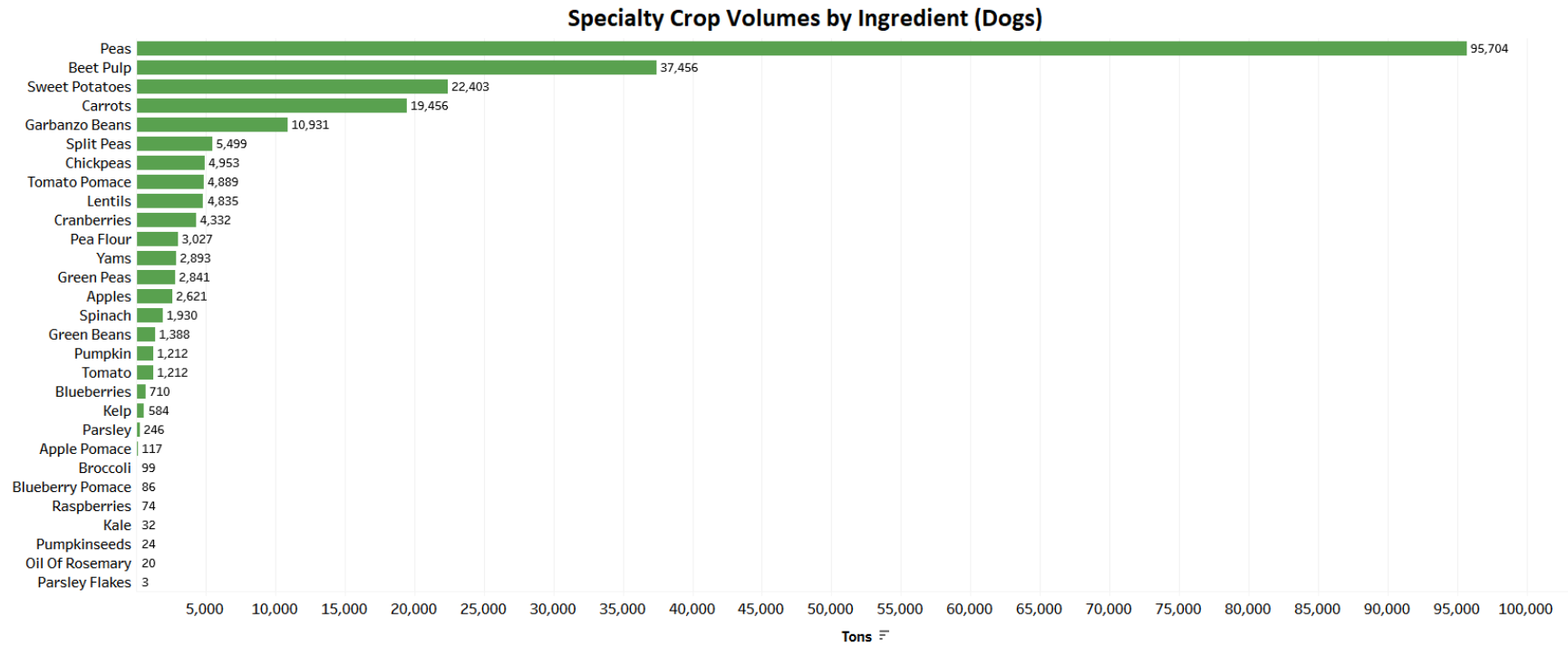


Figure 59, Specialty Crop Volumes by Ingredient (Dogs)

Appendix A, Methodology

Methodology adopted to complete the related research falls into four categories; additional details for each follow:

1. Data acquisition
2. Sales analysis
3. Ingredient analysis
4. Upstream volumes and values

Data Acquisition

Nielsen was used to capture SKU/UPC level data in six sales channels for sales of cat and dog foods nationally for the 52 weeks immediately prior to purchase (June 2019). Many aspects of the sales were provided, which allowed classification of the pet foods to take place. Details related to the data purchase are listed below. Both Option A and Option B were purchased by funding organizations.

(OPTION A) Syndicated Nielsen Data: Brand and Item Ranks (Brand and SKU Level Granularity)

Markets:	Total U.S. xAOC Total Petsmart, Total Petco Total Petsense Total Pet Vah and Pet Supermarket
Category:	Cat Food, Dog Food (includes treats)
Standard Facts:	\$. \$YA, \$ % Change, \$ Share, Units, Units YA, Units % Change Units Share, EQ Vol, EQ Vol YA, EQ Vol % Chg YA, Avg Price, Avg EQ Price, %ACV, Sales/Million (Velocity), Sales/Point of Distribution (Velocity)
Periods:	Latest 52 weeks
Delivery:	Excel Format – e-mail

(OPTION B) Pet Specialty Data: Brand and Item Ranks (Top 30 Brands and Sku)

Markets:	Total Pet Retail Neighborhood Pet Super Store
Category:	Cat Food, Dog Food (includes treats). Item detail includes UPC, Weight, Item Text
Standard Facts:	\$. \$YA, \$ % Change, \$ Share, Units, Units YA, Units % Change Units Share, Lb Vol, Lb Vol YA, Lb. Vol % Chg YA, Avg Price, Avg Lb. Price, Weighted Distribution,
Periods:	Latest 52 weeks
Delivery:	Excel Format – e-mail

Syndicated Data- This term refers to the data source being based on Nielsen's definition of the category, not based on any retailer's definition of the category, or any Custom definition that may have been created through any manufacturer's "Custom hierarchy". In layman's terms, you are getting what Nielsen considers Dog Food and Cat Food. (Treats included)

Total U.S. xAOC - Total U.S. xAOC is our total FMCG Measurement. xAOC specifically stands for eXpanded All Outlets Combined. This is the aggregate of all retail Grocery Stores, Drug Stores, Mass Merchandisers (Target, Walmart, Kmart, Shopko, Etc.), Club Stores (Sam's & Bj's - No Costco), Dollar Stores and Deca Military outlets. This is a comprehensive view of total Mass Market Sales

Pet Specialty Data- this is reference to our new GFK acquisition and partnership which gives us access to independent and neighborhood Pet retail data. This includes your local pet stores.

Below is a list of the fact definitions.

- \$ = Total dollars sold at retail
- \$YA = Total dollars sold a year ago
- \$%Change = Percentage change from a year ago
- \$Share = Share of dollars sales for the entire category of pet food
- Units = Total number of units sold at retail (single package/UPC sold)
- Units YA = Units sold a year ago
- Units%Change = Percentage change from a year ago
- Units Share = Share of units for the entire category of pet food
- EQ Volume = Total equalized units sold. (Based on Oz's or Lbs)
- EQ Volume YA = Total equalized units sold a year ago (Based on Oz's or Lbs)
- Average Price = The average price per unit
- Average EQ Price = Average equalized unit price. (Based on Oz or Lbs)
- %ACV = Percentage of All Commodity Volume of the products sold in the chosen market. This is a weighted distribution metric by volume of store.
- Sales/Millions = Velocity metric, indicating how fast a product moves with equalized distribution. For every million that goes across registers, \$/MM tells what goes to this item\
- Sales/Points of Distribution = Velocity metric- Does the same as above, but instead of basing it on the all commodity volume of where an item is distributed, it is equalizing for distribution based on % of All Commodity Volume Exposure.

Sales Analysis

With the rich dataset purchased from Nielsen, summary statistics were desired to better understand the overall pet food market. This analysis was best handled from a volume and value standpoint. Within the data are standardized units of measure for volumes (weight) and value (\$). Due to how the data was provided by Nielsen, results can be summarized in several ways. Because it offers the most insight into characteristics related to sales, we have chosen to present results here according to "sub-category". Other ways in which data could be summarized include:

- Brand
- Flavor
- Product size
- Protein presence
- Target group
- Presence of a veterinarian claim
- Presence of an organic claim
- Form (bits, chunks, kibble, etc.)
- Value (\$), current, year ago and % change
- Volume, current year ago and % change
- Units, current year ago and % change
- Average unit price

Volume

The following steps were taken to determine the volume of cat and dog foods:

1. Combined all data from all six sales channels
 - a. Petco
 - b. Petsense
 - c. Petsmart
 - d. PetValue
 - e. Supermarket
 - f. AOC (all other channels)
2. Summarize data using standardized (by package sizes and weight) volumetric measure ("EQ Volume")
3. Summarize by key variables, such as
 - a. Brand
 - b. Flavor
 - c. Subcategory (wet, dry, etc.)
 - d. Product size
 - e. Protein presence
 - f. Target group
 - g. Vet claim
 - h. Organic claim
 - i. Form (bits, chunks, kibble, etc.)
 - j. Volume, current year ago and % change
 - k. Units, current year ago and % change
 - l. Average unit price

4. Create tables and charts as appropriate

Value

The following steps were taken to determine the value of cat and dog foods:

1. Combined all data from all six sales channels
2. Summarize data using standardized (by package sizes and weight) value measure (“\$”)
3. Summarize by key variables, such as
 - a. Brand
 - b. Flavor
 - c. Subcategory (wet, dry, etc.)
 - d. Product size
 - e. Protein presence
 - f. Target group
 - g. Vet claim
 - h. Organic claim
 - i. Form (bits, chunks, kibble, etc.)
 - j. Value (\$), current, year ago and % change
 - k. Average unit price
4. Create tables and charts as appropriate

Ingredient Analysis

The most important component of this project was the development of methodology to calculate ‘as sold’ ingredient weights and quantities for all cat and dog food products contained in the purchased Nielsen data. This was accomplished by taking the following summarized steps; additional detail for the most critical portion (recipe reverse engineering) of methodology follows:

1. By species (cat and dog), combine six sales channels within purchased Nielsen data and remove duplicates (by UPC and package size).
2. Determine which UPC’s represented 95% (by volume) for cat and dog foods.
3. Conduct online research for each product to obtain the corresponding ingredient panel, guaranteed analysis and calorie information.
4. Identify the products labeled as “private label”, defined by the original Nielsen data, to find approximate matches to non-private label products. This was done using the following variables, also defined by the Nielsen data, in descending order of importance:
 - a. Species: cat or dog
 - b. Food types: dry food, wet food, and treat; moist for dog food products only
 - c. Target group ages
 - d. Protein presence claim

- e. Strategic ingredient presence claim
 - f. Organic claim
 - g. Veterinarian claim
 - h. Form
5. Extract all the ingredients from pet food ingredient panels, refine (standardize) ingredient names, assign corresponding ingredient panel placement position and summarize the total frequency of each refined ingredient.
 6. Obtain prioritized ingredient list from research funding organizations.
 7. Categorize/aggregate the prioritized ingredients into nutrient groups, such as animal protein, animal fat, plant protein, plant carbohydrate, etc.
 8. Complete pet food recipe reverse engineering:
 - a. Create a database for all standardized ingredients, including their nutrient facts and national level annual average prices.
 - b. Based on the database, apply recipe reverse engineering techniques on sampled products.
 - Sampled products were randomly selected by species, food categories (three for cat foods and ten for dog foods) and dominant ingredients.
 - c. Apply the distributions for the ingredient inclusion rates based on the corresponding placement in non-sampled products.
 9. Combine estimated ingredient inclusion rates from Step 8 for all standardized ingredients, with the sales data from Nielsen, to calculate quantities of each standardized ingredient for a given pet food product.
 10. By UPC, factor up total volumes by percent coverage within Nielsen data.
 11. Summarize the total quantities for standardized ingredients and construct data files, plots and other visualization tools.

Recipe Reverse Engineering

To estimate the quantities of food ingredients 'as sold' for all pet food products, our recipe reverse engineering program was applied. The methodology behind this program is as follows:

1. Achieve all the guaranteed analysis and calories by using the ingredients shown on the ingredient panel for a given food product.
2. At the same time, maintain a relative low-cost level for the formulation while maintaining ingredient panel order.

Due to time limitations, applying the recipe reverse engineering on all the pet food products was not feasible. Therefore, a statistical methodology was developed to apply the recipe reverse engineering on representative samples to determine "prevalence distributions" for ingredient placements and ingredients. These sampled result distributions were then applied to

non-sampled products. To be more accurate, random samples were selected under **subsegments**, depending on different scenarios:

1. Food categories, defined by Nielsen data:
 - a. For cat food products, three categories were considered: dry food, wet food and treats.
 - b. For dog food products, ten categories were considered: dry food, wet food, moist food, biscuit, dental, frozen, jerky, rawhide, refrigerated and soft treat.
2. Dominant ingredients, in this case, the first three ingredients were called the dominant ingredients:
 - a. Within each food category, classified subgroups based on the first ingredients, chicken, beef, grains, broth, etc.
 - b. For each subgroup, determined and categorized **subsegments** according to the combinations and relationships of the three dominant ingredients.

Therefore, **27 subsegments** for cat food products and **69 subsegments** for dog food products were established. Within each **subsegment**, representative sample(s) were randomly selected. Overall, there were 199 samples (approximately 35%) for cat food products and 529 sampled products (approximately 43%) for dog foods.

To have a clearer view of the ingredient quantities in the summary plots, one more aggregation step on the ingredient name was completed. For instance, all livers, hearts and lungs were classified as “organ meat;” “carrots,” “dehydrated carrots,” and “dried carrots” as “carrots;” and all other animal related food ingredients with less than ten occurrences were combined, such as “other animal by-products.” This aggregation was done after the recipe reverse engineering to avoid miscalculation, for a given pet food product.

Upstream Volumes and Values

The first step in quantifying upstream quantities is to adjust ingredient quantities that were determined on an ‘as sold’ basis for moisture content. For example, the average moisture content of dry dog food is approximately 10% moisture. Ingredients such as grains and meats are purchased at higher moisture contents than the finished product, so ingredient quantities ‘as bought’ need to be adjusted for the moisture that is removed in the process of making the finished pet food product. This was done using the following steps:

1. Identify types of pet food products in need of moisture content adjustment:
 - Dry dog food
 - Dog treats
 - Dry cat food
 - Cat treats

- No ingredient quantity adjustments due to moisture characteristics were applied to ingredients used in moist or wet dog food or wet cat food
2. Average moisture content of the finished products used for this adjustment were:
 - Dry dog food (10%)
 - Dog treats (15%)
 - Dry cat food (10%)
 - Cat treats (10%)
 3. Using moisture content of the major ingredients that were developed as part of the ingredient analysis database in “Ingredient Analysis Step 8.a., the quantity of raw ingredients was adjusted for the dry pet food products by the formula:

$$\frac{(\text{As Sold Ingredient Amount} * (1 - \text{Moisture of Pet Food}))}{(1 - \text{Moisture of the Raw Ingredient})}$$

4. Estimate prices of raw ingredients. Prices were collected from a variety of sources including:
 - [USDA - AMS Market News](#)
 - [USDA NASS Crop Values 2018 Summary](#)
 - [USDA 2018 Poultry Production and Value Summary](#)
 - [USDA Market News - Fruits](#)
 - [USDA Market News - Dairy](#)
 - [FeedStuffs - Grains and Ingredients](#)
 - [FeedStuffs - Livestock and Poultry](#)
 - [Univ of Missouri AgEBB By-Products](#)
 - [FeedForLess.com](#)
 - [Alibaba.com Feed Products](#)
5. Prices were converted to \$/cwt and then to \$/ton.
6. Determine value of adjusted raw material ingredient amounts.
 - Adjusted raw ingredient amounts (in tons) were multiplied times the price (\$/ton)
7. Aggregate more than 1,200 specific ingredients into 359 ingredient categories.
8. Categorize 359 ingredients into seven sub-categories and into groups within the sub-categories:
 - Rendered meals: animal meals, fish meal and poultry meal
 - Slaughter/rendering materials: animal fat, poultry fat, by-product and organ meat and meat and poultry
 - Farm and mill-based ingredients: alfalfa, barley, berry, corn, dairy, dried beans, egg, fruit, herb, Mediterranean, minor oilseed, nut, oats, other, other grain, pea

and lentil, peanut, potato, rice, root, soybean, sweetener, tropical (palm and coconut), vegetable and wheat

- Fishery: sea products and seafood
- Mineral and other: fiber and mineral
- Water
- Broth

9. Estimate aggregated tonnage and value for each of the seven sub-categories.
10. Estimates of state-level “as-bought” ingredients were calculated based on each state’s share of direct output from pet food manufacturing sales (from the 2016 analysis that DIS conducted for IFEEEDER) multiplied times the U.S. total ingredient purchases as factored up to U.S. totals. The **average pet food ingredients purchased (tons)** was calculated by dividing the state’s **total pet food ingredients purchased** by the number of **pet food manufacturing facilities** in each state.
11. The **average value of pet food ingredients purchased (dollars)** was calculated by dividing **total value of pet food ingredients purchased (dollars)** by the number of **pet food manufacturing facilities** in each state.
12. State-level factors were calculated for **indirect output based on ingredient purchases** by dividing indirect output estimates from the 2016 study by the direct output for dog and cat manufacturing from the 2016 IFEEEDER study. This factor was then multiplied against each state’s share of **total value of pet food ingredients purchased** to estimate the state’s level of **indirect output based on ingredient purchases**.
13. **Indirect value added based on ingredient purchases** is a measure of the value that is added to farm and commodity handling inputs as those ingredients are sold to pet food manufacturers. This variable was calculated by dividing the estimate of indirect value added for each state from the 2016 IFEEEDER study by direct output and then multiplying that factor time each state’s **total value of pet food ingredients purchased**.
14. **Average indirect output per mill based on ingredient purchases** was calculated by dividing each state’s total **indirect output based on ingredient purchases** by the number of **pet food manufacturing facilities** in each state.
15. **Average direct value added per mill based on ingredient purchases** was calculated by dividing each state’s total **direct value added based on ingredient purchases** by the number of **pet food manufacturing facilities** in each state.

Appendix B, Ingredient List and Categorization Used for Upstream Analysis

This list was reduced from the original 361 standardized ingredient list due to ingredients that were very close in composition and form. For example, water and “water sufficient for processing” were combined as “water.” This affected a total of eight ingredients.

Ingredient	Product Type	Commodity Type
Alfalfa	Farm and Mill-based	Mill Feed
Alfalfa Leaf	Farm and Mill-based	Mill Feed
Alfalfa Meal	Farm and Mill-based	Mill Feed
Algae	Fishery	Other Fish
Almond Oil	Farm and Mill-based	Vegetable Oil
Althea Root	Farm and Mill-based	Root
Anchovies	Fishery	Other Fish
Animal Fat	Meat and Poultry	Animal Fat
Animal Liver Flavor	Meat and Poultry	By-Product and Organ Meat
Animal Plasma	Meat and Poultry	By-Product and Organ Meat
Apple Pomace	Farm and Mill-based	Fruit and Vegetable
Apples	Farm and Mill-based	Fruit and Vegetable
Avocado	Farm and Mill-based	Fruit and Vegetable
Avocado Oil	Farm and Mill-based	Vegetable Oil
Bacon	Meat and Poultry	Meat and Poultry
Bacon Broth	Broth	Other Broth
Bacon Fat	Meat and Poultry	Animal Fat
Bakery Product	Farm and Mill-based	Mill Feed
Bananas	Farm and Mill-based	Fruit and Vegetable
Barley	Farm and Mill-based	Whole Grain
Barley Flour	Farm and Mill-based	Mill Feed
Barley Grass	Farm and Mill-based	Mill Feed
Barley Malt Syrup	Farm and Mill-based	Mill Feed
Beef	Meat and Poultry	Meat and Poultry
Beef Broth	Broth	Beef Broth
Beef By-products	Meat and Poultry	By-Product and Organ Meat
Beef Fat	Meat and Poultry	Animal Fat
Beef Meal	Rendered	Animal Meal
Beet Powder	Farm and Mill-based	Sweetener
Beet Pulp	Farm and Mill-based	Mill Feed
Beets	Farm and Mill-based	Fruit and Vegetable
Bison	Meat and Poultry	Meat and Poultry
Black Beans	Farm and Mill-based	Fruit and Vegetable
Blackberries	Farm and Mill-based	Fruit and Vegetable

Blueberries	Farm and Mill-based	Fruit and Vegetable
Blueberry Pomace	Farm and Mill-based	Fruit and Vegetable
Bone Meal	Rendered	Animal Meal
Brewers Dried Yeast	Farm and Mill-based	Mill Feed
Brewers Rice	Farm and Mill-based	Mill Feed
Brewers Rice Flour	Farm and Mill-based	Mill Feed
Broccoli	Farm and Mill-based	Fruit and Vegetable
Brown Kelp	Fishery	Other Fish
Brown Rice	Farm and Mill-based	Whole Grain
Brown Sugar	Farm and Mill-based	Sweetener
Burdock Root	Farm and Mill-based	Root
Butternut Squash	Farm and Mill-based	Fruit and Vegetable
Calcium Carbonate	Mineral and Other	Mineral
Calcium Lactate	Mineral and Other	Mineral
Cane Sugar	Farm and Mill-based	Sweetener
Canola Meal	Farm and Mill-based	Mill Feed
Canola Oil	Farm and Mill-based	Vegetable Oil
Carrots	Farm and Mill-based	Fruit and Vegetable
Cassava Root Flour	Farm and Mill-based	Mill Feed
Celery	Farm and Mill-based	Fruit and Vegetable
Cellulose	Mineral and Other	Mineral
Chard	Farm and Mill-based	Fruit and Vegetable
Cheddar Cheese	Farm and Mill-based	Dairy and Egg
Cheddar Cheese Powder	Farm and Mill-based	Dairy and Egg
Cheese	Farm and Mill-based	Dairy and Egg
Cheese Powder	Farm and Mill-based	Dairy and Egg
Cheese Product	Farm and Mill-based	Dairy and Egg
Cherries	Farm and Mill-based	Fruit and Vegetable
Chia Seed	Farm and Mill-based	Whole Grain
Chicken	Meat and Poultry	Meat and Poultry
Chicken and Turkey Broth	Broth	Other Broth
Chicken Broth	Broth	Chicken Broth
Chicken By-product Meal	Rendered	Poultry Meal
Chicken By-products	Meat and Poultry	By-Product and Organ Meat
Chicken Fat	Meat and Poultry	Poultry Fat
Chicken Meal	Rendered	Poultry Meal
Chickory Root	Farm and Mill-based	Root
Chickpea Flour	Farm and Mill-based	Fruit and Vegetable
Chickpeas	Farm and Mill-based	Fruit and Vegetable
Chicory	Farm and Mill-based	Root
Chicory Root	Farm and Mill-based	Root

Chicory Root Inulin	Farm and Mill-based	Root
Cinnamon	Farm and Mill-based	Fruit and Vegetable
Citrus Pulp	Farm and Mill-based	Fruit and Vegetable
Coconut	Farm and Mill-based	Fruit and Vegetable
Coconut Flour	Farm and Mill-based	Mill Feed
Coconut Oil	Farm and Mill-based	Vegetable Oil
Cod	Fishery	Cod
Collard Greens	Farm and Mill-based	Fruit and Vegetable
Corn	Farm and Mill-based	Whole Grain
Corn Distillers Dried Grains	Farm and Mill-based	Mill Feed
Corn Flour	Farm and Mill-based	Mill Feed
Corn Germ Meal	Farm and Mill-based	Mill Feed
Corn Gluten Feed	Farm and Mill-based	Mill Feed
Corn Gluten Meal	Farm and Mill-based	Mill Feed
Corn Grits	Farm and Mill-based	Mill Feed
Corn Meal	Farm and Mill-based	Mill Feed
Corn Oil	Farm and Mill-based	Vegetable Oil
Corn Starch	Farm and Mill-based	Mill Feed
Corn Sugar	Farm and Mill-based	Sweetener
Corn Syrup	Farm and Mill-based	Mill Feed
Crab	Fishery	Other Fish
Crab Meal	Rendered	Other Fish
Cracked Pearled Barley	Farm and Mill-based	Mill Feed
Cracked Wheat	Farm and Mill-based	Mill Feed
Cranberries	Farm and Mill-based	Fruit and Vegetable
Cranberry Pomace	Farm and Mill-based	Fruit and Vegetable
Cultured Milk	Farm and Mill-based	Dairy and Egg
Cultured Skim Milk	Farm and Mill-based	Dairy and Egg
Dehydrated Alfalfa Meal	Farm and Mill-based	Mill Feed
Dicalcium Phosphate	Mineral and Other	Mineral
Digest Flavor	Meat and Poultry	By-Product and Organ Meat
Dried Alfalfa	Farm and Mill-based	Mill Feed
Dried Alfalfa Meal	Farm and Mill-based	Mill Feed
Dried Brewers Yeast	Farm and Mill-based	Mill Feed
Dried Cane Molasses	Farm and Mill-based	Sweetener
Dried Yeast	Farm and Mill-based	Mill Feed
Duck	Meat and Poultry	Meat and Poultry
Egg	Farm and Mill-based	Dairy and Egg
Egg Powder	Farm and Mill-based	Dairy and Egg
Egg Product	Farm and Mill-based	Dairy and Egg
Egg Shell Membrane	Farm and Mill-based	Dairy and Egg

Egg Whites	Farm and Mill-based	Dairy and Egg
Expeller Pressed Canola Oil	Farm and Mill-based	Vegetable Oil
Fava Beans	Farm and Mill-based	Fruit and Vegetable
Fennel	Farm and Mill-based	Fruit and Vegetable
Fenugreek Seed	Farm and Mill-based	Fruit and Vegetable
Fish	Fishery	Other Fish
Fish Broth	Broth	Fish Broth
Fish Meal	Rendered	Fish meal
Fish Oil	Fishery	Other Fish
Flaxseed	Farm and Mill-based	Whole Grain
Flaxseed Meal	Farm and Mill-based	Mill Feed
Flaxseed Oil	Farm and Mill-based	Vegetable Oil
Fresh Bartlett Pears	Farm and Mill-based	Fruit and Vegetable
Fructose	Farm and Mill-based	Sweetener
Garbanzo Beans	Farm and Mill-based	Fruit and Vegetable
Gelatin	Meat and Poultry	By-Product and Organ Meat
Glycerin	Farm and Mill-based	Mill Feed
Grain Distillers Dried Yeast	Farm and Mill-based	Mill Feed
Grains	Farm and Mill-based	Whole Grain
Green Beans	Farm and Mill-based	Fruit and Vegetable
Green Lipped Mussels	Fishery	Other Fish
Green Peas	Farm and Mill-based	Fruit and Vegetable
Guar Gum	Farm and Mill-based	Fruit and Vegetable
Ham	Meat and Poultry	Meat and Poultry
High Fructose Corn Syrup	Farm and Mill-based	Sweetener
Hominy Feed	Farm and Mill-based	Mill Feed
Honey	Farm and Mill-based	Sweetener
Hydrogenated Corn Syrup	Farm and Mill-based	Mill Feed
Hydrolyzed Chicken Liver	Meat and Poultry	By-Product and Organ Meat
Hydrolyzed Soy Protein	Farm and Mill-based	Soy Product
Imitation Crab Meat	Fishery	Other Fish
Juniper Berries	Farm and Mill-based	Fruit and Vegetable
Kale	Farm and Mill-based	Fruit and Vegetable
Kelp	Fishery	Other Fish
Kelp Meal	Fishery	Other Fish
Lamb	Meat and Poultry	Meat and Poultry
Lamb and Chicken Broth	Broth	Other Broth
Lamb Broth	Broth	Other Broth
Lamb Meal	Rendered	Animal Meal
Lecithin	Farm and Mill-based	Soy Product
Lentil Fiber	Farm and Mill-based	Mill Feed

Lentil Flour	Farm and Mill-based	Fruit and Vegetable
Lentils	Farm and Mill-based	Fruit and Vegetable
Lettuce	Farm and Mill-based	Fruit and Vegetable
Linseed	Farm and Mill-based	Whole Grain
Liver Broth	Broth	Other Broth
Locust Bean Gum	Farm and Mill-based	Fruit and Vegetable
Long Grain Rice	Farm and Mill-based	Whole Grain
Mackerel	Fishery	Other Fish
Maize	Farm and Mill-based	Whole Grain
Malted Barley	Farm and Mill-based	Mill Feed
Malted Barley Extract	Farm and Mill-based	Mill Feed
Malted Barley Flour	Farm and Mill-based	Mill Feed
Maple Flavored Syrup	Farm and Mill-based	Sweetener
Meat And Bone Meal	Rendered	Meat and Bone Meal
Meat Broth	Broth	Other Broth
Meat By-products	Meat and Poultry	By-Product and Organ Meat
Meat Meal	Rendered	Animal Meal
Menhaden Oil	Fishery	Other Fish
Milk	Farm and Mill-based	Dairy and Egg
Millet	Farm and Mill-based	Whole Grain
Minerals	Mineral and Other	Mineral
Modified Food Starch	Farm and Mill-based	Mill Feed
Modified Rice Starch	Farm and Mill-based	Mill Feed
Modified Tapioca Starch	Farm and Mill-based	Mill Feed
Molasses Beet Pulp	Farm and Mill-based	Sweetener
Monterey Jack Cheese Powder	Farm and Mill-based	Dairy and Egg
Natural And Artificial Flavors	Mineral and Other	Mineral
Natural flavor	Mineral and Other	Mineral
Nonfat Milk	Farm and Mill-based	Dairy and Egg
Oat Bran	Farm and Mill-based	Mill Feed
Oat Fiber	Farm and Mill-based	Mill Feed
Oat Flour	Farm and Mill-based	Mill Feed
Oat Groats	Farm and Mill-based	Mill Feed
Oat Hulls	Farm and Mill-based	Mill Feed
Oat Meal	Farm and Mill-based	Mill Feed
Oats	Farm and Mill-based	Whole Grain
Ocean Fish	Fishery	Other Fish
Oil Of Rosemary	Farm and Mill-based	Vegetable Oil
Oils	Farm and Mill-based	Vegetable Oil
Olive Oil	Farm and Mill-based	Vegetable Oil
Oranges	Farm and Mill-based	Fruit and Vegetable

Organ Meat	Meat and Poultry	By-Product and Organ Meat
Organic Pea Protein	Farm and Mill-based	Fruit and Vegetable
Other Animal By-products	Meat and Poultry	By-Product and Organ Meat
Palm Oil	Farm and Mill-based	Vegetable Oil
Papain	Farm and Mill-based	Fruit and Vegetable
Papaya	Farm and Mill-based	Fruit and Vegetable
Paprika	Farm and Mill-based	Fruit and Vegetable
Parsley	Farm and Mill-based	Fruit and Vegetable
Parsley Flakes	Farm and Mill-based	Fruit and Vegetable
Parsnip	Farm and Mill-based	Fruit and Vegetable
Partially Hydrogenated Vegetable Oil	Farm and Mill-based	Vegetable Oil
Pasta	Farm and Mill-based	Mill Feed
Pea Fiber	Farm and Mill-based	Mill Feed
Pea Flour	Farm and Mill-based	Fruit and Vegetable
Pea Protein	Farm and Mill-based	Mill Feed
Pea Starch	Farm and Mill-based	Mill Feed
Peanut Butter	Farm and Mill-based	Root
Peanut Flour	Farm and Mill-based	Root
Peanut Oil	Farm and Mill-based	Vegetable Oil
Pearled Barley	Farm and Mill-based	Whole Grain
Pears	Farm and Mill-based	Fruit and Vegetable
Peas	Farm and Mill-based	Fruit and Vegetable
Pheasant	Meat and Poultry	Meat and Poultry
Pineapple	Farm and Mill-based	Fruit and Vegetable
Pinto Beans	Farm and Mill-based	Fruit and Vegetable
Pomegranate	Farm and Mill-based	Fruit and Vegetable
Pork	Meat and Poultry	Meat and Poultry
Pork Broth	Broth	Other Broth
Pork By-products	Meat and Poultry	By-Product and Organ Meat
Pork Fat	Meat and Poultry	Pork Fat
Pork Meal	Rendered	Animal Meal
Potassium Chloride	Mineral and Other	Mineral
Potato Flour	Farm and Mill-based	Fruit and Vegetable
Potato Product	Farm and Mill-based	Fruit and Vegetable
Potato Protein	Farm and Mill-based	Fruit and Vegetable
Potato Starch	Farm and Mill-based	Fruit and Vegetable
Potatoes	Farm and Mill-based	Fruit and Vegetable
Poultry	Meat and Poultry	Meat and Poultry
Poultry Broth	Broth	Poultry Broth
Poultry By-product Meal	Rendered	Poultry Meal
Poultry By-products	Meat and Poultry	By-Product and Organ Meat

Poultry Fat	Meat and Poultry	Poultry Fat
Powdered Cellulose	Mineral and Other	Mineral
Psyllium Seed Husk	Farm and Mill-based	Mill Feed
Pumpkin	Farm and Mill-based	Fruit and Vegetable
Pumpkinseeds	Farm and Mill-based	Fruit and Vegetable
Quinoa	Farm and Mill-based	Whole Grain
Quinoa Seed	Farm and Mill-based	Whole Grain
Raspberries	Farm and Mill-based	Fruit and Vegetable
Red Peppers	Farm and Mill-based	Fruit and Vegetable
Rice	Farm and Mill-based	Whole Grain
Rice Bran	Farm and Mill-based	Mill Feed
Rice Flour	Farm and Mill-based	Mill Feed
Rice Hulls	Farm and Mill-based	Mill Feed
Rice Pasta	Farm and Mill-based	Mill Feed
Rice Starch	Farm and Mill-based	Mill Feed
Rice Syrup	Farm and Mill-based	Mill Feed
Rolled Oats	Farm and Mill-based	Mill Feed
Rosehips	Farm and Mill-based	Fruit and Vegetable
Rosemary	Farm and Mill-based	Fruit and Vegetable
Rye	Farm and Mill-based	Whole Grain
Rye Flour	Farm and Mill-based	Mill Feed
Salmon	Fishery	Salmon
Salmon Meal	Rendered	Fish meal
Salmon Oil	Fishery	Other Fish
Salt	Mineral and Other	Mineral
Scrambled Egg	Farm and Mill-based	Egg
Sea Cucumber	Fishery	Other Fish
Seabass	Fishery	Other Fish
Seaweed Meal	Fishery	Other Fish
Sesame Oil	Farm and Mill-based	Vegetable Oil
Sesame Seeds	Farm and Mill-based	Whole Grain
Shrimp	Fishery	Other Fish
Shrimp Meal	Fishery	Other Fish
Skim Milk	Farm and Mill-based	Dairy and Egg
Sole	Fishery	Other Fish
Sorghum	Farm and Mill-based	Whole Grain
Soy Flakes	Farm and Mill-based	Soy Product
Soy Flour	Farm and Mill-based	Soy Product
Soy Grits	Farm and Mill-based	Soy Product
Soy Protein Concentrate	Farm and Mill-based	Soy Product
Soy Protein Isolate	Farm and Mill-based	Soy Product

Soybean Germ Meal	Farm and Mill-based	Soy Product
Soybean Hulls	Farm and Mill-based	Soy Product
Soybean Meal	Farm and Mill-based	Soy Product
Soybean Mill Run	Farm and Mill-based	Soy Product
Soybean Oil	Farm and Mill-based	Soy Product
Spearmint	Farm and Mill-based	Fruit and Vegetable
Spinach	Farm and Mill-based	Fruit and Vegetable
Split Peas	Farm and Mill-based	Fruit and Vegetable
Sugar	Farm and Mill-based	Sweetener
Sunflower Lecithin	Farm and Mill-based	Mill Feed
Sunflower Oil	Farm and Mill-based	Vegetable Oil
Sunflower Seed Meal	Farm and Mill-based	Mill Feed
Sunflower Seeds	Farm and Mill-based	Whole Grain
Swede	Farm and Mill-based	Fruit and Vegetable
Sweet Potato Flour	Farm and Mill-based	Fruit and Vegetable
Sweet Potatoes	Farm and Mill-based	Fruit and Vegetable
Swiss Cheese Powder	Farm and Mill-based	Dairy and Egg
Tapioca	Farm and Mill-based	Root
Tapioca	Farm and Mill-based	Root
Tapioca Flour	Farm and Mill-based	Mill Feed
Tapioca Starch	Farm and Mill-based	Root
Textured Soy Protein	Farm and Mill-based	Soy Product
Tomato	Farm and Mill-based	Fruit and Vegetable
Tomato Pomace	Farm and Mill-based	Fruit and Vegetable
Tomato Puree	Farm and Mill-based	Fruit and Vegetable
Tricalcium Phosphate	Mineral and Other	Mineral
Tuna	Fishery	Tuna
Tuna Broth	Broth	Broth
Tuna By-product	Fishery	Other Fish
Tuna Meal	Rendered	Fish meal
Turkey	Meat and Poultry	Meat and Poultry
Turkey Broth	Broth	Poultry Broth
Turkey By-product Meal	Rendered	Poultry Meal
Turkey Meal	Rendered	Poultry Meal
Vegetable Broth	Broth	Other Broth
Vegetable Glycerin	Farm and Mill-based	Fruit and Vegetable
Vegetable Oil	Farm and Mill-based	Vegetable Oil
Vegetable Pomace	Farm and Mill-based	Fruit and Vegetable
Vegetables	Farm and Mill-based	Fruit and Vegetable
Venison	Meat and Poultry	Meat and Poultry
Water	Water	Water

Water Sufficient For Processing	Water	Water
Watercress	Farm and Mill-based	Fruit and Vegetable
Wheat	Farm and Mill-based	Whole Grain
Wheat Bran	Farm and Mill-based	Mill Feed
Wheat Flour	Farm and Mill-based	Mill Feed
Wheat Germ	Farm and Mill-based	Mill Feed
Wheat Germ Meal	Farm and Mill-based	Mill Feed
Wheat Gluten	Farm and Mill-based	Mill Feed
Wheat Middlings	Farm and Mill-based	Mill Feed
Wheat Mill Run	Farm and Mill-based	Mill Feed
Wheat Starch	Farm and Mill-based	Mill Feed
Whey	Farm and Mill-based	Dairy
White Rice	Farm and Mill-based	Whole Grain
Whitefish	Fishery	Other Fish
Whole Grain Corn	Farm and Mill-based	Whole Grain
Whole Navy Beans	Farm and Mill-based	Fruit and Vegetable
Wild Boar	Meat and Poultry	Meat and Poultry
Wild Rice	Farm and Mill-based	Whole Grain
Xanthan Gum	Farm and Mill-based	Sweetener
Yams	Farm and Mill-based	Fruit and Vegetable
Yeast Culture	Farm and Mill-based	Mill Feed
Yellow Peas	Farm and Mill-based	Fruit and Vegetable
Zucchini	Farm and Mill-based	Fruit and Vegetable

Appendix C, Guaranteed Analysis for Pet Food Products

Cat food products were categorized into three types: dry food, wet food and treats. In addition to the three for cats, moist food for dog food products was added.

From Figure 60 to Figure 63 illustrates the guaranteed analysis for cat food products, by brand and owner and by different food types. A few key variables and associated ranges include:

- The guaranteed minimum crude protein ranges from:
 - 21% to 42% for dry food
 - 5.5% to 18% for wet food
 - 3.4% to 30% for treats
- The guaranteed minimum crude fat ranges from:
 - 9% to 21.2% for dry food
 - 0.1% to 7% for wet food
 - 0.1% to 17% for treats
- The maximum crude fiber guarantee ranges from:
 - 1.1% to 6% for dry food
 - 0.5% to 3.8% for wet food
 - 0.4% to 4.5% for treats

From Figure 64 to Figure 67 illustrate the guaranteed analysis for dog food products by brand and owner and by different food types. A few key variables and associated ranges include:

- The minimum crude protein guarantee ranges from:
 - 17% to 58% for dry food
 - 13% to 18% for moist food
 - 5% to 18% for wet food
 - 3% to 73% for treats
- The guaranteed minimum crude fat ranges from:
 - 7% to 20% for dry food
 - 7% to 8% for moist food
 - 2% to 8% for wet food
 - 0.2% to 16% for treats
- The maximum crude fiber guarantee ranges from:
 - 2% to 11% for dry food
 - 2% to 3% for moist food
 - 1% to 2% for wet food
 - 0.1% to 10% for treats

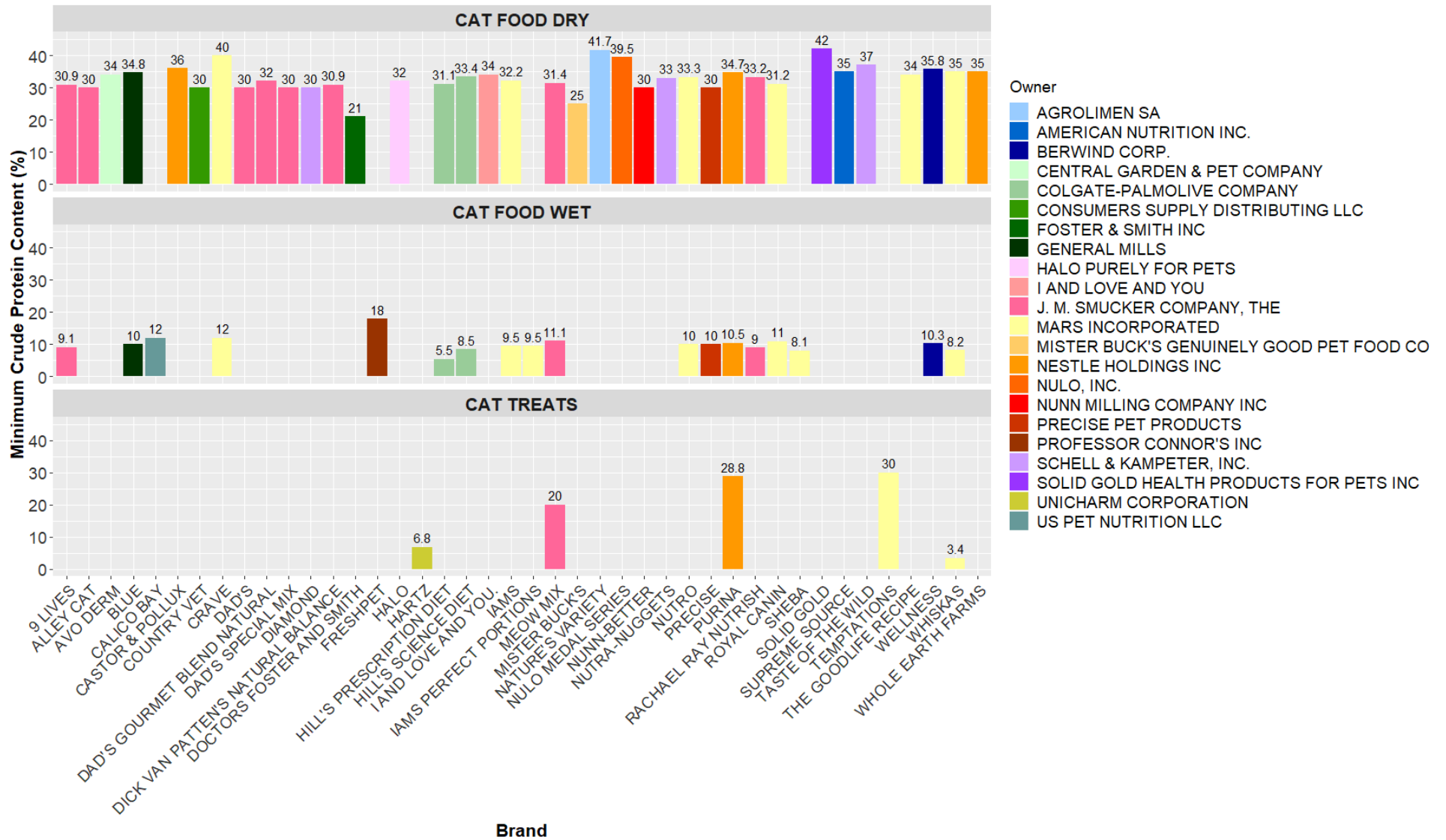


Figure 60, Minimum Crude Protein Content in Cat Food Products

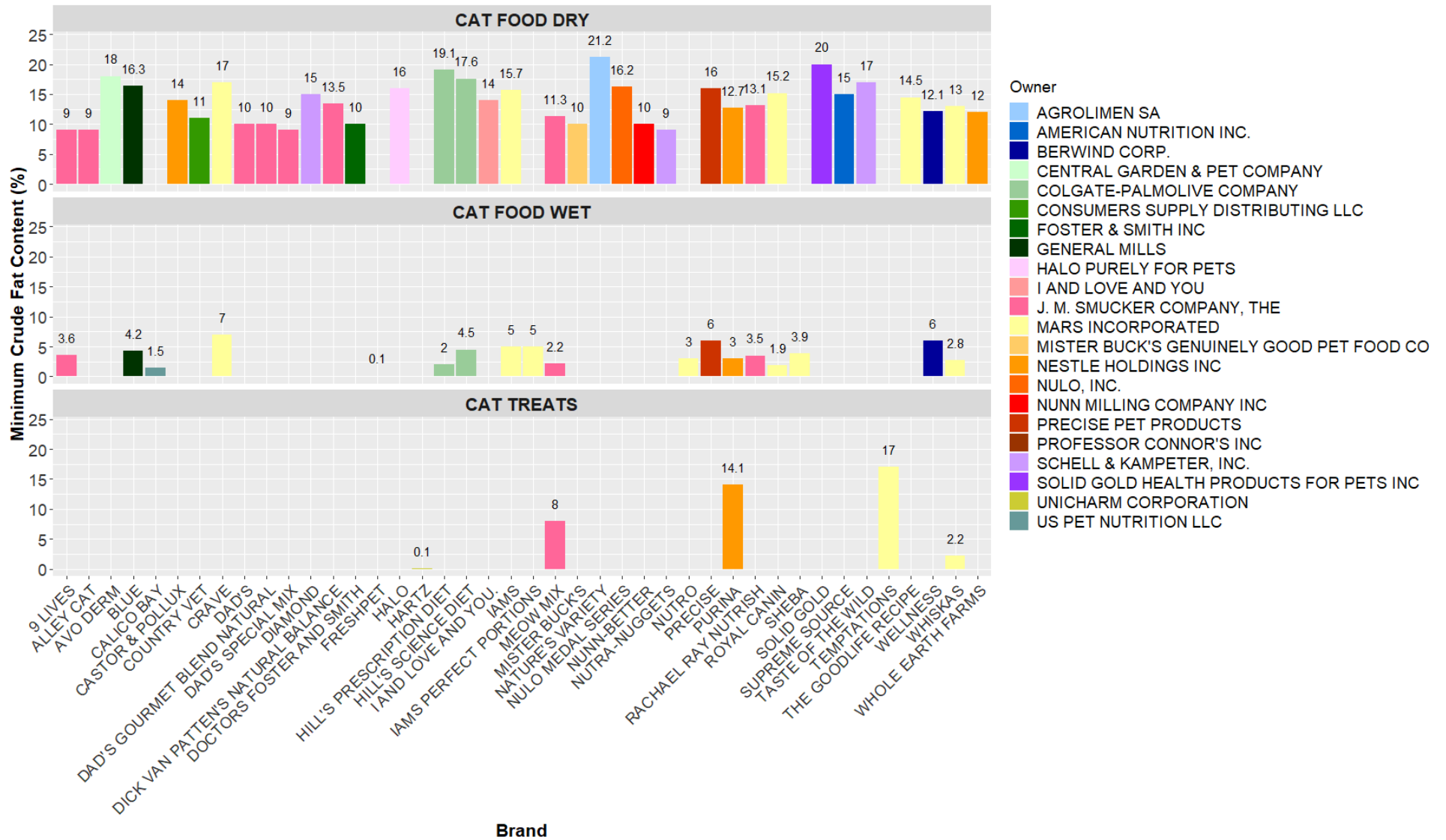


Figure 61, Minimum Crude Fat Content in Cat Food Products

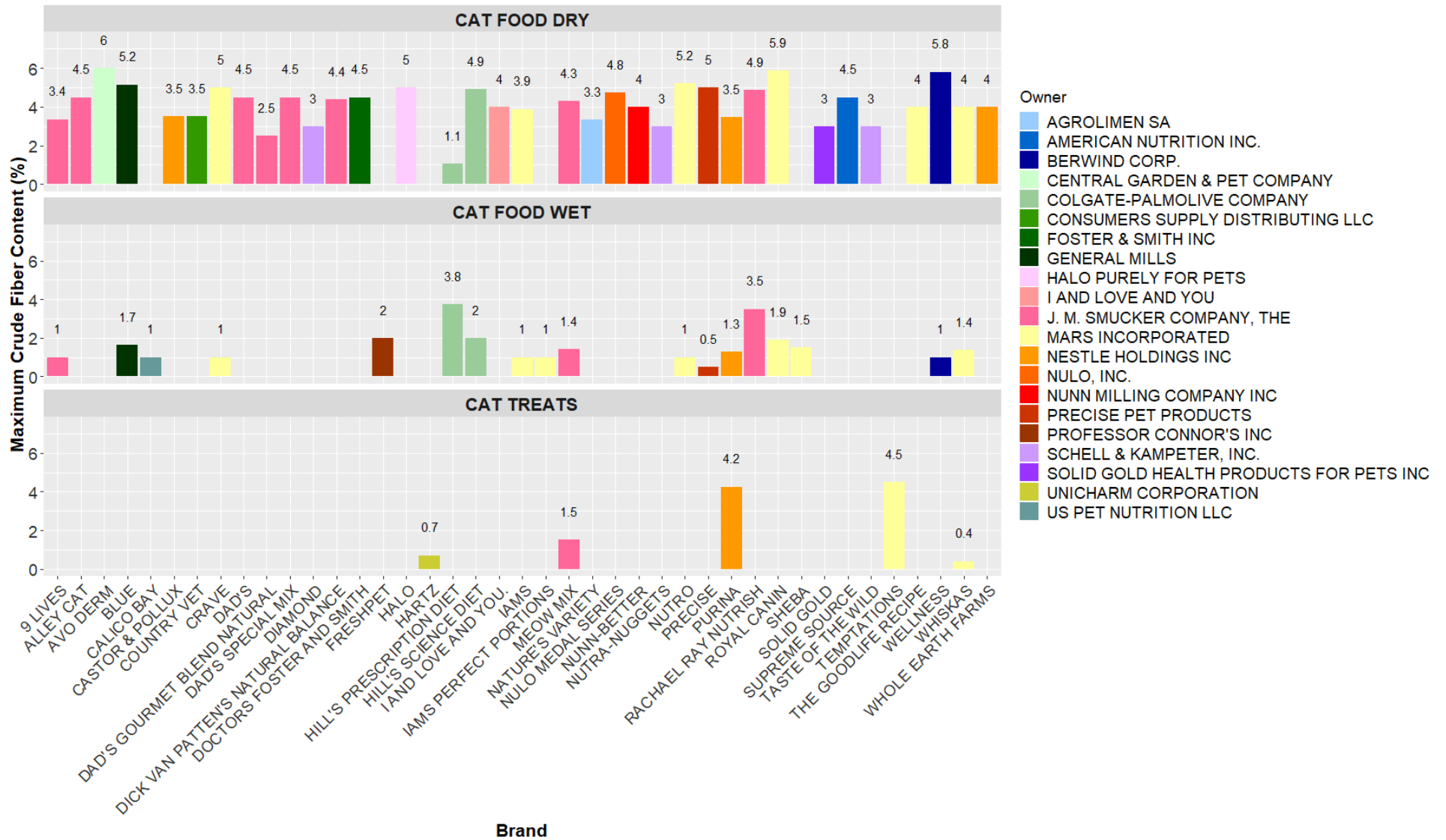


Figure 62, Maximum Crude Fiber Content in Cat Food Products

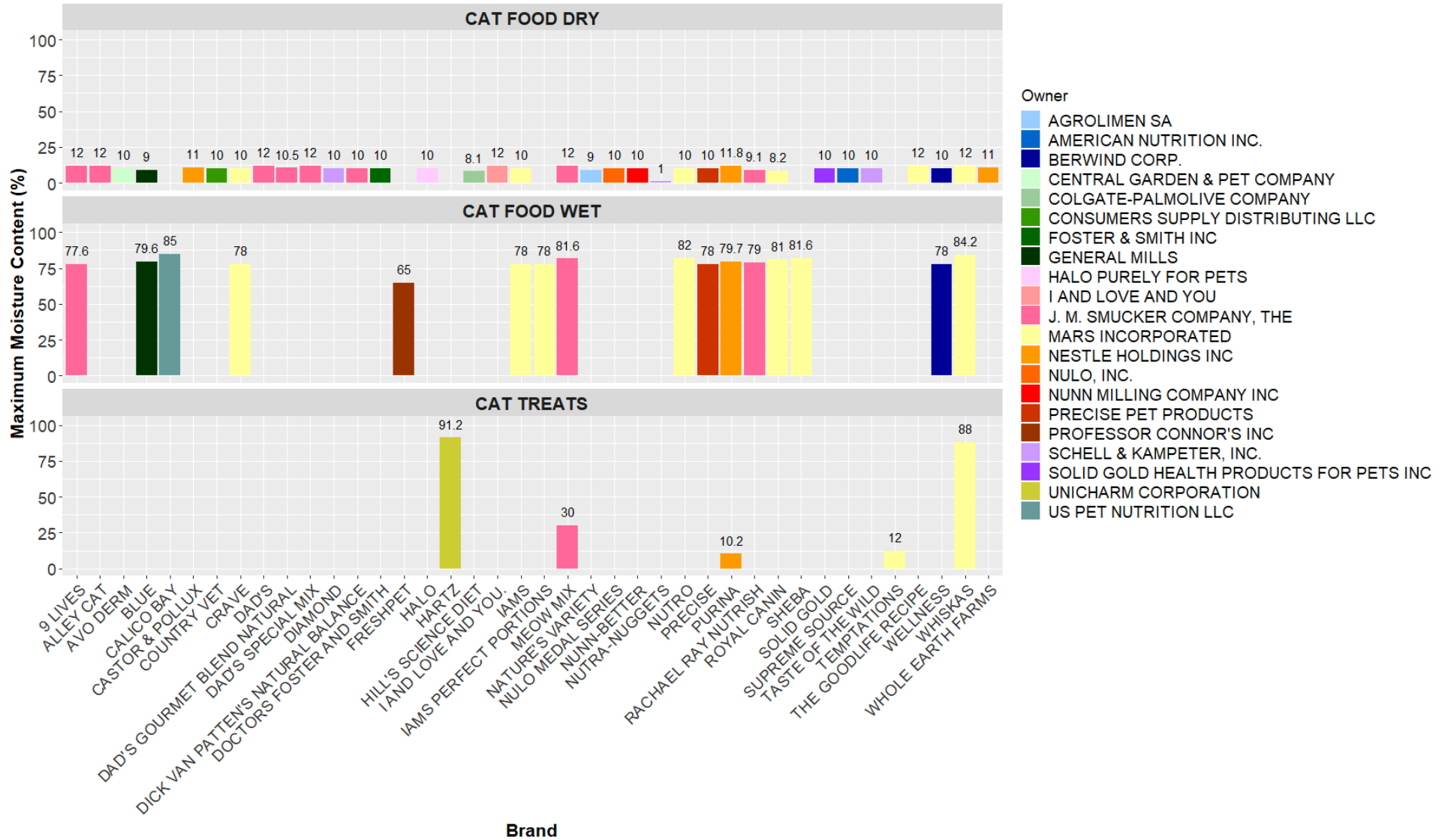


Figure 63, Maximum Moisture Content in Cat Food Products



Figure 64, Minimum Crude Protein Content in Dog Food Products

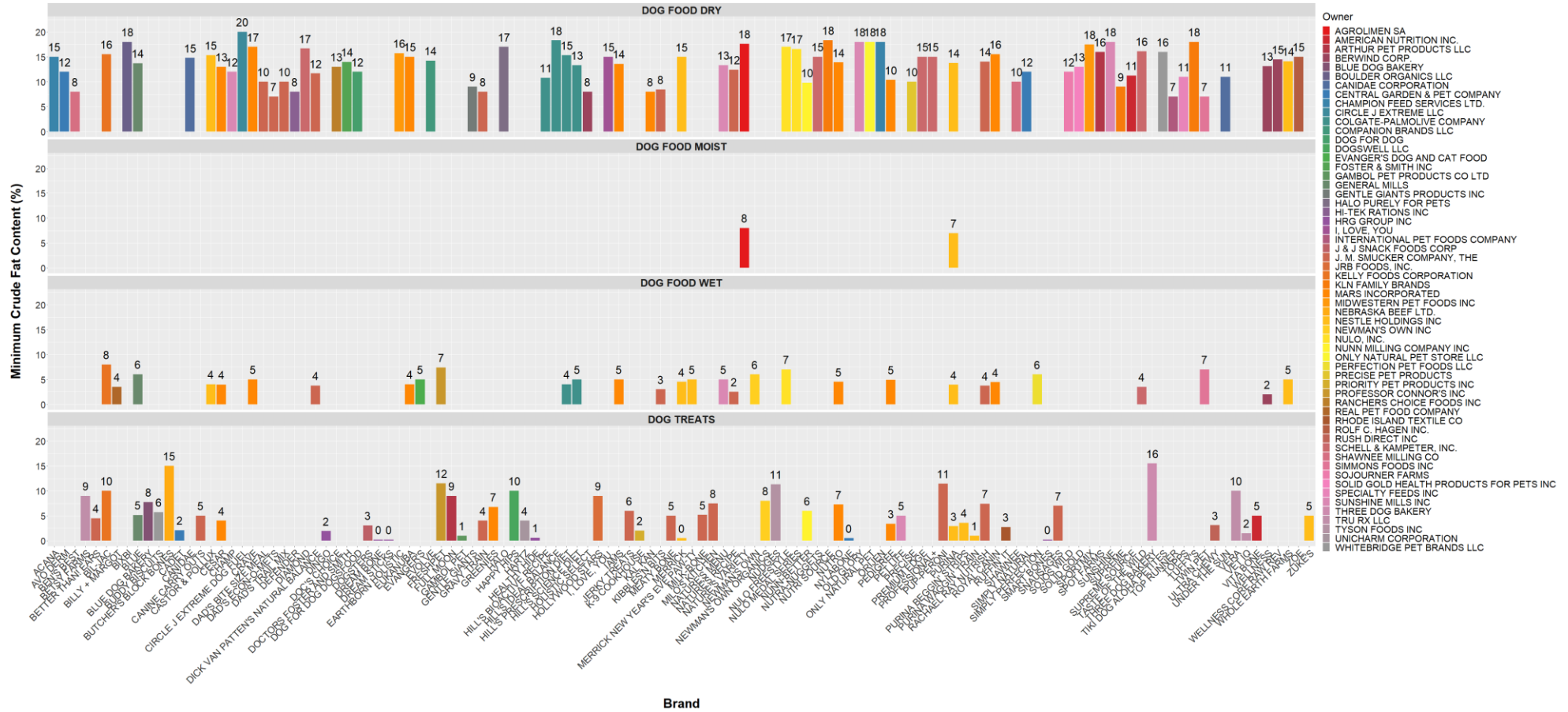


Figure 65, Minimum Crude Fat Content in Dog Food Products

Pet Food Production and Ingredient Analysis

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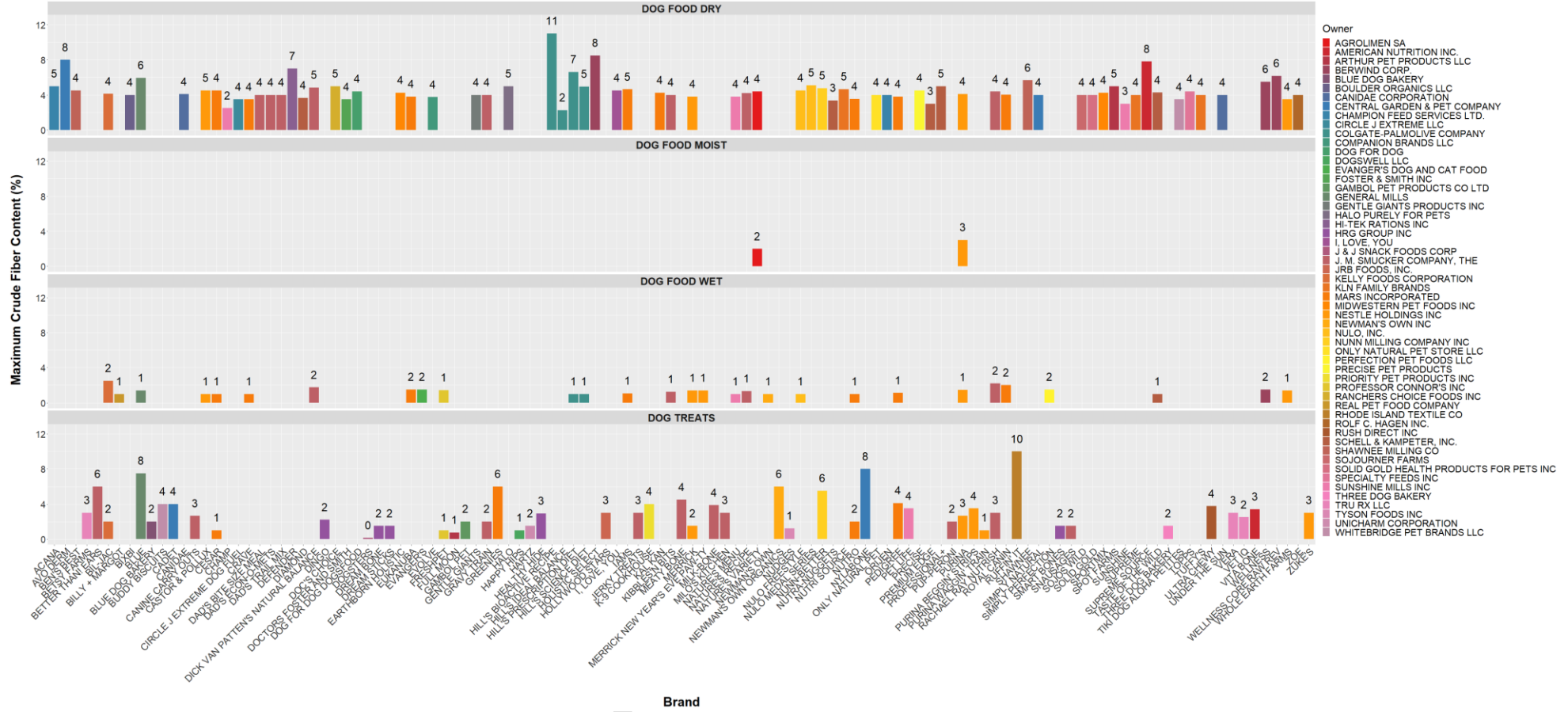


Figure 66, Maximum Crude Fiber Content in Dog Food Products

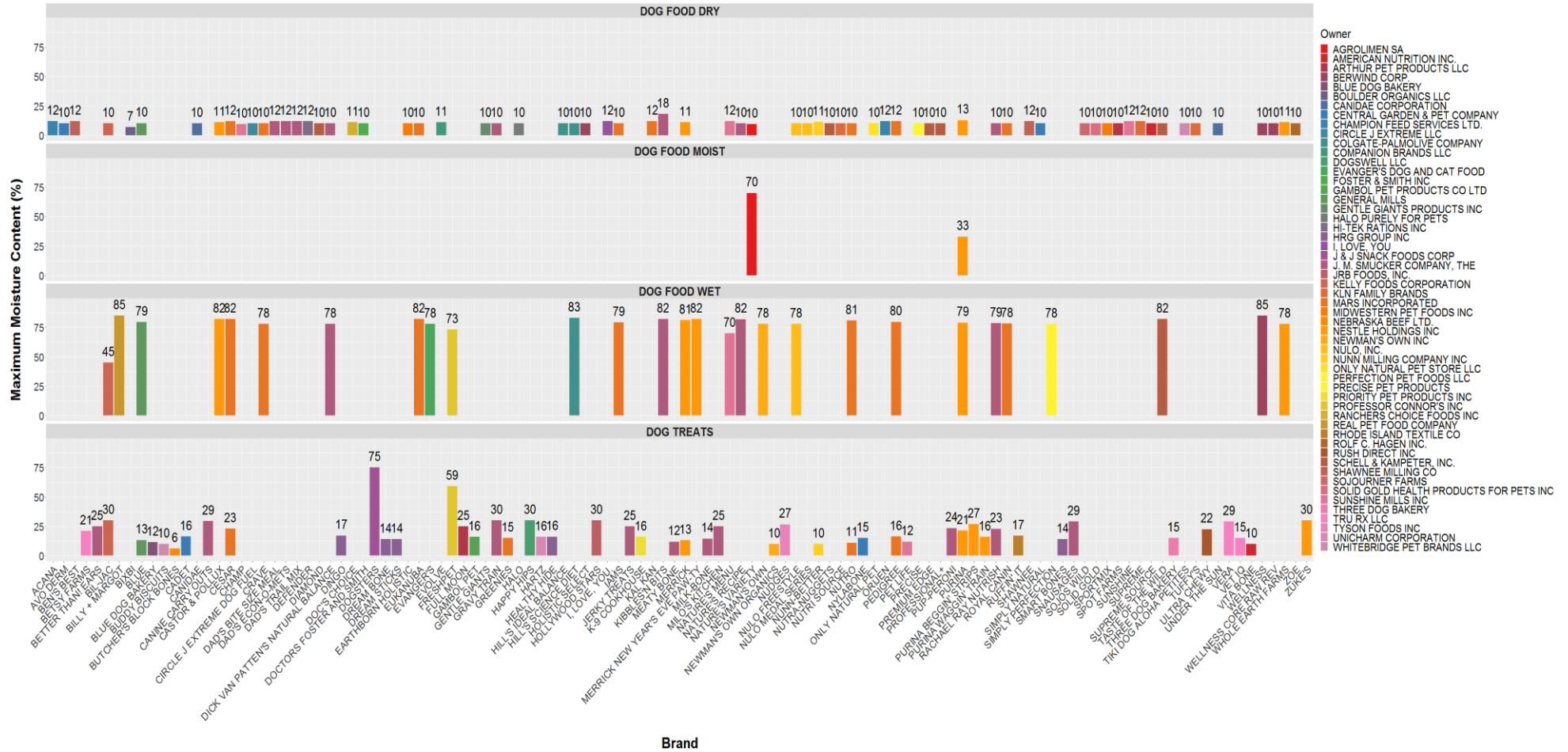


Figure 67, Maximum Moisture Content in Dog Food Products

Appendix D, Total Reported Retail Volume vs. Calculated Ingredient Volume

Note on pet food ingredient analysis: Because the additives, such as preservatives, flavors and colors, etc., are not considered in this project, there is a difference between the product sales volume and total ingredient volume. Within the reverse engineering procedure used, only the food ingredients were calculated. The average weight percentage of calculated ingredients was 85% and 88% for cat and dog foods, respectively. The difference between the tonnage calculated from the Nielsen data and our ingredient data is 13%. Below is a dry dog food example.

Food ingredients: turkey meal, peas, chickpeas, sweet potatoes, potatoes, poultry fat, dried beet pulp, salmon oil, dried seaweed meal, dried chicory root, carrots, blueberries, cranberries, spinach, parsley and pomegranates.

Additives: natural flavor, dicalcium phosphate, salt, calcium carbonate, betaine, choline chloride, potassium chloride, vitamin E supplement, zinc oxide, zinc proteinate, ferrous sulfate, manganous oxide, vitamin A supplement, D-calcium pantothenate, niacin, riboflavin, copper sulfate, manganese proteinate, thiamine mononitrate, calcium iodate, pyridoxine hydrochloride, vitamin D-3 supplement, copper proteinate, folic acid, biotin, sodium selenite, vitamin B-12 supplement, cobalt carbonate and rosemary extract.

Summary: For this example, the food ingredients represented 85.2% of the total product weight while the additives were 14.8% of the total product weight based on the reverse engineering calculation.

Appendix E, Additional Ingredient Volume and Value Detail

Table 14, U.S. Total Pet Food Ingredients from Farm and Mill-based

U.S. Total Pet Food Ingredients from Farm and Mill-based		
Item	Tons	\$ Value
Corn	1,958,061	\$438,558,151
Soybean	548,882	\$190,318,933
Wheat	412,472	\$178,521,422
Rice	330,651	\$131,019,084
Pea	206,459	\$126,162,404
Vegetable	97,582	\$78,447,053
Egg	51,639	\$77,651,578
Dairy	43,513	\$34,816,254
Barley	110,920	\$28,349,288
Other Grain	21,767	\$15,725,864
Root	71,212	\$15,169,664
Minor Oilseed	23,341	\$12,015,102
Sweeteners	45,291	\$11,669,647
Potato	37,575	\$10,285,547
Oats	40,503	\$9,670,739
Berry	10,558	\$8,930,910
Fruit	8,310	\$7,130,601
Coconut/Palm Products	2,542	\$5,469,760
Dried Beans	12,797	\$5,143,446
Yeast	3,668	\$5,056,287
Peanut	428	\$2,058,732
Herb	1,550	\$1,245,329
Alfalfa	2,881	\$1,151,382
Tree Oil	93	\$281,178
Nut	2	\$30,670
Total Farm and Mill-based	4,042,698	\$1,394,879,026
Note: Data factored up from Nielsen Data to represent National Data		
Note: Commodity Type of all ingredients Items are listed in the Appendix		

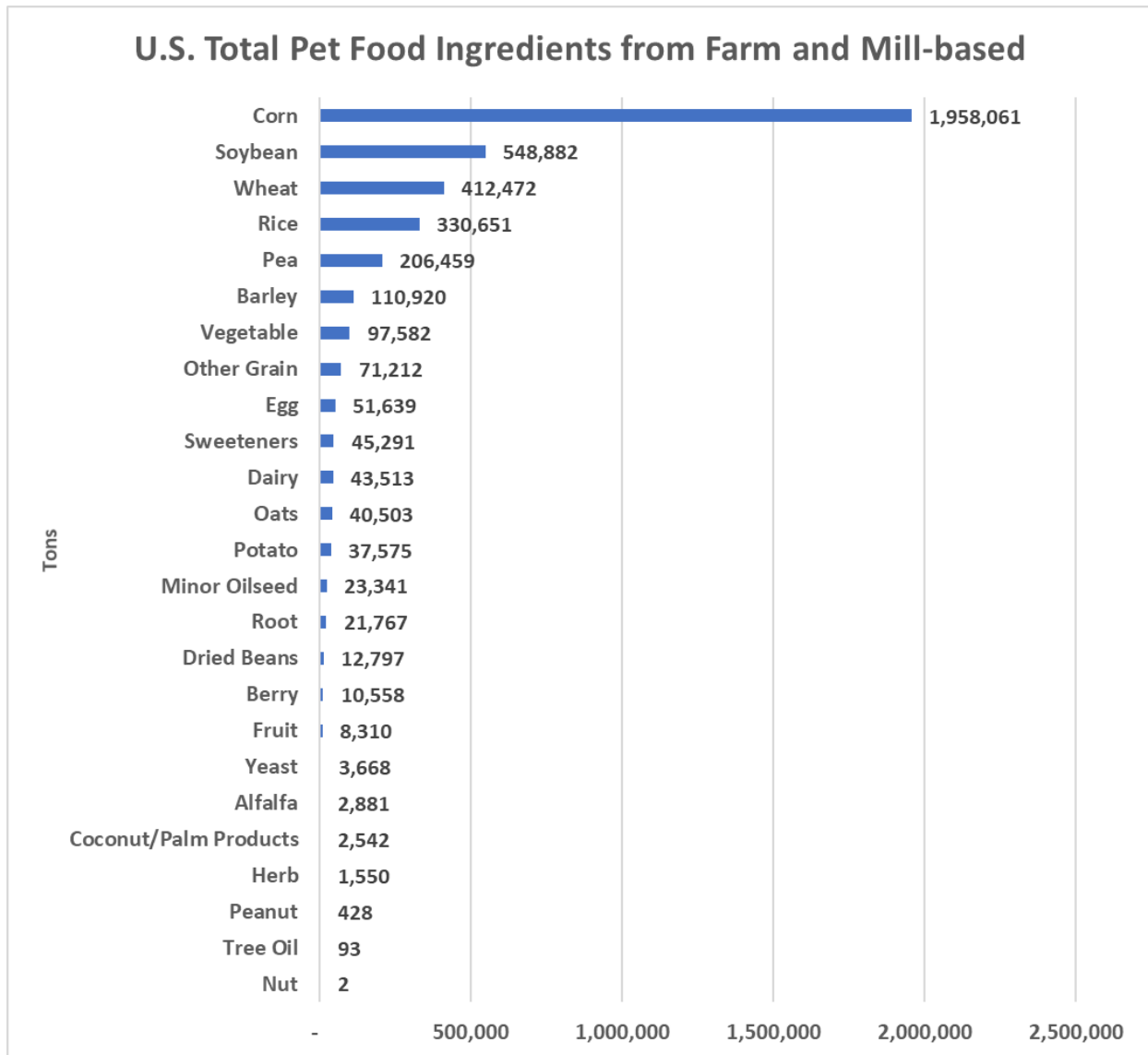


Figure 68, U.S. Total Pet Food Ingredients from Fam and Mill-based

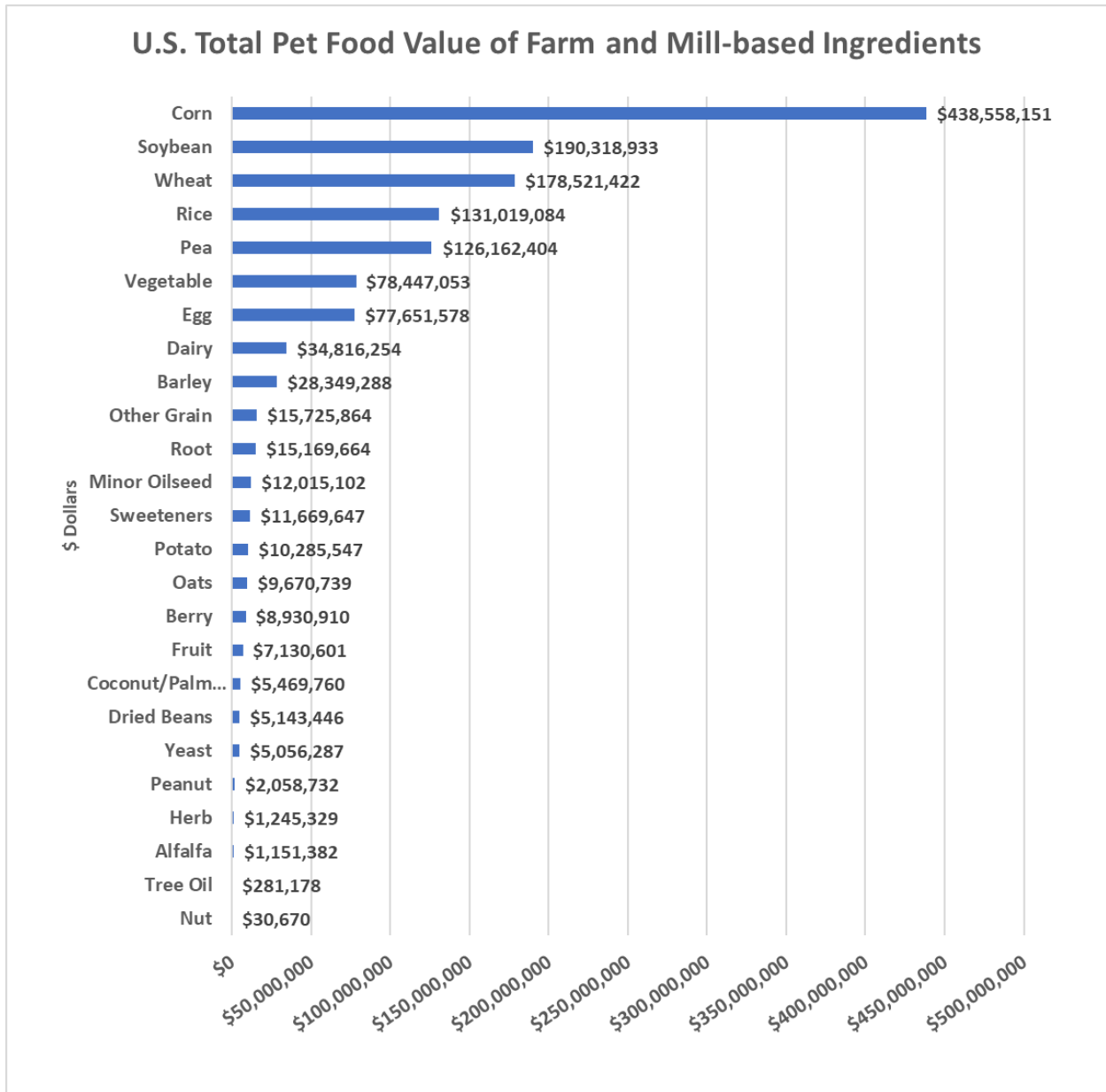


Figure 69, U.S. Total Pet Food Value of Farm and Mill-based Ingredients

Table 15, U.S. Total Pet Food Ingredients from Fishery – Detail

U.S. Total Pet Food Ingredients from Fishery		
Item	Tons	\$ Value
Salmon	87,495	\$429,521,196
Fish	40,492.5	\$107,855,746
Tuna	14,472	\$101,301,814
Cod	10,270	\$88,692,469
Whitefish	29,052	\$85,416,069
Fish Oil	4,388	\$39,491,687
Salmon Oil	714.7	\$14,912,966
Shrimp	3,206	\$10,181,473
Sole	596	\$5,159,797
Ocean Fish	5,556	\$3,529,509
Crab	119	\$2,224,579
Mackerel	601	\$1,765,853
Seaweed Meal	440	\$1,099,322
Seabass	78	\$771,452
Kelp	1,012	\$734,720
Anchovies	103	\$379,842
Tuna By-product	18	\$63,323
Sea Cucumber	0	\$26,779
Brown Kelp	5	\$9,957
Algae	42	\$4,151
Imitation Crab Meat	4	\$4,051
Kelp Meal	6	\$2,993
Green Lipped Mussels	0	\$1,969
Menhaden Oil	2	\$1,647
Total Fishery Ingredients	198,671	\$893,153,362
Note: Data factored up from Nielsen Data to represent National Data		
Note: Commodity Type of all ingredients Items are listed in the Appendix		

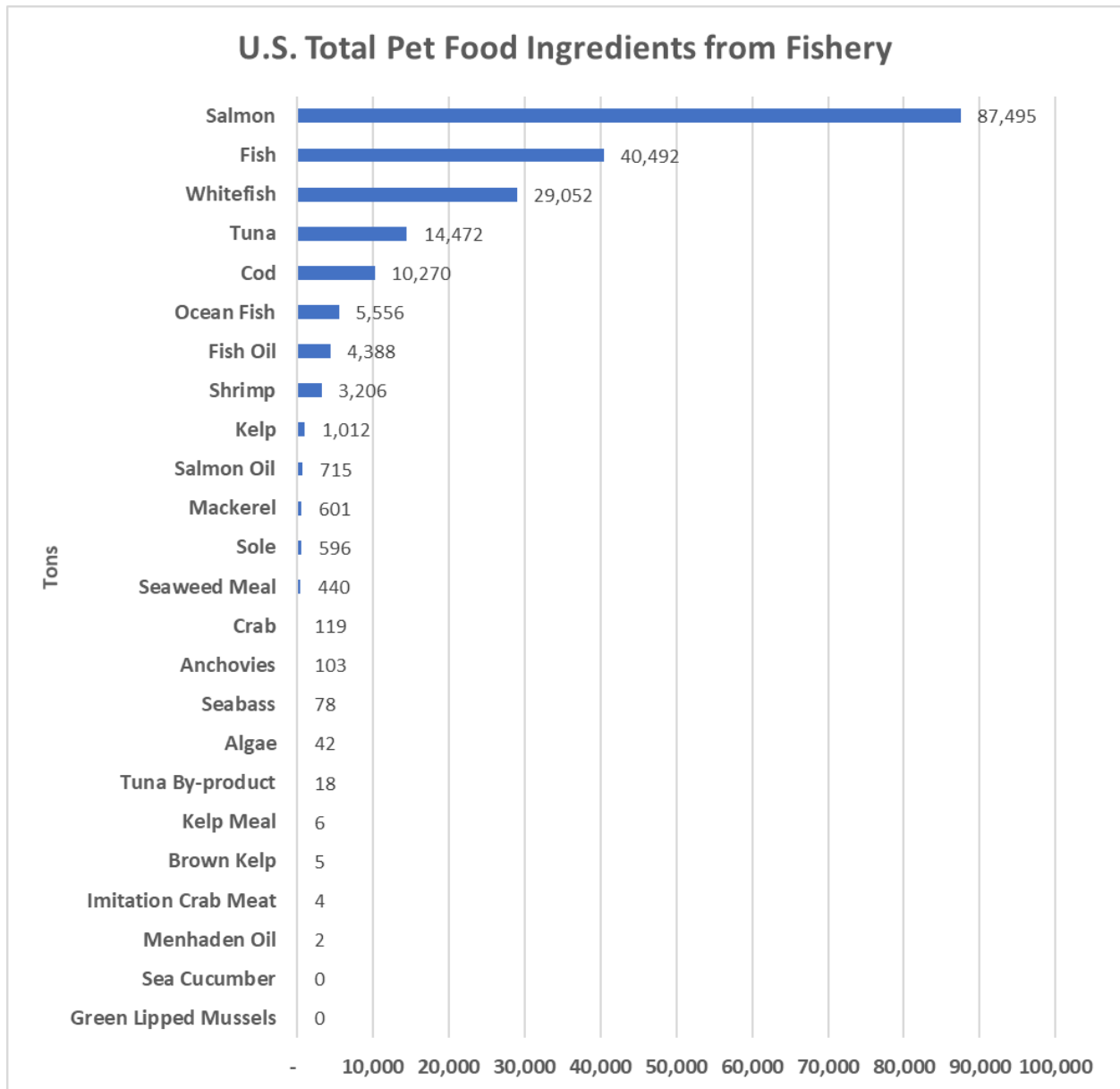


Figure 70, U.S. Total Pet Food Ingredients from Fishery – Detail

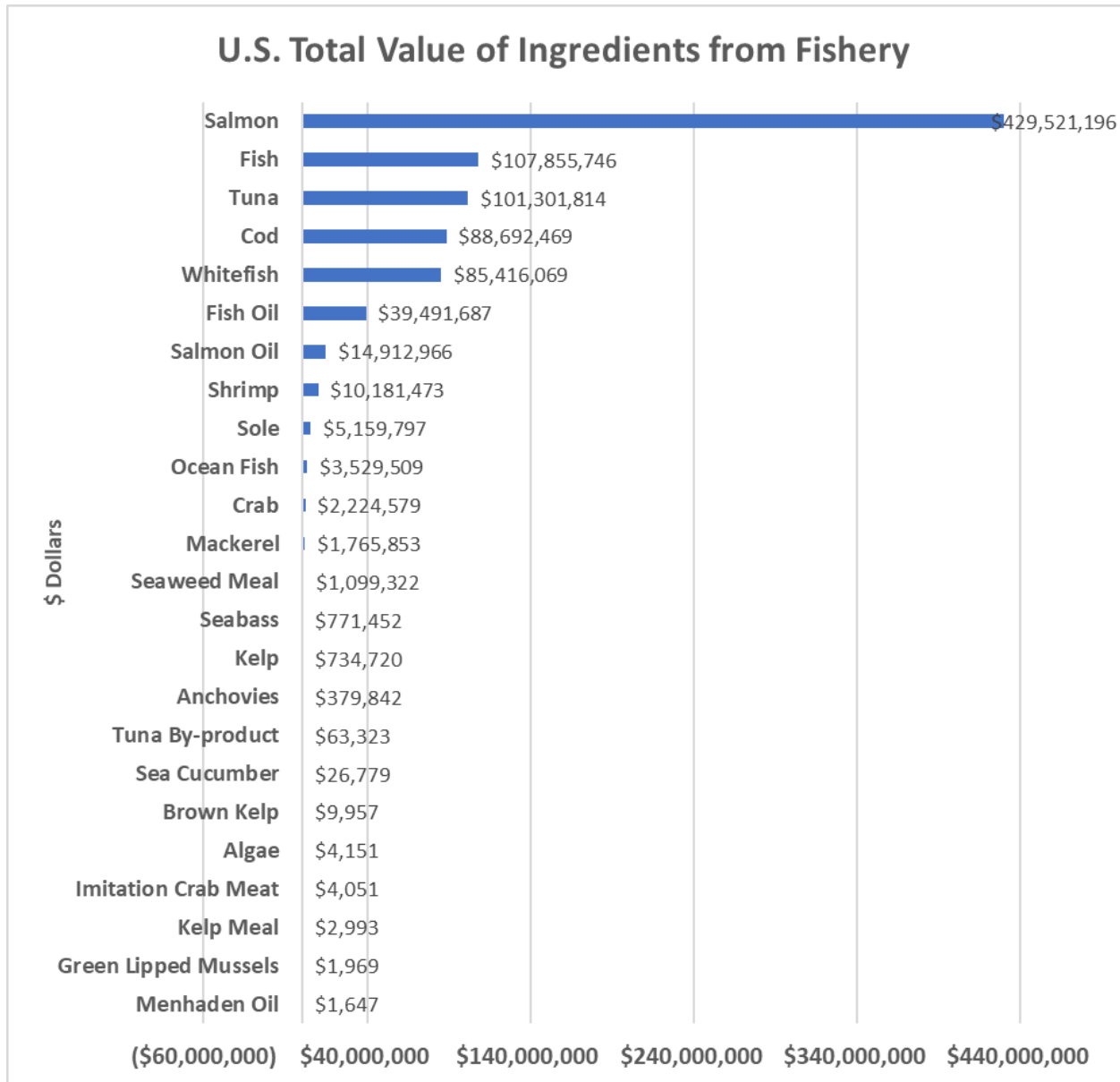


Figure 71, U.S. Total Value of Ingredients from Fishery – Detail

Table 16, U.S. Total Pet Food Ingredients from Broth

U.S. Total Pet Food Ingredients from Broth		
Item	Tons	\$ Value
Chicken Broth	70,563	\$352,812,987
Beef Broth	39,580	\$197,900,124
Poultry Broth	27,046	\$135,229,749
Fish Broth	15,018	\$75,091,496
Bacon Broth	3,954	\$19,772,272
Chicken and Turkey Broth	3,862	\$19,309,039
Meat Broth	1,857	\$9,286,090
Turkey Broth	1,407	\$7,033,779
Tuna Broth	1,053	\$5,266,299
Lamb Broth	897	\$4,484,386
Lamb and Chicken Broth	650	\$3,252,489
Vegetable Broth	569	\$2,843,107
Pork Broth	207	\$1,033,818
Liver Broth	188	\$939,879
Total Broth Ingredients	166,851	\$834,255,514
Note: all broth valued at \$250/cwt		
Note: Data factored up from Nielsen Data to represent National Data		

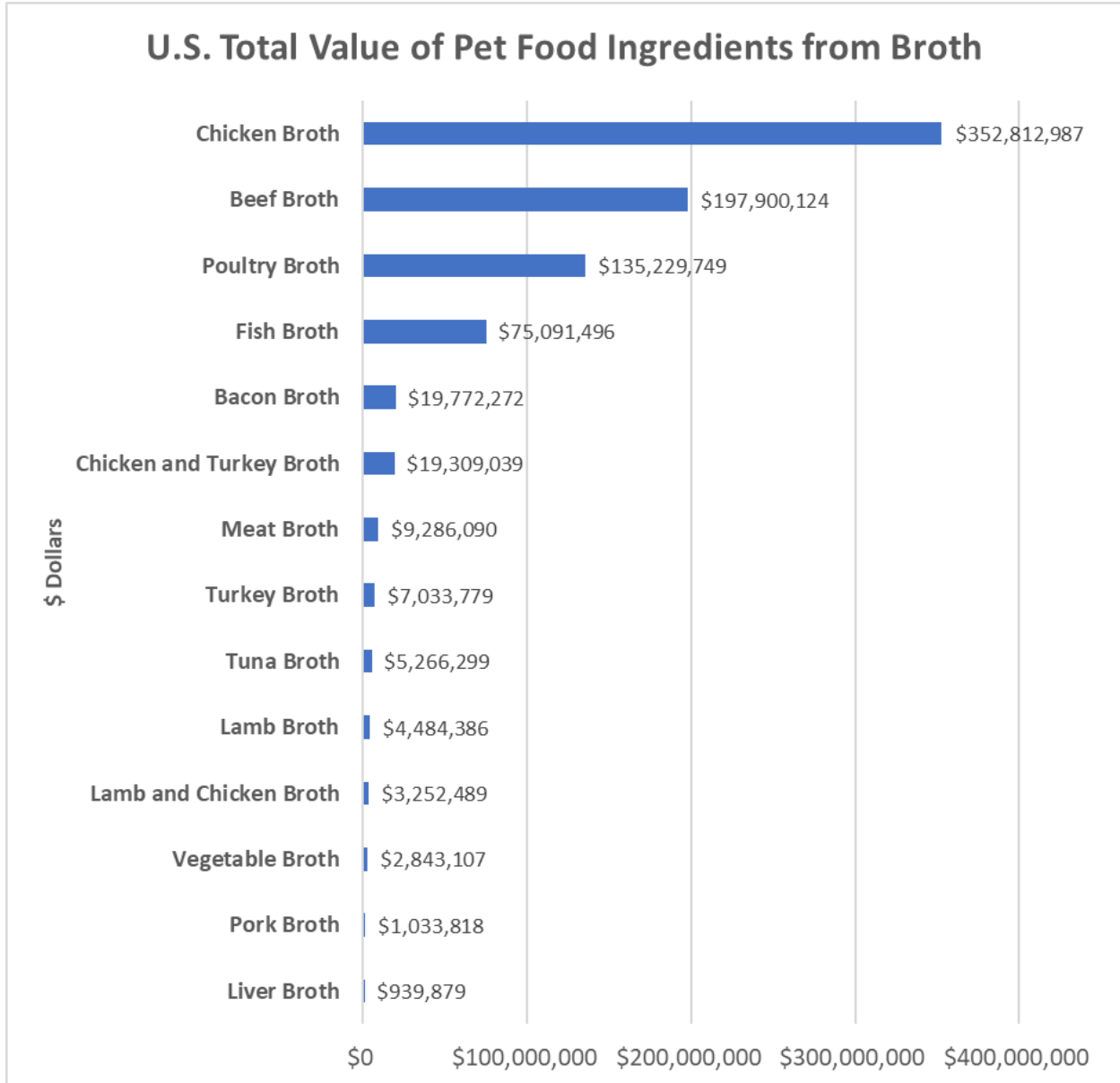


Figure 72, U.S. Total Value of Pet Food Ingredients from Broth