



Pet Food: How is it Made

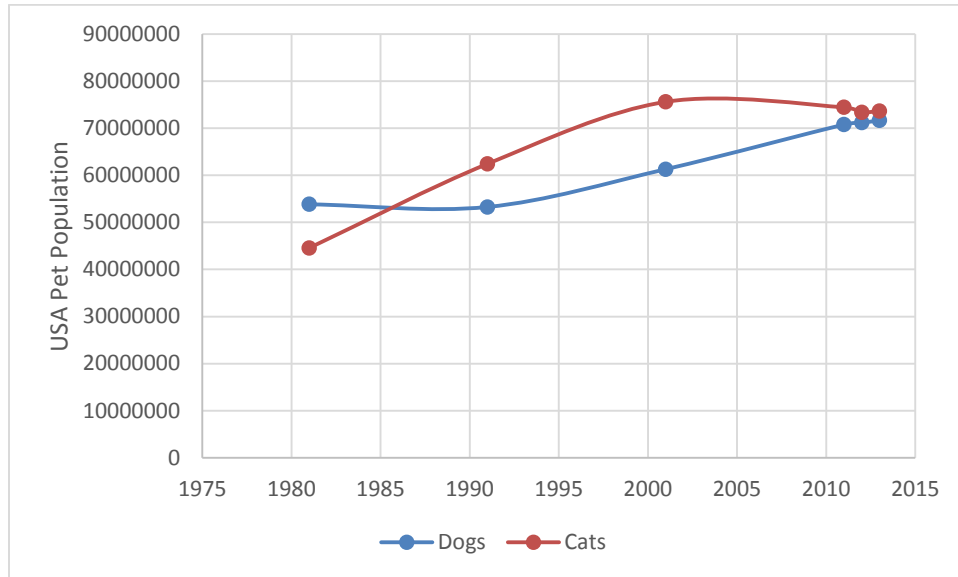
A White Paper

Dave Albin

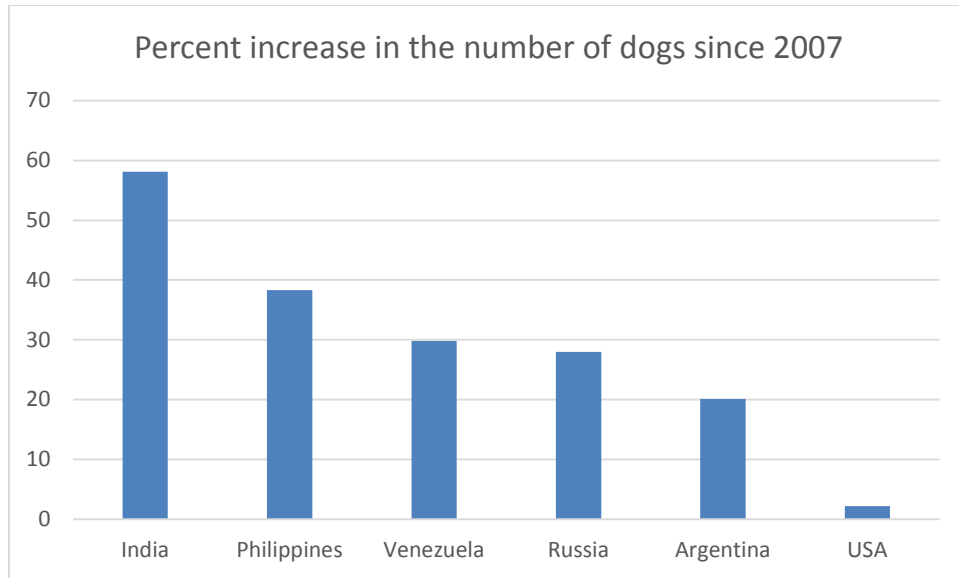
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The pet food industry in the USA has grown over the last 25 years in response to increased numbers of companion and/or working animals. While a pet could be virtually any animal species, including fish, birds, reptiles, and traditional livestock animals, many pet food products are developed for dogs and cats.

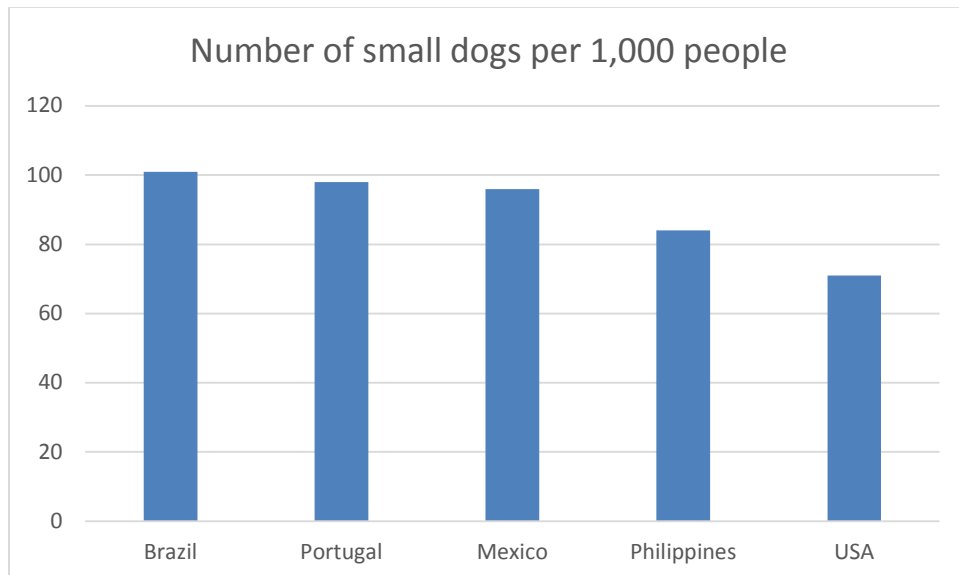
The United States has the greatest number of dogs, both in absolute terms and per capita, compared with all other countries.¹ While pet cats still outnumber dogs in the USA, the gap between the two is almost nonexistent as more and more people obtain pet dogs (see below)².



In other countries, the importance of the pet food industry can be assessed in different ways. Some countries exhibit growth through recent percentage increases in the number of dogs. By this metric, India, Philippines, Venezuela, Russia, and Argentina are the fastest growers (see below)¹. Data from the USA is shown as a reference.



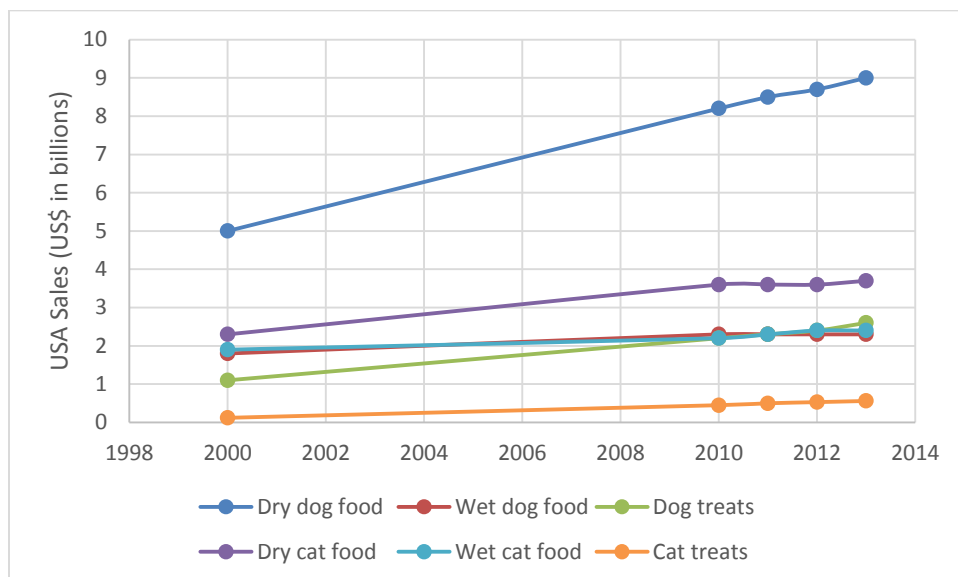
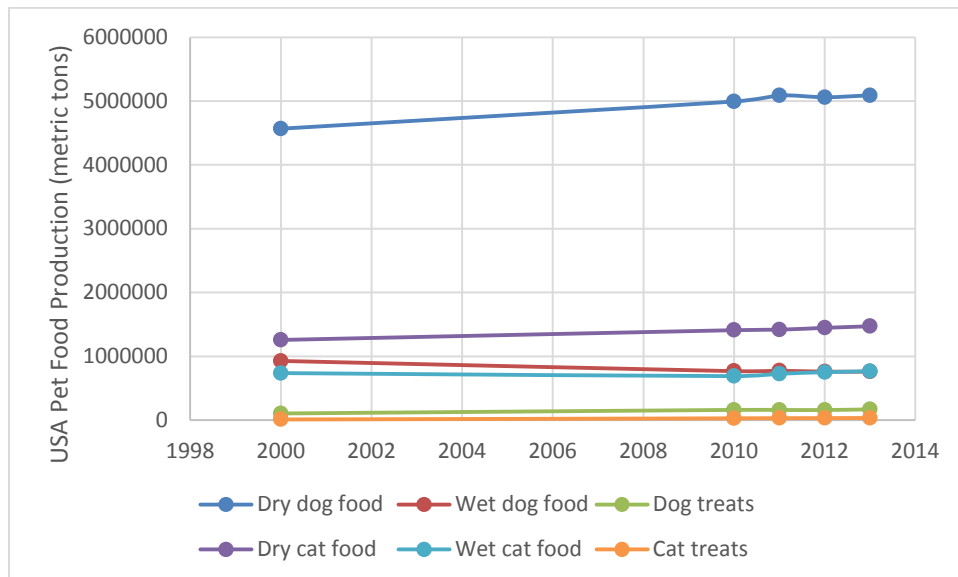
In addition, the number of small dogs per capita indicates that the nature of pet ownership is changing (see below)¹. Small dogs are kept for companion, rather than working, purposes, often taking on characteristics of a family member. Indeed, the pet-as-family-member trend is prevalent for all dogs and cats³.



Still another statistic is spending per dog, which is highest in the EU countries, especially Norway and Switzerland, which are both above Australia - this goes along with declining numbers of pet dogs in the EU¹.

Pet food products are unique; they often don't fit neatly into any other food or feed category, and thus, have their own classification system, which is not static. In general terms, however, pet food is either dry, wet or a treat. For simplicity, dry pet food ("kibble") typically contains

about 10% moisture, while wet pet food is characterized by about 80% moisture. Product formulators follow guidelines set by AAFCO in order to make certain label claims of nutrient sufficiency⁴. Treats span the spectrum of moisture contents, exhibit the most diversity in terms of final product (appearance, size, shape, texture, and so on) and may or may not make any claims of nutrient sufficiency. These groupings can be further subdivided into products for dogs or cats. Using these categories, the majority of pet food produced in the USA is dry and manufactured for dogs (see below)². Dry pet food for dogs plus cats now equals 79% of all pet food and treats (in terms of volume). Interestingly, the value of dog food sales (US\$) is rising faster than volume, indicating that the market for higher-value dog foods may be growing. Also of interest, the production of wet dog food has been declining. Finally, dog treats are only 2% of the total volume produced, but account for over 12% of total sales value.



The production of pet foods is as varied as the products available on the market⁵. Many of the initial steps are similar; namely, development of formulations to meet market demand and AAFCO requirements; procurement of raw materials; initial grinding, or other methods to accomplish size reduction, of ingredients; weighing; and adequate mixing.

For dry kibble products, the mix is thermally processed (heated) to allow binding and shaping, reduction or elimination of microbes, and enhancement of nutrient quality and palatability. While some processes use baking or pelleting, extrusion is most often used to thermally process and form shaped, dry, pet food. The extrusion cooking process begins in a pre-conditioner, where water, steam heat and mixing can be applied before the mixed pet food ingredients encounter rapidly-rotating screws in the extruder barrel. So, while the cooking process begins with pre-conditioning, it is completed in the extruder barrel. The kibble is formed, with the elevated temperatures and pressures found in the extruder barrel, as the ingredients are forced through a die plate at the end. A cutting device attached to the die plate quickly cuts and releases the shaped products from the extruder. To reduce moisture content for long term storage, it is important to dry and cool the extruded, shaped product. During the drying phase, heat is used to remove moisture, but must be properly controlled to prevent over-drying of the product resulting in damaged nutrients and a brittle final product. Following a brief cooling phase after heating, the dry pet food is then externally coated with a process called enrobing. This is accomplished with fats and oils, as well as palatants. This final step before packaging increases the energy content of the pet food and enhances the flavor.

For wet pet foods, the goal is typically to take the homogenous mix of ingredients and form either “chunk” or “loaf” products. As mentioned earlier, these products are high moisture, and utilize a liquid portion often referred to as “gravy”. A chunk-forming operation occurs with thermal processing with extrusion, baking, steam-heating in tunnels, heat-exchangers or boiling followed by sizing or cutting into the final chunk. Making the liquid gravy is a simpler process; water is mixed with a thickening agent and/or palatants. Once the chunk and gravy portions have been produced, the final product packaging is then filled with the appropriate amount of chunk and gravy materials using a filling machine. For loaf products, the mixed material is often transferred to the filling machine directly, bypassing the equipment to make chunk materials. Product packaging usually consists of cans, semirigid flexible containers, or pouches. Once filled, the packages must be sealed and made commercially sterile. Commercial sterility is achieved with a retort pressure cooker that allows batches of sealed containers to reach carefully-designed temperatures for designated periods of time. The thermal processing procedure must be appropriately designed, and performed the same way each time to ensure that a safe and shelf-stable product has been produced.

Pet treats do not neatly fit into the dry or wet categories and represent the entire spectrum of products. Pet treats may resemble kibble from an extruder, or take on characteristics of other products, such as human food. However, the same processes described for dry and wet pet foods hold true for treats in that a mixture of ingredients is formed into a product with thermal processing, which serves as a food safety-control step, and the final product is packaged for sale.

As indicated already, the market for pet food products, especially dry pet food and treats, is expanding and diverse. Market trends emerge and contract over time, but the concept of humanization of pets, which helps to drive all segments of the pet industry⁶, is particularly prevalent. This is also shown by the increased competition between the pet and human food industries for similar ingredients⁷.

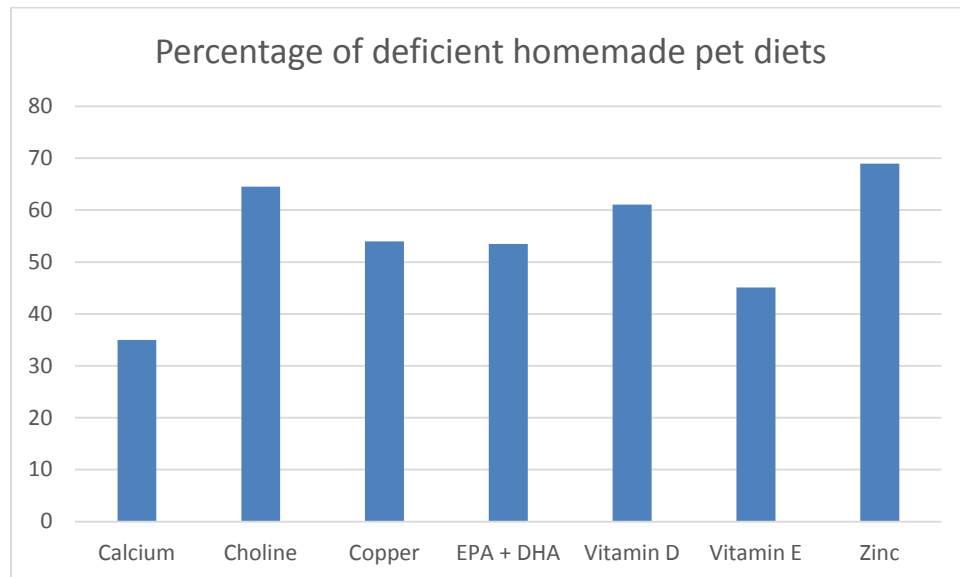
Increased competition and prices for ingredients desired for human consumption and by humans to feed their pets, especially animal proteins, is part of the reason that pet foods have begun to use exotic, or alternative, ingredients. These ingredients include duck, bison, venison, rabbit and various organ meats. These types of ingredients also serve as unique marketing tools and reinforce the idea that the predatory instincts of dogs and cats should be considered when purchasing pet foods and treats. These pet products will be formulated without grains and soy, and this may feature prominently on the packaging for marketing purposes.

Identity preservation of ingredients, which are careful controls placed throughout the supply chain to enable origination, tracking and processing information, is another aspect of the expanding marketplace for pet food, especially following toxic melamine contamination of protein ingredients in 2007, and recalls of these products with ingredients from a company in China⁸. Still other marketing approaches involve the use storytelling (why a company is a passionate about pet food, information about their own pets, how the purchase of this product helps other dogs and cats, etc.), environmental sustainability, and myriad other reasons (i.e., raw or minimally-processed pet foods, homemade pet foods that are superior to commercial pet foods, to name a few) why a certain pet food is of higher quality than others.

It must be stated, however, that the validity of at least some of the marketing approaches should be questioned. For example, the protein and energy in pet foods containing soy ingredients were well digested by dogs and puppies, provided that the soy was properly heat-processed beforehand⁹. Also, cats consumed commercial-type pet foods with widely-varying levels of dietary fat and carbohydrate, and were able to adapt to the different diets¹⁰.

Ultimately, consumers will decide what types of pet food products are best for their pets. Recent evidence suggests a relatively high percentage of the animal ingredients in commercial pet foods are mislabeled¹¹ and that many homemade pet food recipes are deficient in essential

nutrients (see below)¹². Therefore, further opportunities exist for even higher standards of pet food manufacturing.



Recommendations:

- Establish a pet food production line for dry dog food and/or treats
- Work with equipment that can serve growing markets in developing countries, or that can focus on specialty, high-value pet food products in developed countries
- Establish and optimize manufacturing of one complete dog food product, from start to finish, before trying to make any changes
- When changing product formulations or types in order to keep up with evolving market demand, work with equipment and professional consultants, such as myself, who can help you come up with feasible, quality and nutrient-balanced options

References:

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⁴<http://www.aafco.org/>, accessed October 8, 2014

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⁶[http://www.petfoodindustry.com/Pet_market_to_reach_US\\$73_billion_in_2014.html](http://www.petfoodindustry.com/Pet_market_to_reach_US$73_billion_in_2014.html), accessed October 10, 2014

⁷http://www.petfoodindustry.com/Snapshot_of_petfood_ingredient_market_shows_ongoing_growth.html, accessed October 10, 2014

⁸http://en.wikipedia.org/wiki/2007_pet_food_recalls, accessed October 10, 2014

⁹<http://journalofanimalscience.org/content/early/2013/04/09/jas.2011-4662.abstract>, accessed October 10, 2014

¹⁰<http://www.ncbi.nlm.nih.gov/pubmed/24033683>, accessed October 10, 2014

¹¹<http://www.sciencedirect.com/science/article/pii/S0956713514004666>, accessed October 10, 2014

¹²<http://viewer.epageview.com/Viewer.aspx?docid=c66789c4-1b3d-4bd6-89fd-a2880107f748#?page=16>, accessed October 10, 2014