

# Nutritional Sustainability of Pet Foods: Can We Create a More Sustainable System?

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# Nutritional Sustainability of Pet Foods<sup>1,2</sup>

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## ABSTRACT

Sustainable practices meet the needs of the present without compromising the ability of future generations to meet their needs. Applying these concepts to food and feed production, nutritional sustainability is the ability of a food system to provide sufficient energy and essential nutrients required to maintain good health in a population without compromising the ability of future generations to meet their nutritional needs. Ecological, social, and economic aspects must be balanced to support the sustainability of the overall food system. The nutritional sustainability of a food system can be influenced by several factors, including the ingredient selection, nutrient composition, digestibility, and consumption rates of a diet. Carbon and water footprints vary greatly among plant- and animal-based ingredients, production strategy, and geographical location. Because the pet food industry is based largely on by-products and is tightly interlinked with livestock production and the human food system, however, it is quite unique with regard to sustainability. Often based on consumer demand rather than nutritional requirements, many commercial pet foods are formulated to provide nutrients in excess of current minimum recommendations, use ingredients that compete directly with the human food system, or are overconsumed by pets, resulting in food wastage and obesity. Pet food professionals have the opportunity to address these challenges and influence the sustainability of pet ownership through product design, manufacturing processes, public education, and policy change. A coordinated effort across the industry that includes ingredient buyers, formulators, and nutritionists may result in a more sustainable pet food system. *Adv. Nutr.* 4: 141–150, 2013.



# Sustainability

- Definition: “meeting the needs of the present without compromising the ability of future generations to meet their needs”
  - Continuous scale
- Food system (local → global)
  - Production, transformation, distribution, access, and consumption



# Sustainability

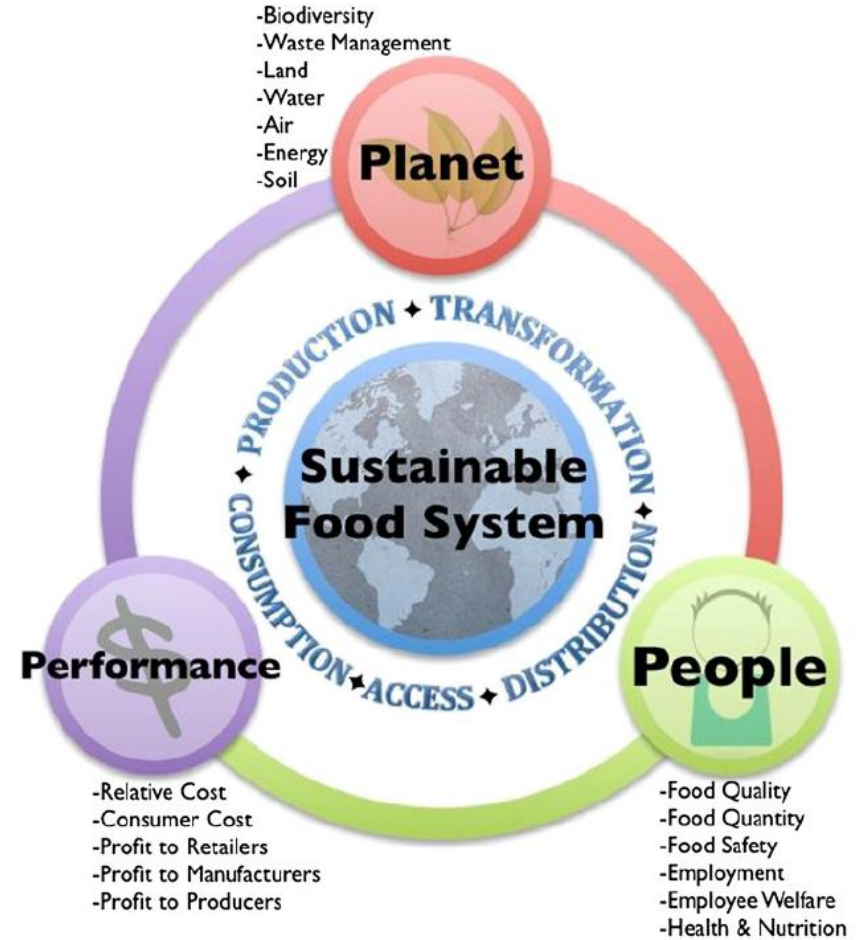
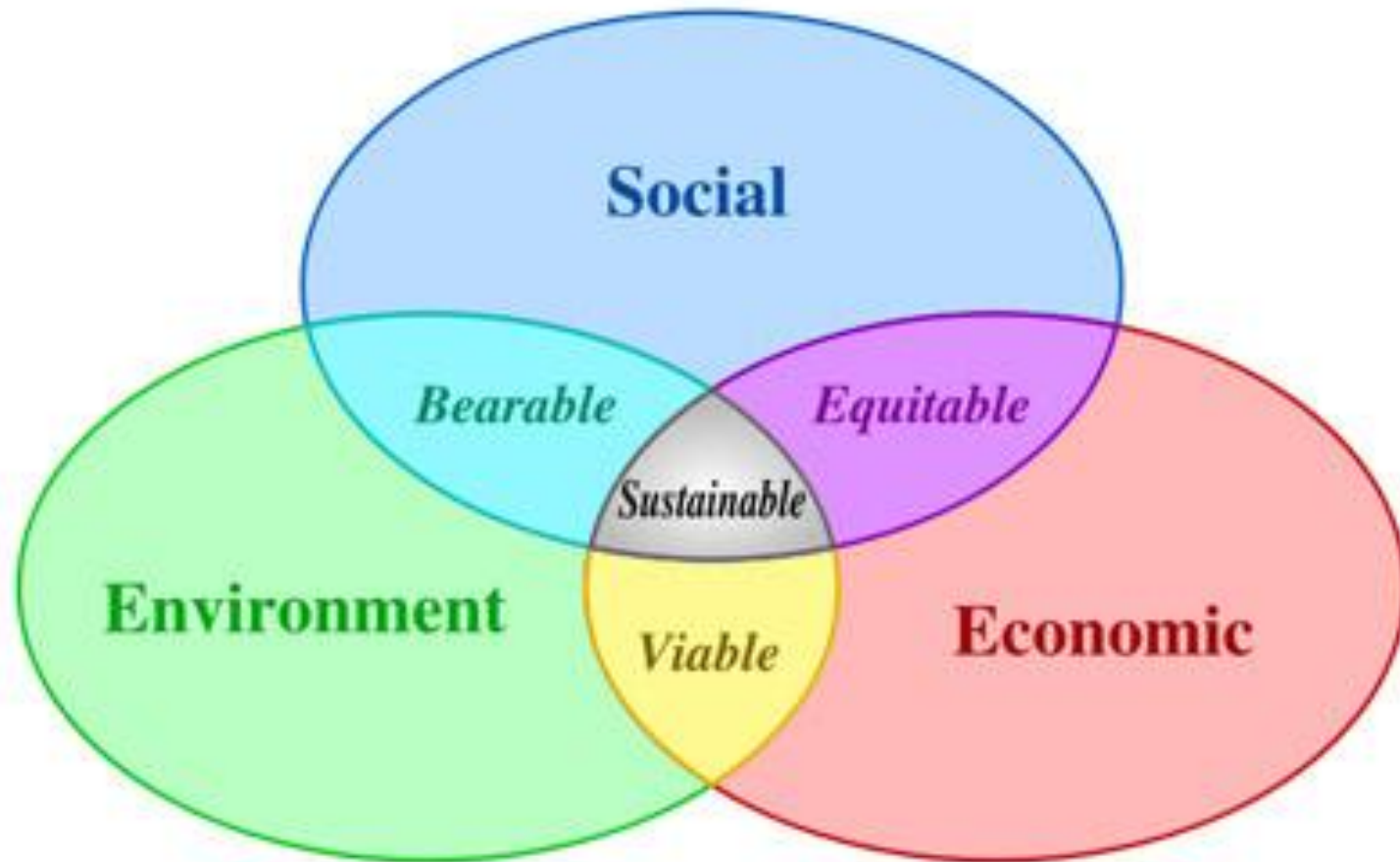


Figure 1 Components of a sustainable food system.



# Sustainability



# Nutritional Sustainability

- Definition: “ability of food system to provide sufficient energy and essential nutrients required for health without compromising that of future generations”
- Foods affect health by:
  - Nutrient content
  - Amount consumed
  - Non-nutritive substances (pesticides, fertilizers, preservatives, heavy metals, and microbiological contaminants)



# Assessment

- Global warming, eutrophication, acidification, photochemical smog, and land use
  - Carbon, water, and nitrogen cycles
- Agricultural energy inputs (crops):
  - Fertilizers; machinery; fuels; irrigation; pesticides
- Livestock species differ:
  - Diet and ingredient selection
  - Reproductive and metabolic efficiency
  - Production strategies



# Greenhouse Gases and Water

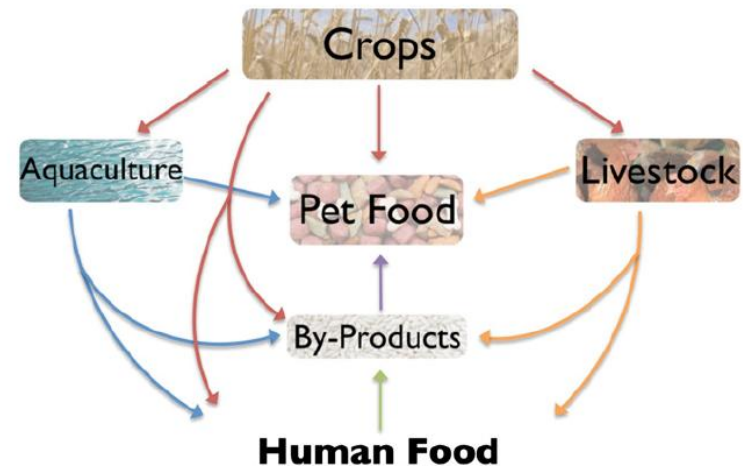
- Global warming potential:
  - Carbon dioxide (CO<sub>2</sub>) = 1
  - Methane (CH<sub>4</sub>) = 25
  - Nitrous oxide (N<sub>2</sub>O) = 298
- Water
  - Blue: surface water/groundwater consumed
  - Green: rainwater consumed
  - Gray: freshwater needed to dilute pollutants





# Pet Food Industry is Unique

- Linked with human food system and livestock production
  - Use of secondary products
  - Competition
  - Foods are “complete and balanced”
- Socioeconomics and cultural beliefs
- Anthropomorphism of pets



# Pet Food Issues

- Animal health and welfare
  - Pet health should not be compromised
  - Livestock production
- Pet owner/guardian education
  - Will they purchase sustainable products?
  - Feed to maintain healthy BW
- Worker income/quality of life
  - Pay
  - Working conditions



# Pet Food Issues

- Processing, packaging, and transportation
  - Distance traveled
    - Related to diet production
    - Related to business activities
  - Efficiencies
    - Crop/livestock production
    - Manufacturing
  - Packaging type and amount



# Pet Food Issues

- Ingredient selection
  - Animal- vs. plant-based proteins
  - Farming and fishing practices
  - Handling, storage, and processing
  - Search for alternatives
  - Feed vs. human grade ingredients

### Pet Nutrition Facts

**Ingredients:** Chicken, Whole Grain Corn, Whole Grain Sorghum, Whole Grain Wheat, Chicken By-Product Meal, Soybean Meal, Corn Gluten Meal, Animal Fat (preserved with mixed tocopherols and citric acid), Brewers Rice, Chicken Liver Flavor, Soybean Oil, Flaxseed, Iodized Salt, Potassium Chloride, Choline Chloride, Vitamin E Supplement, L-Lysine, vitamins (L-Ascorbyl-2-Polyphosphate (source of Vitamin C), Vitamin E Supplement, Niacin, Thiamine Mononitrate, Vitamin A Supplement, Calcium Pantothenate, Biotin, Vitamin B12 Supplement, Pyridoxine Hydrochloride, Riboflavin, Folic Acid, Vitamin D3 Supplement), Calcium Carbonate, minerals (Ferrous Sulfate, Zinc Oxide, Copper Sulfate, Manganous Oxide, Calcium Iodate, Sodium Selenite), Taurine, preserved with Mixed Tocopherols and Citric Acid, Phosphoric Acid, Beta-Carotene, Rosemary Extract.

With all the goodness of whole grain, carefully prepared to promote healthy digestion

**Guaranteed Analysis:**

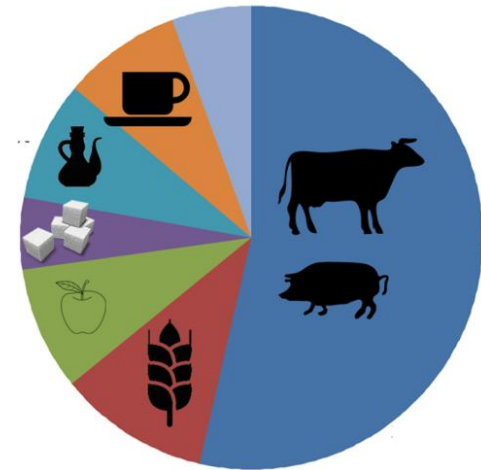
Crude Protein .....	Min.	21.5 %
Crude Fat .....	Min.	13.0 %
Crude Fiber .....	Max.	3.0 %
Moisture .....	Max.	10.0 %
Calcium .....	Min.	0.5 %
Phosphorus .....	Min.	0.4 %
Phosphorus .....	Max.	0.8 %
Vitamin E .....	Min.	400 IU/kg
Ascorbic Acid* (Vitamin C) .....	Min.	85 mg/kg
Taurine* .....	Min.	0.04 %
Total Omega-6 & 3 Fatty Acids* .....	Min.	3.0 %

\*Not recognized as an essential nutrient by the AAFCO Dog Food Nutrient Profiles.



# Ingredient Selection

- Animal- vs. plant-based proteins
  - Cost of secondary products?
    - Cost or credit to human food system?
  - Animal vs. plant sources
    - Animal-based products more “expensive” than plant-based products (by 5- to 20-fold)
  - Animal species differ
    - Ruminants > non-ruminants > poultry
    - Production scheme
    - Geography and climate



# Ingredient Selection

- Animal-based sources differ

**Table 1.** Fossil energy estimates to produce 1 kcal of animal protein<sup>1</sup>

Animal product	Fossil energy input (kcal):protein produced (kcal)
Broilers	4:1
Turkeys	10:1
Dairy (milk)	14:1
Swine	14:1
Beef cattle	40:1
Lamb	57:1



# Ingredient Selection

- Animal-based sources differ

**Table 3.** Water footprints of common animal products<sup>1</sup>

Product	Water, m <sup>3</sup> /ton
Cow's milk	1000
Chicken egg	3300
Chicken	4300
Goat	5500
Pig	6000
Sheep	10,400
Beef cattle	15,400



# Ingredient Selection

- Plant-based sources differ
  - Pulses > oil crops > cereals > fruits > roots/tubers > vegetables > sugar crops
  - Geography and climate
  - Nutritional quality
    - Protein quality
    - Tannins; lectins; phytate; fiber
    - Trypsin inhibitors





# Ingredient Selection

- Plant-based sources differ

**Table 2.** Water footprints of common crops and crop-derived oils<sup>1</sup>

Product	Water, m <sup>3</sup> /ton
Maize	1222
Barley	1423
Rye	1544
Rice (paddy)	1673
Oats	1788
Wheat	1827
Soybeans	2145
Sorghum	3048
Millet	4478
Maize oil	2575
Soybean oil	4190
Rapeseed (canola oil)	4301
Sunflower oil	6796
Linseed oil	9415
Olive oil	14,726



# Ingredient Selection

- Farming and fishing practices
  - Carbon/water footprints; land use; deforestation
  - Economics
  - Morbidity and mortality of animals
  - Wild-caught vs. farm-raised fish
  - Reality vs. perception



# Ingredient Selection

- Ingredient handling and processing
  - New technologies?
- Search for alternatives
  - Algae
  - Insects
  - Bacteria
  - In vitro “meat”
  - GMO’s
- Competition with human food chain



# Dietary Nutrient Composition

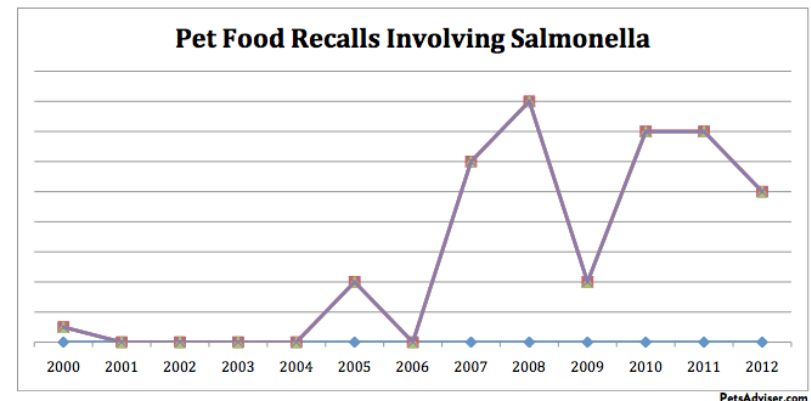
- Dietary protein concentrations vs. dog/cat requirements
  - Many commercial diets contain 40-50% crude protein or more

	<b>Adult dog</b>	<b>Adult Cat</b>
<b>NRC minimal requirement</b>	<b>8% CP</b>	<b>16% CP</b>
<b>NRC recommended allowance</b>	<b>10% CP</b>	<b>20% CP</b>
<b>AAFCO recommended allowance</b>	<b>18% CP</b>	<b>26% CP</b>



# Protein Source

- Availability
- Marketability
- Price
  - Farmer/retailer
  - Consumer costs
- Safety
  - Nutrient imbalance
  - Pathogens
  - Mycotoxins



Note: This chart is for representative purposes only, in order to show the approximate impact of various pet food recalls due to Salmonella concerns. Weighting factors include number of units recalled, as well as number of deaths and illnesses.



# Protein Source

- Protein quality

- Digestibility

- What is available to host?

- Raw ingredients

- Losses due to shipping, processing, or storage

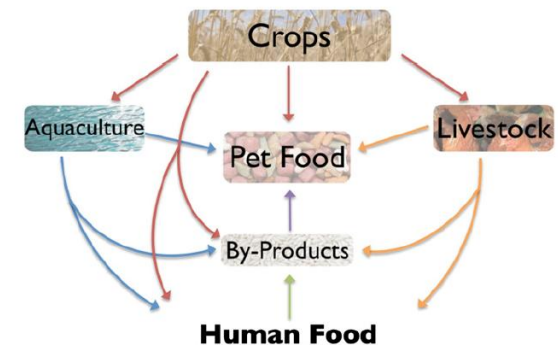
- Amino acid profile

- How does amino acid profile of diet compare to needs of the host?



# Summary Points

- Sustainability is a complex issue with many components to consider
  - Environment vs. economics vs. social aspects
- Defining sustainability of ingredients/diets often difficult and controversial
- Pet food industry is quite unique



# Summary Points

- Considerations for pet food industry
  - Ingredient selection
  - Dietary protein concentration
  - Dietary protein source
  - Feeding recommendations
  - Many others
    - Production, packaging and transportation
    - Animal welfare
    - Pet owner/guardian education
    - Worker quality of life





# What's Next?

- Veterinary/client perspective
  - Andrea Fascetti, Professor
  - University of California-Davis
- Ingredient sustainability
  - Jason Rokey, Purchasing Manager
  - Lortscher Animal Nutrition
- Q&A/discussion

