



Executive Summary

Written by The Centre for Feed Innovation in collaboration with the Pet Sustainability Coalition

The global pet food sector continues to expand, while manufacturers face pressures related to ingredient costs, environmental impacts, supply chain disruptions, and evolving consumer expectations. Ingredient choices are particularly important because they account for a substantial share of pet food's environmental footprint. Conventional ingredient markets are also exposed to increasing risks from climate change, disease, competition, and price volatility. Alternative ingredients could offer pet food manufacturers new opportunities to diversify ingredient supply, reduce environmental impacts, and deliver nutritional or functional value.

This report assesses nine alternative ingredients for their potential to play a larger role in dog and cat food: algal oil as an alternative source of EPA + DHA, and algal protein, bacterial protein, black soldier fly larvae (BSFL), brown seaweed, cultivated meat, mycoprotein, red seaweed, and yeast protein as alternative proteins. Each ingredient is evaluated across five domains: supply, current adoption, sustainability, nutrition and health, and consumer acceptance.

Key Takeaways

A diverse alternative ingredient supply base is emerging with varying levels of production maturity

Some alternative ingredients, including seaweeds and yeast protein, benefit from established global production systems and supply chains, while algal oil and algal protein are commercially available at smaller scales. Bacterial protein, mycoprotein, BSFL, and cultivated meat remain at earlier stages of commercialization, with broader adoption constrained by factors including production scale, cost, supplier availability, and regulation. Future supply could expand as new facilities are built, but the pace and extent of growth are likely to vary considerably by ingredient, and will depend on overcoming challenges including cost competitiveness and regulatory hurdles.

Several alternative ingredients already have an established presence in pet food

In the United States (US), top manufacturers are already selling a wide range of products, including dry and wet foods, treats, supplements, and toppers for both dogs and cats, that contain alternative ingredients. Adoption remains concentrated among more established ingredients such as brown seaweed and yeast protein, while algal oil has an established but smaller presence. Bacterial protein, cultivated meat, and mycoprotein were not identified in the assessed US dataset, although some have regulatory pathways or commercial activity in other markets.

Alternative ingredients can offer opportunities to reduce the environmental impacts of pet food

Alternative proteins generally have lower environmental impacts than chicken meat, particularly for greenhouse gas emissions and land use, but their advantages over animal byproducts are less consistent. Bacterial protein performs particularly strongly across the assessed impact categories, while several other proteins can achieve lower greenhouse gas emissions under favorable production conditions. Algal oil can reduce reliance on wild-capture fisheries and achieve greenhouse gas emissions comparable to or lower than fish oil, but generally has higher land and freshwater use. Environmental performance can vary substantially with feedstock, energy source, production system, and allocation assumptions.

Growing evidence supports the nutritional suitability of some alternative ingredients, but important evidence gaps remain

Feeding studies generally found that several alternative ingredients can be incorporated into dog and cat diets at the tested inclusion levels while maintaining food intake, body weight, and other measures of basic nutritional suitability. However, effects on digestibility, gastrointestinal outcomes, and acceptability varied by ingredient and formulation, and the evidence base is much stronger for some ingredients than others. Evidence is particularly limited for cats and for several emerging ingredients, while reported health-related benefits remain preliminary and should be interpreted within the conditions of individual studies.

Consumers show some openness to alternative ingredients, with acceptance shaped by familiarity and perceived benefits

Pet owners are generally more receptive to alternative ingredients when they perceive clear benefits for pet health and nutrition and are confident in their quality and safety. Sustainability can strengthen acceptance, but tends to be more persuasive when paired with clear benefits for the pet rather than presented alone. Unfamiliarity remains an important barrier across several ingredients, while BSFL faces additional challenges related to disgust and safety perceptions. Acceptance also varies substantially by ingredient and should not be assumed to translate directly into purchasing behavior.

Assessment Table

RECOMMENDATION FRAMEWORK

●●● Prioritize for evaluation

The evidence provides a sufficiently strong basis for the assessed role that manufacturers may reasonably prioritize further product-, supplier-, regulatory- and formulation-level evaluation now.

●●○ Evaluate selectively

The ingredient has a credible role, but important limitations mean evaluation should focus on particular applications, markets, suppliers or formulations.

●○○ Monitor development

The ingredient has potential, but current limitations in evidence, commercial readiness, cost, regulation or other areas make active near-term evaluation less compelling.

SUPPLY Is this ingredient ready and approved to be used at scale in pet food?	SUSTAINABILITY Can this ingredient help to meet sustainability goals?	NUTRITION & HEALTH What are the nutritional and health effects of this ingredient for dogs and cats?	CONSUMER ACCEPTANCE Will consumers buy pet foods with these ingredients?
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Algal oil				Strong basis for use as an alternative oil that can supplement or replace fish oil.				●●● Prioritize for evaluation			
Supply			Sustainability			Nutrition & Health			Consumer Acceptance		
Production maturity Commercial		Regulatory status in key markets Established with restrictions US ✓ EU ✓ GB ✓ CN ✓ BR ✓ Current use in US market 3.4% of assessed products Wet + dry foods Top-10 ✓	Comparison with fish oil		Effect on nutritional and health outcomes			Consumer signal			
Estimated annual global production ~50,000–55,000 MT			Greenhouse gas emissions	↓ Below fish oil	Outcome	Healthy adult dogs	Healthy adult cats	Not assessed			
Price USD 6,000–15,000/MT			Land use	↑ Above fish oil	Tested dietary inclusion	0.4–1.0%	0.5–3.0%				
				Food intake and acceptability	≈ ↑	↑ ↓					
				Nutrient digestibility and utilization	≈ ↑	Not assessed					
				Gastrointestinal outcomes (GI)	≈	Not assessed					
				Body and physiological condition	≈	≈					
				Other reported effects Dogs: Coat + blood serum / immune / antioxidant biomarker effects reported Cats: Serum DHA / EPA effects reported			Potential appeal Health and Nutrition Sustainability				
							Main barrier Unfamiliarity				

Algal protein				Commercially available, with some nutritional evidence, but limited evidence for an expanded alternative protein role.				●○○ Monitor development															
Supply			Sustainability		Nutrition & Health			Consumer Acceptance															
Production maturity Commercial	Regulatory status in key markets Established with restrictions US△ EU✓ GB✓ CN✓ BR✓	Current use in US market 0.3% of assessed products Predominantly supplements	Comparison with animal byproducts (ABPs) and chicken meat Greenhouse gas emissions ↑ Above chicken meat Land use ↓ Below ABPs and chicken meat Freshwater Use ↔ Between ABPs and chicken meat		Effect on nutritional and health outcomes <table><tr><th>Outcome</th><th>Healthy adult dogs</th><th>Healthy adult cats</th></tr><tr><td>Tested dietary inclusion</td><td>0.2–1.5%</td><td rowspan="5">No eligible feeding trials identified</td></tr><tr><td>Food intake and acceptability</td><td>≈↓</td></tr><tr><td>Nutrient digestibility and utilization</td><td>≈↑</td></tr><tr><td>Gastrointestinal outcomes (GI)</td><td>↑↓</td></tr><tr><td>Body and physiological condition</td><td>≈</td></tr></table> Other reported effects Dogs: Immune biomarker effects reported Cats: Not assessed			Outcome	Healthy adult dogs	Healthy adult cats	Tested dietary inclusion	0.2–1.5%	No eligible feeding trials identified	Food intake and acceptability	≈↓	Nutrient digestibility and utilization	≈↑	Gastrointestinal outcomes (GI)	↑↓	Body and physiological condition	≈	Consumer signal Mixed - Positive Potential appeal Health and Nutrition Sustainability Main barrier Unfamiliarity	
Outcome	Healthy adult dogs	Healthy adult cats																					
Tested dietary inclusion	0.2–1.5%	No eligible feeding trials identified																					
Food intake and acceptability	≈↓																						
Nutrient digestibility and utilization	≈↑																						
Gastrointestinal outcomes (GI)	↑↓																						
Body and physiological condition	≈																						

Bacterial protein		Credible alternative protein with strong sustainability and promising nutrition evidence, but limited commercial scale.		●●○ Evaluate selectively																			
Supply		Sustainability		Nutrition & Health		Consumer Acceptance																	
Production maturity Early commercial Estimated annual global production ~15,000–25,000 MT Price USD 1,300–11,000/MT*		Regulatory status in key markets Established with restrictions US △ EU ✓ GB ✓ CN ✓ BR ✓ Current use in US market No products identified		Comparison with animal byproducts (ABPs) and chicken meat Greenhouse gas emissions ↓ Below ABPs and chicken meat Land use ↓ Below ABPs and chicken meat Freshwater Use ↓ Below ABPs and chicken meat		Effect on nutritional and health outcomes <table><tr><th>Outcome</th><th>Healthy adult dogs</th><th>Healthy adult cats</th></tr><tr><td>Tested dietary inclusion</td><td>4.0–10.0%</td><td rowspan="5">No eligible feeding trials identified</td></tr><tr><td>Food intake and acceptability</td><td>≈</td></tr><tr><td>Nutrient digestibility and utilization</td><td>≈ ↓</td></tr><tr><td>Gastrointestinal outcomes (GI)</td><td>↑ ↓</td></tr><tr><td>Body and physiological condition</td><td>≈</td></tr></table> Other reported effects Dogs & Cats: Not assessed		Outcome	Healthy adult dogs	Healthy adult cats	Tested dietary inclusion	4.0–10.0%	No eligible feeding trials identified	Food intake and acceptability	≈	Nutrient digestibility and utilization	≈ ↓	Gastrointestinal outcomes (GI)	↑ ↓	Body and physiological condition	≈	Consumer signal Not assessed Potential appeal Health and Nutrition Sustainability Main barrier Unfamiliarity	
Outcome	Healthy adult dogs	Healthy adult cats																					
Tested dietary inclusion	4.0–10.0%	No eligible feeding trials identified																					
Food intake and acceptability	≈																						
Nutrient digestibility and utilization	≈ ↓																						
Gastrointestinal outcomes (GI)	↑ ↓																						
Body and physiological condition	≈																						

SUPPLY	SUSTAINABILITY	NUTRITION & HEALTH	CONSUMER ACCEPTANCE
Is this ingredient ready and approved to be used at scale in pet food?	Can this ingredient help to meet sustainability goals?	What are the nutritional and health effects of this ingredient for dogs and cats?	Will consumers buy pet foods with these ingredients?



Black soldier fly larvae

Some nutritional evidence supporting its use as an alternative protein, but commercial and consumer response barriers currently constrain broader use.

Monitor development

Supply

Production maturity

Early commercial

Estimated annual global production

~30,000–40,000 MT

Price

USD 3,800–6,000/MT

Regulatory status in key markets

Established with restrictions

US ✓ EU ✓ GB ✓ CN ✓ BR ✓

Current use in US market

0.2% of assessed products

Top-10 ✓

Most often treats

Sustainability

Comparison with animal byproducts (ABPs) and chicken meat

Greenhouse gas emissions

↔ Between ABPs and chicken meat

Land use

↓ Below ABPs and chicken meat

Freshwater Use

↓ Below ABPs and chicken meat

Nutrition & Health

Effect on nutritional and health outcomes

Outcome	Healthy adult dogs	Healthy adult cats
Tested dietary inclusion	3.0–36.5%	3.0–37.5%
Food intake and acceptability	≈	↑ ↓
Nutrient digestibility and utilization	↑ ↓	↑ ↓
Gastrointestinal outcomes (GI)	↑ ↓	↑ ↓
Body and physiological condition	≈	↑ ↓

Other reported effects

Dogs: None identified

Cats: Antioxidant, immune and blood serum effects reported

Consumer Acceptance

Consumer signal

Mixed - Negative

Potential appeal

Health and Nutrition

Sustainability

Main barrier

“Ick” Factor

Safety Concerns

Brown seaweed		Established functional ingredient, but limited evidence for an expanded role as an alternative protein.		●○○ Monitor development																		
Supply		Sustainability		Nutrition & Health		Consumer Acceptance																
Production maturity Established		Comparison with animal byproducts (ABPs) and chicken meat Greenhouse gas emissions ↔ Between ABPs and chicken meat Land use Insufficient data Freshwater Use Insufficient data		Effect on nutritional and health outcomes <table><tr><th>Outcome</th><th>Healthy adult dogs</th><th>Healthy adult cats</th></tr><tr><td>Tested dietary inclusion</td><td>1.5%</td><td rowspan="4">No eligible feeding trials identified</td></tr><tr><td>Food intake and acceptability</td><td>Not assessed</td></tr><tr><td>Nutrient digestibility and utilization</td><td>≈ ↑</td></tr><tr><td>Gastrointestinal outcomes (GI)</td><td>≈</td></tr><tr><td>Body and physiological condition</td><td>≈</td><td></td></tr></table> Other reported effects Dogs & Cats: Oral health effects reported at supplemental dosages		Outcome	Healthy adult dogs	Healthy adult cats	Tested dietary inclusion	1.5%	No eligible feeding trials identified	Food intake and acceptability	Not assessed	Nutrient digestibility and utilization	≈ ↑	Gastrointestinal outcomes (GI)	≈	Body and physiological condition	≈		Consumer signal Emerging	
Outcome	Healthy adult dogs					Healthy adult cats																
Tested dietary inclusion	1.5%					No eligible feeding trials identified																
Food intake and acceptability	Not assessed																					
Nutrient digestibility and utilization	≈ ↑																					
Gastrointestinal outcomes (GI)	≈																					
Body and physiological condition	≈																					
Estimated annual global production 18.5 million MT		Potential appeal + Health and Nutrition + Sustainability + Perceived Naturalness																				
Price USD 300–1,000/MT; >USD 4,000 typically organic		Current use in US market 14.6% of assessed products Predominantly dry food		Main barrier − Unfamiliarity																		

Cultivated meat		Technical potential and relatively high consumer acceptance for use as an alternative protein, but commercial challenges and evidence gaps currently constrain broader use.			●○○ Monitor development																		
Supply		Sustainability		Nutrition & Health		Consumer Acceptance																	
Production maturity Early commercial		Regulatory status in key markets Very limited US— EU△ GB△ CN— BR—		Comparison with animal byproducts (ABPs) and chicken meat Greenhouse gas emissions ↔ Between ABPs and chicken meat Land use ↓ Below ABPs and chicken meat Freshwater Use ↔ Between ABPs and chicken meat		Effect on nutritional and health outcomes <table><tr><th>Outcome</th><th>Healthy adult dogs</th><th>Healthy adult cats</th></tr><tr><td>Tested dietary inclusion</td><td rowspan="5">No eligible feeding trials identified</td><td>24.4%</td></tr><tr><td>Food intake and acceptability</td><td>↑</td></tr><tr><td>Nutrient digestibility and utilization</td><td>↑ ↓</td></tr><tr><td>Gastrointestinal outcomes (GI)</td><td>≈</td></tr><tr><td>Body and physiological condition</td><td>≈</td></tr></table> Other reported effects Dogs & Cats: Not assessed		Outcome	Healthy adult dogs	Healthy adult cats	Tested dietary inclusion	No eligible feeding trials identified	24.4%	Food intake and acceptability	↑	Nutrient digestibility and utilization	↑ ↓	Gastrointestinal outcomes (GI)	≈	Body and physiological condition	≈	Consumer signal Positive Potential appeal Health and Nutrition Sustainability Main barrier Unfamiliarity Safety Concerns	
Outcome	Healthy adult dogs	Healthy adult cats																					
Tested dietary inclusion	No eligible feeding trials identified	24.4%																					
Food intake and acceptability		↑																					
Nutrient digestibility and utilization		↑ ↓																					
Gastrointestinal outcomes (GI)		≈																					
Body and physiological condition		≈																					
Estimated annual global production <500 MT																							
Price USD 37,000—>100,000/MT* w/ high uncertainty																							

SUPPLY	SUSTAINABILITY	NUTRITION & HEALTH	CONSUMER ACCEPTANCE
Is this ingredient ready and approved to be used at scale in pet food?	Can this ingredient help to meet sustainability goals?	What are the nutritional and health effects of this ingredient for dogs and cats?	Will consumers buy pet foods with these ingredients?

Mycoprotein

Credible alternative protein, but pet-food-specific evidence and commercial supply remain limited.

Evaluate selectively

Supply

Production maturity

Early commercial

Estimated annual global production

~50,000–65,000 MT

Price

USD 3,800–5,300/MT*

Regulatory status in key markets

Partially established

US— EU ✓ GB ✓ CN— BR ✓

Current use in US market

No products identified

Sustainability

Comparison with animal byproducts (ABPs) and chicken meat

Greenhouse gas emissions

↔ Between

ABPs and chicken meat

Land use

↓ Below

ABPs and chicken meat

Freshwater Use

↔ Between

ABPs and chicken meat

Effect on nutritional and health outcomes

Outcome

Healthy adult dogs

Healthy adult cats

Tested dietary inclusion

4.0–16.0%

Food intake and acceptability

≈

Nutrient digestibility and utilization

↓

Gastrointestinal outcomes (GI)

↑ ↓

Body and physiological condition

Not assessed

Other reported effects

Dogs & Cats: Not assessed

Consumer Acceptance

Consumer signal

Emerging

Potential appeal

+

Health and Nutrition

+

Sustainability

Main barrier

–

Unfamiliarity

Red seaweed		Large production base and some nutritional potential, but limited evidence for an expanded alternative protein role.		●○○ Monitor development																					
Supply		Sustainability		Nutrition & Health		Consumer Acceptance																			
Production maturity Established		Comparison with animal byproducts (ABPs) and chicken meat Greenhouse gas emissions ↔ Between ABPs and chicken meat Land use Insufficient data Freshwater Use ↔ Between ABPs and chicken meat		Effect on nutritional and health outcomes <table><tr><th>Outcome</th><th>Healthy adult dogs</th><th>Healthy adult cats</th></tr><tr><td>Tested dietary inclusion</td><td>1.5–3.0%</td><td>2.0%</td></tr><tr><td>Food intake and acceptability</td><td>≈</td><td>≈</td></tr><tr><td>Nutrient digestibility and utilization</td><td>≈</td><td>≈</td></tr><tr><td>Gastrointestinal outcomes (GI)</td><td>↑ ↓</td><td>≈</td></tr><tr><td>Body and physiological condition</td><td>≈</td><td>≈</td></tr></table> Other reported effects Dogs: Antioxidant-marker effects reported Cats: Not assessed		Outcome	Healthy adult dogs	Healthy adult cats	Tested dietary inclusion	1.5–3.0%	2.0%	Food intake and acceptability	≈	≈	Nutrient digestibility and utilization	≈	≈	Gastrointestinal outcomes (GI)	↑ ↓	≈	Body and physiological condition	≈	≈	Consumer signal Emerging Potential appeal + Health and Nutrition + Sustainability + Perceived Naturalness Main barrier − Unfamiliarity	
Outcome	Healthy adult dogs					Healthy adult cats																			
Tested dietary inclusion	1.5–3.0%					2.0%																			
Food intake and acceptability	≈	≈																							
Nutrient digestibility and utilization	≈	≈																							
Gastrointestinal outcomes (GI)	↑ ↓	≈																							
Body and physiological condition	≈	≈																							
Estimated annual global production 21.2 million MT																									
Price USD 300–2,900/MT																									
Regulatory status in key markets Broadly established US ✓ EU ✓ GB ✓ CN ✓ BR ✓																									
Current use in US market 0.2% of assessed products Predominantly wet food																									

Yeast protein

Established functional ingredient with a credible basis for an expanded role as an alternative protein.

●●●

Prioritize for evaluation

Supply

Production maturity

Established

Regulatory status in key markets

Broadly established

US ✓ EU ✓ GB ✓ CN ✓ BR ✓

Current use in US market

19.5% of assessed products

Top-10 ✓

Price

USD 1,500–7,600/MT

Sustainability

Comparison with animal byproducts (ABPs) and chicken meat

Greenhouse gas emissions

↔ Between ABPs and chicken meat

Land use

↓ Below ABPs and chicken meat

Freshwater Use

↔ Between ABPs and chicken meat

Nutrition & Health

Effect on nutritional and health outcomes

Outcome

Healthy adult dogs

Healthy adult cats

Tested dietary inclusion

10.0–29.9%

10.0%

Food intake and acceptability

≈ ↑

↑

Nutrient digestibility and utilization

≈ ↓

↑

Gastrointestinal outcomes (GI)

↑ ↓

≈

Body and physiological condition

≈

≈

Other reported effects

Dogs & Cats: None identified

Consumer Acceptance

Consumer signal

Emerging

Potential appeal

Health and Nutrition

Sustainability

Main barrier

Unfamiliarity

Recommendations for Pet Food Manufacturers

Pet food manufacturers should take a differentiated approach to alternative ingredients, prioritizing evaluation where the evidence and commercial readiness are strongest while monitoring ingredients where important constraints remain.

1 Prioritize for Evaluation

Algal oil and yeast protein warrant prioritization for evaluation. Algal oil offers an alternative source of EPA + DHA, combining established commercial supply and adoption with a strong nutritional basis and potential environmental advantages over fish oil, although cost and some environmental trade-offs remain. Yeast protein also benefits from established commercial supply, existing pet food use, and a supportive nutritional evidence base, although higher-protein products can remain costly.

2 Evaluate Selectively

Bacterial protein and mycoprotein warrant selective evaluation as alternative proteins. Bacterial protein has a particularly strong sustainability case and promising dog nutrition evidence but remains limited in commercial scale, while mycoprotein has a credible nutritional basis but limited pet-food-specific evidence and supply.

3 Monitor Development

Algal protein, black soldier fly larvae, brown seaweed, cultivated meat, and red seaweed are better suited to continued monitoring for substantially expanded protein use. Algal protein and seaweeds currently have limited evidence for substantial protein replacement; black soldier fly larvae face important commercial and consumer barriers; and cultivated meat remains constrained by commercial scale, cost, regulation, and a limited pet-food evidence base.

Overall, alternative ingredients are most valuable when they address a specific formulation, sourcing, or sustainability need. Wider use will depend on whether an ingredient can combine reliable supply, regulatory access, nutritional suitability, competitive economics, and consumer acceptance with a clear advantage over the conventional ingredient it supplements or replaces. For manufacturers, this means prioritizing evaluation where that case is already strong, while monitoring other ingredients as their evidence base and commercial readiness develop.

Legend and notes

This legend explains the symbols and terminology used in the preceding assessment tables.

Supply	Estimated annual global production across sectors. Current use in US market, based on KibbleLab (2026).		
Price*	Where commercial price data were unavailable, cost of production estimates from TEAs were used. Ranges vary by ingredient form, grade, and production system and are not direct measures of nutritional cost equivalence.		
Regulatory symbols	✓ Route identified	— No route identified	△ Narrow/limited route
Sustainability	For proteins: ↓ below ABPs and chicken meat ↔ between ABPs and chicken meat ↑ above chicken meat Algal oil is compared with fish oil.		
Current use	Top-10 ✓ indicates used by at least one of the top ten largest pet food companies by revenue in 2025 according to Pet Food Industry.		
Country codes	US - United States, EU - European Union, GB - Great Britain, CN - China, BR - Brazil		
Nutrition & Health	≈ maintained ↑ increased ↓ decreased ↑↓ varied ≈↑ maintained or increased ≈↓ maintained or decreased ? uncertain Tested inclusion levels reflect reviewed studies and are not recommended or maximum safe inclusion levels.		

Discuss the findings with CFI

Interested in the findings, sharing relevant work, or exploring collaboration? Get in touch with CFI.

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Read the full report

Explore the full analysis, supporting evidence, and methodology.

[Full Report](#) →

About The Centre for Feed Innovation

The Centre for Feed Innovation (CFI) is an independent think tank working to improve the sustainability and resilience of animal feed systems. We assess emerging and alternative feed ingredients across aquaculture, livestock, and pet food, helping decision-makers understand their potential, limitations, and opportunities for responsible adoption.



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