# YEM TEKNOLOJİSİNİN GELECEĞİ: İNOVASYON, DİJİTALLEŞME VE KÜRESEL YEM ÜRETİMİNDE TRENDLER

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## GİRİŞ

Hayvancılık sektörü, küresel nüfusun hızla artan protein talebini karşılamada temel bir rol üstlenirken, bu talebin çevresel, ekonomik ve sosyal açıdan sürdürülebilir bir şekilde karşılanması giderek daha karmaşık ve çok katmanlı bir mesele haline gelmektedir. Birleşmiş Milletler Gıda ve Tarım Örgütü (FAO), 2050 yılına kadar küresel gıda üretiminin %60 oranında artırılması gerektiğini öngörmektedir; bu artışın yaklaşık %70'lik kısmı hayvansal protein kaynaklarından sağlanacaktır (1). Dünya nüfusu, 8 milyarı aşmış durumdadır ve 2100'de 11,2 milyara ulaşması beklenmektedir (2). Bu demografik büyüme, özellikle gelişmekte olan ülkelerde kentleşme ve orta sınıfın genişlemesiyle birleştiğinde, et, süt ve yumurta gibi hayvansal ürünlere olan talebi %40 oranında artırmaktadır (3). Ancak, bu talebi karşılamak için hayvancılık sektörünün üretim kapasitesini genişletmesi, yalnızca niceliksel bir mesele değil; aynı zamanda verimlilik, kaynak kullanımı ve çevresel uyumluluk gibi niteliksel zorluklarla da şekillenmektedir. Yem, bu denklemin merkezinde yer alan en kritik unsurdur. Hayvancılık işletmelerinde toplam maliyetlerin %65-75'ini oluştururken (4), hayvan performansı, büyüme hızı, ürün kalitesi ve hatta hayvansal ürünlerin besin değeri üzerinde doğrudan bir etkiye sahiptir. Geleneksel yem üretim yöntemleri—özellikle soya ve mısır gibi monokültür ürünlere dayalı sistemler—modern dünyanın sürdürülebilirlik beklentilerine yanıt vermekte zorlanmaktadır. Soya üretiminin %80'inin

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