

pigs are about 53 kJ/g. Heat production is, however, related much more closely to total protein synthesis, most of which takes place in tissues other than "meat". Ways and means of manipulating protein synthesis and the energy cost of growth by nutrition, anabolic agents and anti-microbial growth promoters are considered.

#### GENETIC IMPROVEMENT OF FEED EFFICIENCY OF GRAZING LIVESTOCK

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Livestock production under grazing is characterised by inability to directly measure feed intake, an interactive pasture-animal complex, marked seasonal fluctuation in feed quantity and quality, high animal maintenance costs and relatively low production levels. Harvesting ability of the animal, resilience to feed fluctuations, resistance to disease or stress and voluntary feed intake contribute importantly to total feed efficiency. Greatest scope for genetic improvement however is through increasing feed conversion efficiency.

The high proportion of maintenance to total feed requirements in a free-grazing system calls into question the effectiveness in improving total productivity of traditional evaluation and selection on yields per animal. An "efficiency index", equivalent to the yield of an animal of average liveweight having similar predicted efficiency, is proposed for adjusting observed yields for the effect of liveweight on feed conversion efficiency. In many situations the efficiency index can be approximated by a linear function of yield and liveweight, to which standard selection index methods can be applied to optimise genetic progress, given appropriate genetic parameters for liveweight and production traits. The procedure is illustrated for single-purpose dairy production using New Zealand data.

#### FEED EFFICIENCY DURING EARLY LACTATION IN COWS OF SPECIALIZED AND DUAL PURPOSE GENOTYPES

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Feed efficiency analysis of dairy cows feed according to their production potential and belonging to extremely different genotypes (from the *Holstein* to the *Charolais* breed) show that both between and within genotypes, the very first factor of variation is the milk production yield. The second factor observed is the magnitude of weight loss after calving which is related to a mobilization of energy stores.

Using the energy system of LEROY, it was not possible according to the analysis of between and within genotype variations to determine the exact contribution of body store mobilization to milk production. The energy equivalence of the weight change seems to vary from one genotype to another; it should be more accurately defined by taking into account the variations in the feeding level and in the proportion of concentrates in the diet which affects the utilization rate of the rations.

#### GENETIC DIFFERENCES IN FEED UTILIZATION BY DAIRY CATTLE

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Selection for production of milk or fat corrected milk can be expected to result in an automatic increase in gross feed efficiency. The effectiveness of indirect selection is expected to be 70 to 95 per cent as great as direct selection. Correlated responses of body weight change are less well known. Magnitude of genotype by environmental interactions, defined by energy in the diet, from most work seems negligible or small, but may be real for some comparisons.