Teagasc

Research Report 2006

www.teagasc.ie

BEEF AND SHEEP PRODUCTION RESEARCH

Grange Beef Research Centre Dunsany, Co. Meath
(Tel: 046-9061100  Fax: 046-9026154)

and

Animal Production Research Centre, Athenry, Co. Galway
(Tel: 091-845845  Fax: 091-845847)
Members of the Teagasc Authority, 2006

Dr. Tom O' Dwyer (Chairman)
Mr. James Beecher
Mr. Gerry Henchy
Mr. Ruaidhri Deasy
Dr. Patrick Fottrell
Mr. Joe Fitzgerald
Mr. Tom Gill
Mr. Patrick Kelly
Ms. Anna Mae McHugh
Mr. Michael O'Dwyer
Mr. James Brett

Director of Teagasc

Mr. Jim Flanagan

The Teagasc Research Report is published annually in 7 sections, as follows:

Dairy Products Research Centre
The National Food Centre
Grange and Athenry Research Centre (Beef and Sheep Production)
Dairy and Pig Production Research Centre, Moorepark
Oak Park Research Centre (Crop Production and Horticulture)
Johnstown Castle Research Centre (Soils, Environment and Land Use)
Rural Economy Research Centre (Agri-Food Economics)

Available from Teagasc, Oak Park, Co. Carlow. Tel +353 53 70200
# Table of Contents

**STAFF LIST** ........................................................................................................... x

**HIGHLIGHTS FROM THE 2006 BEEF RESEARCH PROGRAMME** .......... 1

**HIGHLIGHTS FROM THE 2006 SHEEP RESEARCH PROGRAMME** ...... 8

**GENETICS AND BEEF SYSTEMS** ........................................................................ 11

Performance of beef suckler cows with low and high residual feed intake on grass-based systems .................................................................................................................. 11

Effect of residual feed intake on immune function of beef suckler cows at weaning and housing .............................................................................................................. 11

Effect of weaning strategy on immune function of beef suckler cows and their calves ......................................................................................................................... 11

Relationship between beef suckler cow colostrum production and immunoglobulin G\textsubscript{1} absorption in their calves ................................................................. 12

Growth, muscular scores and carcass traits of progeny from sires differing in breeding value for carcass conformation ........................................................................ 13

Effect of sire genotype for the beef production sub index and carcass weight on progeny performance ............................................................................................ 16

Effect of contrasting genetic merit for beef production on calving performance in beef herds .............................................................................................................. 17

The relationship of scores and measurements on the live animal and carcass grades with carcass traits ................................................................. 19

Pasture or concentrate finishing of Holstein-Friesian, Aberdeen Angus x Holstein-Friesian and Belgian Blue x Holstein-Friesian steers for beef production .................................................................................................. 22

Comparison of Holstein-Friesian, Norwegian Red and Jersey young bulls for beef production ........................................................................................................ 34

Effects of level and method of feeding on muscle chemical composition in steers .............................................................................................................................. 37

Performance of finishing beef steers offered total mixed rations constituted at feeding or ensiling ..................................................................................................... 38

Heterogeneity of genetic parameters for calving difficulty in Holstein heifers in Ireland ................................................................................................................. 40
The effect of breed on growth rate and body measurements in beef × dairy and dairy male cattle ..................................................................................................41

GRASSLAND AND FORAGE CONSERVATION .............................................43

Yield and weed suppression of grass / legume mixtures compared with monocultures in the first year after sowing.................................................................43

Growth and development of seedlings of perennial clover species compared with perennial ryegrass ..............................................................................................44

Growth and intake of weanling heifers managed on pasture or indoors on grass silage during winter ..........................................................................................45

Growth of steers grazing perennial ryegrass cultivars bred for normal or elevated concentrations of water soluble carbohydrates............................................47

Intake, digestibility, N metabolism and growth in growing steers offered zero-grazed grass supplemented with sucrose .........................................................48

Intake, digestibility and growth in steers offered grass silage supplemented with sucrose ...............................................................................................................50

Chemical composition of six Lolium perenne L. cultivars, two of which were bred for elevated water-soluble carbohydrate concentration .....................................50

Aerobic stability and deterioration of grass silages differing in glucose content .........................................................................................................................................52

Aerobic stability and deterioration of grass silages after mixing with concentrates at feedout ........................................................................................................54

Fungal contamination of eight precision-chop grass silages on Irish farms ..........55

Stover development in forage maize: interaction of harvest date, plastic mulch and cultivar .................................................................................................................56

Cob development in forage maize: interaction of harvest date, plastic mulch and cultivar .................................................................................................................57

Mycotoxins and other secondary metabolites produced by *Penicillium* spp. isolated from baled grass silage in Ireland .................................................................60

Factors controlling the conservation characteristics of baled silage, and their interactions ............................................................................................................61

NUTRITION AND PRODUCT QUALITY ..........................................................63

Rumen fermentation and plasma metabolites in steers offered concentrates differing in energy source either as a supplement to grass silage or *ad libitum* ......63
Rumen fermentation, microbial protein synthesis and nutrient flow to the omasum in beef cattle offered grass silage, maize silage and whole-crop wheat.................................................................63

Intake, rumen fermentation and nutrient flow to the omasum in beef cattle offered grass silage fortified with sucrose and/or supplemented with concentrate............................................................................64

Effect of grass regrowth interval on intake, rumen digestion and nutrient flow to the omasum in beef cattle .........................................................................................................................66

Differentiation of beef according to the pre-slaughter diet of cattle using the stable isotope ratios of carbon and nitrogen .....................................................................................................67

Temporal change in the carbon stable isotope ratios of beef following a change in ration composition...............................................................................................................................69

Hooves: a new tissue for high-resolution reconstruction of bovine dietary histories ..........................................................................................................................71

How fast are ratio dietary carbon and nitrogen replenished in bovine muscles? ...............................................................................................................................71

Experimental determination of turnover of carbon isotopes in bovine hair and hoof ...................................................................................................................72

Supplementation of heifers with ruminally-protected polyunsaturated fatty acids (PUFA): effects on colour stability of retail-packaged minced beef ..................72

Feeding a diet with CLA-enriched beef improves the diabetic phenotype in ob/ob mice ...................................................................................................................74

The record of dietary change and climatic conditions in the stable isotope composition of different sheep tissues .................................................................................75

Accumulation of intermediates during in vitro ruminal fermentation of polyunsaturated plant oils and oilseeds ....................................................................76

Accumulation of biohydrogenation intermediates during in vitro ruminal fermentation of camelina oil-based rations ..................................................................77

LABOUR USAGE AND ENVIRONMENT ........................................................................79

Model-based calving monitor using real time image analysis ..............................................79

Intensity of agricultural contractors usage on suckler beef farms in Ireland ..................81

Effect of low-rate intermittent aeration on nutrient concentration and homogeneity of beef cattle slurry ..........................................................................................82
SYSTEMS MODELLING

The Grange Beef Model: A mathematical model of Irish spring-calving suckler beef production systems ................................................................. 85

Investigating development options for Irish suckler beef farmers: a mathematical modelling approach ................................................................. 88

HEALTH AND WELFARE

Transportation stress in young bulls: alters expression of neutrophil genes associated with the regulation of apoptosis, tissue remodeling, margination, and bactericidal function ................................................................. 92

Gene expression profile of bovine neutrophils during transportation stress .......... 98

Effect of floor type on the welfare and performance of finishing beef steers ........ 116

Effect of sea transport from Ireland to the Lebanon on performance, behaviour and physiology of bulls ................................................................. 117

Temporal patterns of inflammatory gene expression in local tissues after banding or burdizzo castration in cattle ......................................................... 119

Effects of banding or burdizzo castration of bulls or cortisol infusion on neutrophil phagocytosis and respiratory burst, CD62-L expression, and serum Interleukin-8 concentration ......................................................... 124

GRANGE LABORATORIES: TECHNIQUE AND DEVELOPMENT .............. 132

Fibrinogen: investigation of alternative method of analysis ................................. 132

ATHENRY RESEARCH REPORT (CATTLE) .......................................... 133

Negative energy balance and gene expression in dairy cow metabolic and reproductive tissues ................................................................. 133

Repeatability of embryo survival beef heifers ...................................................... 134

Identification of proteins that regulate uterine function in the cow insulin-like growth factor binding protein (IGFBP) expression in the bovine uterus throughout the oestrous cycle ......................................................... 135

Effect of dietary ω-3 polyunsaturated fatty acid supplementation on hormone and metabolite concentrations and corpus luteum size in beef heifers .......... 137

Relationships between feed, rumen fluid, blood plasma, follicular fluid and endometrial tissue concentrations of the omega-3 (ω-3) fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) in cattle .......... 138

Omega-3 fatty acid intake and immune response indicators in cattle ................. 139
Uterine gene expression in cows of high and low fertility ........................................ 140

An examination of the molecular mechanisms controlling the tissue accumulation of conjugated linoleic acid (CLA) in cattle ......................................................... 141

Development of a bovine intermuscular adipocyte cell line........................................ 142

Uterine gene expression of cows with high and low polyunsaturated fatty acid concentrations ............................................................................................................ 143

The association between circulating metabolic hormones during the early post partum period and subsequent fertility in dairy cows ...................................... 145

**SHEEP PRODUCTION** .......................................................................................... 149

Effects of extended grazing, grass silage feed value and winter shearing on ewe and lamb performance ........................................................................................ 149

The effects of herbage allowance and frequency of allocation, and silage feed value on lamb birth weight and subsequent performance when offered to ewes in mid gestation........................................................... 150

The effects of grazing date and management of autumn pasture on subsequent herbage yield............................................................................................................ 152

An evaluation of grass allocation management to single and twin bearing ewes in late pregnancy on ewe and subsequent lamb performance.............................. 153

The effects of herbage allocation and concentrate supplementation on the performance of replacement ewe lambs offered extended grazed pastures.............. 154

Effect of maturity of maize at harvest and system of ensiling grass silage on ewe performance and subsequent lamb growth rate .................................................. 156

Effect of season of shearing on ewe productivity and subsequent lamb performance ............................................................................................................. 156

An on-farm evaluation of the effect of season of shearing on ewe productivity and subsequent lamb performance.............................................................. 157

An evaluation of the effect of plane of nutrition at different phases during the rearing phase of replacement ewes, differing in genotype, on lifetime performance .................................................................................................................. 157

The effects of grazing management, date of closure and subsequent harvest date on herbage yield and feed value ................................................................. 157

Organic system for sheep at Mellows ........................................................................ 158
Hill Sheep Farm: flock performance details for 2006 ...............................................159

Habitat selection of hill sheep on the Teagasc hill sheep farm, using satellite
tracking and field observations ..................................................................................162

The impact of hill sheep activity on the population dynamics and diet of
small mammals ..........................................................................................................163

Sustainable agri-environmental management of hill and mountain peatland........164

Pedigree Galway sheep – population size and performance details .................165

Genetic diversity in Galway sheep compared with Suffolk and Texel breeds ....165

Conservation of semen from Galway rams...............................................................166

Evaluating the impact of pedigree sheep breed improvement programme
(PSBIP) for terminal sire breeds ..............................................................................167

Association between ewe breed type and longevity in a lowland production
system ......................................................................................................................168

Performance of pedigree Belclare sheep flocks .....................................................170

Effects of BMP15 and GDF9 mutations on ovarian follicle population and
gene expression in Cambridge ewes ........................................................................171

Effect of sperm dose on pregnancy rate in sheep ..................................................172

Effect of nematophagous fungi on Teladorsagia circumcincta eggs in ovine
faeces maintained at 16°C .......................................................................................173

Development of a PCR diagnostic test for the rapid detection of the
nematophagous fungus Duddingtonia flagrans .......................................................175

Anthelminthic efficacy on ovine parasitic nematode populations on the Teagasc
sheep farms ..............................................................................................................178

Efficacy of levamisole on ovine parasitic nematodes and whether efficacy
of benzimidazole is improved by fasting lambs prior to benzimidazole
administration ..........................................................................................................179

The evidence for anthelminthic resistance in farms in Co. Kilkenny .................180

The effectiveness of copper oxide wire particles as an anthelminthic in purebred
Suffolk lambs exposed to a natural nematode challenge post weaning ..............181
The epidemiology of Lymnaea truncatula and the prevalence of Fasciola hepatica within hosts (snail and sheep) on the Teagasc hill sheep farm: preliminary results ................................................................. 182

SCIENTIFIC PUBLICATIONS ........................................................................................................ 185

TECHNICAL PUBLICATIONS .................................................................................................. 192
BEEF AND SHEEP RESEARCH
Grange Beef Research Centre, Dunsany, Co. Meath
Animal Production Research Centre, Athenry, Co. Galway
Staff List 2006
E.G. O’Riordan, B.Agr.Sc., Ph.D. (Head of Centre)

Grange
Beef Production Department
P. O’Kieley, M.Agr.Sc., Ph.D. (Acting Head)
M.J. Drennan, B.Agr.Sc., M.S., Ph.D.
M.G. Keane, M.Agr.Sc., M.S., Ph.D.
A. Black, B.Agr.Sc., Ph.D.
M. McGee, B.Agr.Sc., Ph.D. MBA
A.P. Moloney, B.Sc., Ph.D.1
H. Scully, B.Eng.2
R.J. Fallon, B.Agr.Sc., Ph.D.
H. Taweel, B.Agr.Sc., Ph.D.
P. Crosson, B.Agr.Sc., Ph.D.3

Technicians

Walsh Fellows

Centre Staff
Administration Officer: A. Dowling
Technician: P.L. Murray (Stores), Stores Assistant J. Gill (Acting)
Farm Steward: F. Collier

Farm Staff

Canteen and Cleaning Staff
P. Killion1, P. Martin, M. Geraghty, S. Loughran, S. Martin

Athenry
Sheep Production Department
J.P. Hanrahan, B.Agr.Sc., M.S., Ph.D. (Head)
B. Good, B.Sc., Ph.D.

Technicians

Beef Production Department (Athenry)
J. M. Sreenan, B.Agr.Sc., Ph.D., D.Sc. (Head)9
M. G. Diskin, B.Agr.Sc., Ph.D.
D. G. Morris, Ph.D.
R. Fitzpatrick, B.Sc., Ph.D2
S. Waters, B.Sc., Ph.D.2

Technicians
W. Connollys, A. Glynn, P. Joyce, J. Nally

Walsh Fellows

Centre Staff
Administration Officer: J. O’ Mahony
Supplies Officer: J. Golden
Farm Manager: S. Murphy
Executive Assistants: M. Clarke1, M. Kelly4, M. Curley

Farm Staff
C. Farragah, J. Hanley, M. Walsh, P. Connolly, P. Creven, T. Murphy, F. Burke, G. Burke, J.N. Walsh, P.J. Hughes, P. Murphy, T. Keane, C. Caulfield, G. Somers, M. Somers, C. McNamara, M. Kilkelly, M. Shiels, M. Ward, A. Monaghan, P. J. Hastings1, M. Murphy

Porter and Kitchen Staff
P. Conneely, J. Regan, E. Sheils, A. Fahy, N. Somers, M. Somers, E. Moriarty, S. Hally

1Staff member of Ashtown Food Centre based at Grange; 2Contract Scientist; 3Moorepark staff member; 4Job Sharing; 5Leave of Absence; 6From May 2006; 7Based at Hill Sheep Farm, Leenane; 8Based at Oak Park; 9Retired June 2006.