



The importance of nutrition during gestation for lamb vigour and survival

John Rooke, Gareth Arnott, Cathy Dwyer and Kenny Rutherford

Leading the way in Agriculture and Rural Research, Education and Consulting

The importance of nutrition during gestation for lamb vigour and survival



- Research into practice
- Knowledge gaps
- Information base
 - systematic review with strict study acceptance criteria

The importance of the gestation period for welfare of lambs: maternal stressors and lamb vigour and well-being

[Rooke et al., Journal of Agricultural Science (in press)]

The importance of nutrition during gestation for lamb vigour and survival



- To state the obvious
- Nutrition is critical
- No feed
- A ewe survival problem !



- The importance of nutrition is therefore how much can we deviate from ideal

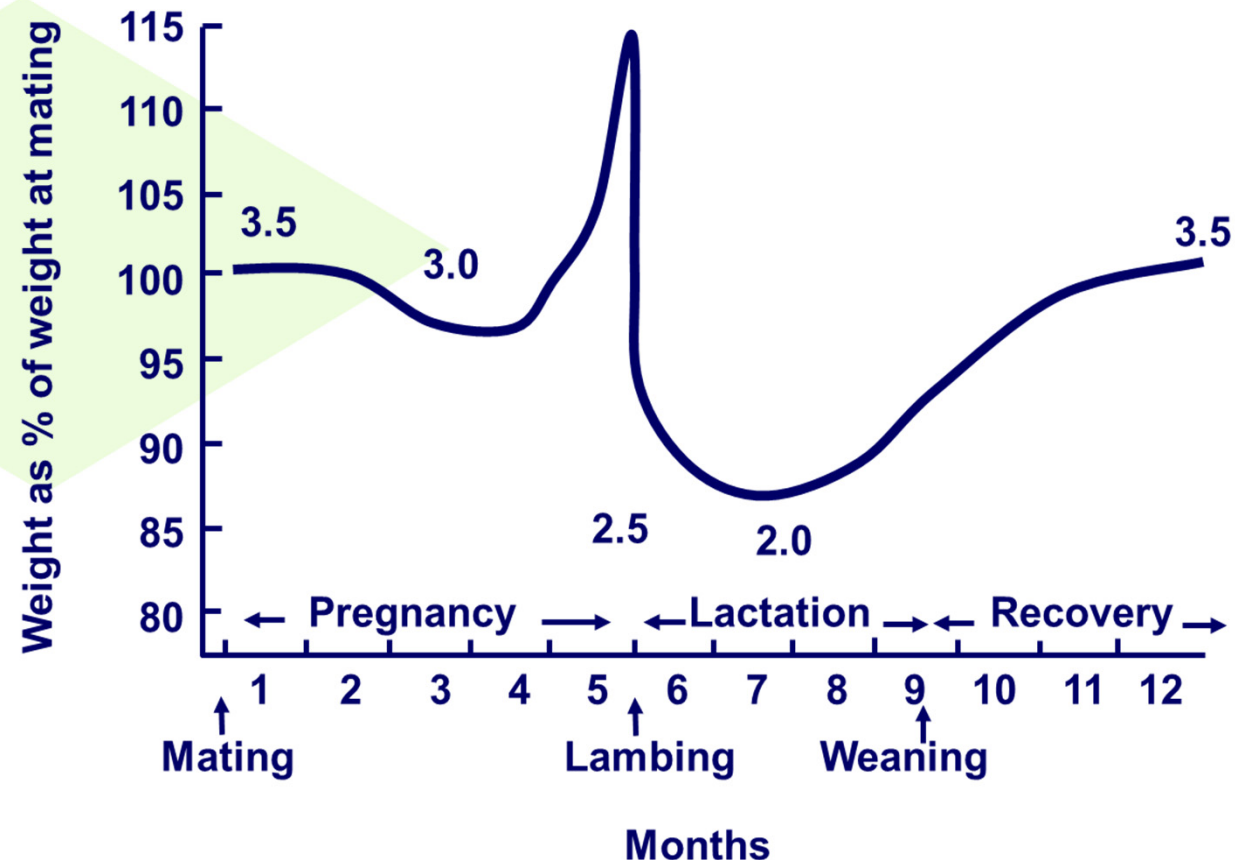
In practice - annual targets



Breed	Mating	Mid Pregnancy	Lambing
Lowland	3.5	3.0	2.5
Prolific	2.5-3.0	2.5	2.5

Expected that ewes lose body condition during pregnancy - fed less than requirements

From "Year round feeding the ewe for lifetime production" SAC.



Does research adequately describe practice?



- The problem with experiments
 - Severity of treatments constrained by legislation/ethics



is not allowed

- Measurement increases level of husbandry / intervention at lambing
- Research probably under-represents severity of practical conditions

Review - end points



End-point	Number of reports
Birth-weight	57
Survival	29
Ewe / lamb behaviour	14
Colostrum intake / IgG absorption	14
Thermogenesis	5

Since birth-weight consistently reported and reduced birth-weight associated with increased risk of mortality

Birth-weight used as proxy for mortality

Nutritional interventions

- Under-nutrition (less than requirement for maintenance+pregnancy)
- Over-nutrition (more than requirements)
- Specific nutrients (trace elements / vitamins)

Under-nutrition



Timing of intervention

- Imposed later than gestation day (GD) 90 – 100
 - Under-nutrition reduced birth-weight in all studies
- Imposed before GD 90 – 100
 - More variable, birth-weight reduced in minority of studies (5 of 17)
 - The studies in which birth-weight was reduced (5) are interesting

Over-nutrition



Response	Positive	No difference	Negative
Birth-weight	3	6	2
Survival	0	7	1
Others	1	2	4

No benefit to feeding ewes more than requirement for maintenance and pregnancy – in fact may be negative

Specific nutrients



- Co, I, Se, Vitamin E considered
- Interpretation of many studies difficult because of baseline status of ewes (deficient / marginal / adequate)
- Aim to ensure requirements met
- Are there benefits to feeding in excess of requirement?
- Possibly for n-3 fatty acids (no specific requirement in most systems) but negative implications for milk yield / quality

Under-nutrition: interactions



Extent and severity of under-nutrition

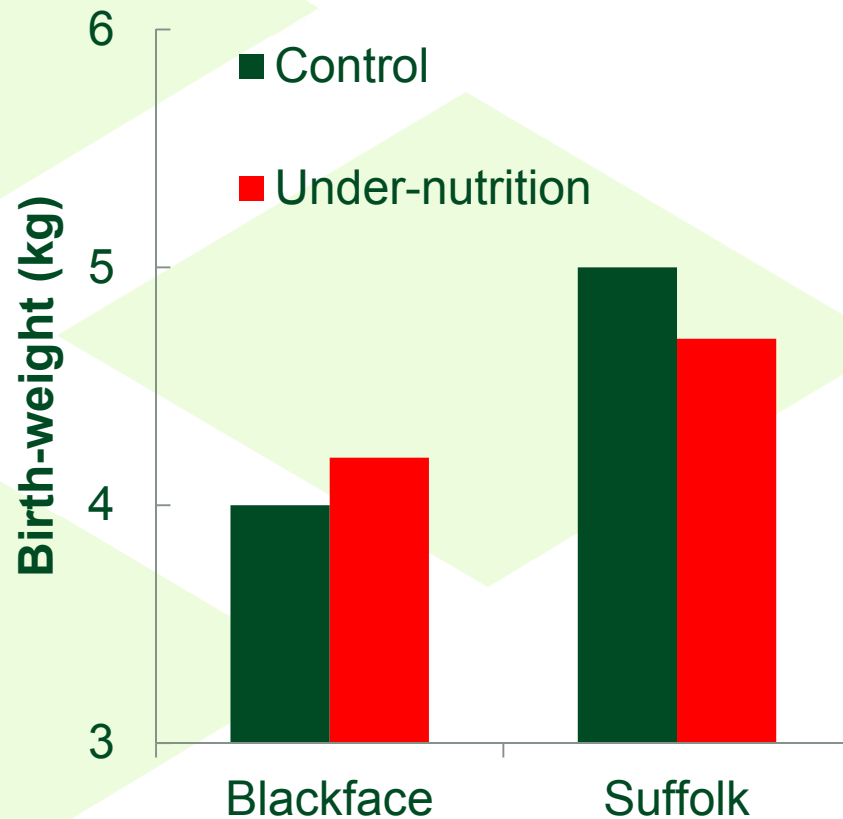
- Imposed later than GD 90 – 100
 - As expected, increasing extent or severity of challenge, increases extent of reduction in birth-weight
- Imposed before GD 90 – 100
 - More variable most under-nutrition in range 0.5 – 0.9 of requirement
 - Exception: Vincent et al. 1985: 0.15 requirement GD 0 - 60

Treatment	Birth-weight (kg)	Mortality (%)
Control	4.3	6
0.15 x requirement	3.6	42

Under-nutrition: interactions



Breed



Under-nutrition treatment: 0.70 of requirement from GD 1-90.

Lamb birth-weights (kg)

Suffolk : Birth weight reduced by under-nutrition

Blackface: No effect

Hill-breed (Blackface) , adapted to poorer environment, partitioned more nutrients to lamb than lowland breed (Suffolk)

Rooke et al. (2011).

Under-nutrition: interactions



- Litter size

Triplets more adversely affected by under-nutrition; differences between singles and twins more variable

- Other challenges – handling, housing, shearing, disease, thermal

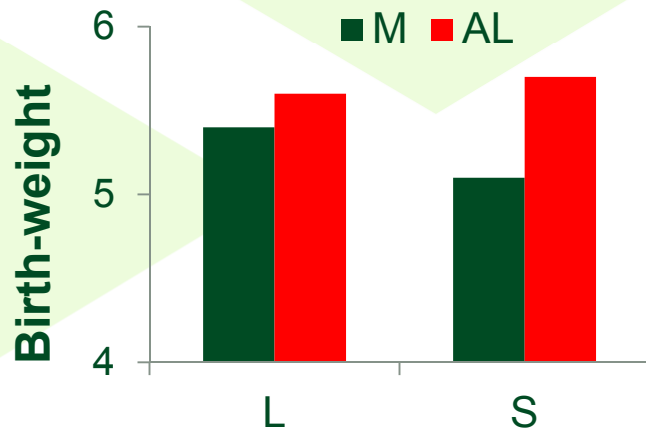
Few studies

Under-nutrition - interactions



- **Ewe body reserves** (Kenyon et al. 2009; van der Linden et al. 2010); 2 x 2 factorial: Large (L, 60kg; BCS 3.0) v Small (S, 43 kg; BCS 2.0) ewes; Ad libitum (A) v maintenance (M) feeding, GD 21-140

Ewes with greater body reserves better able to withstand under-nutrition



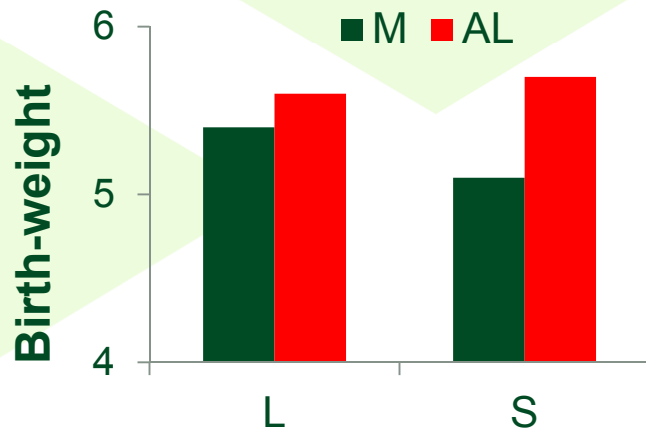
Ewe lamb performance as mothers

Under-nutrition - interactions

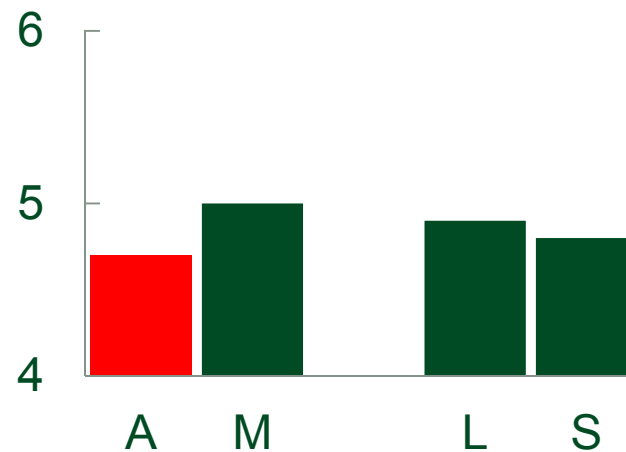


- **Ewe body reserves** (Kenyon et al. 2009; van der Linden et al. 2010); 2 x 2 factorial: Large (L, 60kg; BCS 3.0) v Small (S, 43 kg; BCS 2.0) ewes; Ad libitum (A) v maintenance (M) feeding, GD 21-140

Ewes with greater body reserves better able to withstand under-nutrition



But lambs born to M ewe lambs were heavier than borne to Ad lib ewe lambs. No effect of grandparent size.



Conclusions



- Under-nutrition is the practical concern
- Adequate feeding in last third of pregnancy important to maintain birth-weight
- Earlier under-nutrition less critical

But

- Interactions important and deserve more research
- Trans-generational effects of nutrition on birth-weight exist

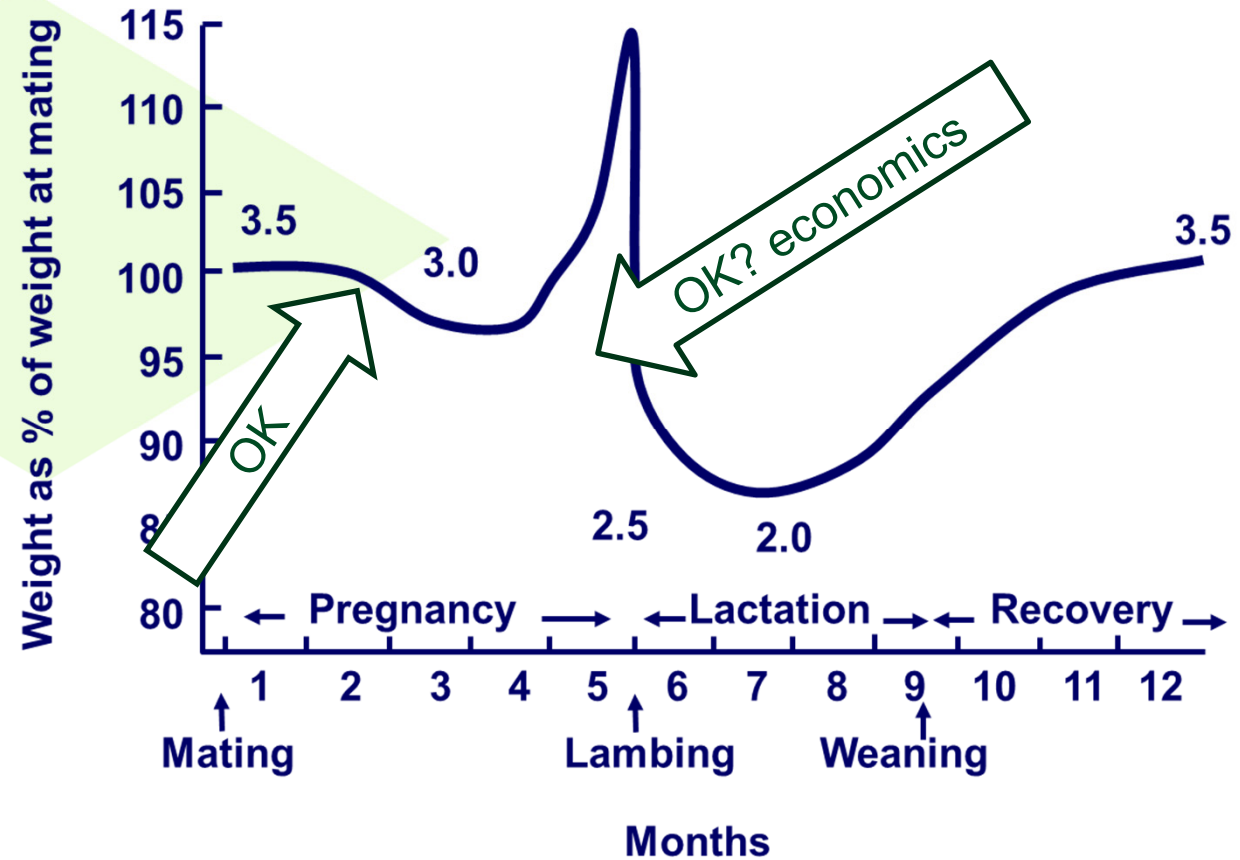
Annual targets



Breed	Mating	Mid Pregnancy	Lambing
Lowland	3.5	3.0	2.5
Prolific	2.5-3.0	2.5	2.5

← Breed?

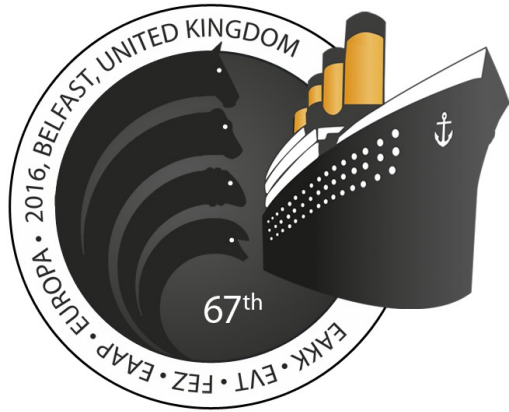
OK →



Acknowledgments



- Thanks to all SRUC staff and students, past and present involved with research
- We gratefully acknowledge funding from
 - Defra
 - Project AW0509: Early environment effects on animal welfare, health and productivity
 - Scottish Government
 - SPASE Module 2: Effects of early environment on behaviour, reproduction, welfare and product quality of livestock



Belfast

EAAP 2016

European Federation of
Animal Science Annual
Meeting – Livestock
Systems and Science

Belfast

28 August–1 Sept 2016

www.eaap2016.org

