Development and use of the Moorepark Dairy Systems Model

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Overview

- MDSM
  - Brief description
  - Uses
- New sub model development
- Further model development
MDSM

• Stochastic budgetary simulation model of a dairy farm

• Objective – Develop a model capable of representing all aspects of the production system
  – Technical change
  – Institutional change
  – Economic change
Risk

• Incorporated through stochastic budgeting
  – Key variables included
  – Probability distributions
  – Monte Carlo Simulation
  – @Risk computer package
  – Output distributions
Model Uses
Model applications

- System
- Genetic
- Regional and climatic effects
- Policy analysis
- Investment appraisal
- Environmental
- Decision support
Sample - application

- Infertility significant cost on dairy farms
  - Calving date
  - Culling costs
  - Labour costs
  - Age profile of herd
- Research question –
  - “Is it more economic to cull a dairy cow at end of lactation or extend lactation if she fails to become pregnant?”
Considerations

- Increased feed costs
  - Reduced grazed grass in diet
- Increased labour costs
- Increased milk output initially but reduced lifetime performance
- Increased milk solids concentration
- Calf value
- Cull value
- Reduced subsequent fertility performance
Assumptions

• Milk price taken @ 22c/l with a 40Ha farm
• Full costs included
• 5 Comparisons carried out;
  – 365 day calving interval
    • High milk yield and poor fertility (HMPF)
    • Low milk yield and good fertility (LMGF)
    • Standard MPK system (MPK)
  – A proportion of herd with 730 day calving interval
    • High milk yield with 30% of cows in herd recycled (HMRE)
    • Low milk yield with 10% of cows in herd recycled (LMRE)
Net Profit on 40Ha farm

Butler et al., 2010 JDS, 93: 1283-1295
New sub-model development

- New sub models to answer new questions
  - Grass growth model – Cristina Hurtado - Uria
  - Animal health model – Eugene Doherty
  - GHG emissions model - LCA – Donal O’ Brien
  - Milk processing sector model – Una Geary
Grass growth model
Animal health model

• Sub optimal animal health
  – Reduced animal performance
  – Reduced potential for expansion
  – Increased costs

• Model will capture
  – Biological impacts of disease
  – Quantify lost revenue
  – Quantify costs to control the disease
GHG emissions model

- Develop model of GHG for Irish production systems
- Establish economic and GHG effect of mitigation strategies inside farm gate
- Complete LCA for Irish dairy products

O’Brien et al., 2010, JDS 93: 3390-3402
Milk processing sector model

- Stimulus project
- Linkage between Moorepark, RERC, UCD, CIT, UCC and Massey University NZ
- Develop model of processing sector
  - Product portfolio
  - Processing costs
  - Carbon
  - Transport
- Optimise the overall Industry

Geary et al., JDS accepted
Further model development

- Dynamic nature of the simulations
- Guide research experimentation
- Grass intake model  - Brendan O Neill
Grass intake model

- Walsh Fellowship linked with UCD and INRA France
- Determine the factors affecting Dry matter intake at pasture
- Use model to predict intake
  - Sward quality
  - Pre and post grazing herbage yields
  - Grass type
- Link with lactation model
Model development goal

• “Develop dynamic, interactive models capable of modelling the whole production system as accurately as possible in order to answer key industry questions as and when they arise.”