The development of a bioeconomic model to evaluate the impact of maternal traits on the economic performance of grass-based suckler beef cow production systems

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Profitability on suckler beef farms is extremely low with family farm incomes in 2012 of -€105/ha when direct payments are excluded. Cow maternal traits (fertility and milk yield) are key drivers of profitability in suckler beef production systems. In Ireland, suckler cow maternal traits, and in particular fertility traits, are poor and declining. Data from the Irish Cattle Breeding Federation (ICBF) shows that the current calving rate is 0.8 calves per cow and mean age at first calving is 32 months with only 12% of heifers first calving at between 22 and 26 months of age. Similar trends are also evident for other maternal traits such as milk production. Notwithstanding the need to reverse the genetic decline in maternal milk, whole-farm strategies are needed to establish the economic consequences of this loss in milk yield and the capacity to offset this or otherwise increase weaning weights through alternative management strategies to increase live weight gain of suckler progeny pre-weaning. This proposal consists of modelling tasks to further develop and greatly enhance the capacity of existing Teagasc beef farm systems models, through development of sub-models that specifically focus on 1) the key factors determining reproductive performance, and 2) the impact of maternal milk traits on whole-farm technical and economic performance.

Overall Project Objective(s).

- To further develop of the Grange Beef Systems Model (Crosson, 2008) focusing on suckler beef cow herd reproductive performance facilitating the whole farm technical and economic evaluation of alternative reproductive performance indicators (age at first calving, calving to first oestrus, first oestrus to conception, early and late embryo survival, etc.).
- To further develop the Grange Beef Systems Model (Crosson, 2008) to investigate the impact of maternal milk and weaning strategies on whole-farm systems technical and economic performance.
- To apply this model to investigate pertinent scenarios of interest to beef cattle farmers and provide information on the farm level impacts of alternative reproductive and weaning management strategies.

What is the scientific impact of the research?

The model developed in this study will adopt a whole-farm modeling approach focusing on economic outcomes from herd level biological responses to different management strategies. This will address a critical deficit in the literature.

Few models have simulated reproductive or pre-weaning live weight performance in suckler beef cow herds. Roughsedge et al. (2003a, b) focused on alternative replacement strategies and consequential herd level biological and economic performance in future generations. Villalba et al. (2006) evaluated relationships between nutrition and reproductive performance and applied stochastic modeling approaches to develop a herd level model. Blanc and Agabriel (2008) used an animal level approach to model reproductive performance in suckler cows based on calving date, body condition score and bull exposure and evaluated herd level reproductive performance taking into account among cow variability. Werth et al. (1991) used a herd level model to evaluate the economics of production systems with varying reproductive performance factors; in this case three post-partum intervals and three conception rates were evaluated.

Previous studies assumed that pre-weaning, cows and calves are managed similarly in the cow calf herd and calves are weaned at fixed ages (e.g. Sanders and Cartwright, 1979, Tess and Kolstad, 2000, Rotz et al., 2005; Veysset et al., 2005; Crosson et al., 2006; Crosson, 2008). Pang et al. (1999) investigated alternative weaning ages, ranging from 140 to 220 days of age, for spring and

autumn calving cow calf systems and found that autumn calving and older ages at weaning were more economically efficient. However, in this study cow herd management was fixed.
The model developed in this study will build on these previous studies by providing greater flexibility around the management strategies to improve reproductive and pre-weaning live weight performance in the context of pasture based systems.