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## ***Culled early or culled late: economic decisions and risks to welfare in dairy cows***

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### **Abstract**

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*Involuntary culling (IC) is where a cow is disposed of due to injury, poor health or infertility. The main reasons for IC are infertility, mastitis and lameness. These reasons have differing age profiles in when they affect cows, cost variable amounts to treat and have an effect on the value of the cow at market. They also reduce cow welfare in different ways. These factors influence the economically optimum cow replacement decision, which must balance the risks of future loss from the current cow against its future prospects and the net costs of a replacement. So the farmer's economic decision as to when to cull a cow may not occur at the same time as when the cow could, and sometimes should, be culled to maximise her welfare. To explore this dilemma, we developed a Dynamic Programme (DP) model to assess the optimum replacement policies for each of 180 possible cow states (12 parities and 15 milk-yield levels) under a simplified set of alternative husbandry systems and remedial practices. The DP was used to explore the relationships between financial outcomes, investment in improving welfare, lifespan and IC in dairy systems. There is a trade-off between dairy cattle lifespan and risk of suffering over which farmers have some control by the replacement and investment decisions they make. Our results show that improving cow welfare by reducing mastitis, lameness or infertility over the long term increases the mean longevity of the herd and also reduces the potential of long-term suffering resulting from chronic conditions. Additionally, it has the effect of increasing replacement opportunities and the annuities for each cow (£ per cow per year) mainly by increasing milk yield and reducing costly on-farm culls, creating a win-win situation for both farmer and cow.*

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