lactation (Strucken *et al.* 2011; Strucken *et al.* 2012). These results appear to support a causal hypothesis where the negative correlation between production and fertility is due to an energy deficit in early lactation. The expectation was that the fertility index would cause a decreased potential maximum milk yield and a slower growth rate. However, the results showed an increased initial milk yield (y-intercept) and an increased growth rate causing an early production peak. The increased initial milk yield and growth rate during early lactation occurs to provide offspring with sufficient milk despite a potential energy deficit. Peak lactation occurs earlier when a fertility index is implemented in the breeding program, allowing for a longer decline in milk yield and hence increasing optimal birth spacing (despite no apparent impact upon the gradient of decay in milk yield).

Correction for environmental effects revealed that high producing dairy cows have a higher genetic potential than is currently supported by the production environment. In contrast, cows with a low fertility and milk yield showed a maximised genetic potential where production was biased upwards by a favourable production environment.

CONCLUSION

Selecting for increased fertility increases initial milk yield and growth rate in amount of daily milk production causing an early production peak. Early peak lactation occurs to provide offspring with sufficient milk despite a potential energy deficit, and provides an increased duration over which milk production declines. This provides sufficient time for the cow to recover from the energy deficit during early lactation prior to a subsequent pregnancy. Further, current production environments could be optimised to fulfil the genetic potential of high producing dairy cows.

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