Fertility and milk yields – can we manage both together?

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It has become a widely held dogma that fertility has declined in dairy cattle due to high milk yields. Indeed in America and Europe studies have shown a temporal correlation between increasing lactation yields and declining pregnancy rates with artificial insemination. However, this does not prove cause and effect. Looking more closely at data suggests this may not be the whole story or the main problem across the industry. Table 1 shows the average calving index of herds of differing lactation yields in the UK who form performance bench mark groups for National Milk Records PLC.

Herd average lactation yield	Average calving index (days)
4-6,000	407
6-8,000	427
8-10,000	422
10,000+	439

Table 1. Herd average lactation yield (NMR Herd Companion 31/1/2011)

There is not a significant difference in calving index until yields exceed 10,000 litres and many moderately yielding herds have poor fertility.

Although overall lactation yield has increased, the real indicator of production is milk yield per individual cow per year (Fig. 1). This is reduced in herds that have difficulty getting cows back in calf as animals with extended calving intervals spend a longer proportion of their life producing lower yields over extended lactations and often longer dry periods. The average calving index of different milk per cow per year groups (Table 2) suggests that poor milk/cow/year performance may be caused by poor fertility. Rather than concentrating on high yields being a cause of poor fertility we need to focus on improved fertility as the key to efficient milk production.

Table 2. Herd milk per cow per year (NMR Herd Companion 31/1/2011)

Herd average lactation yield	Average calving index (days)
<6,000	424
6-7,500	438
7,500-9,000	422
9,000+	420

Genetic potential

Many herds are composed of cows with a wide range of genetic potential for production. Cows of higher genetic potential may produce more milk and thus require greater nutritional inputs. Farming systems are generally more likely to fail to fulfil the nutritional requirements of these high yielding cows. If they try to meet these requirements by feeding more parlour concentrates, the high yielding group will be at a greater risk of developing ruminal acidosis.

These are not issues of yield per se but rather our ability to manage and supply sufficient and appropriate nutrition to support milk production. Studies of populations with even greater genetic potential, such as high yielding herds in Northern Spain by Lopez-Gatius and others, demonstrate that feeding an animal to meet their potential for production can also result in improved fertility. Low yielding animals in these circumstances may have poorer fertility because they have other health problems.

Negative energy balance is the key issue limiting fertility at the time of peak milk production. But what are the underlying issues that lead to negative energy balance and body condition loss? The energy requirement due to lactation (and maintenance) is

The BCF scanner in use on a farm.

obviously one side of the equation. The other side of the equation is energy intake comprised of both the energy density of the food and the feed intake. Good quality home produced forages are the cornerstone to an economic ration, increasing both energy density and palatability and thus intake.

The most important predictor of body condition loss after calving is actually body condition at calving. Fatter cows do not eat as much and thus lose more body condition than thinner cows. This initial excess body condition is usually gained at the end of the previous lactation when animals are being

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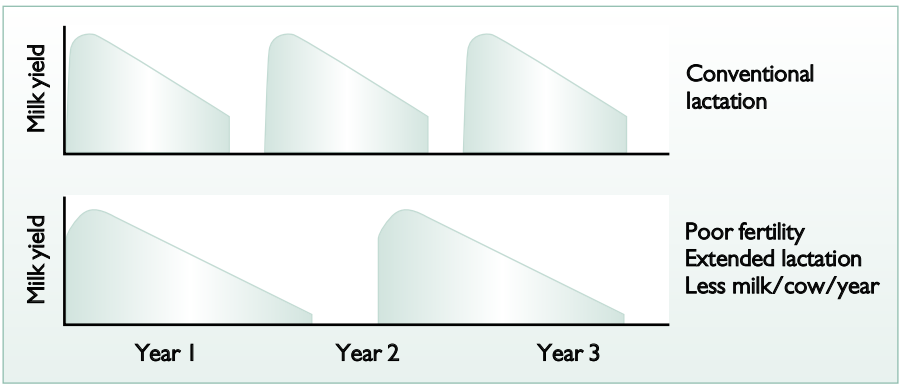
Fig. 1. Milk yield per individual cow per year.



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fed to support a higher milk yield than they are actually producing. Why are they still milking at this low yield? The likely reason is that they took too long to conceive and this resultant cycle of fluctuating body condition and poor fertility occurs leading to poor production efficiency. What can be done?

Breaking the cycle

This cycle can be broken at two points. The first involves monitoring body condition score and making adjustments through group feeding, and diet manipulation (and in extreme cases early drying off or culling) to prevent weight gain and then subsequent loss. The second aims to improve fertility. This is difficult in the face of poor body conditioning, but it is important to accurately diagnose the cause of poor fertility. These causes can be separated into four major areas:

- Anoestrus or failure to cycle.
- Failure to show oestrus behaviour when cycling.
- Failure to conceive when served.
- Loss of the embryo after fertilisation.

Modern portable ultrasound systems used for regular veterinary fertility assessments enable structures on the ovaries to be identified and measured so that the physiological status of each animal can be determined.

If the majority of cows do not have uterine infections at post calving checks, these routines checks can be omitted and individual animals submitted for treatment by farm staff when identified. These checks can be re-instated if several animals are detected with uterine infections at pre-breeding checks. At the pre-breeding check, all animals should have a corpus luteum or have bulling string and a dominant follicle on their ovaries. Small ovaries, with no follicles over 5mm diameter, or presence of a corpus luteum suggest anoestrus and the health of the animal and body condition score should be evaluated. Back fat and internal abdominal fat can also be objectively measured through the use of ultrasonography.

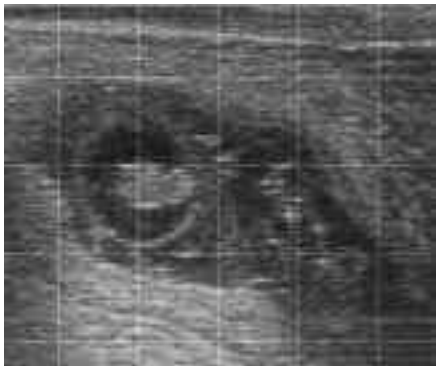
Repeated examinations of animals not yet served during the breeding season, allows assurance that animals are still cycling as well as identification of pathology such as follicular and/or luteal cysts. This is greatly aided by recording brief descriptions of sizes and locations of ovarian structures to show they have changed over time. If the cows are cycling, but behavioural oestrus not detected, reviewing oestrus detection protocols with farm staff is indicated. However, recent studies at the University of Liverpool, led by Prof. Hilary Dobson, have shown that 40% of cycling cows may not show any oestrus behaviour. Cows that are lame, high yielding (over 55kg), or of low body condition, are particularly affected.

- Post calving check 14-28 days
- Pre-breeding 35-49 days
- Every month through the breeding period if not served.
- Pregnancy diagnosis 28-35 days (prior to the second return to heat after service).

Table 3. Possible timing of examinations.

Early pregnancy diagnosis before the second return to oestrus (occurring between 36-48 days after correctly timed service) allows identification of non-pregnant cows which may then be targeted for heat observation. Ultrasonography allows foetal viability to be determined by identification of a foetal heart beat and foetal membrane integrity. Early pregnancy diagnosis does not guarantee that the foetus will be carried to term, but twinning, a major risk factor for abortion, can also be identified. Twins are more likely to abort than singles and generally do so later in gestation. Most twins result from twin ovulations and do not usually migrate from the uterine horn adjacent to the ovary where the egg was ovulated.

Dead foetus (Dr Robert Smith, University of Liverpool).



Therefore, by counting the number and location of corpora lutea on the ovaries, the suspected number of foetuses can be determined. If both twins are in the same uterine horn they are four times more likely to abort than if they are in different horns. Loss of twin pregnancies also tends to be higher later in gestation.

Detection of twins allows improved management of the cows, such as monitoring of body condition and either earlier drying off or earlier transfer onto a transition cow diet to meet the extra energy demand.

Rechecking pregnancy at 90 days of gestation or later is a sensible option. Twinning is also a risk factor for post partum disease and subsequent poor fertility, therefore proactively identifying and managing these cows may prevent subsequent problems.

Studies carried out by Prof. Phil Garnsworthy at University of Nottingham, UK, suggest that high starch low fat diets improve return to ovarian cyclicity but produce poor quality embryos. In comparison, a lower starch and higher fat diet is associated with higher quality embryos but also a slower return to cyclicity. Determining existing fertility problems on a farm may indicate that further diet analysis and modification are required.

In summary, high lactation yields will only result in high milk per cow per year and efficient milk production if cows are also fertile. Improved fertility reduces the number of days cows have decreased. A team approach using focused management and modern monitoring and diagnostic techniques is needed to achieve this. ■