

## 2 Defining your terms

### Objective:

- To identify the value of different fertility performance measures and the most relevant for specific herd situations.

### Challenge:

- Become as familiar with your chosen fertility measures as you are with your key production performance measures
- Establish how your current herd performance compares with the targets for these measures.

### Target

Select four to five key measures for your initial improvement efforts.

### Measuring fertility

A confusing array of different terms, measures and indices have been developed by herd managers, advisers and researchers over the years to describe fertility performance and underpin improvement efforts.

They vary widely in their complexity, in their limitations and in the herd records required to develop and utilise them effectively.

All the measures have their own particular value and place in fertility management but experience shows their usefulness primarily depends upon the resources and needs of the individual herds using them.

## What's in this section?

- Understanding the range of fertility terms and measures used
- Appreciating their strengths, weaknesses and overall value
- Establishing the most appropriate measures to use.

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## A summary of the section

- Performance measures covering each building block of fertility success or failure are widely available
- Some measures, such as Culling Rate and Calving Interval, are very crude and provide only the first indication of a problem
- Average figures often hide major variations between individuals, groups and time periods
- Voluntary Waiting Period, Submission Rate, Pregnancy Rate and Failure to Conceive Culling Rate are the most valuable fertility measures
- Herds with limited base records should focus initial fertility improvement efforts on more general measures, recognising their limitations
- Milk recorded herds have extra sources of often untapped information of great value in fertility improvement
- The fullest possible picture of fertility performance and the greatest potential for improvement comes from comprehensive computer records.

See also...

<b>Section 3:</b>	Identifying critical records
<b>Section 4:</b>	Planning your approach
<b>Section 5:</b>	Establishing your starting point
<b>Section 9:</b>	Managing block-calving herds
<b>Section 11:</b>	Factsheet 1: Fertility terms and definitions
<b>Section 12:</b>	Worksheet 1: Initial fertility analysis for basic record herds

# Action plan

To select four-five key fertility measures for your initial improvement efforts.

## 1. Evaluate the available fertility measures

Assess the value and limitations of the many available measures of fertility to identify the most suitable for your needs (**Page 2:4**).

## 2. Appreciate the interrelationships between key measures

Understand the close relationships between key fertility measures and their implications for your improvement target setting (**Page 2:4**).

## 3. Harness your most suitable measures

Select the four-five fertility measures most suitable for your needs and record-keeping system (**Page 2:16**).

# Key fertility measures

Selecting the right performance measures for the individual herd circumstances from the vast range of possibilities is the single most critical decision in fertility improvement.

As a fertility measure, it is of limited value in seasonal calving herds.

Typical ranges: 355-430 days  
Target: 365-375 days

## Evaluating Calving Interval and Index

Calving Interval is the interval in days for an individual cow between one calving and the next.

Perhaps the most commonly used term in fertility management, Calving Index is the average Calving Interval of all cows in a herd at any given time, expressed in days. It is calculated retrospectively.

Calving Index is easily calculated and understood, as well as being available through milk records.

It describes the overall fertility picture for an all-year calving herd fairly well but should only be used as the first indicator of problems.

### Limitations

Calving Index is too historical to be of immediate value in assessing fertility status.

It also hides extreme and costly within-herd variations; after all, the average of two cows with Calving Intervals of 330 and 400 days is 365 days.

Calving Index usually fails to recognise the impact of cows already culled from the herd, although it should be possible to adjust for culled animals using milk records data.

## Evaluating Calving to First Service Interval

Calving to First Service Interval is the number of days from the time a cow calves until her first service.

Like Calving Index, Herd Calving to First Service Interval is the average of all cows in the herd receiving a first service.

Calving to First Service Interval is presented in standard milk records as a herd average. It may also be presented for each monthly calving group.

The measure combines the effects of Voluntary Waiting Period and Submission Rate, so includes an element of possibly deliberate delay and a variable depending on heat expression and detection.

Short intervals – under 50 days – clearly compromise Pregnancy Rates.

While longer intervals may help improve Pregnancy Rates in these cases, there is little benefit in exceeding 50-60 days.

Excessively long intervals indicate considerable time delays and financial losses.

## Limitations

Calving to First Service Intervals allow no differentiation between the impact of deliberate first service policy decisions and heat detection efficiency.

Like other average values they may disguise wide within-herd variations and cannot be used to pinpoint particular problem areas unless calculated for specific groups of animals, periods of time or even individuals.

**Typical ranges: 40-80 days**  
**Target: 60-65 days**

### Assuming an average gestation period of 280 days:

- Calving to First Service Intervals greater than 85 days mean no chance of achieving a 365-day Calving Interval, even with 100% Heat Detection and 100% Pregnancy Rates.
- Calving to First Service Intervals of 60-65 days mean a good chance of achieving 375-380 day Calving Intervals without high Culling Rates, providing Heat Detection and Pregnancy Rates are both above average – 60% and 50% respectively.

**Throughout Pd+ all references to milk yield relate to milk sold per cow per year rather than recorded yield, since production losses attributable to fertility problems invariably relate to reduced milk sales.**

## Evaluating Voluntary Waiting Period

Also measured in days, the Voluntary Waiting Period is the time after calving when cows are deliberately left unserved.

Voluntary Waiting Period is an essential first stage in any disciplined approach to fertility management.

As an active, planned measure it helps prevent animals being served too soon; can be varied according to the season; and focuses attention on targets, policy and heat detection.

The Voluntary Waiting Period can be adjusted during the year with each monthly calving group in line with the desired calving pattern.

At the start of the calving season it may be appropriate to set a longer Voluntary Waiting Period to prevent cows calving too early in the season.

Later on, the waiting period can be reduced to encourage late-season calvers to tighten up their pattern.

## Limitations

Voluntary Waiting Period has few, if any, limitations, other than being a little difficult to track and police effectively in large herds without computerised records and action/exception lists.

It may not be recognised as a set interval in block-calving herds where service usually commences on a specific calendar date rather than at any particular time after calving.

**Typical ranges: 50-80 days**  
**Target: 45-55 days**

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## Evaluating Submission Rate

The Three-week Submission Rate is the percentage of cows receiving at least one insemination in the first three weeks of the mating period – which begins once the Voluntary Waiting Period has been completed.

If, after the Voluntary Waiting Period, 50 cows are eligible for service and 30 are served, the Submission Rate is  $\frac{30}{50} \times 100 = 60\%$ .

Submission Rate is a valuable measure for all herds.

It is calculated early enough in the season to provide a timely indication of problems, such as poor expression and detection of heat and to enable appropriate action to be taken.

Submission Rate records are particularly valuable when presented as CuSum graphs (**Section 3**).

### Limitations

The only real limitation to the use of Submission Rates is the need to record calving date, Voluntary Waiting Period and the number of cows served in the period of mating.

This information may be available through milk recording services but only a small proportion of herds actually make use of it.

**Typical ranges: 40-90%**  
**Target: 70% (90% for block-calving herds)**

## Evaluating Heat Detection Rate

The Heat Detection Rate is the proportion of cows correctly identified in heat as a percentage of those eligible for heat in a defined period.

**It takes account of both:**

- Missed heats – cows not seen in heat
- False positives – cows incorrectly identified as being in heat (generally because they are involved in bulling activity with other animals in heat).

**If 50 cows are due to come on heat in a specific period and 35 cows are correctly detected, the Heat Detection Rate is  $\frac{35}{50} \times 100 = 70\%$ .**

A distinction is made between the Heat Detection Rate for first service – effectively the Submission Rate – and that following first and subsequent services – commonly known as Return to Service Heat Detection Rate (**Section 6**).

Heat Detection Rate is one of the key indicators of both the extent to which oestrus is expressed and the efficiency of its detection.

Inadequate nutrition and a variety of housing and health conditions may cause poor heat expression.

Low detection rates may be the result of insufficient observation, poor building layout and time pressures on staff.

Heat detection is relevant both prior to first service and subsequently in observing returns to service.

**The importance of a good Heat Detection Rate cannot be overestimated (Table 2.1).**

**Table 2.1: The impact of two Heat Detection Rates in a 100-cow herd**

Insemination number	Cows eligible for service	Cows seen and served
<b>60% Heat Detection</b>		
1	100	60
2	40	24
3	14	8
4	5	2
5	2	1
<b>Total</b>		<b>99</b>
<b>40% Heat Detection</b>		
1	100	40
2	60	24
3	36	14
4	22	9
5	13	5
<b>Total</b>		<b>92</b>
<b>Difference</b>		<b>7</b>

**Compared to a 60% rate, a 40% Heat Detection in a 100-cow herd is likely to result in:**

- **7 fewer calves in the year**
- **7 extra culls**
- **Reduced milk production**
- **A 9-day increase in the Calving to Conception Interval.**

## Limitations

The only limitation to Heat Detection Rate as a measure is the need to record signs of heat and services and then to predict possible future return dates.

**Typical ranges: 40-90%**  
**Target: 70% (90% for block-calving herds)**

## Evaluating Calving to Conception Interval

Calving to Conception Interval is the number of days from calving to the service at which a cow actually gets pregnant.

Herd Calving to Conception Interval is the average performance of all cows pregnant in the breeding season.

Calving to Conception Interval is an up-to-date and more relevant version of Calving Interval.

Because it reflects the situation before any culling, it is more meaningful in describing true performance.

A short Calving to Conception Interval indicates a well-planned Voluntary Waiting Period, good heat expression and detection and a high Pregnancy Rate.

# D.

## Limitations

Calving to Conception Interval information is less readily available than Calving Interval, although all milk as well as fertility recording services provide it.

Averages, of course, fail to demonstrate important variations between individuals and groups.

**Typical ranges: 80-150 days**  
**Target: 85-95 days**

## Evaluating Days Open

Days Open is the average number of days from calving to conception for those cows conceiving and from calving to culling for those failing to do so.

**If 80 cows in a herd of 100 conceive again with a Calving to Conception Interval of 90 days and the remaining 20 are culled an average 300 days after calving, the Days Open are  $\frac{(80 \times 90) + (20 \times 300)}{100} = 140$ .**

Days Open is particularly valuable for taking into account the culled animals that are ignored in Calving to Conception Interval calculations.

## Limitations

One of the major limitations of the measure is that it can be low simply because cows failing to conceive are culled quickly; a management decision made on the basis of milk yield or fodder supply rather than of any relevance to fertility.

**Typical ranges: 120-150**  
**Target: 120**

## Evaluating First Service Pregnancy Rate

The First Service Pregnancy Rate is the number of first services given over a period or to a group of animals that result in a diagnosed pregnancy as a percentage of the total number of first services given.

**If 55 of 110 cows hold in-calf to the first service, the First Service Pregnancy Rate is  $\frac{55}{110} \times 100 = 50\%$ .**

First Service Pregnancy Rate is one of the single most valuable measures of herd fertility available and useful in all herds.

It captures all aspects of cow fertility, together with associated health and nutritional issues, such as the fertility of the bull; and all the most important management influences, including heat detection accuracy and AI timing and technique.

First Service Pregnancy Rate is a key measure in any fertility recording service. Presented as a CuSum graph, it gives a dynamic picture of service success trends which is extremely useful in identifying seasonal, feeding and management effects (**Section 3**).

## Limitations

Although a very good measure, First Service Pregnancy Rate does not tell the whole story.

Where there is a delayed interval to first service – say 80 days – it is quite possible, for instance, to show excellent Pregnancy Rates and still see the calving pattern slip.

First Service Pregnancy Rate provided through milk recording suffers from the limitation of being based on Assumed Pregnancy Rates with their inherent inaccuracies.

It is much more meaningful when accompanied by actual pregnancy diagnosis information.



**Typical ranges: 35-75%**  
**Target: 55%**

### Evaluating Overall Pregnancy Rate

The Overall Pregnancy Rate is the total number of services given to a group of animals or, over a specified period, resulting in a diagnosed pregnancy as a percentage of the total number of services.

**If 110 pregnancies are achieved from 200 inseminations the Overall Pregnancy Rate is  $\frac{110}{200} \times 100 = 55\%$ .**

Overall Pregnancy Rate summarises the whole herd fertility picture and is used in nearly all reproductive efficiency calculations.

Like First Service Pregnancy Rate, it captures all aspects of cow and bull fertility, together with management factors.

**Differences in Overall Pregnancy Rate have a huge effect on the number of inseminations required and calves born (Table 2.2).**

**Table 2.2: The impact of two Pregnancy Rates in a 100-Cow Herd**

Insemination number	Number of inseminations	Number of calves born
<b>60% Pregnancy Rate</b>		
1	100	60
2	40	24
3	16	10
4	6	4
5	3	1
<b>Total</b>	<b>165</b>	<b>99</b>
<b>45% Pregnancy Rate</b>		
1	100	45
2	55	25
3	30	13
4	17	8
5	9	4
<b>Total</b>	<b>211</b>	<b>96</b>
<b>Difference</b>	<b>46</b>	<b>3</b>

**Compared to a 60% rate, a 45% overall pregnancy in a 100-cow herd is likely to result in:**

- **An extra 46 inseminations in the year**
- **3 fewer calves**
- **3 extra culls**
- **Reduced milk production.**

# D.

## Limitations

Overall Pregnancy Rate is too historical to be of immediate management use.

It may also hide seasonal, feeding and management variations and is of little value in pinpointing the cause of any fertility problems.

**Typical ranges: 35-75%**  
**Target: 55%+**

## Evaluating Assumed Pregnancy Rate

Any Pregnancy Rate not calculated from an actual pregnancy diagnosis is an Assumed Pregnancy Rate.

This measure is commonly used by milk recording services and is generally based on the absence of a subsequent service 60 days after the earlier service.

It must be distinguished both from actual diagnosed Pregnancy Rates and from Non-return Rates.

Assumed Pregnancy Rate tends to be used when pregnancy diagnosis has not been recorded.

It is valuable for being widely available.

Because the measure assumes that a cow is in-calf if not served again within 60 days of the last recorded service it is of most value where oestrus detection is very reliable.

It should only be used as a guideline.

## Limitations

The Assumed Pregnancy Rate will over-estimate the true situation if there are a high proportion of returns to service after a long interval through embryo loss or where cows are sold not-in-calf and this event has not been recorded.

Evidence from Northern Ireland suggests it may over-estimate the true Pregnancy Rate by as much as 16%.

**Typical ranges: 35-85%**  
**Target: 65%+**

## Evaluating Non-return Rate

A Non-return Rate is commonly calculated by AI services on the assumption that an animal not subsequently recorded as being re-served is pregnant.

The number of cows apparently not returning to service is expressed as a percentage of the total number served.

Non-Return Rate is not normally available on-farm. It is useful as a means of comparing AI personnel.

## Limitations

Non-return Rate is very different from Pregnancy Rate because the figure is based on the assumption that an animal not served again by the AI service is in-calf.

This ignores animals sold not in-calf or subsequently served by natural service, probably over estimating Pregnancy Rate by more than 20%.

It is not a very helpful fertility measure.

**Typical ranges: 55-75%**  
**Target: 75%+**

## Evaluating Conception Rate

Conception Rate measures the number of cows actually conceiving as distinct from maintaining a pregnancy.

It does not account for early embryo losses and can be as high as 80-90%.

Conception Rate effectively measures the ability to conceive.

Typically, 30-40% of cows that conceive are later not in-calf.

### Limitations

Since early embryo loss begins within a few days of conception and maintained pregnancy is what matters to dairy herds in practice, Conception Rate is of limited value as a fertility measure.

It is rarely recorded on-farm and only research standards are available.

## Evaluating Culling Rate

The Culling Rate is the number of cows in a defined period (usually 12 months) that are sold, die or are transferred out of the herd before starting another lactation as a percentage of the total number of cows calving in the period.

If 28 cows are culled from a herd in a year in which the herd size averages 140, the Culling Rate is  $\frac{28}{140} \times 100 = 20\%$ .

Culling Rate is a simple measure available on all farms and a valuable starting point from which to review fertility performance.

Excessive levels of culling, identified from the Movement Book over a 12-month period often provide the first indication of problems.

### Limitations

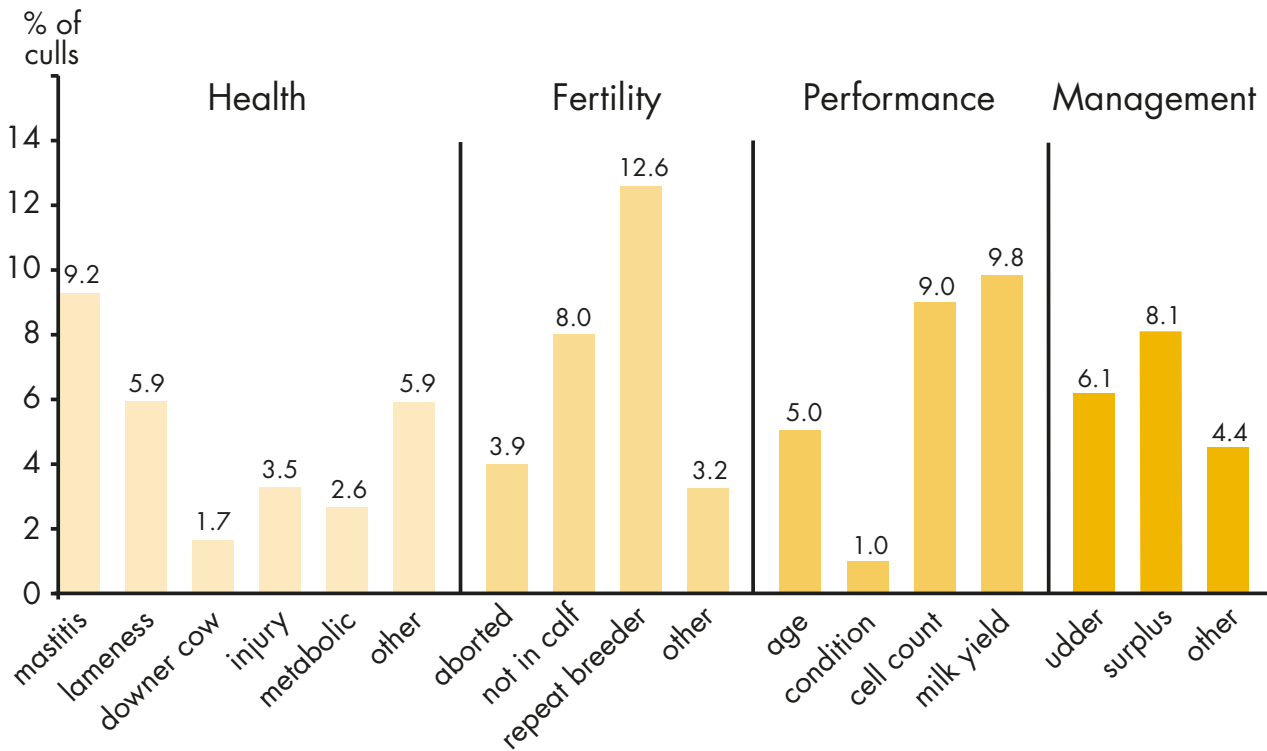
Culling Rate does, however, remain of limited value as a fertility measure.

While data from Kingshay, the Agricultural Research Institute of Northern Ireland, Daisy Research and Intervet show fertility-related issues accounting for between a quarter and a half of all herd culling (**Figure 2.1**), a high Culling Rate need not necessarily mean poor fertility.

Like Calving Index, culling data is also too historical to be of immediate value.

**Typical ranges: 12-35%**  
**Target: 12-18%**

**Figure 2.1: Reasons for culling**



Source: DairyCo Longevity Report.

## Evaluating Failure to Conceive Culling Rate

The Failure to Conceive Culling Rate is the number of cows transferred out of a herd for failure to conceive in a given period (usually 12 months) as a percentage of the total number of cows calving in the period.

**If 150 cows are served and 135 are diagnosed in-calf, under normal circumstances 15 will be sold for failure to conceive, giving a failure to conceive Culling Rate of  $\frac{15}{150} \times 100 = 10\%$ .**

Failure to Conceive Culling Rate is a very useful way of describing the overall state of fertility within a herd and, therefore, in raising awareness of fertility problems.

It is easy to calculate from culling records and can be used to establish if fertility is an important factor in a high overall Culling Rate.

The measure is most valuable in seasonal-calving herds where high levels of culling to maintain a tight calving pattern are a costly consequence of poor fertility.

### Limitations

Like Culling Rate, the information is too historical to be of immediate management value and does nothing to pinpoint the cause of any problems.

Failure to Conceive Culling Rate is likely to be underestimated wherever there is more than one reason given for culling.

Fertility is often regarded as a secondary reason for culling, with mastitis, low milk yield or age given prominence in many records.

**Typical ranges: 1-20%**  
**Target: Under 6%**

**Three newer and particularly useful fertility measures are:**

- 100-Day In-calf Rate
- 6-Week In-calf Rate
- 200-Day Not In-calf Rate.

### Evaluating 100-Day In-calf Rate

The 100-Day In-calf Rate is a measure quantifying the percentage of cows in the herd diagnosed in-calf again to a service within 100 days of calving.

**If 120 cows calve and 90 are confirmed pregnant to a service within 100 days of calving, the 100-Day In-calf Rate is  $\frac{90}{120} \times 100 = 75\%$ .**

100-Day In-calf Rate is a very meaningful measure in most situations.

It describes how many cows will calve within about 13 months of their previous calving date and is of particular value in herds with a spread calving pattern.

It reflects Submission Rate and, therefore, heat detection accuracy and Pregnancy Rate; being especially valuable in highlighting cases where a high proportion of animals are 'losing time'.

The measure is also valuable for revealing ranges of performance which are often disguised by simple averages within Pregnancy Rates or the Calving Index.

### Limitations

100-Day In-calf Rate is only a viable measure where pregnancy diagnosis is carried out on all stock.

**Typical ranges: 60-95%**  
**Target: 90%+ (95%+ in block-calving herds)**

### Evaluating 6-Week In-calf Rate

In the same way as the 100-Day Rate, the 6-Week In-calf Rate records the proportion of cows intended for re-breeding that are in-calf six weeks after the start of the breeding season.

**If 120 cows calve and 80 are confirmed pregnant within 6 weeks of the start of the breeding season, the 6-Week In-calf Rate is  $\frac{80}{120} \times 100 = 67\%$ .**

Of similar value to the 100-Day In-calf Rate, the 6-Week In-calf Rate is an especially useful measure in herds with a marked seasonal calving pattern (Section 9).

### Limitations

The absence of pregnancy diagnosis would mean this measure is unavailable.

**Typical ranges: 25-85%**  
**Target: 75%+**

### Evaluating 200-Day Not In-calf Rate

The 200-Day Not In-calf Rate is the number of cows in the herd not back in-calf 200 days after calving, and which will fail to calve within 15 months of their previous calving as a result.

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Like the 100-Day In-calf Rate, the 200-Day Not In-calf Rate is a very useful fertility measure in most situations.

It takes account of Submission Rates, Pregnancy Rates and embryo losses and is valuable in revealing ranges of performance hidden by more general measures as well as in highlighting where there are serious delays in getting animals back in-calf.

A total of seven 21-day cycles are effectively allowed between a first service at 55 days and the 200-day cut-off point.

## Limitations

Routine pregnancy diagnosis is essential for this measure.

**Typical ranges: 1-20%**  
**Target: Under 6%**

## Evaluating Percent Conceiving of Calved

Percent Conceiving of Calved is simply the proportion of calved animals that conceive again.

**If 100 animals calve in one season and of that total 85 conceive again, the Percent Conceiving of Calved is 85%.**

Percent Conceiving of Calved shows the proportion of animals back in-calf in the subsequent lactation.

It reveals the impact of service success in much the same way as Overall Pregnancy Rate and recognises Failure to Conceive Culling Rate.

## Limitations

The measure gives no indication of numbers conceiving by a certain date, fails to account for 'days lost' and does not pinpoint possible causes like poor heat detection.

It is also too historic to have immediate management value.

**Typical ranges: 70-90%**  
**Target: 87-89%**

## Evaluating Percent Conceiving of Served

Percent Conceiving of Served is the proportion of the total number of animals served that conceive.

**If 100 animals are served and, from all services, 90 eventually conceive, the Percent Conceiving of Served is 90%.**

Percent Conceiving of Served indicates service success in much the same way as Overall Pregnancy Rate.

## Limitations

Again the measure is too historic for immediate management use, gives no indication of numbers conceiving by a certain date, fails to account for 'days lost' and does nothing to pinpoint likely causes.

**Typical ranges: 75-95%**  
**Target: 95%**

**Factsheet 1 defines other terms used in fertility and dairy herd performance monitoring.**

# Record-keeping suitability

UK herds broadly fall into one of three record-keeping categories which can be used as a starting point for establishing the most appropriate fertility measures:

- Basic:** Ad hoc recording by hand.
- Ranging from the simplest to very sophisticated calculations.
- No computerised records or milk recording information.
- Standard:** Milk recording data available.
- Complemented by a range of manual records.
- No computerised records.
- Comprehensive:** Computer-based record-keeping.
- Either on-farm or veterinary surgeon/bureau based.
- Detailed fertility management packages.

Herds employing no official recording system frequently keep detailed, up-to-date fertility records in a variety of diaries, charts and calendars, providing the basis for utilising a far wider range of fertility measures than might initially appear possible.

Equally, the fact that a unit has computer facilities or milk recording systems does not necessarily mean it is in a position to use the most sophisticated fertility improvement measures.

## Appreciating interrelationships

The close interrelationships between the various measures of fertility must, of course, be appreciated if they are to be harnessed effectively in improvement efforts.

In particular, Heat Detection, Pregnancy Rate and Calving to First Service Interval are inextricably linked in determining Calving to Conception Interval and Failure to Conceive Culling (**Table 2.3**).

**Reducing the Calving to First Service Interval by 10 days can reduce Calving to Conception Interval by 5-10 days and Culling Rate by up to 2 %.**

**Only through a combination of a 70% Heat Detection Rate, 60 % Pregnancy Rate and 60-day Calving to First Service Interval is it possible to achieve a Calving Interval of under 370 days.**

Table 2.3: Important fertility measure interrelationships

Heat Detection Rate (%)		50				60				70			
		40		60		40		60		40		60	
Pregnancy Rate (%)		A	B	A	B	A	B	A	B	A	B	A	B
Average Calving to First Service Interval (days)	80	125	21	116	8	121	15	111	4	118	10	106	2
	70	115	19	106	7	115	15	101	4	108	8	96	2
	60	110	17	99	6	110	15	92	3	101	7	87	1

A = Calving to Conception Interval (days)

B = 200-Day Not In-calf Rate (%) – effectively the Failure to Conceive Culling Rate

## Harnessing the measures

The most suitable fertility measures for a particular herd generally depend upon:

- The availability of information with the recording system (**Section 3**)
- The extent of detail required in defining fertility problems
- The veterinary, advisory and other resources available (**Section 4**)
- The seasonality of calving, with block-calving herds requiring a different approach to those without such a tight seasonal pattern (**Section 9**).

For herds with comprehensive record-keeping systems the choice of fertility measures is virtually unlimited; the only proviso being that the information must be up-to-date and actively used.

For the majority of herds with manual records, though, the starting point for improvement efforts has to be more restricted, employing measures that can be derived easily from the available information with a clear awareness of their limitations.

**Whatever fertility measures are chosen, current herd performance needs to be evaluated financially and appropriate improvement targets set (Section 5).**

## Basic Record Herds

Herds with basic record-keeping systems are likely to find the following measures of most immediate value in their fertility improvement efforts:

- Calving Intervals and Index
- Overall Pregnancy Rate
- Culling Rate
- Failure to Conceive Culling Rate.

Calving Intervals can best be assessed by calculating the number of days between the two most recent calvings for each cow in the herd. Averaging these will give the Herd Calving Index.

A rough assessment of Overall Pregnancy Rate can be made by dividing the number of straws of semen used in the most recent year by the average herd size to calculate the services per pregnant animal, then using a ready reckoner (**Table 2.4**).

Table 2.4: Pregnancy Rate ready reckoner

Services per pregnant animal	Pregnancy Rate (%)
1.5	67
1.8	56
2.0	50
2.3	43
2.5	40
2.8	36



Some adjustments may be needed in this assessment to account for natural services.

Records kept in the movement book or herd diary will allow reasonably accurate assessments to be made of the Annual Herd Culling Rate.

The Failure to Conceive Culling Rate can, of course, only be calculated if reasons for culling have been recorded.

**Worksheet 1 provides a proforma for preliminary assessments of herd fertility in basic record herds.**

## Standard record herds

**UK herds which currently milk record have additional fertility management data immediately available to them – based primarily on calving and service dates – making the following fertility measures of particular value:**

- Calving to First Service Interval
- Calving to Conception Interval
- Heat Detection Rate (as indicated by intervals between services)
- Assumed Pregnancy Rate.

**This information can best be enhanced by:**

- Undertaking pregnancy diagnoses to remove much of the error within the Assumed Pregnancy Rate
- Identifying Pregnancy Rate trends with the CuSum technique (**Section 3**)
- Recording Submission Rates and identifying trends with CuSums.

## Comprehensive Record Herds

As well as enabling more detailed analyses of basic and standard records, the dedicated computer-recording systems currently used by many UK herds offer the opportunity to use a wider range of more sophisticated measures of fertility performance that would otherwise be difficult or time-consuming to employ manually.

**Foremost among these are:**

- Voluntary Waiting Period
- Submission Rate
- First Service Pregnancy Rate
- 100-Day In-calf Rate
- 6-Week In-calf Rate
- 200-Day Not In-calf Rate.