18

Best management practices for rearing young stock

This chapter introduces the concept of best management practice to audit farm practices in rearing dairy heifer replacements.

The main points in this chapter

- A US study of calf rearing recorded ten calf-rearing practices that were closely associated with mortality in milk-fed calves.
- Best management practice and quality assurance are processes for describing and implementing the most suitable procedures for a particular set of tasks to achieve a desirable outcome.
- Essentially it means 'Saying what you should do', 'Doing what you say' and 'Recording what you have done'.
- With regards rearing dairy heifer replacements, it can be undertaken by auditing the six major components of any heifer-rearing program. Checklists have been developed for these six, namely:

1. Planning general herd and heifer management.
2. Planning heifer supply programs.
3. Planning heifer care from birth to weaning.
4. Planning heifer care from weaning to mating.
5. Planning heifer mating programs.
6. Planning heifer care from mating to calving.

'Best management practice' and 'quality assurance' are processes for describing and implementing the most suitable procedures for a particular set of tasks to achieve a desirable outcome. With something as complex as running a dairy farm, it is best to partition the major outcome – that is, profitable milk production – into several sets of management decisions that producers must make. These include growing productive forages, efficient feeding management, effective animal health and rearing replacement heifers (see Figure 18.1). Essentially best management practice means:

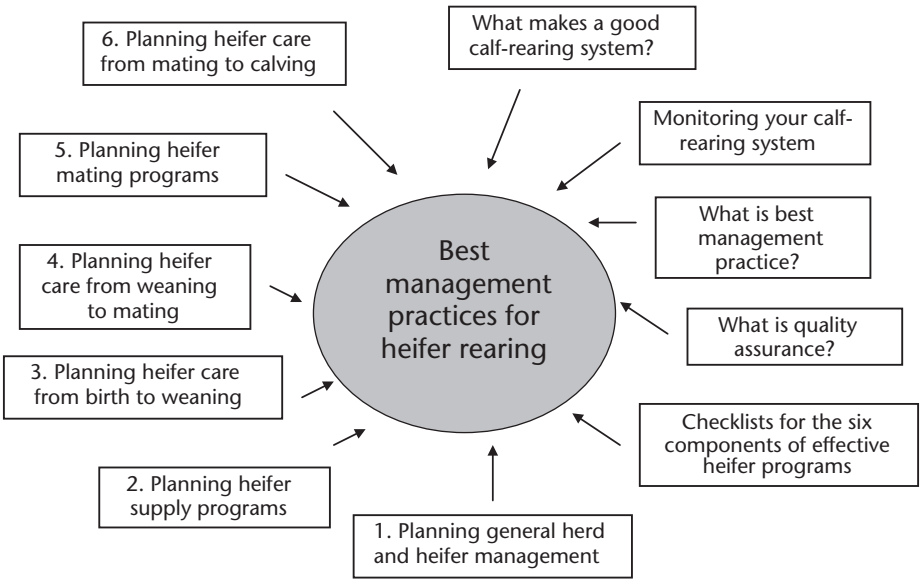

Figure 18.1. Best management practices for rearing dairy replacement heifers

- saying what you should do
- doing what you say
- recording what you have done.

This should improve all aspects of your calf-rearing operation.

Quality assurance (QA) programs are in their infancy in Asia. With increasing focus on meeting customer requirements, QA programs are likely to become an integral part of dairy enterprises in future years.

18.1 What makes a good calf-rearing system?

For every hundred dairy farmers, there would be close to a hundred different ways they rear their heifer replacement calves. In Western countries, more and more farmers are feeding less milk for fewer weeks and reaping the benefits of early rumen development, provided they feed top-quality concentrates and low-quality, but palatable, roughages. Most farmers now provide shedding for their milk-fed calves to protect them from the extremes of climate. There may be only 20 different rearing 'systems', but a lot more rearing practices, after taking into account the subtleties of physical facilities, feeding programs, disease management and human–calf interactions.

A survey of 1700 dairy farms in the US documented a series of calf-rearing practices that were closely associated with mortality in milk-fed calves (Losinger and Heinrichs 1997). For a variety of reasons, US dairy farmers lose many more pre-weaned calves (8–9%) than do Australian farmers (3–5%), whereas, from Chapter 6, calf mortalities on tropical Asian dairy farms are likely to be 15–25%. The following list summarises those factors that were associated with high death rates in US calf-rearing units in year-round calving herds. It must be emphasised that these data are for 'typical' US dairy systems

that differ in many ways to Asian farms. Therefore, it is the general principles rather than the actual 'numbers' that are important in this study.

18.1.1 Herd performance

Low-producing herds have higher calf losses. In the study, low production was quantified as less than 7700 L/cow rolling herd average, which would equate to herds producing less than 3000 L/cow rolling herd average in Asia. One concludes that lower producing herds were less carefully managed, including the calf-rearing unit.

18.1.2 Size of operation

Larger calf-rearing units had higher mortality rates. A large unit is defined as one rearing more than 30 calves over a 3-month period, which would equate to 120 calf/yr unit on a year-round calving herd. One could conclude that in the US, bigger units are less well managed than smaller units. This is not necessarily the situation in Asia and other less well-developed tropical dairy regions.

18.1.3 First colostrum feeding management

Newborn calves allowed to suckle their dam for their first drink of colostrum have higher death rates than do those fed colostrum by hand. Removing the calf from its dam immediately after birth reduces the chances of ingestion of faecal material as the calf looks for the teat. Furthermore, a controlled feeding of sufficient, good-quality colostrum within a short period after birth will ensure absorption of sufficient colostral antibodies into the calf's bloodstream. Depending on nature to do this with modern day milking cows is a lot more haphazard.

18.1.4 Group size

Calves reared in groups of seven or more have higher death rates than calves reared in groups of six or less. The smaller the group size, the better individual attention for each calf.

18.1.5 Gender of rearer

Calves reared by men had higher death rates than calves reared by women. One can only conclude that women have better rearing skills than men, which may be related to their more developed maternal instinct. In my experience, the best calf rearers are female nurses, because they have been trained to anticipate health problems before they happen.

18.1.6 Relationship of rearer to farm owner

Calves reared by the farmer's children or employees have higher death rates than calves reared by the farm owner or spouse. One can conclude that if you own the calves, you will take more care with them.

18.1.7 Time of feeding roughage

Higher death rates were found on farms where feeding of hay or other roughages was delayed until calves were 20 days or more old. The earlier that calves are offered roughage, the sooner their rumen begins to develop and the sooner they are likely to be

Best management practices provide practical guidelines for herd and feeding management of milk-fed calves.

weaned, either voluntarily or because of the feeding system. There was no effect of age of feeding concentrates or free choice of water on calf death rates.

18.1.8 Feeding mastitic or antibiotic milk

Heifer calves reared in units where mastitic or antibiotic milk was fed to them had higher death rates then in units where it is discarded, or fed to less valuable calves.

18.1.9 Feeding whole milk to calves

Calves fed whole milk from a bulk tank had lower death rates than calves not fed whole milk. It is assumed that calves not fed whole milk were fed milk replacer.

These nine factors sum up a good calf-rearing system, in which calves are provided with close attention to their health, digestive development and welfare by a person who really cares for them.

18.2 Monitoring your calf- and heifer-rearing system

It has been frequently stated that 'if you cannot measure it, you cannot manage it'. In the course of their operations, calf rearers already do collect, and can easily collect more, data on their stock. Much of this data could be, but probably has not been, used in

making management decisions to improve the profitability and efficiency of their operation. Such decisions include:

- By recording the ear tag of any calf requiring veterinary treatment then recording how many lactations it remains in the milking herd, decisions could be made on whether similarly treated calves should be sold or still kept as replacements for the milking herd.
- Once farmers know the total costs for their first-calf heifers to enter their dairy herd and start generating income, they can then decide on whether it is more profitable to sell all their calves and rely on purchased in-calf heifers to maintain or expand herd sizes.
- By monitoring feeding and management costs from weaning to first calving, farmers can compare that with purchasing pregnant heifers reared on other farms.
- By monitoring live weights and wastage rates, at different stages of rearing, farmers can decide on optimum target live weights, and hence feeding management, for their particular operation.
- In many Western countries, milk processors require farms to enter audits for quality assurance programs. If this eventually occurs in tropical Asia, some form of record keeping will become mandatory.
- Record keeping can assist with identifying areas requiring attention and to direct staff to problem areas or potential risk areas on farm.

The following sections list some of these measures that can be easily collected and used in making these future decisions.

18.2.1 Pre-calving (heifer's dams)

- genetic merit of dams of replacement heifers
- costs of semen and hence each live heifer calf.

18.2.2 Post-calving (heifer's dams)

- calving difficulties (%)
- calves born dead (%)
- colostrum quality (proportion of different quality categories)
- average time after birth that colostrum is administered to newborn calves
- quantity of colostrum fed plus subsequent calf antibody status.

18.2.3 Pre-weaning

- litres of vat milk used to feed each calf
- weekly concentrate intake: as a guide to weaning age
- proportion of calves that die, are sick, or sold (and why) (%)
- record ear tag of each treated calf: to assist in future decision making about their fate
- average weaning age
- approximate time spent on rearing calves (hr/day and hence min/calf until weaning)
- costs of purchased feeds
- costs of veterinary treatment (drugs and visits)
- costs for routine management (vaccines, drenches, etc.)

- capital cost of shed and equipment: to calculate costs for depreciation
- live weight and wither height at 12 weeks of age: to compare pre-weaning performance from year to year.

18.2.4 Pre-mating

- weekly concentrate and hay inputs: to help plan future feeding programs as they vary with season
- quality of supplements
- live weight and wither heights at 6, 9 and 12 months, and at mating at 15 months
- conception rate at mating
- inseminations per conception, if using artificial insemination
- faecal egg counts at strategic times: to assist with drenching program
- proportion of heifers that die, are sick, or sold (and why) (%)
- costs of purchased feeds, veterinary treatment and routine management
- costs of mating (semen and oestrus synchronisation, or bull)
- total rearing costs per calving heifer: the 'bottom line'.

18.2.5 Post-calving

- days to successful insemination
- inseminations per conception
- proportion of first lactation heifers that die, are sick, or sold (and why) (%)
- first lactation yield of milk or milk solids
- first lactation yield as a percentage of yields on mature cows
- wastage rate from birth to second calving, as a percentage of heifer calves reared.

18.3 What is best management practice and quality assurance?

Although heifer-rearing programs must be tailored towards individual producers, there are several general principles associated with all 'best management practices'. Those relevant to heifer-rearing programs, which producers should aim for are:

- incorporating heifer rearing into a business plan for the entire dairy enterprise
- making a commitment to continuous improvement in rearing costs, timeliness of each phase of the program and on the end product, namely heifer quality
- developing closer relationships and alliances with all outside service providers to the program, such as veterinarians, feed suppliers, dairy advisers, semen suppliers and AI technicians
- using performance recording, then benchmarking achievements with the industries' best practice for performance indicators such as heifer wastage rates, heifer milk production (as a proportion of herd average), heifer fertility and cost per first lactation heifer
- integrating environmental and animal welfare concerns in all aspects of the program
- being involved with other producers to improve knowledge and upgrade the competitiveness of the dairy enterprise.

Best management practices provide practical guidelines for herd and feeding weaned heifer management.

The six lists of questions in the following sections were developed for a quality assurance program developed in the US (Dairy Quality Assurance Center 1998). The major objective of the program is to increase herd performance while at the same time reducing herd costs and meeting customer demands for animal care and quality animal products. These checklists document the most appropriate questions dairy farmers, their staff, advisers and suppliers of services to their heifer-rearing program should seek to answer. Each question provides for a 'yes' or 'no' answer. Just because farmers and advisers tick the 'no' box does not necessarily indicate that they are not doing a good job with their young stock management. It could simply indicate that they have considered the question and decided it is not relevant to their particular heifer management program.

This audit was developed on accepted norms for US dairy producers. However, quite a few of these practices have yet to be accepted as routine by Asian producers, such as testing all cows for certain diseases. Nevertheless, such practices have been included in the following checklists, because in the future, they may become integrated into Asian dairy production systems.

18.3.1 Planning general herd and heifer management

Profit starts and ends with a commitment by owners and/or managers of dairy enterprises to seek quality. Unless management is committed to improve quality, few gains will be achieved by producers and service providers associated with heifer

Table 18.1. A checklist for general herd and heifer management

Yes	No	Best management practices checklist
		Do you consistently meet milk quality standards for somatic cell counts and bacterial levels?
		Do you believe it is more profitable to increase milk quality and yield via replacement heifers than to improve milk quality and yield from the current herd?
		Do you have a permanent 'tamper-proof' animal identification system in place?
		Can you readily track and validate to others the quality represented in your replacement heifers?
		If you rear your heifers off farm, do you have in place a measurement system to evaluate such a rearing program?
		Have you been able to consistently produce more milk per cow each year?
		After accounting for purchased supplements, have you been able to consistently increase milk production per hectare of forage grown on farm each year?
		Do your first lactation heifers consistently produce >80% of the full lactation milk yield of your mature cows?
		Is your target live weight at first calving based on breed and target milk yield of your mature cows in the herd?
		Do you participate in other quality assurance audits in a quality assurance program?

operations. A commitment to producing quality replacement heifers is one important step towards increasing herd health and quality milk production.

Producers should review the checklist in Table 18.1 to see how many of the practices they can tick in the 'yes' column.

18.3.2 Planning heifer supply programs

Quality replacement heifers programs can be described as those that produce strong healthy pregnant heifers at 24 months of age, after which the heifers become productive members of the milking herd for at least five lactations. Planning quality heifers starts with the present herd. The key time to start 'quality' replacement heifer programs is before mating.

Producers should review the checklist in Table 18.2 to see how many of the boxes they can tick in the 'yes' column.

Table 18.2. A checklist for planning heifer supply programs

Yes	No	Best management practices checklist
		Do you participate in a herd-testing program to help identify the best cows from which to produce your replacement heifer calves?
		Have you and your veterinarian developed a routine herd health program including appropriate vaccination schedules for your cows?
		Do you routinely score the body condition of your cows to evaluate management and assure that they are in good condition to produce thrifty, healthy calves?
		If seasonally calving, do you have a compact calving program with all your replacement heifers born within 6–8 weeks?
		If not, are you able to achieve this by using AI over your maiden heifers?
		Do you select sires that will breed top-quality replacement heifers?

18.3.3 Planning heifer care from birth to weaning

Quality replacement heifers start by being strong calves at birth, followed by a quality meal of colostrum and then consuming some solid feed within the first 2 weeks of age. Producers should review the checklist in Table 18.3 to see how many of the boxes they can tick in the 'yes' column.

Table 18.3. A checklist for planning heifer care from birth to weaning

Yes	No	Best management practices checklist
		Are your calf mortality losses less than 5% of calves born, prior to and during the first 24 hr of life?
		Are your calf mortality losses from 24 hr of age to weaning less than 3% of live calves born?
		Are your springing cows and heifers provided with a clean, dry area for calving?
		Do you remove the calf from her mother, preferably at birth, but at least within the first 12 hr?
		Do you dip the navel in a strong (7%) iodine solution immediately after birth?
		Do you have a good program to supply high-quality colostrum, such as: 1. Use a colostrometer to monitor colostrum quality and only feed good-quality colostrum? 2. Ensure the calf gets 2 or more litres immediately after birth? 3. Provide another 2 or more litres within 6–12 hr of birth? 4. Use a stomach tube, if necessary? 5. Clean bottles, buckets and equipment regularly? 6. Pool colostrum from older cows tested negative for Johne's disease and enzootic bovine leucosis?
		Do you test the blood of some calves to check the efficiency of your colostrum program?
		Do you remove calves to a clean, dry area, preferably at birth, but at least within the first 12 hr?
		Do you use a permanent form of identification for each calf?
		Do you minimise contact between batches of calves until about 5 weeks of age?
		Do you provide calves with access to water at all times?
		Do you provide at least 1–2 m^2 per calf during milk rearing?
		Do you provide concentrates to each calf within the first week of age?
		Do you ensure calves each consume 0.75 kg of calf concentrate for 2 or more days prior to weaning
		Do your calves weigh 100 kg (Friesian) or 90 kg (Jersey) by 12 weeks of age?
		Do you weigh calves using cattle scales?
		Do you monitor the health and welfare of calves at least twice each day?
		Have you discussed your calf health management program with your veterinarian?
		To minimise the spread of Johne's disease, do you remove all possible avenues of infection between adult animals and calves?
		Do you isolate any calves showing signs of ill health to minimise spread of infection, then feed them last?
		Do you know how much money can be saved by early weaning?
		Do you quarantine any pre-weaned calves introduced onto your farm?
		Do you use the best possible feeds in your program (milk replacer, concentrates, straw)?

Table 18.3. A checklist for planning heifer care from birth to weaning (continued)

Yes	No	Best management practices checklist
		Have you discussed the use of waste (antibiotic/mastitic) milk with your veterinarian?
		Do you dehorn and remove extra teats from heifer calves during the milk-rearing stage?
		When selling excess calves, do you follow all the regulations regarding suitability for sale (minimum age, health status, antibacterial residues) and transport them in a suitable trailer?
		Score each of the following six disease problems you may encounter during milk rearing. Use a ranking of 1 (least problem) to 6 (biggest problem). Scours or diarrhoea Respiratory problems Joint or navel problem Trauma Unknown Rarely have illness

18.3.4 Planning heifer care from weaning to mating

It is a challenge to produce quality heifers between weaning and mating. Once they have been weaned off milk, their feeding management is frequently neglected, yet this is one of the most important periods of their life. Heifers achieve puberty at about one half their mature size. The sooner they reach puberty and start cycling, the more likely they will conceive when mated at 15 months of age.

Producers should review the checklist in Table 18.4 to see how many boxes they can tick in the 'yes' column.

Table 18.4. A checklist for planning heifer care from weaning to mating

Yes	No	Best management practices checklist
		Do you have feeding strategies to minimise the growth check immediately after weaning?
		Does your focus on heifer growth include nutrition, health, parasite control and social factors?
		Do you understand the importance of achieving target minimum live weights and wither heights for age at every stage of heifer development?
		Do you routinely monitor heifer growth using cattle scales?
		Do you routinely monitor wither height?
		Do you understand the change heifers go through as they switch from a milk-based diet to a fully developed ruminant using solid feeds?
		Do you feed calf concentrates before, during and after weaning?
		Do you base your feeding program on growth rates, which can vary dramatically with the availability and quality of pastures being grazed?
		In year-round calving herds, do you group heifers on age and/or live weight?
		If growth rates fall below acceptable targets, do you supplement heifers with quality feeds, such as cereal grain and/or good-quality conserved forages?

Table 18.4. A checklist for planning heifer care from weaning to mating (continued)

Yes	No	Best management practices checklist
		Are you aware of potential problems (fatty udder syndrome) arising from feeding excess high-energy/low-protein feeds between weaning and puberty?
		To minimise the spread of Johne's disease, do you ensure heifers under 12 months of age do not graze pastures that have been stocked with adult animals during the previous 12 months?
		Have you developed a health management program (vaccinations, internal and external parasite control) in conjunction with your veterinarian?
		Do you use individual needles during any vaccination program requiring intramuscular injections, disinfecting needles in alcohol?
		If your herd is diagnosed with enzootic bovine leucosis, are you meticulous in ensuring no cross contamination of animals with blood or milk?
		Do you have an effective fly control program, if necessary?

18.3.5 Planning heifer mating programs

Successful mating programs for replacement heifers require all animals to be cycling. All the hard work and quality management will only return profit to your operation if conception rates are high when heifers are mated at 15 months of age.

Table 18.5. A checklist for planning heifer mating programs

Yes	No	Best management practices checklist
		Do your replacement heifers have body condition scores of 5 to 6 units and are they gaining weight at mating?
		By 15 months of age, have all your replacement heifers achieved minimum target live weights for mating (330 kg for Friesians and 245 kg for Jerseys)?
		Do you treat your heifers for internal and, if required, external parasites just prior to mating?
		With seasonal calving herds, do you plan heifer calving dates in relation to those of your mature cows? This may be a week or two earlier to assist with feeding management of newly calved heifers.
		Are you aware of the benefits of using AI over natural mating?
		Are you aware of the benefits of using dairy (as against beef) bulls or semen?
		Do you use AI for mating well-grown heifers, then follow on with good-quality herd bulls to 'clean up' these heifers and any smaller ones not inseminated?
		If using AI, do you select semen from sires or breeds selected for ease of calving?
		Have you selected the most appropriate heat-detection procedure for your operation?
		Do you choose to use heat synchronisation, if appropriate, for your heifer mating program?
		If using natural mating, do you select sufficient good-quality bulls, taking note of their mobility and libido (one bull per 30 heifers plus one spare)?
		If using natural mating, do you ensure all bulls have been vaccinated against vibriosis?
		Do you routinely test your heifers for pregnancy to plan their calving program?

Producers should review the checklist in Table 18.5 to see how many of the boxes they can tick in the 'yes' column.

18.3.6 Planning heifer care from mating to calving

Good heifer management is vital up to the point of calving, particularly if the calf is destined for the replacement herd.

Producers should review the checklist in Table 18.6 to see how many of the boxes they can tick in the 'yes' column.

Table 18.6. A checklist for planning heifer care from mating to calving

Yes	No	Best management practices checklist
		Do your heifers gain on average 0.6–0.8 kg/day after mating?
		Do your heifers calve down in body condition score 5 to 6 units?
		Do you introduce your heifers to the milking shed (or at least run them through the milking shed) prior to calving?
		Do you avoid mixing replacement heifers with older dry cows?
		Do you avoid high somatic cell counts by keeping replacement heifers in a clean dry paddock for at least 1 month before calving?
		Do you store good-quality, tested colostrum (either freshly chilled or frozen from the previous year) from older cows to feed all calves routinely from first-calf heifers?
		Have you and your veterinarian developed a health treatment program for heifers pre- and immediately post-calving?

18.4 Ensuring the relevance of these BMPs to tropical small holder dairy farmers

I believe that the above collection of checklists can form the basis of a quality assurance scheme for rearing dairy replacement heifers in tropical Asia. However, it must be emphasised that this set of BMPs was specifically developed for a modern dairy farm operating in the US (or other Western countries) where farmers can find technical support from a variety of sources. This is rarely the case in Asia because farms are generally very small, farmers have limited technical support and, in many cases, they may not even have the technical skills to decide if they are doing a good job or not.

That is not to say the lists are not really relevant to SHD farmers in tropical Asia. They can become an integral part of any training program for farmers that is conducted by government or dairy cooperative advisers. Furthermore, they can become incorporated into the curriculum for a university undergraduate program to educate our future dairy advisers, research scientists and other dairy stakeholders.

As they stand now, some cannot easily be acted upon. However, it is up to the users of the technical information contained in this book to select those most appropriate for

their training programs and perhaps rephrase or reinterpret them to make them more relevant for their students or program participants. It is better for the trainer or educator to place them into context for their particular target audience than for them to be taken directly as they are presented in the tables above.