11
Conclusions

This chapter concludes the manual with some final overviews, such as the role of a demonstration or model farm in promoting good animal welfare practices to reach the widest audience possible.

The main points of this chapter

- Closer attention needs to be given to the economics of current small holder dairy (SHD) systems. Sourcing high yielding dairy cows, but providing the feeding and management that only utilises a small proportion of their potential, is just not sustainable in the long run.
- Local milking cows will often perform similarly to the imported animal under traditional levels of herd management, they are two to three times cheaper to purchase and are likely to be more resilient to poor welfare practices.
- To ensure sustainability, the current production systems need to evolve into more resource efficient ones, and this includes providing closer attention to cow comfort and hence cow welfare. Such systems will require more skilled farmers and better-trained support staff, so there needs to be greater emphasis given to farmer training and capacity building programs.
- No matter how much the animal welfare and extreme animal liberation lobby groups speak out against the farming of cattle for milk and meat, it is certain that humans will never cease cattle farming. Commercial and

nationalistic interests will continue to facilitate the global distribution of dairy and beef cattle from regions approaching or exceeding self-sufficiency to other regions where demands for milk and meat far exceed supplies.

- High performing genotypes require excellent farm management to help them achieve their potential. Under the more traditional farm management that exists in many tropical SHD systems, such animals will often perform less well than the local stock.
- Recent studies in Bangladesh suggest that Jersey crossbreds may be more suitable and productive than Friesian crossbreds on traditionally managed SHD farms.
- Farmers are experiential learners. They learn more by doing something themselves (and being able to monitor its impact) than by the more traditional learning programs of classroom tuition and short 'hands on' practical sessions. Model farms provide them with a practically based learning environment.
- The model farm should then be established to provide farmers and service providers with an overview of the cause and effect of modifications in farm practices. This is ideally suited to demonstrate the beneficial impacts of improved animal welfare.
- This chapter lists a series of improved management practices that can be demonstrated on a model farm.
- Competent, welfare-minded dairy farmers are those who extend their farming skills to cover cow psychology as well as cow production technology and farm business management. In essence, they should be able to put themselves 'inside the cow's skin' to develop the ability to 'think like a cow'.
- Happy cows make happy farmers.

11.1 Considering current production constraints on tropical dairy farms

This manual covers a wide range of topics primarily related to ensuring the sustainability of dairy production systems in tropical developing countries. Clearly, to achieve this aim, closer attention needs to be given to the economics of current systems. Sourcing high yielding dairy cows, but providing the feeding and management that only utilises a small proportion of their potential is just not sustainable in the long run. It is also a contributory factor to their suboptimal animal welfare. This is because such animals are more susceptible to the traumas of heat stress, poor housing conditions and all too often, subsistence feeding

management. Currently the majority of these farms are only operating at a small fraction of their potential economic efficiency.

However, this observation must be viewed from the perspective that the SE Asian countries currently importing large numbers of dairy heifers from Western countries are unlikely ever to be able to greatly increase their national dairy cow populations through natural multiplication from within their own dairy herds. The local farmers suffer from poor reproductive performance (such as high ages at first calving and lengthy calving intervals) and high stock mortalities (particularly young replacement heifers). The major avenue to increase national herd sizes will have to be through continuing livestock importations.

No matter how much the animal welfare and extreme animal liberation lobby groups speak out against the farming of cattle for milk and meat, certainly humans will never cease cattle farming. Commercial and nationalistic interests will continue to facilitate the global distribution of dairy and beef cattle from regions approaching or exceeding self-sufficiency to other regions where demands for milk and meat far exceed supplies. This means that the animal welfare issues discussed in this book will always be there.

Producing more milk will then require purchasing more stock that will require lengthy periods of adaptation. These importing countries seem to prefer importing in-calf heifers rather than unbred, virgin heifers. However, even though they can purchase 'two high genetic animals for the price of one' (namely the pregnant heifer and her foetus), the heifers only have a few months to adapt to the local management conditions before she is expected to calve down then be able to conceive for her second calving. At least many of these heifers are now being transported by plane, which removes much of the transport stress suffered by heifers spending many weeks on ships. However, importing unbred heifers provides a much greater adaptation period before they are expected to produce milk then get back into calf again.

Two observations made by the senior author are pertinent in this discussion. First, in a herd of imported unbred heifers, all of which were cycling before air transportation, only 50% were still cycling, presumably due to the stresses of trying to adapt to their post-arrival feeding and herd management as well as their new climatic environment. The second observation was made at a farmer meeting in which he was told that 20 to 30% of the imported pregnant heifers suffered lactation anoestrus for so long post-calving that they were sent off to the local abattoir. One enterprising farmer identified these cows and purchased them before slaughter, provided them with good feeding, housing and welfare practices after which they all cycled and eventually conceived. Therefore, one must conclude that the reproductive endocrine responses in these cows due to their poor adaptation to suboptimal post-arrival management are likely to be more costly than those associated with milk synthesis in the udder.

With the costs of farm inputs destined to rise regularly, higher levels of cow and herd performance are necessary to ensure a reasonable profit margin for these farmers. It is just not good business sense to purchase such imported stock, say for US$2500 to 3000 each, then only feed and manage them to produce on average 10 to 12 L/cow/day of milk. Furthermore, the reproductive inefficiencies mentioned above will make it even less worthwhile. This is highlighted by the fact that up to 20% of progeny die during milk rearing and the surviving heifers frequently don't have their first calf until 30 to 36 months of age followed by a calving interval of 18 months. Local milking cows will often perform similarly to the imported animal under traditional levels of herd management, but are two to three times cheaper to purchase and likely to be more resilient to the existing poor welfare practices.

As standards of living improve, the cost of labour (both on farm and employed off farm labour) will rise. There is increasing competition, and therefore reduced availability, from both humans and other livestock sectors within each country, for the high quality feeds required to produce local milk. In addition, the costs of any imported dairy inputs, such as veterinary drugs and farm machinery, will only increase in the future. On the income side, the global markets will always place constraints on the maximum unit returns farmers can receive for their milk sales, as it is often cheaper to import the ingredients for processed dairy products. Therefore, future income and profit streams must come from increases in farm outputs of raw milk. To ensure sustainability, the current production systems need to evolve into more resource efficient ones. This includes providing closer attention to cow comfort and welfare. Such systems will require more skilled farmers and better-trained support staff which means there needs to be more emphasis given to farmer training and capacity building programs.

High levels of heat and humidity stress, inadequate levels of moderate quality feeds and less than ideal herd management practices, place enormous constraints on imported dairy animals. Future increasing concerns about the public accountability of animal welfare from exporting countries should (and eventually will) add another layer of concern to the future prospects for these countries to achieve their targeted levels of national self-sufficiency in dairy products.

Many of the SE Asian dairy industries have recently established large-scale dairy feedlots to provide more milk and so reduce imports of dairy products. However, these countries all have government-driven development policies for small or medium-sized farms to continue to supply the bulk of locally produced milk. This means existing farms will need to be better managed. Increased resources will also be required but these must be looked upon as future investments, not costs, in current dairy systems. Given better farm management and strategic investments, the increased levels of milk produced on such farms should provide sufficient profits – incentives to upgrading current farm management practices.

Frequently the text in this book has emphasised the impact of poor cattle welfare on animal performance and on the resultant farm profitability and potential sustainability. It is the obligation of all stakeholders in cattle farming to work steadfastly towards reducing stresses (psychological as well as physiological) on cattle as they have to cope with the current and improved production systems. Farmers, service providers, trainers and government/private bureaucrats are all stakeholders in cattle farming. Not only should they all become more familiar with key aspects of meat and milk production technology and farm business management, but the increasing public accountability of farmers towards the welfare of their stock should provide the incentive for them to also become more aware of the psychological needs of the stock under their control.

11.2 The genotypes of dairy stock imported onto tropical dairy farms

The intense genetic improvement programs for dairy stock being undertaken in the developed dairy industries of Australasia, North America and Europe will lead to higher genetic merit cows in the developing countries through continuing importations, such as in tropical Asia, Africa and Latin America. Such selection programs are leading to reductions in the genetic diversity of the world's dairy cow population. Such losses in genetic variability increase disease susceptibility in high producing genetic lines. For example, Phillips (2002) partly attributed the recent outbreak of 'mad cow disease' in the UK to the increased susceptibility to the disease due to the lack of genetic diversity in the country's population of Friesian dairy cows. This was a result of intense selection for high cow performance.

The more specialised a domestic animal becomes, the more specialised an environment it will require. For example, Friesians require better environmental support than a beef cow, that could survive under wild conditions. Friesian cows would greatly suffer in the wild with their huge udders, while their calves are weaker and take longer to walk unassisted compared to beef breed calves.

Selection for increased milk production and cow performance has continued for more than a century in Europe. It has produced dramatic results with cows producing more than 50 L/day of milk under optimal feeding and herd management. Dairy selection programs have also been undertaken in tropical regions utilising the tropical adaptation genes of Zebu (*Bos indicus*) stock. The resultant progeny have been nowhere near as productive as their temperate counterparts because of environmental and genetic constraints. The more recent importations of dairy stock to tropical developing countries have almost entirely been based on Friesians. This has been primarily due to the often mistaken belief that such stock would always be the most productive in their new environment.

Even within the temperate dairy gene pool, there are breeds that exhibit a greater degree of tropical adaptation than do Friesians, such as Jersey, Brown Swiss and Red Danish. In addition, there are synthetic dairy breeds bred specifically for tropical conditions that – although in short supply – could be the centre of a breed multiplication scheme within the host country. Such breeds include the Australian Friesian Sahiwal, Australian Milking Zebu, the Brazilian Girolando and purebred Sahiwal.

High performing genotypes require excellent farm management to help them achieve their potential. Under the more traditional farm management that exists in many tropical SHD systems, such animals will often perform poorly compared with the local stock. This is primarily because of their propensity to preferentially utilise their body reserves to produce milk during early lactation. Without sufficient nutrient intakes, they will lose weight and upset the hormonal balances to allow them to regain their normal oestrus cycle for many months following calving. Reduced reproductive performance of high grade Friesians is an all too common feature of traditional feeding and herd management on tropical SHD farms. As already mentioned, the inability to get back in calf within several months due to lactation anoestrus can represent up to 20 or 30% of imported dairy stock being culled and slaughtered after just one lactation (Moran 2012a).

The following Table 11.1 presents recent data derived from SHD farms in Bangladesh (Milk Vita 2013), relating to the genetic improvement of the local dairy animal, known as the Pabna Milking Cow (PMC) through cross breeding with established improved dairy breeds. The Sahiwal crossbreds were either Sahiwal x PMC or Sahiwal x (PMC x Friesian), the Friesian crossbreds were either Friesian x PMC or Friesian x (PMC x Sahiwal) while the Jerseys crossbreds were either Jersey x PMC or Jersey x (PMC x Sahiwal).

Compared to the Friesian crossbreds, the Jersey crossbreds were 3.2 kg lighter at birth but had a 12-day longer lactation length, produced an extra 131 kg milk

Table 11.1. Performance of three breed types in Bangladesh.

	Sahiwal	Friesian	Jersey
Birthweight (kg)	26.3	27.2	24.0
Lactation length (days)	282	290	302
Lactation yield (kg)	1735	2893	3024
Average milk yield (kg/d)	6.2	10.0	10.0
Fat%	4.4	4.1	4.9
Solids Not Fat (SNF) %	8.0	8.0	8.1
Age at first service (months)	29.8	27.1	25.0
Services per conception	1.3	1.7	1.2
Days to first post partum heat	137	149	98
Calving interval (days)	419	430	382

over their entire lactation and had an 0.8% higher fat% and 0.1% more Solids Not Fat contents. In addition, they were 2.1 months younger at first service, required 51 days less to first post partum heat, and 0.5 less services per conception and subsequently had a 48-day shorter calving interval. Western data usually show Jerseys producing less milk per day than Friesians but these data showed identical daily milk yields (10.0 kg/cow/day). The poorer performance of the Sahiwals compared to the Friesian crossbreds is also apparent from these data, although the Sahiwals required fewer services per conception, had fewer days to first post partum heat and shorter calving intervals than the Friesians. Clearly, under traditional management in a hot and humid environment where cows were only producing 10 kg/cow/d on average, Jersey crossbreds performed better than Friesian crossbreds.

No matter what genotype is favoured for dairy development programs, farm management practices almost always can be rectified to better achieve their productive potential (Figures 11.1 and 11.2). Not only do these improvements need to be directed towards providing better cow comfort and nutrient status, a more concerted effort in addressing all aspects of cow welfare will almost always reap benefits (Figure 11.3).

Figure 11.1: A well-designed and managed free stall shed in the tropics.

Figure 11.2: A well-managed small holder dairy shed in the tropics.

11.3 The role for model farms

The close relationship between animal welfare, cow performance and farm profitability on SHD farms has been highlighted throughout this manual. Similarly, the text has laid emphasis on the general lack of awareness of this association by poorly resourced tropical farmers. Farmer-orientated capacity building programs are then a high priority to rectify this deficiency.

Changes in a single farm practice can have a diversity of outcomes. Unlike researchers who use traditional approaches to scientific logic in a research environment, to try and hold all other variables constant when assessing the impact of one particular variable, farmers live in the 'real world of commercial agriculture' where any single variable can rarely be held constant on farm. Therefore, capacity building for poorly resourced and skilled farmers should ideally be undertaken on a farm.

A model or demonstration farm highlights the dynamic nature of farming as it can expose farmers to practical innovations and new ideas. There are various ways in which such innovations can be introduced to a group of farmers, but the

Figure 11.3: A 24-month-old pregnant dairy heifer, the result of good feeding, management and welfare.

important objective is for these farmers to understand how it impacts on 'the bottom line', that is the herd performance and farm profitability. In addition, animal welfare is a very complex part of farm management that unlike, say, feeding a better quality ration to milking cows to increase milk yields, is likely to impact on many aspects of herd performance when practice changes are made. In addition, animal welfare is directed to satisfy or improve the animals' coping mechanisms, with the success or otherwise being made apparent through a variety of performance parameters (as discussed in Chapter 8.2).

Farmers are experiential learners in that they learn more by doing something themselves (and being able to monitor its impact) rather than by the more traditional learning programs of classroom tuition and short 'hands on' practical sessions. However, classroom sessions are important because they provide the opportunity to explain the theories behind such practices, which are an integral component of any learning process. Better comprehension of 'why things happen' will improve the understanding of 'how to make things happen', because all too frequently 'things do not go according to plan' because of various unknown and/or unexpected consequences of farmers' actions.

Since farmers learn more by watching and then doing, they need to be provided with every opportunity to watch. This can be provided on the farms of collaborating farmers, or better still, on a model farm. The latter is more desirable because there is more control over farm activities and it is easier to monitor the impacts of changes in farm practices. Using selected farmers who agree to allow their farms to be more closely monitored will provide a control situation so farmers can more easily see and understand the impact of any direct changes in herd performance and farm profitability as a result of such improved management practices.

The model farm should then be established to provide farmers and service providers with an overview of the cause and effect of modifications in farm practices. This is ideally suited to demonstrate the impacts of improved animal welfare. For example, the many benefits rising from the construction of a more 'cow friendly' shed can be demonstrated by comparing herd performance with that of an existing more traditional shed construction. As SHD farmers in many countries routinely travel twice each day to deliver their milk to the milk collection centre, establishing a model farm in close proximity to the collection centre, should encourage them to frequently visit it to monitor progress in any demonstration trial. Offering regular field days, at which the latest results are discussed, would further help in their dissemination. Although such a model farm may be the initiative of the public service providers, if well-managed and effective, it is likely to create interest within the private sector which could then be levered to provide additional resources for its operation.

11.3.1 Modus operandi of a model farm

Such a farm requires careful planning, preparation and construction to ensure it has a sustainable future as a farmer extension tool. The following is a list of some of the prerequisites:

- The farm should be located in established or soon to be established dairying regions, close to other commercial dairy enterprises.
- It should be of a commercial size and relevant to dairy farming within the next 5 to 10 years, say, between 10 and 20 milking cows and associated young stock. If it is too large, small holder farmers will have difficulty relating to it and so adopting any improved management practices. The size of the forage production area should be such as to provide fresh forage for, say, 8 to 10 milking cows per ha forage per year. This may or may not include home-grown forages conserved as silage.
- The facilities should be constructed of materials that are readily available and likely to be used by local dairy farmers.

- It should be stocked with imported cows and young stock, assuming these will become the future benchmark of developing dairy industries.
- The farm should be managed by an experienced SHD farmer with a proven track record of innovative dairy farming.
- The day-to-day management would be the responsibility of the manager. However, the manager should be supported by an advisory group of experienced dairy specialists. These should represent a range of agencies, from the investors, to large-scale milk processors, dairy cooperatives and government (and maybe expatriate) dairy advisers and maybe educational institutes. This group would meet several times each year to monitor progress in the farm's economic performance as well as its role as an extension tool.
- The farm must be operated as a commercial business with additional resources available to develop effective extension activities, such as regular visits from local dairy farmers and other dairy stakeholders.
- The milk produced should be sold through the normal market outlets, either through a milk collection centre or direct to an established milk processor. Consideration could be given at a later date to value add some of the milk.
- The initial finances to purchase (or rent) the land and construct the facilities could be sourced from agribusiness, and maybe even government or other dairy industry stakeholders. The stakeholders will then be invited to become involved in the overall management of the farm.
- As well as documenting cow and farm performance, all data on cash inputs and outputs should be collated and regularly summarised to form an integral part of the extension message.
- There should be regular meetings (small groups of farmers visiting) and an annual regional forum to demonstrate and extend the correct farm management practices.

11.3.2 Examples of improved management practices

The following list shows some of the improved management practices, many of which will lead to better animal welfare, that could be demonstrated on a model farm:

Sheds and facilities
Loose housing rather than tie stalls
Free stalls rather than open lounging
Compost barn as an open lounging system
Rubber mats in the free stalls
Outside sand yard for resting at night
Good slope on floor to aid cleaning

Flood wash system to clean floor
Cow shed design: adequate height and open sides
Cattle crush and yards for ease of handling stock
Mating yard, if using bulls not AI
Young stock rearing area not directly adjacent to adult cow area
Individual pens or cages for milk rearing calves
Effluent dam to minimise nitrogen losses through volatilisation
Pump and pipes to distribute liquid effluent onto forage production area
Mechanical milking, not hand milking, probably with bucket milkers
Hot water to clean milk handling and milk feeding equipment
Separate area in which cows can give birth
Hospital or isolation pen for sick stock
Vermin-free and insect-proof storage area for feeds
Refrigerator and lockable cabinet for drug storage
Fans and maybe even sprinklers for heat stress management
Plant trees and grass around sheds
Area for staff to relax when not working
Office area for keeping and storing farm records

Feed and forage management
Routine use of inorganic fertilisers on grass production area
Short harvest interval for Napier grass (30 days not 60 days)
Consider routine wilting of freshly harvested forage to improve appetite and hence increase productivity
Consider making silage out of excess wet season forage to feed back to stock in dry season
If using raw ingredients for concentrate formulations, a separate area for mixing them on the floor
Ensure farms can source adequate supplies of quality forages to make up for any shortfalls in home-grown forages
Ensure farms can source adequate supplies of quality ingredients for supplementing forages
Provision of continuous supplies of fresh clean drinking water
Harvesting and feeding adequate quantities of quality green forages (say 40 kg/cow/d) to milking herd
Use mechanical chopper for processing forages
Consider ribbon mixer or small total mixed ration (TMR) wagon to mix all the feed ingredients
Consider routine analyses of nutritive value of all feed inputs
Formulate rations based on minimum costs of feed energy and protein within each feed type

Feed scales for weighing feeds
Chest girth tape for assessing stock live weights
Picture guides to routinely monitor body condition

Herd management practices
Feed colostrum to calves immediately following birth
Consider calf milk replacer as cheaper alternative to whole milk
Ensure calves are fed high protein concentrate formulations, not the same as for milking cows
Develop regular vaccination for young stock (*Clostridium*) as well as adult stock
Routinely monitor respiration rates to decide on heat stress alleviation procedures
Learn to identify early symptoms of ill health in calves, heifers and adult cows
Develop animal health protocols for milk-fed calves with local veterinarian
Develop animal health protocols for weaned heifers and adult cows with local veterinarian
Follow recommended Best Management Practices (BMP) for all aspects of herd management such as feeding, breeding, rearing young stock, milk harvesting, animal health and stock welfare
Do not use calves for milk letdown before milking
Only wash teats (not entire udder) when preparing cows for milking
Ensure cows stand for 30 min following milking
If using mechanical milking, change milk liners after every 2500 milkings
Routinely use pictorial standards (as in Chapter 6) to monitor various measures of stock welfare
Encourage staff to be involved in monitoring stock health and performance during their daily work routines, and writing observations down on a whiteboard
Collect sufficient production and financial data to routinely monitor the Key Performance Indicators discussed in Chapter 9.

11.4 In summary

In spite of several decades of dairy farming in the tropical developing countries of SE Asia, the productivity of SHD farming has remained relatively low due in part to the lack of appropriate dairy research and application. Small farmers, due to their socioeconomic and agro-economic conditions being greatly different to those in developed countries, cannot readily adopt the science and technology available in developed countries. Even the most appropriate technology is rarely transferred to small holders *en masse* due to a lack of effective support services (Moran 2014). There needs to be large-scale institutional support to facilitate dairy industry growth through mechanisms such as providers of farmer credit, farmer training centres, well-equipped milk collection centres, processing and marketing facilities,

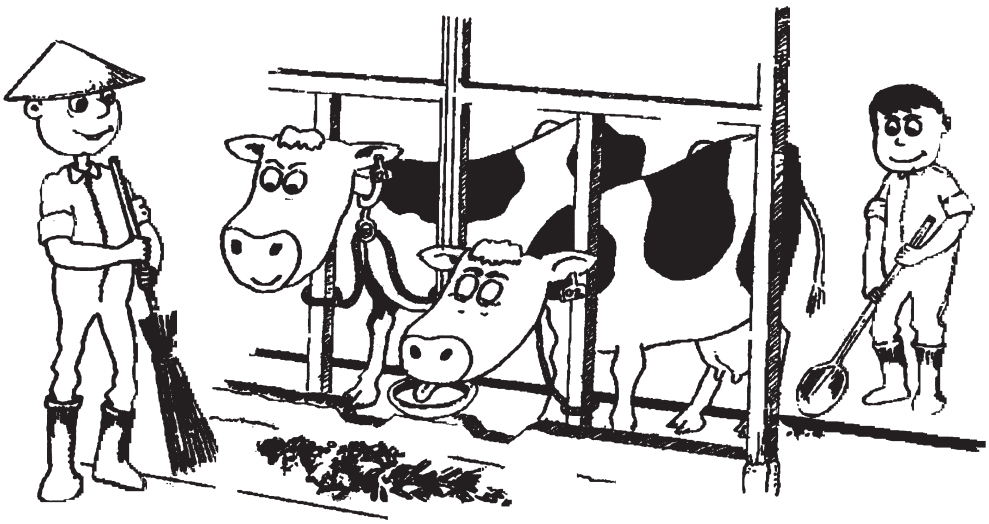

Figure 11.4: Happy cows on a well-managed small holder farm.

farmer cooperatives or groups and appropriate research and extension infrastructures and methodologies. School milk programs have been successful in encouraging the development of SHD farming by promoting milk drinking to improve health among children, particularly in rural areas. It is then essential for any production technology being transferred to these farmers to be relevant to

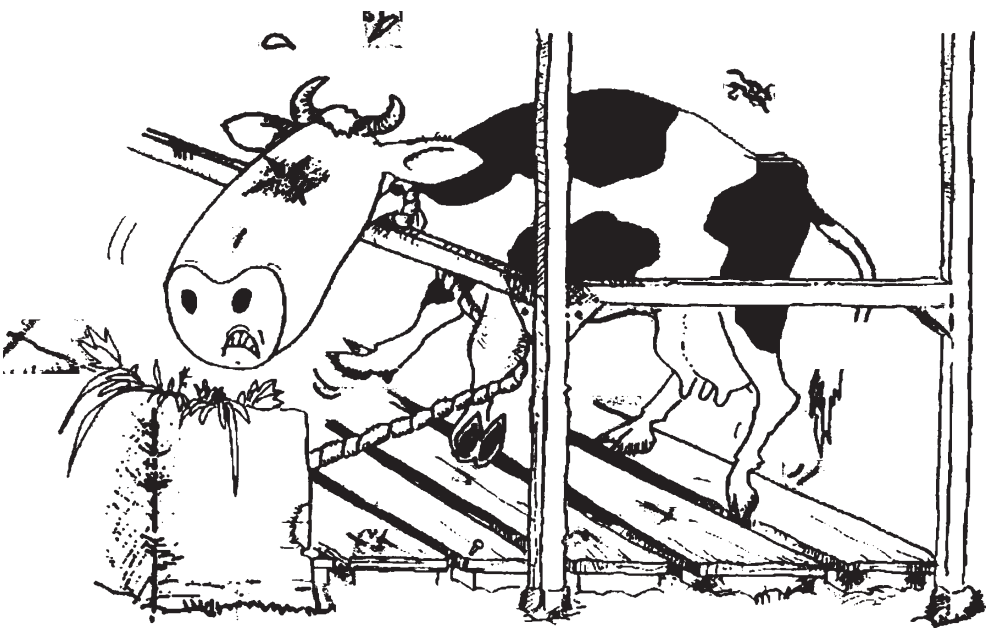

Figure 11.5: An unhappy cow on a poorly managed small holder farm.

their needs as well as being economically and practically feasible, given their local support networks of dairy cooperatives, advisers (government and agribusiness), creditors and milk handling and processing infrastructures. Production technology skills should automatically lead to animal welfare skills.

Good dairy cattle husbandry includes the provision of appropriate resources of feed and shelter, effective management and sympathetic stockpersonship. These include:

- Physical resources necessary to ensure proper feeding, housing and hygiene
  - ➤ Well-constructed, properly replenished feed stores
  - ➤ Accommodation that is hygienic, physically and thermally comfortable and unlikely to cause injury
  - ➤ Facilities for routine preventative medicine and the care of individual sick animals.
- Strategic management designed to address the physiological, health and behavioural needs of the animals
  - ➤ Feeding, production, health and welfare plans devised and implemented with professional advice as appropriate to the needs of the system and the individual animals
  - ➤ Comprehensive records relating to feeding, production, health and welfare.
- Competent stockpersonship, sympathetic to the day-to-day needs of the stock
  - ➤ A skilled empathetic approach to animal handling
  - ➤ Early recognition and attention to any signs of disease or injury
  - ➤ Work practices that encourage competent and caring stock handlers and which give them the time to develop empathy with the animals in their care.Competent, welfare-minded dairy farmers are those who extend their farming skills to cover cow psychology as well as cow production technology and farm business management. In essence, a farmer should be able to put themselves 'inside the cow's skin' to develop the ability to 'think like a cow'.

The term 'happy cow' is becoming more commonly used in dairy circles, particularly in Asian developing countries. In fact 'Happy cows, happy farmers' became a theme song at a recent dairy farmer meeting in Vietnam. The Figure 11.4 and 11.5 cartoons also promote the message that well-managed small holder farms produce happy cows.

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