# 19

# The future for smallholder dairy industries in tropical Asia

This chapter focuses on three key aspects influencing the future of Asia's smallholder dairy industries, namely the role of 'high technology', issues of environmental sustainability and the balance between the public and private sectors in future development programs.

### The main points in this chapter

- Dairy development in Asia and other tropical regions has not kept pace with 'the West' mainly because of unfavourable climates (for milking cows) and a range of socio-economic constraints.
- New technology must be appropriate to the needs of the user, which is not always the case when 'high technology' is directly transplanted from temperate to tropical dairy industries.
- Without proper focus on natural resource management, smallholder dairy farming can become a polluter, hence become socially unacceptable in close proximity to urban areas.
- The public and private sectors both have key roles to play in dairy development, but they should be complementary not competitive.
- Most smallholder farms have the potential to become technically, socially and ecologically sound. As they constitute the majority of milk production systems in Asia, it is not only economical but also ethical to give real attention and effective support to their sustainable development.

Over the last 20 years of dairy research, development and extension, many Western countries have produced sophisticated dairy production systems. Herd sizes have grown, efficient feeding systems have evolved and many farmers routinely monitor test results on their cows for milk production, composition and quality, and for mastitis. They then use this information for making decisions on culling milking cows and for breeding genetically improved stock. High labour costs have led to much mechanisation, such as machine milking and forage conservation, while grazing cows can harvest their own forages far more efficiently than farmers can. Low population

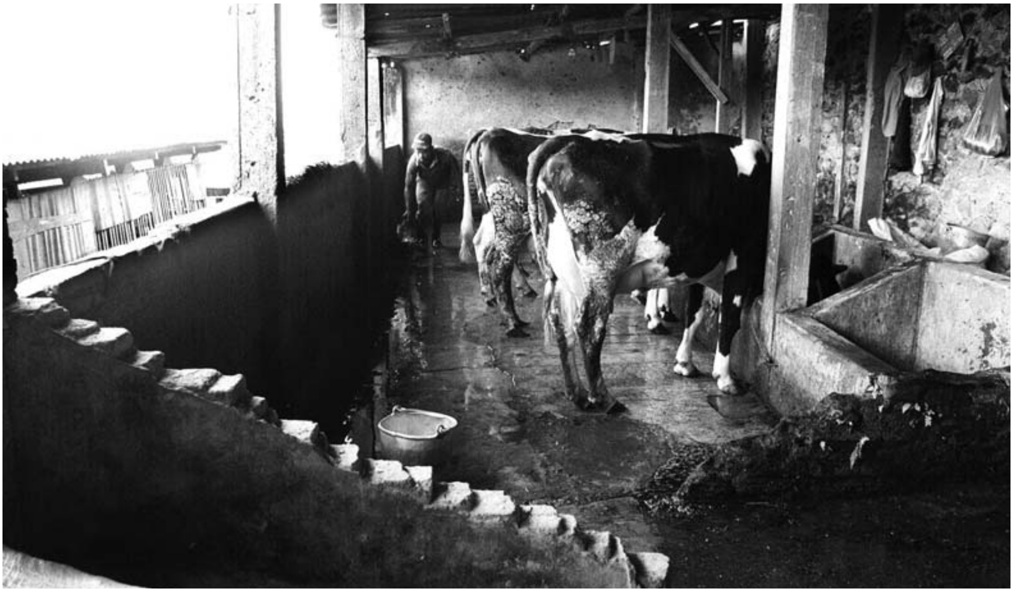

**Figure 19.1** Many smallholder farmers are very poorly resourced (Indonesia)

pressures, hence relatively cheap land, have allowed farms in Western countries to expand in both size and cow numbers.

Unfortunately, this has not been the case for smallholder dairy farmers in most Asian countries. Being in the tropics, feed quality suffers from high temperatures and strongly seasonal rainfall patterns. Dairy cows are temperate animals with thermo neutral (comfort) zones closer to 10°C than to 30°C. Furthermore, high humidities reduce feed intakes which exaggerate the adverse effects of high fibre forages on appetite. In fact, a good measure of heat stress, the temperature humidity index, shows milking cows in the lowlands of the humid tropics to be in the 'high stress' and 'reduced performance' zones for much of most days throughout the year. Many dairy specialists argue that potentially high performance dairy breeds, such as Friesians, may not necessarily be the best cattle genotype for tropical regions, except in highland areas or those with low humidities.

There are many socio-economic reasons why the efficiency of smallholder dairy farming has not greatly improved over the last two decades. Granted, numbers of cows have greatly increased in most Asian countries, largely through government support for social welfare and rural development programs. The increased demand for milk (accentuated through school milk programs) and the concept of national food security are the driving forces behind dairy development initiatives. However, in terms of feed inputs per kg of milk produced, improvements have been slow.

Much of the technical progress in Western dairy countries has not been relevant to Asia, and in fact, some of it may have been unwisely transplanted. Commercial interests in selling 'improved genetics' often do not explain the need for the feeding and husbandry that go with the breeding. Granted, milking cows must get back in calf to

**Figure 19.2** Dairy cows grazing under coconuts in Sri Lanka

keep producing milk, so good herd fertility is essential. However, poor early lactation feeding will not allow these 'improved' cows to express their potential for good fertility.

This chapter focuses on three key aspects influencing the future of Asia's smallholder dairy industries, namely the role of 'high technology', issues of environmental sustainability and the balance between the public and private sectors in future development programs.

## 19.1 The relevance of 'high technology'

Technological change plays a key role in agricultural development. The invention, innovation, diffusion chain involves many links. New technology may be transferred from overseas, where it was generated at international research centres or developed domestically by privately or publicly funded research. Private sector research is done by farmers and agribusiness, but since new knowledge is public good for the benefit of all peoples, public sector funding is also needed. Research prioritisation should be guided by the demands of producers, processors and consumers of new technology. The new social science of Farming System Research provides for assessment of producer objectives and constraints and for testing research results, but this is costly on-farm. Additional assessment is desirable as economic viability is a prerequisite, so it should involve cost-benefit analysis.

It has been my experience that with many developing tropical dairy industries, government policy makers all too often consider advanced technology and genetics as the panacea for their dairy industry. This approach is likely to yield disappointing results until some of the more basic dairy husbandry issues (feeding and herd management)

**Table 19.1** The relevance of 'high technology' to developing tropical dairy industries

| Links in the production supply chain | Very relevant in all-sized dairies | May be relevant in large dairy operations | Not relevant for next 5 to 10 years |
|---|---|---|---|
| 1. Soils and fodder production | Effluent distribution systems | Some farm mechanisation | Genetically modified plants |
| | Macro nutrient fertilisers | Commercial silage additives | Organic production technology |
| | Micro nutrient fertilisers | | Biodynamic production technology |
| | Latest generation pesticides | | 'Alternative' fertilisers |
| | Latest generation herbicides | | |
| | Most farm mechanisation | | |
| | Latest generation plant genetics | | |
| 2. Young stock | Electrolyte fluid replacers | Routine antibiotic therapy | Computerised (automatic) calf feeders |
| | Thermometers to monitor sick calves | Immunoglobulin monitoring equipment | Unnecessary overuse of antibiotic therapy |
| 3. Nutrition and feeding | Macro mineral supplements | Computer software to monitor farm costs | Probiotics |
| | Access to computer software to formulate rations | Computerised animal identification systems | Micro mineral supplements |
| | Individual animal identification | Total mixed rations | Vitamin/micro mineral injections |
| | | | Computerised feed dispensers |
| 4. Animal health | Latest generation drugs | Computer software to document animal health procedures | Routine blood profiles |
| | Latest generation vaccines | Access to some very sophisticated veterinary practices | Excessive use of antibiotics |
| | Access to most modern veterinary practices | | |
| 5. Reproduction | Artificial insemination technology | Oestrus synchronisation | Single sexed semen |
| | Aids for heat detection | | |
| 6. Breeding | High genetic merit semen | Exotic high genetic merit heifers | Embryo transfers |
| 7. Environment | Effluent management systems | Village biogas systems | |

| Links in the production supply chain | Very relevant in all-sized dairies | May be relevant in large dairy operations | Not relevant for next 5 to 10 years |
|---|---|---|---|
| | Farm biogas systems | Climate controlled sheds | |
| | Advances in building designs | | |
| | Latest generation heat stress alleviation systems | | |
| 8. Milk harvesting | Bucket milking machines | Automatic teat cup removers | Robotic milkers |
| | Herringbone dairies | Automatic cow exit | Rotary dairies |
| | | | Oxytocin for milk letdown |
| | | | Automatic laboratory milk assay equipment |
| | | | Rapid exit dairy systems |
| | | | Computers in the milking parlour for individual cow monitoring |
| 9. Value adding | Farmer access to equipment to value add raw milk | Village access to equipment to value add raw milk | The latest advanced equipment to value add raw milk |
| | Processing, packaging and marketing at the dairy co-op level | | |
| 10. Miscellaneous | | Computer (Information) technology | Growth hormone (Bovine somatotrophin or BST) |

have been addressed at the grass roots level. Fortunately for many of these countries, there is considerable opportunity for improvement in basic farm management as many of the stakeholders in the dairy industry are relatively well educated, and a large network of government extension/animal health services can be mobilised.

The terms 'high or new technology' could be defined as the latest production technology in current or potential use by developed Western dairy industries. Dairy production technology can be broken down into nine key task areas (links) in a supply chain for any dairy farm, no matter its size or location. These were discussed in Chapter 2 and are listed in Table 19.1.

Much of this 'high technology' has been developed by advanced temperate countries with far more sophisticated and productive dairy industries than those likely to evolve in many South and East Asian counties for years (or even decades) to come. High technology has evolved through many routes, be they the end point of lateral thinking and human trial and error in the mind, the laboratory or on the farm. It can be questioned that some of these evolutionary steps in dairy production technology may not, as yet or ever, be relevant to tropical smallholder dairy industries. Table 19.1 categorises these technologies into those currently very relevant in all-sized dairy operations in South and East Asia, those that may be relevant in large dairy operations and those not likely to be relevant to many of these dairy industries within the next 5–10 years.

The term ‘latest generation’ refers to the most recent stage of commercial evolution in particular farm production aids, such as pesticides, herbicides, plant genetics, veterinary drugs and vaccines. Plant and animal scientists are continually researching dairy production technology and as new discoveries are made and innovations evolve, they are upgraded from 1st to 2nd to 3rd generations and so forth, hence use of the term ‘latest generation’ in Table 19.1.

This table is rather subjective and may be incomplete. However, it should stimulate debate and become the basis of lengthy discussions between dairy production specialists into the future. Whatever their outcome, it is important to discriminate between **high technology** and **appropriate technology**.

### 19.1.1 The process of technological change

Driven by rapidly growing private investment in research and development (R&D), the knowledge divide between industrial and developing countries is widening. Including both public and private sources, developing countries invest only 11% of what industrial countries put into agriculture R&D as a share of agricultural R&D. Many international and national investments in R&D have paid off handsomely, with an average of 43% return on the investment dollar in 700 R&D projects evaluated in developing countries (World Bank 2007).

The process of technological change can be divided into three phases; invention, innovation and diffusion. Diffusion would be similar to extension, the third aspect of the acronym, R, D & E. However there are often other stages in the R, D & E chain leading to a usable invention, for example:

- Basic, applied and adaptive studies
- Development and testing
- Extension to the end users, namely producers, processors and consumers of farm products
- Technology has also been introduced from other countries, as part of the technology transfer.

Many agricultural innovations in the past were developed and spread through private enterprise, some by farmers themselves, while others such as machinery and fertilisers were developed and disseminated by industrial enterprises. Public sector involvement is relatively recent, but over the last few decades, the widespread drive for privatisation has been extended to R&D and it could be argued that publicly funded R&D must be maintained to achieve maximum benefit. Typical outcomes of private R&D include genetic material (including genetically modified organisms or GMO), nutritional additives, drugs, vaccines, farm machinery and equipment, which can be sold at a price that incorporates a share of the costs of research. Private R&D is usually concentrated at the applied, near market end of the chain. It has been suggested that because public sector R&D can give high rates of return, it should receive continued funding and support in developing countries (Upton 2004). An important element of the prioritisation process must be the assessment of the demand for alternative types of innovation, as participatory approaches to identifying and executing research are vital.

There is a need to ensure that proposed new technologies are appropriate, that they accord with the producer's objectives and constraints, and match with consumer demands in accessible market outlets. Sustainability of livestock operations depends on availability of inputs, particularly fodder resources, but also on delivery systems for concentrate feeds, genetic material and disease control measures. The physical infrastructure of roads and appropriate institutional framework are also prerequisites.

A major challenge is to narrow income and productivity gaps between favoured and less favoured regions. Better technologies for soil, water and livestock management and more sustainable and resilient livestock systems, including varieties more tolerant of pests, disease and drought, are needed for these regions. Approaches that exploit biological and ecological processes can minimise the use of external inputs, especially agricultural chemical and unnecessary veterinary drugs. Examples include conservation tillage, improved tillage, green manure over crops, soil conservation and pest control that relies on biodiversity and biological control more than pesticides. Because most of these technologies are location specific, their development and adoption require more decentralised and participatory approaches, combined with collective action by farmers and communities.

Revolutionary advances in biotechnology do offer potentially large benefits to poor producers and poor consumers, so long as they are combined with other appropriate farm management practices. But today's investments in biotechnology, concentrated in the private sector and driven by commercial interests, have had limited impacts on smallholder productivity in the developing world, the exception being genetically modified cotton in China and India. Low public investment and slow progress in regulating possible environmental and food safety risks have restrained the development of GMOs that can help the poor. The World Bank (2007) argues that the potential benefits of these technologies will be missed unless the international development community sharply increases its support to interested developing countries.

Low spending is only part of the problem. Many public research organisations face serious leadership, management and financial constraints that require urgent attention. International research institutions, such as the International Livestock Research Institute in Kenya, also lack resources and personnel to deliver on their very broad mandate which includes encouraging the development of national agencies (Phelan, pers. comm.). However, higher value markets open new opportunities for the private sector to foster innovation along the value chain. Grasping them often requires partnerships among the public sector, private sector, farmers and civil society in financing developing and adapting innovation. With a wider range of institutional options now available, more evaluation is needed of what works well in what contexts.

Generally, improved technology will reduce costs and induce shifts towards more commercial systems. In most cases, farmers are already making use of most of the

**Figure 19.3** Smallholder dairying is usually undertaken as part of mixed farming (West Java, Indonesia)

available technologies that meet their risk and return objectives and their market opportunities. The existence of other technologies locally, used by some commercial farmers, does not necessarily make them 'available' to traditional farmers, as the availability of technology depends partially on the capacity and objectives of the farmer. Productivity growth is likely to be driven mainly by increases in the opportunity cost of labour, which in turn drives the demand for a switch in use of available technology or even to the development of new technologies, not by availability of improved technologies. In fact, with low labour costs, there are few economies of scale in production due to limited incentive or means to invest in scale-dependent technology. Staal *et al.* (2008) report that in such diverse settings as Brazil and India, many small-scale dairy farmers have similar levels of unit profitability to larger-scale producers.

### 19.1.2 Technology and fertilisers

The 30 years from 1930–1960 saw a global population increase of 50% (Upton 2004). During this time the necessary world food supplies were largely obtained through the introduction of industrial manufactured farm inputs, such as machinery, fertilisers, herbicides and pesticides. For the industrialised countries, these new farm inputs were increasingly adopted but the developed countries largely found them expensive and often inappropriate.

For example, the rapid growth in the use of nitrogenous and other fertilisers was substituted for farmyard manure, including dairy shed effluent, in the maintenance of soil fertility, thus enabling Western farmers to abandon mixed crop-animal husbandry systems. The introduction of chemical herbicides and pesticides also reduced the need for rotational cropping. By the late 1980s, nitrogenous fertilisers provided 50% of the total annual nitrogen flux in global cropland with animal wastes providing less than 9%. In developing countries relative prices made fertilisers less attractive. An estimated 70% of total fertiliser inputs in developing countries are still derived from animal manure. The structure of many tropical soils is poor and would benefit from application of such manure even when fertilisers are used. Inorganic fertilisers are a good investment on any tropical dairy farm, with cost:benefit ratios of at least 4:1 (Moran 2005).

### 19.1.3 Technology and animal health

One misuse of 'high technology' is in the area of animal health, not because farmers are accessing new technology, but because much of it is dated. Like human medicine, developments in the 'latest generation' veterinary drugs proceed at a very fast rate. All too often the veterinary drugs found on many smallholder dairy farms in South and East Asia are not the latest 'generation' but frequently those that were developed several years ago in the West. In all too many cases, drug companies are promoting, hence selling, the backlog of old products at discounted prices, or local veterinarians may not even be aware of the latest developments in drug therapy. Use of first generation vaccines, which have been stored appropriately and still within their 'use by date', may still be useful for smallholder dairy farmers.

The poor storage conditions on-farm of these drugs and their continued use well past their 'use by date', either through the veterinarian's ignorance or, more commonly, that of the smallholder farmer, is a major problem. Appropriate drug storage facilities maintaining optimum conditions, including refrigeration if necessary, are a common feature on most Western farms but only on very few Asian dairy farms.

FAO estimate that 30% of livestock production in developing countries is lost through disease. In addition, routine disease control adds to the cost of production. Upton (2004) argues that technology is available for the control and treatment of many tropical livestock diseases but the delivery of veterinary service is beset with severe institutional problems. Due to increasing foreign debt and shortage of funds, many Asian governments face increasing pressure to reduce spending, to recover costs from users and to switch to private service providers wherever possible.

Well-trained veterinarians have a smorgasbord of drugs at their disposal and part of their training is to ensure that the most appropriate are prescribed for particular animal health situations. All too frequently farmers are prescribed antibiotics as the first drug to use, to treat the symptoms rather than the disease. For example, in young stock management, there is an overuse of antibiotics for calf scours. The majority of scouring calves die because of loss of essential minerals via the faeces, not because of excessive levels of infection in their gut.

Rather than detail treatment of calf scours in a book primarily on Farm Business Management, the reader is referred to my book on calf rearing (Moran 2002) and Chapter 10, where I wrote:

> Many calf rearers have routinely used antibiotics to control potential pathogens, as well as to increase feed intake and utilisation. This is not necessary with ideal management and facilities, such as where colostrum intake is adequate, the rearing unit is clean and

> well ventilated and not densely stocked and the operator is experienced. Because this ideal scenario is not common, antibiotics have been used as insurance against disease, particularly when rearing calves bought from often unknown sources. This could mask any disease outbreak for several days and also give a false sense of security, which often leads to an even poorer job in calf raising. Concern about the development of antibiotic resistant strains of bacteria has led to a marked reduction of this practice in certain countries.

There is no reason whatsoever why smallholder dairy farmers in the tropics should not have access to the latest drug technology, particularly since the tropics is a far from ideal environment for rearing and milking dairy cattle.

## 19.2 Making agriculture more sustainable

The environmental footprint of livestock farming has been large, but there are many opportunities for reducing it. Since the 1992 Earth Summit in Rio de Janeiro, it is generally accepted that the environmental agenda is inseparable from the broader agenda of smallholder agriculture for development. And the future of agriculture is intrinsically tied to better stewardship of the natural resource base on which it depends.

Both intensive and extensive agriculture face environmental problems, but of different kinds. Agricultural intensification has generated environmental problems from reduced biodiversity, mismanaged irrigation water, agrochemical pollution, and health costs and deaths from pesticide poisoning. The livestock revolution has its own cost, especially in densely populated and peri-urban areas, through animal waste and spread of animal diseases such as avian influenza. Many less favoured areas suffer from deforestation, soil erosion, desertification, and degradation of pastures and watersheds. For example, in the East African highlands, soil erosion results in productivity losses measured as high as 2–3% per year, in addition to creating offsite effects such as siltation of reservoirs.

The answer is not to slow down agricultural development, but to seek more sustainable production systems and enhance agriculture's provision of environment services. Many promising technological and institutional innovations can make agriculture more sustainable with minimal tradeoffs on growth and poverty reduction. Water management strategies in irrigated areas must improve water productivity, meeting demands of all users, including the environment, and reduce water pollution and the unsustainable mining of groundwater. These strategies depend on removing incentive for wasteful water usage, devolving water management to local user groups, investing in better technologies, and regulating externalities more effectively. Decentralising governance in irrigation management has a higher chance of success if legal frameworks clearly define the roles and rights of user groups and if the capacity of groups to manage irrigation collectively is increased.

Better technologies and better ways of managing modern farm inputs can also make rainfed farming more sustainable. One of agriculture's major success stories in the past two decades is conservation (or zero) tillage. This approach has worked in commercial agriculture in Latin America, among smallholders in South Asia's rice-wheat (hence livestock) systems. As survey data from 20 countries show, women's engagement in community organisations improves the effectiveness of natural resource management (NRM) and the ability to resolve conflicts.

Getting incentives right is the first step towards sustainable resource management. Widespread adoption of more sustainable approaches is often hindered by inappropriate pricing and subsidy policies and the failure to manage externalities. Strengthening property rights and providing long-term incentives for NRM with off-farm benefits, such as matching grants for soil conservation, are necessary in both intensive and extensive farming areas. Inappropriate incentives that encourage the mining of our natural resources, such as subsidies to water intensive crops that cause groundwater over-pumping, must be reduced.

Such reforms are often politically difficult. Better water measurement through technology, such as remote sensing, better quality of irrigation systems and services, and greater accountability to water users can generate political support for otherwise stalled reforms.

There is a real urgency to deal with climate change throughout the tropics. Poor people who depend on livestock are most vulnerable to climate change. Increasing crop failures and livestock deaths are already imposing high economic losses and undermining food security in Sub Saharan Africa, and they will get far more severe as global warming continues. More frequent droughts and increasing water scarcity will devastate large parts of the tropics and undermine irrigation and drinking water in entire communities of already poor and vulnerable people. The international community must urgently scale up its support to climate proof the farming systems of the poor. Based on the 'polluter pays principle', it is the responsibility of the richer countries to compensate the poor for costs of adaptation. So far, global commitments to existing adaptation funds have been grossly inadequate (World Bank 2007).

Developing country agriculture and deforestation are also major sources of greenhouse gas emissions. They contribute 22–30% of the total emissions, more than half of which are from deforestation largely caused by agricultural encroachment (13 million ha of annual deforestation globally). Carbon trading schemes, especially if their coverage is extended to provide financing for avoiding deforestation and soil carbon sequestration (such as conservation tillage) offer significant untapped potential to reduce emissions from land use change in agriculture. Some improvements in land and livestock management practices are often win-win situations, in that after initial investments, they can lead to more productive and sustainable farming systems.

Biofuels provide another opportunity and challenge to smallholder dairy farming. Few of the current biofuel systems are economically viable and many pose social (rising food prices) and environmental (deforestation) risks. To date, production in industrial countries has developed behind high protective tariffs on biofuels and with large subsidies. Such policies hurt developing countries that are, or could become, efficient producers in profitable new export markets. Poor consumers also pay higher prices for food staples as grain prices rise in world markets due to the diversion of grain to biofuels or indirectly due to land conversion away from food production. With the dependence of concentrates to intensify dairy production, ingredient costs for such high energy and protein supplements can also be influenced by similar economic pressures. Increased public and private investment in research is important to develop more efficient and sustainable production processes based on feeds other than human food staples. One promising area of work for smallholder dairy farmers is with tree legumes. Investors in Sri Lanka are currently assessing Gliricidea as a multi purpose crop for biofuel for generating electricity, supplying a valuable plant protein source for intensive livestock farming, and finally, timber for building.

### 19.2.1 Pollution and the public perception of dairy farming

There is little doubt that dairy farming, small- or large-scale, creates public concern about its impacts on human wellbeing and the environment. Moreover, due to expansion of urban areas, many farms that used to be located in rural areas are now peri-urban. Due to limitations of land and increases in family farms, the disposal of dairy waste can become a potential threat to community environment, particularly if their disposal is not well managed.

In a well-established dairying cooperative in Thailand, Chantlakhana and Skunmun (2002) evaluated the impacts of 47 smallholder dairy farms on local residents through personal interviews and samplings of the water, soil and air. On average, each farm had 20 milking cows, less than 0.3 ha for family and dairy housing and produced about half a ton of fresh manure each day, with some air dried and sold as fertiliser but much of it still being released into the surrounding areas. Three groups of people were surveyed, namely the dairy farmer households (Group 1), non-dairy households located 500 m from the nearest dairy barn (Group 2) and non-dairy households located more than 5 km from the nearest dairy barns (Group 3).

These groups were located in various areas around the dairy cooperative, namely:

- Location A: an area with irrigation canals and a high density of dairy farms
- Location B: a municipality area where public services such as roads, telephones and sewage systems were available
- Location C: a manufacturing area where factories exist among the dairy farms.

**Nuisance from dairying to people.** Only people in non-dairying households believed that dairying caused some nuisance to them (53%, 50% and 27% of those surveyed in locations A, B and C respectively). Specific nuisances ranked from high to low were as follows: smell of manure and urine, flies, bellowing noise and dust from dried manure. However, there were no real objections from non-dairy households in regions where dairying had been established for a long time.

**People's perception of the effects of dairy waste on the environment.** Interviewees had both positive and negative opinions on the water, soil and air environment. All dairy farmers (Group 1) appreciated the benefits of manure on improving soil fertility, while 7–14% of Group 2 indicated an adverse effect of soil manure on soil salinisation. Most non-dairy people (Groups 2 and 3) agreed that dairying created undesirable smells and water pollution to the community. All dairy farmers (Group 1) argued that dairy waste only created water pollution for a short period during the wet season, but this was much less than the pollution caused by wastewater from factories in Location C.

**People's health.** Results showed no significant differences in disease incidences over a 12-month period in all the three groups surveyed. Important diseases, ranked in decreasing order of occurrence were: respiratory diseases, skin diseases, diarrhoea and allergy. Interviewees agreed that it would be difficult to relate these diseases directly to dairy farming.

There is an urgent need to implement appropriate waste management systems for smallholder dairy farms. Liquid waste can contaminate water resources and public waterways, while piling and drying manure on bare land can lead to leaching and seeping of inorganic and organic matter into underground water. Cement drainage ditches should be constructed for waste water and liquid manure disposal and sewage tanks for holding liquid waste outside dairy barns. In addition, low cost cement floors should be constructed for drying manure. For the long term, central waste water treatment systems or biogas digesters should be considered, but only after careful planning and with active farmer participation in the decision-making process.

Future national dairy development programs should include elements of environmental protection with farmer training and regular monitoring of water, soil and air quality. In addition, dairy cooperatives should be provided with appropriate information regarding possible long-term effects of environmental pollution and sanitary measures to safeguard against risks to human health.

## 19.3 The role for Public Private Partnerships in dairy development

The recent price rises in dairy imports has lead to a resurgence in dairy development throughout Asia. Rather than repeat the mistakes of the past, a concerted effort is being made to revisit the past to more fully understand why so many of the so-called integrated dairy programs and projects of the 1970s and 1980s failed and which of their characteristics succeeded. One major finding is that dairy development requires major inputs from the private as well as the public sector, in other words a Public Private Partnership (PPP).

With the help of international communities, many of the early government to government programs established hugely expensive, high capacity technologies and equipment. In some cases, local dairying was held back as the projects imported large quantities of subsidised skim milk powder and butter oil. Sometimes these countries were able to use these commodities to develop their own dairy industries, while at other times, they could not. In the latter cases, local milk prices were depressed, milk production dropped and the dairies became underutilised, partly because of the high price of imported replacement equipment and spare parts. There were many classic examples of inappropriate high technology, as discussed earlier in this chapter. Today, these countries are still highly dependent on imported milk.

In February 2008, a workshop on smallholder dairy development (APHCA 2008) was held at Chiang Mai in Thailand, attended by 50 participants from 18 countries and funded by three international aid agencies, namely Animal Production and Health Commission of Asia and the Pacific (APHCA), Food and Agriculture Organisation

(FAO) and the Common Fund for Commodities (CFC). By comparing the industries in nine different Asian countries, representing three broad categories of access to formal and informal milk markets, Dugdill and Morgan (2008) reviewed a variety of farmer models and of factors (both positive and negative) influencing smallholder participation in dairy food chains, that is the entire milk production, processing and marketing chain from the farm to the kitchen table. They identified six different 'smallholder producer models' with varying degrees of public and private involvement, ranging from dairy cooperatives to contract farming to community bank-funded livestock and dairy development and other collective/community dairy cow keeping models. In differentiating between the public and private sectors, their conclusions (with examples from various study countries) are summarised below.

### 19.3.1 The key roles for both public and private sectors

The public and private sectors both have key roles to play in dairy development, but they should be complementary not competitive. The public sector covers any stakeholder employed by a government agency, namely public servants generally paid a wage similar to other government employees in that country.

The private sector covers all other stakeholders, whose remuneration is more flexible and generally related to the performance of the dairy industry in their region. Such stakeholders include:

- Commercial farmers, both smallholder and large scale
- Rural traders, entrepreneurs, brokers and intermediaries
- Suppliers of farm inputs (feed, stock, veterinary drugs, machinery)
- Post farm gate stakeholders in the dairy value chain, such as transporters, cooperatives, milk processors, informal milk marketers
- Service providers (excluding government officers), such as veterinarians, inseminators, private consultants, contractors
- Financial institutions
- Non-government organisation and private aid agencies
- Administrators in dairy cooperatives and other farmer organisations including multinationals.

The key roles for the public sector should be to:

- Promote dairy development through policies, advocacies and strategies via tailored national institutions
- Provide technical support services and farmer training programs (although the private sector has an equally important role)
- Facilitate organisations of milk producers, legal framework and trade
- Promote milk consumption for improved nutrition.

Makeham and Malcolm (1986) expressed concern about public involvement in farming with rather strongly worded comments. There are numerous examples of economic disasters or near disasters which have occurred in such activities as federal, state, local government, tractor hiring services, marketing boards, distribution of inputs and supply of foodstuffs to consumer and sometimes government-backed cooperatives. A build-up of bureaucracies with exceptionally low levels of productivity, and resistance to measures based on such criteria as profitability and sound resource use is all too common. Equally important, excess government participation in practical agriculture can create the situation whereby responsibility and accountability are not fostered. It's called the 'it's the government's money, so it doesn't matter' syndrome. It is often as though economic analysis of the use of government funds is something that cannot be done, and to be accountable to the providers of these funds would be too cumbersome an imposition upon the spenders.

Sometimes when the public sector 'overplays' its role, there is a reduced input from the private sector. This can become a vicious cycle because a lack of private sector participation can lead to further government intervention, hence continued reluctance of the private sector to participate. Reasons for limited private sector involvement can be many and varied, such as:

- Restrictions on private sector activities and other infrastructure constraints
- Barriers to establishment, registration and licencing of businesses, especially with small to medium enterprises
- State intervention in pricing (farm inputs as well as outputs)
- Shortage of technical and business skills
- Poorly developed financial sector
- Corruption and poor governance
- Perceived business risks
- Provision of free or subsidised services by government
- Poor (or poorly policed) regulations on food safety
- Availability of cheap imports and other examples of poor market protection
- Government support for cooperative models
- Existence of state owned enterprises.

Young (2008) concluded his review of PPPs by suggesting ways to encourage private sector involvement:

- Governments should not abandon their responsibilities.
- Focus on correcting market failures, if they can be corrected.
- Clearly delineate government and private sector responsibilities to dairy development.
- Investigate other successful models of free enterprise, such as poultry.
- Avoid 'crowding out' with too much competition and create a business friendly environment.
- Consider private delivery of public services.

### 19.3.2 Lessons learnt from the nine country study

From the APHCA study of nine different Asian dairy industries, Dugdill and Morgan (2008) summarised a range of 'lessons learnt', with examples from different countries. These were as follows:

How did the various smallholder producer models perform?

1. Centrally planned models, or those where government intervened in milk pricing, did not fare well in the long term (Pakistan, Vietnam).
2. Government-owned dairies, especially large-scale ones where civil servants managed the business did not fare well (Bangladesh, Pakistan, Vietnam), although there were exceptions such as recent centrally owned but market orientated Chinese companies.
3. Most of the successful models are private sector based, as they have more flexibility and are less constrained by regulations than other producer models, such as cooperatives.
4. There are concerns if the private sector wants to maximise profits and reduce risks by using cheap imported (subsidised) dairy commodities rather than setting up more difficult to manage, local milk procurement schemes.

The key lessons for the public sector were:

1. It must be careful about interventions such as pricing policies (Sri Lanka, Thailand) and dairy cow loan schemes (Bangladesh, Mongolia, Vietnam).
2. Government investment in large state-run processing does not work (Pakistan, Philippines). They should carefully target smallholder dairy development interventions (Bangladesh, India, Mongolia, Philippines, Vietnam).
3. It should encourage graduation from subsistence to commercial smallholder and/or larger-scale farming by adopting more appropriate policies and strategies (Bangladesh, India, Philippines, Thailand).

The key lessons for the private sector were:

1. It should become engaged sooner rather than later in the development process. Creative and carefully thought out linkages between smallholder groups and the private sector, such as technical assistance and financial support, will enable smallholders to move up the marketing chain more easily (Vietnam, Bangladesh, Mongolia, Philippines, Pakistan).
2. Milk quality and attractive product branding and presentation are prerequisites for persuading modern urban consumers to switch from imports to locally produced milk (China, India, Mongolia, Philippines).
3. Value adding activities can enhance returns to dairying. Selected smallholders close to formal and informal markets should produce high value added ready-to-drink indigenous and niche products (China, Mongolia, Philippines).

The key lessons applying across the entire dairy sector were:

1. Smallholders need accessible and affordable complete packages of technical support services (such as animal health and AI services) to produce milk competitively (Bangladesh, India, Mongolia). Not surprisingly, the key technical constraints are lack of feed and fodder, dairy breeding stock and training. Technical know-how and skills can be delivered through vocational and outreach training by industry institutions or smallholder dairy groups.
2. Pro-poor social programs, including school milk programs, need to be carefully targeted and are usually sustainable only if linked to remunerative markets

(Bangladesh, Mongolia). The important socio-economic-cultural-environmental benefits have been previously discussed in Chapters 2 and 3 of this book.

3. Lactose intolerance is basically a myth because many people seen as non-milk drinkers are increasing consumption of ready-to-drink processed and cultured milks (Philippines, Thailand, Vietnam). School milk programs help develop the milk drinking habit while promoting future demand, but should be based on locally produced rather than imported milk.

The five overarching principles of smallholder dairy development are:

1. Smallholder dairying is straightforward in concept but complex in execution.
2. Dairy farmers must be competitive to access markets, by producing top quality milk at affordable prices. Success requires adoption of a complete cow-to-consumer strategy and intervening at every stage of the dairy food chain to ensure profitable product integrity.
3. Strategies for and including smallholders require deliberate and creative development processes that are sensitive to the impact of policies, programs and activities of the farmers themselves.
4. The impact of such policies, programs and activities on the farmers depends on the local context and the people involved.
5. The private sector must be fully engaged with both government and farmers in developing regional strategies and also national action plans.

## 19.4 Ensuring a future for smallholder dairying

With growing political attention to narrowing current income disparities, there are many opportunities to better use dairying as an instrument for development. When planning regional strategies, Young (2008) made some salient comments. These include:

- **Think globally but act locally.** As part of a global industry, smallholder dairying has to be competitive in a world of declining trade barriers. The 'one size fits all' approach does not work given the vastly different scenarios across Asia.
- **Focus on the long term.** It is too easy to be distracted by current issues and overlook the long-term requisites that are fundamental for their success.
- **Consider a wide range of possible scenarios.** There are many critical uncertainties, such as climate change and changes in consumer preferences and trade policies. These must be factored in when formulating strategies for them to remain relevant and flexible enough across the region.
- **Design for impact.** The regional strategy is about people, the millions of rural poor, and not about milk or cows. Policy makers must always remember who the intended beneficiaries are and how their lives will be affected by any proposed interventions.
- **Avoid overprescriptive blueprints.** By developing a range of options, individual countries and regions can select those most relevant to their needs and available resources.

- **Don't overlook financing needs.** Dairy development is capital intensive compared to other forms of livestock production. Finances should be mainly 'up-front' because ongoing donor support may not be sustainable.
- **Consider the enabling environment.** Although such strategies can be successful under a wide range of situations, they must take into account the key features of the region, such as its transport infrastructure, electricity and water supplies, financial services, telecommunications, current animal husbandry practices, technical support and market linkages.
- **Adopt a demand-led approach.** The engine of these strategies is growing consumer demand. However, as consumers are better informed, they become more discriminating in their tastes and more demanding of quality, product range and convenience. Without consistency of quality, smallholders may be sidelined for industrial-scale dairy operations or imported product. There may be market niches for smallholder products.
- **Establish preconditions.** Dairy development will not work without social stability, adequate governance and sound macro-economic policies. It must also meet the conditions of political feasibility, administrative capacity and financial affordability.

If the world is committed to reducing poverty and achieving sustainable growth, the future must include more sustainable livestock farming. As there are no magic bullets, this requires broad consultations at the country level to customise agendas and define implementation strategies. It also requires having livestock farming work in concert with other sectors at the local, national and global levels. It requires building the capacity of smallholders and their organisations, private agribusiness and the state. It requires institutions to help agriculture serve development and technologies for sustainable NRM. And it requires mobilising political support, skills and resources. However, it is difficult for developing countries to strive for sustainability when so many of their populations are faced with poverty and hunger. It is difficult to stop people from cutting and burning the forest, eroding the land or destroying the animals and fishes when they and their families are hungry. It is difficult to take an altruistic viewpoint on reducing global greenhouse gas production when there is such a discrepancy between the world's rich and the world's poor. In other words, it is not easy to be green when you are in the red! The need to strengthen moral and religious beliefs and the idea of sacrifice for the common good and survival of future generations are admirable philosophies which should be practised by every element of society as part of their everyday life, not just those who demonstrate such beliefs in closed communities.

Smallholder farms, though ecologically sustainable, are basically traditional systems which need further technical improvements to increase the farm outputs, hence profitability, to satisfy the food requirements of rising human population. However, research activities directly relevant to the development of small-scale production systems have received little attention from both scientists and policy makers of the developing countries. Chantalakhana and Skunmun (2002) argue that most scientists and high level administrators have been overly influenced by, and even overwhelmed with, the commercial production of commodities for export to earn foreign exchange, with insufficient emphasis on import replacement.

Since most smallholder dairy farms have the potential to be technically, socially and ecologically sound, and they constitute the majority of milk production systems in South and East Asia, it is not only economical but also ethical to give real attention and effective support to their sustainable development. Short-term gain and quick profit incentives must be seriously and carefully evaluated against any loss of natural resources and human survival in the long term. That is not to say that with appropriate management and sound government policies, large commercial dairy farms cannot contribute to the milk flow. However, even after 20 or 30 years of bitter experience, there are still far too many instances where large dairy operations have failed because not enough attention has been given to the basics (namely the nine links in the supply chain of a profitable dairy enterprise as described in Chapter 2).

Unlike crop science, most dairy production and health research is confined to the research station or laboratory. Such research can be criticised for not being relevant or practical enough to solve the 'real farm problems'. Unfortunately, far too many dairy scientists are 'compartmentalised' in their scientific thinking rather than intuitively looking 'at the big picture' and employing a farming system or holistic approach to their work. Very few seem interested in, or have a real understanding of, the concept of sustainable farming, and there is little evidence of local farmer participation from the beginning to the very end of any project. Local farmers' knowledge and problems must form the basis of their research. Changes in technical efficiencies can have carryover effects on socio-economics. Because village animal production involves the entire family, men, women, old and young including children, it must consider the needs and limitations of all these potential stakeholders in any one smallholder dairy farm.

In addition, research organisations in developing countries need to review their philosophies on science and technology and direct them more to the needs of farmers and local communities, not towards international publications or their own self-interest. As Chantalakhana and Skunmun (2002) express it so eloquently, 'Animal scientists working on sustainable livestock production must be those with utmost interest in people, and not only money.'